

Fresno County General Plan Background Report

Adopted
October 3, 2000

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The Fresno County General Plan Update was a multi-year process. Many elected and appointed officials and members of the public participated in this update. Their contributions are appreciated.

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FRESNO COUNTY GENERAL PLAN BACKGROUND REPORT SUMMARY OF REVISIONS

The Fresno County General Plan Background Report has been modified to incorporate changes directed by the Board of Supervisors in adopting the General Plan on October 3, 2000. The modifications take the form of replacement pages as listed below:

(NOTE: Replacement pages have been incorporated into the following (web version) Background Report.)

- Revised cover and title page to show adoption date.
- Updated Report Credits page.

Chapter 1

Pages 1-44

- Revised third and fourth sentence of the third paragraph.
- Revised second sentence of fifth paragraph.
- Changed pagination.

Pages 1-45 and 1-46

- Revised Table 1-16 as follows:
 1. Changed population holding capacity for Del Rio from “N/D” (no data) to 350 (residents);
 2. Changed the total population holding capacity for the specific plan areas from 139,173 (residents) to 25,050 (residents);
 3. Changed the total unincorporated population holding capacity to 316,521 (residents); and
 4. Changed the total county population holding capacity from 1,679,572 (residents) to 1,565,821 (residents).

Pages 1-75 and 1-76

- Added new heading “California State Lands Commission” and two new paragraphs of text.
- Revised the text under the heading ” San Joaquin River Parkway.”

Page 1-88

- Revised definition of Sphere of Influence.

Chapter 5

Page 5-54

- Revised first paragraph under the heading “Law Enforcement.”

Chapter 7

Page 7-64

- Revised fourth sentence of third paragraph.

Page 7-65

- Changed heading “San Joaquin Parkway Plan” to “ San Joaquin River Parkway Master Plan.”

Page 7-66

- Revised first paragraph under the heading “Aggregate Resources.”
- Revised second sentence in the third paragraph under the heading “Aggregate Resources.”

Page 7-72

- Revised the eighth bulleted item.

Page 7-74

- Revised last bibliographic listed on page.

Figure 7-8

- Updated figure to show locations of mineral resources based on Special Publication 103 (Revised 1999).
- Revised source reference.

Figure 7-9

- Revised source reference.

Figure 7-10

- Revised source reference.

Figure 7-11

- Revised map to correct errors.
- Revised source reference.

Figure 7-12

- Revised map to correct shape and the designation of certain areas.
- Revised source reference.

Figure 7-13

- Revised map to correct the shape and designation of certain areas.
- Revised source reference.

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INTRODUCTION



This document contains revised background information compiled for the Fresno County General Plan. This document is an update to the *Public Review Draft Background Report* published in May 1997. The report has been revised based on public comments on the May 1997 *Background Report*, information developed for the *Economic & Growth Scenarios Report*, and other work completed more recently as part of the General Plan Update. This document, however, does not represent a wholesale update of the May 1997 *Background Report*: the overall baseline date for the General Plan Background Report, 1996-1997, has not changed and most of the information in the document has not been updated to 1999. However, key information, such as population projections, has been updated.

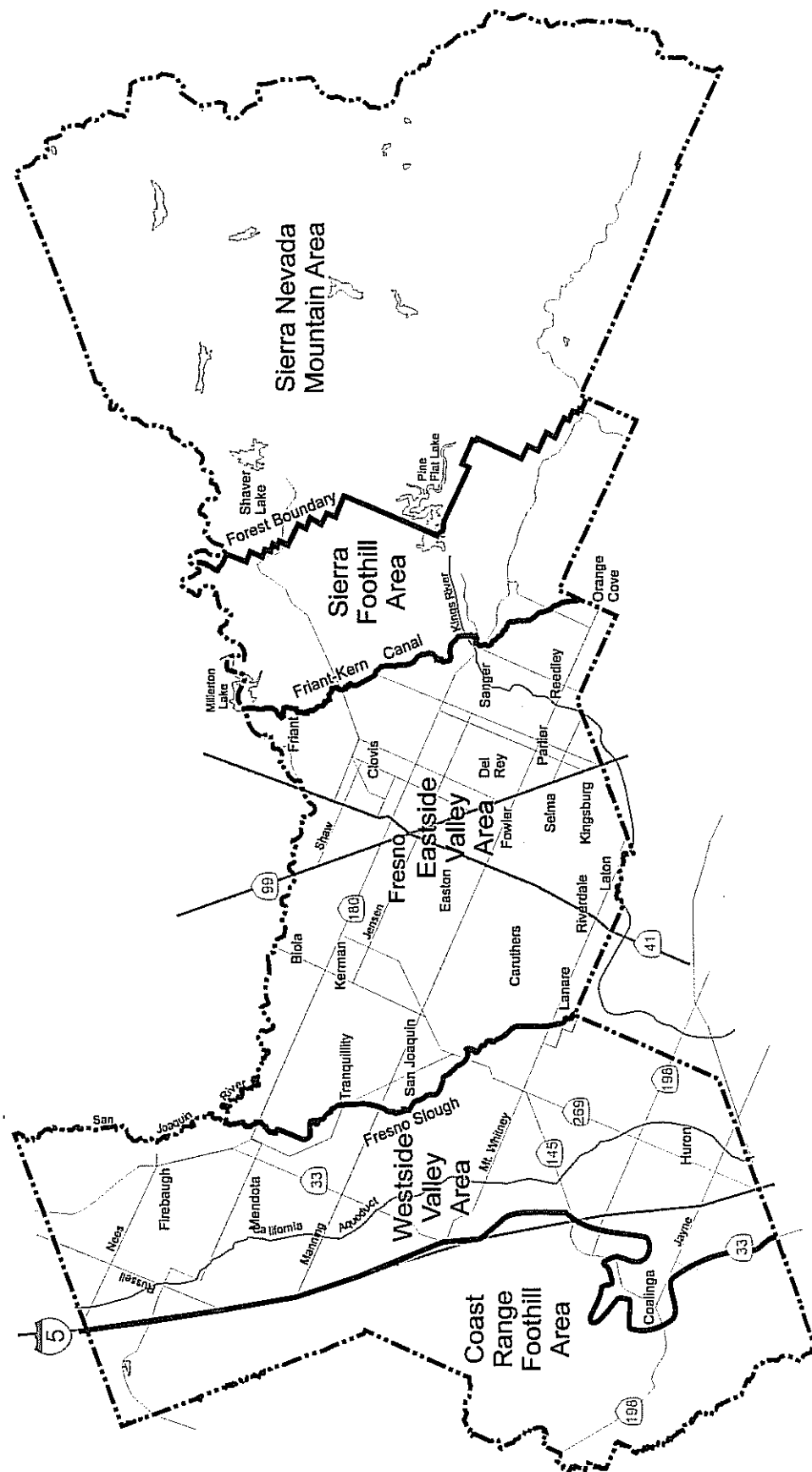
The report discusses all the significant issues to be addressed in the Plan and also serves as the "environmental setting" portion of the environmental impact report being prepared for the *General Plan*.

The Background Report was prepared by a multi-disciplinary consulting team headed by J. Laurence Mintier & Associates. It is organized into ten chapters and was prepared as follows:

Chapter 1:	Land Use and Population	Crawford, Multari, Clark, & Mohr
Chapter 2:	Agriculture	Crawford Multari, Clark, & Mohr
Chapter 3:	Economic and Fiscal Considerations	Applied Development Economics, Crawford, Multari, Clark, & Mohr
Chapter 4:	Transportation and Circulation	DKS Associates
Chapter 5:	Public Facilities and Services	EIP Associates, Montgomery Watson
Chapter 6:	Recreation, Archeology, and Historical Resources	Crawford, Multari, Clark, & Mohr
Chapter 7:	Natural Resources	EIP Associates, Montgomery Watson
Chapter 8:	Air Quality	Mintier & Associates
Chapter 9:	Safety	EIP Associates
Chapter 10:	Noise	EIP Associates

Additionally, Crawford, Multari, Clark, & Mohr coordinated preparation of the Background Report maps. Mintier & Associates was responsible for compiling and editing the entire report.

Figure 1 divides the county into five geographic areas, which are referenced several places in the Background Report.



CHAPTER 1: LAND USE AND POPULATION



1.1 INTRODUCTION

The policies, programs, and standards of the general plan must be based upon a thorough and accurate understanding of existing conditions within the county if the goals of the plan are ever to be achieved. The existing conditions to be understood involve such diverse topics as the physical characteristics of the county (related to both the natural and built environments), social and economic characteristics (the nature of the population and the economy), the type and responsibilities of local governmental institutions, and the nature of existing government policies (such as those in the present *Fresno County General Plan*).

Chapter 1 reviews the present context for land use planning in Fresno County. The chapter describes how land in both the cities and unincorporated areas of the county is currently used, and assesses the potential for additional development that is either implied or explicitly authorized by existing planning policies. The discussion of existing land uses and land use policies and regulations is based upon both a detailed land use inventory (using information furnished by the Fresno County Geographic Information System), and a review of current planning documents, including the present *Fresno County General Plan* and *Zoning Ordinance*, the general plans of each of the incorporated cities in the county, and the plans of other levels of government covering land in Fresno County, such as state, federal, and regional planning agencies.

When considering the seven topics or *elements* that a general plan is required by state law to cover (land use, circulation, housing, conservation, open space, noise, safety), the issue of land use is probably of greatest interest to the public. The *Land Use Element* of the general plan determines the locations within the unincorporated areas of the county where agricultural, residential, commercial, and industrial land uses may occur at present and in the future. The *Land Use Element* also works with the other parts of the plan to determine the location, rate, and timing of growth, public facilities and infrastructure, and to identify areas of the county where human activities should be limited because of sensitive environmental characteristics, natural or human-caused hazards. This chapter provides some of the background information necessary to the development of a new land use element for the *Fresno County General Plan*.

1.2 SUMMARY OF EXISTING PLANS

The following discussion is an overview of the various official County planning documents and their policies that affect land use in Fresno County. The section includes summary reviews and evaluations of four different levels of plans: elements of the present *General Plan* that address county-wide issues; elements of the five regional plans; the various community plans; and specific plans that have been adopted as part of the *Fresno County General Plan*. The purpose is to provide a summary of existing County land use plans and policies and to determine the implications of each plan on growth and development in the unincorporated areas. Later sections of this chapter evaluate the implications of the general plans of each of the incorporated cities, county-wide

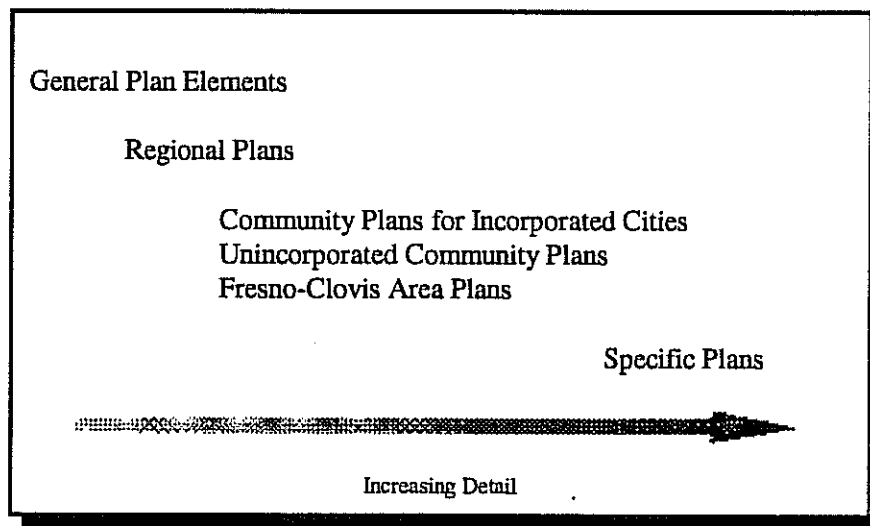
functional plans undertaken within the county, and the policies of regional governmental agencies that may affect growth in Fresno County.

1.3 FRESNO COUNTY GENERAL PLAN

The last comprehensive revision of the *Fresno County General Plan* was completed in February, 1976. The Plan consists of nine elements: land use, transportation, scenic highways, parks and recreation, open space/conservation, safety/seismic safety, noise, housing, and public facilities. According to State law, the parks and recreation and public facilities elements are optional. A scenic highways element is no longer required in accordance with revisions to Section 65302 of the California Government Code enacted in the years since the *Plan* was adopted. All of the elements have been amended several times over the years since adoption.

PLAN ORGANIZATION

The *General Plan* is organized into a hierarchy of increasingly detailed plans for subareas of the county, as follows:



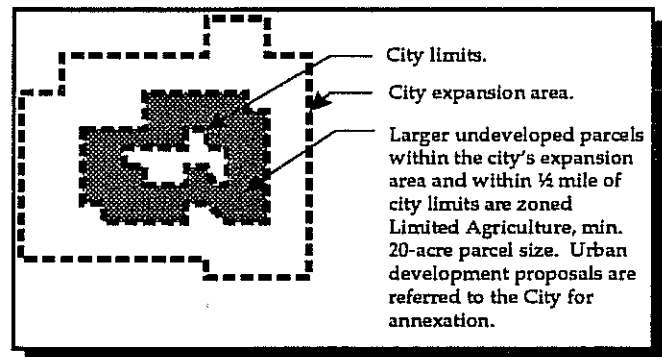
The individual general plan elements provide goals, policies, and programs that apply generally throughout the county. Five regional plans are provided for areas outside incorporated cities and community plan areas. The general plan also includes land use plans for the unincorporated areas surrounding all fifteen incorporated cities in the county. There are also separate plans for unincorporated communities and neighborhoods and six specific plan areas. Together, the regional, community, and specific plans form a mosaic that governs land use for the unincorporated areas of Fresno County. Each of these plan categories are discussed in greater detail below.

GROWTH AND DEVELOPMENT POLICIES

The urban areas of Fresno County began as small agricultural service centers that grew proportionately with the expansion of agribusiness in the central San Joaquin Valley. Initially, towns, and later cities, were located along the early stage routes and the Southern Pacific Railroad right-of-way, followed much later by the development of State Route 99. The size of communities varies dramatically. The Fresno/Clovis metropolitan area, one of the most populous in the state with almost 500,000 residents, is the center of business, education, and cultural activities in the county. At the other end of the spectrum are numerous rural villages with just a few hundred year-round residents.

The *General Plan* distinguishes between *intensive* and *non-intensive* development policies. Non-intensive policies pertain to non-urban types of land use, such as agriculture, rangeland, river influence areas, and open space. Intensive development policies relate to urban development, such as rural and urban residential, commercial, industrial, and planned rural communities. The *General Plan* provides guidance for the location and pace of additional urban development through the various regional, community, and specific plans.

The policies of the *Fresno County General Plan* do not specifically address the pace of new development in the unincorporated county. Section 205-02 of the *Land Use Element* provides policies to guide the development of the so-called "fringe areas" adjacent to the cities. In general, these policies seek to concentrate urban development within each city and to restrict the untimely encroachment of urban development onto productive agricultural land. To that end, undeveloped land



within a city's planning area that is planned for urban development is placed in a Reserve designation and zoned Limited Agriculture with a minimum parcel size of twenty acres. Urban development proposals in the Reserve are processed by the County only if requested by the City Council. Areas within a city's expansion area containing existing urban development, and within one-half mile of the city limits are zoned for such uses consistent with the County's community plan if they are fully developed. Larger undeveloped or underdeveloped properties are placed in a holding/limited agricultural zone district. Urban development proposals within one-half mile of the city limits are referred to the City for annexation and are processed by the County only if released by the City when annexation is not feasible. Within a city planning area containing existing urban development and more than one-half mile from the city limits a holding zone is also used. However, intensive development is allowed, particularly in planned industrial areas, consistent with the Community Plan. A community water and/or sewer service and other infrastructure may be required as a condition of such development.

Similar policies guide the development of the unincorporated communities. The purpose of these policies is to maintain compact urban boundaries, optimize provision of urban services, and minimize intrusion of urban development onto productive agricultural land. Intensive development is accommodated consistent with the community plans.

LAND USE DESIGNATIONS

Table 1-1 describes the land use designations applied by the *General Plan* in the unincorporated areas of the county.

TABLE 1-1 SUMMARY OF EXISTING GENERAL PLAN LAND USE DESIGNATIONS Fresno County			
Designation	Description	Location	Density
Agriculture	Land designated for the production of crops and livestock, agriculture processing centers	Valley floor between Friant-Kern Canal and the coast ranges	20 acre min. parcel size
Irrigated Agriculture	Production of crops and agriculture processing facilities	East of the Friant-Kern Canal	20 acre min. parcel size
Westside Rangeland	Land designated for grazing and other agricultural operations; mining; oil and gas development; open space	Western Fresno County in the coast ranges	40 acre min. parcel size
Eastside Rangeland	Land designated for grazing and other agricultural operations; open space	Eastern Fresno County east of the Friant-Kern Canal	40 acre min. parcel size
River Influence Areas	Land designated for grazing and other agricultural operations; sand and gravel extraction; recreation; habitat	Kings River and environs from Pine Flat Dam to county line, and San Joaquin River from Millerton Dam to SR 145	20 acres
Open Space	Land or water areas which are essentially unimproved and planned to remain open in character	Non-agricultural and mountain areas	5 acres
Public Lands and Open Space	Unimproved and planned to remain open in character	Various locations east of the Friant-Kern Canal	5 acres
Reserve	Land designated for limited agriculture	Within city spheres of influence	20 acres
Rural Residential	Rural homesites	Various locations on the valley floor	1 du/2 acres

TABLE 1-1

**SUMMARY OF EXISTING GENERAL PLAN
LAND USE DESIGNATIONS
Fresno County**

Designation	Description	Location	Density
Foothill Rural Residential	Rural homesites	Various locations east of the Friant-Kern Canal	1 du/2 acres
Rural Settlement	Non-urban community in a rural setting	Rural areas on the valley floor	1 du/2 acres
Low Density Residential	Residential development	Various locations, Community Plans	1 du/12/500 sq. ft.
Medium Density Residential	Residential development	Various locations, Community Plans	1 du/6,000 sq. ft.
Medium High Density Residential	Residential development	Various locations, Community Plans	1 du/2,400 sq. ft.
Mountain Residential	Recreation oriented residential	Mountain communities	1 du/2-5 acres
Mountain Urban	Various intensities of residential, commercial and other land uses	Mountain communities	As determined by zoning
Neighborhood Commercial	Commercial activities serving a local area	Community Plans	No min. lot size required
Office Commercial	Land designated for administrative, business, medical, professional and general offices	Community Plans	1 du/2,400 sq. ft.
Community Commercial	Land designated for development of a unified retail center located on the periphery of a community	Community Plans.	No min. lot size required.
Central Business Commercial	Land designated for commercial centers that carry a full range of products and offices	Community Plans	No min. lot size required
Regional Commercial	Land for regional commercial center serving 50,000 persons or more	Community Plans	No min. lot size required
Highway Commercial	Land designated for one-stop concentrated service nodes for the traveling public	Freeway interchanges	No min. lot size required

TABLE 1-1

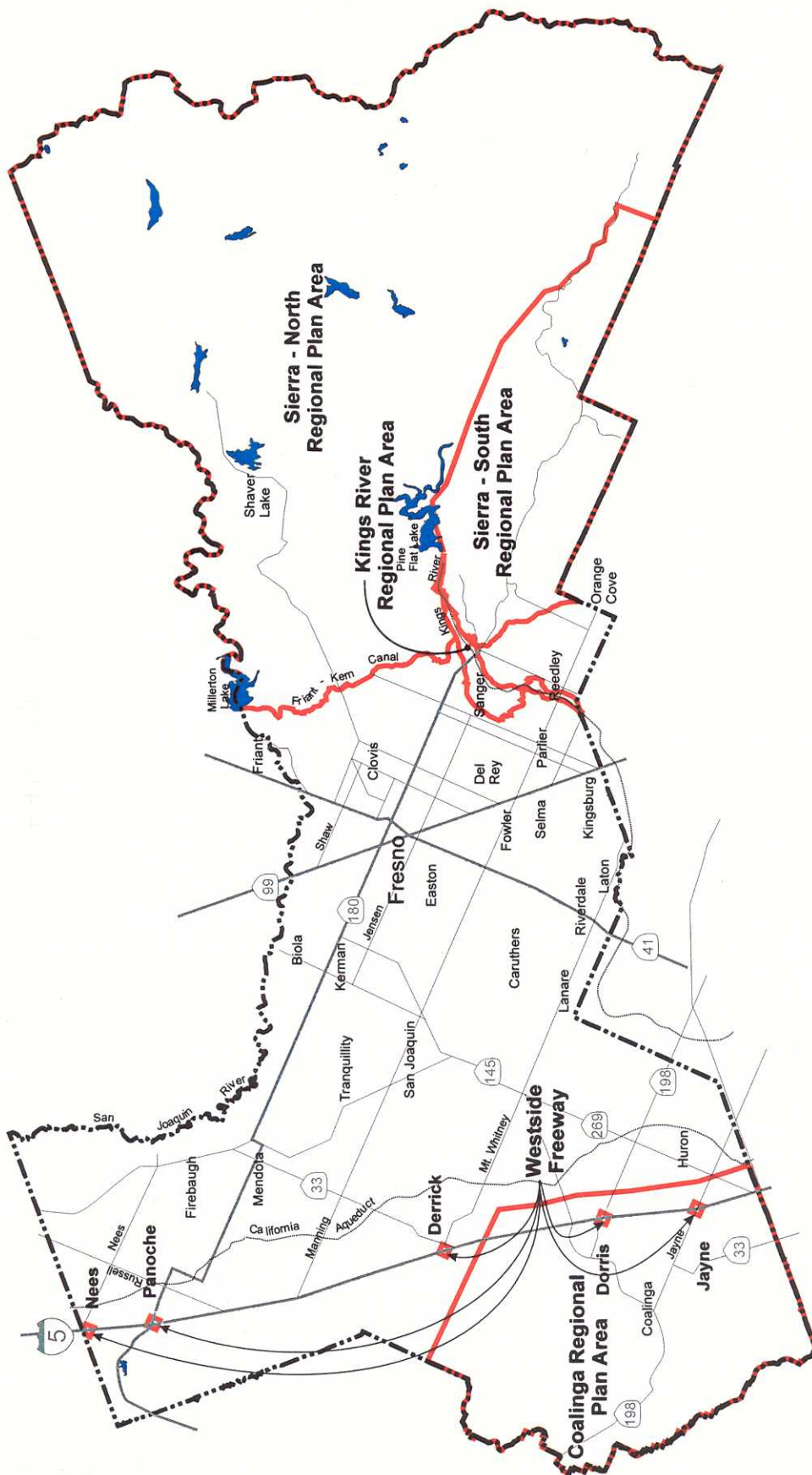
**SUMMARY OF EXISTING GENERAL PLAN
LAND USE DESIGNATIONS
Fresno County**

Designation	Description	Location	Density
Service Commercial	Land designated for general commercial uses that require large building sites	Community Plans	No min. lot size required
Mountain Commercial	Mixed retail, service, heavy commercial, and residential uses in mountain areas	Mountain communities	1 acre min. lot size
Special Commercial	Commercial that does not fit into any of the other commercial categories		No min. lot size required
Limited Industrial	Restricted, non-intensive manufacturing, and storage businesses	Community Plans	No min. lot size required
General Industrial	Full range of manufacturing, processing, and storage	Community Plans	No min. lot size required
Golden State Industrial Corridor	General industry along the SR 99/SP Railroad right-of-way	Along SR 99 from Kingsburg to Fresno	No min. lot size required
Public Facilities	Land designated for services and facilities which are necessary for a community	Schools, civic centers, parks, etc.	No minimum lot size required
Railroad Corridor	Land designated for railroad facilities	SP right-of-way and others	N/A
Planned Rural Community	Land designated for the adoption of a specific plan for low- and medium-density residential land uses	Semi-rural areas	Not to exceed 2 du/acre

Source: Fresno County General Plan, 1977

REGIONAL PLANS

Regional plans have been prepared for five sub-areas of the county where more precise policies and standards are needed to address specific resource issues such as open space and agricultural land preservation. Regional plan areas are shown in Figure 1-1. Each Plan covers three primary topics: land use, transportation, and environmental resource management.



 Regional Plan Boundary
 Westside Freeway Plan Areas

Sierra-North Regional Plan

The *Sierra-North Regional Plan* covers northeastern Fresno County and land within the Sierra Nevada lying east of the Friant-Kern Canal and north of the Kings River. The Plan covers an area of about 2,270 square miles which is more than one-third of the land in Fresno County. The area within the community of Shaver Lake governed by the *Shaver Lake Community Plan* and the area covered by the *Kings River Regional Plan* are excluded (see Figure 1-1). About 84 percent of the land within the planning area is owned by the federal government in the form of national parks and forests. Private ownership consists primarily of grazing and timber holdings.

The *Sierra-North Regional Plan* covers a timeframe of 10 years and was prepared in response to growing development pressures within the foothills and mountain communities. The land use element discusses a wide range of issues, including constraints to development, rural residential development, public facilities and services, and population forecasts. The Plan projects a five percent annual population growth rate through the year 1990, the last year for which projections are made, and a buildout population of about 14,000 persons. The *Land Use Element* provides policies for non-intensive (open space and rangeland) and intensive (residential, commercial, and industrial) land uses and includes guidance for the location of new towns.

Coalinga Regional Plan

The Coalinga Region is located in the southwestern portion of the county and includes about 580 square miles bounded on the east by Interstate 5, township 19 to the north, and the county line to the south and west, and excluding the area within the *Coalinga Community Plan*. The Coalinga region is diverse and includes agricultural and range land, the foothills of the coast ranges, mineral resource mining sites, oil fields, as well as fragile environmental resources. The Plan covers a timeframe of about twenty years during which the population of the area is expected to decline slightly. Included in the planning area is the proposed Coalinga Air Cargo Port which is expected to generate a substantial number of jobs as the airport is developed into a regional export center for agricultural products.

Limitations to development of the area include local and regional policies relating to the preservation of agricultural and range land; natural hazards such as flooding and earthquakes; the availability of water; local and regional policies intended to preserve sensitive natural plant and animal habitats; and expanded oil field operations.

The *Land Use Element* provides goals and policies, as well as development standards and criteria for residential, commercial, industrial, and open space/agricultural land uses. The *Environmental Resources Management Element* emphasizes the need for groundwater management and the need for sensitive development of expanded oil and mineral resource extraction operations.

Westside Freeway Sub-Regional Plan

The *Westside Freeway Sub-Regional Plan* provides guidance for land use along the Interstate 5 freeway in western Fresno County. The main objectives of the Plan are to manage continued commercial development at appropriate locations along the freeway corridor and to help preserve the scenic amenities along the freeway. Major new development is designated for the Panoche Road, Doris Avenue, and Jayne Avenue interchanges. Less intensive commercial development will

be allowed at the Nees Avenue and Derrick Avenue interchanges. The remaining interchanges are limited to agricultural uses.

Kings River Regional Plan

The Kings River originates in the high Sierra Nevada and flows to the San Joaquin Valley where it has deposited rich alluvial soils that have contributed greatly to the agricultural economy of Fresno County. This unique river area is rich in natural resources such as natural woodland and riparian vegetation; valuable rock, sand, and gravel resources; and abundant water. The planning area consists of about 19,500 acres located in east-central Fresno County along the Kings River extending from Pine Flat Dam to the Fresno-Tulare County line near Reedley. The planning area includes all of the land within the river valley proper and within one-quarter mile on each side of the river channel. No specific timeframe is provided.

The primary objectives of the *Plan* are to protect the sensitive biological and agricultural resources along the river, to protect people and property from flood damage, and to provide for the conservation, utilization, and development of mineral resources while minimizing impacts from the extraction activities. The *Plan* provides policies and standards intended to preserve large lot agriculture and open space along the river, and to limit the expansion of residential and other intensive uses to areas where impacts on the river system and surrounding resources will be minimized.

Sierra-South Regional Plan

The *Sierra-South Regional Plan* covers an area bounded by the *Kings River Regional Plan* on the northwest, the South Fork of the Kings River to the north, Kings Canyon National Park on the east, Tulare County to the south, and the Friant-Kern Canal to the west. The planning area includes the foothills of the Sierra and covers a timeframe of about ten years.

Land uses within the planning area include agriculture, rangeland, rural homesites, and timber harvesting. As with the Sierra-North planning area, the federal government is the largest land owner. Most of the remaining private land is included within land conservation contracts. The main objectives of the plan are to preserve the scenic open space character of the area and to concentrate new development in appropriate locations where impacts to the area's sensitive resources can be minimized. The Plan projects a population of about 6,700 in 1995, the last year for which projections are provided.

Constraints to development include water supply; sensitive natural habitat; wildfire hazard; and expansive soils.

PLANS FOR UNINCORPORATED COMMUNITIES

As discussed above, the *Fresno County General Plan* establishes a broad policy framework that guides land use decisions in the unincorporated areas. Because of the diverse geography and land uses within the county (ranging from highly urbanized areas, to the intensive agricultural uses on the San Joaquin Valley floor, to the High Sierra), individual community plans have been prepared within the framework of the overall county plan to address the unique issues and concerns arising in the different unincorporated areas. The community plans supplement the countywide general

plan for the areas that they cover, and address land use, circulation, housing, public services, and other issues in much the same way that the general plans of the incorporated cities address such issues, although not to the same level of detail. The plans contain specific goals, policies, and programs that apply to each particular community and area.

The characteristics of the unincorporated areas with community plans are summarized on Table 1-2 and the areas they cover are shown by Figure 1-2. Table 1-2 is a summary of land use for each community plan and a comparison of existing population with buildout population. Many of the community plans were adopted in the 1970's not long after adoption of the last comprehensive revision to the overall *Fresno County General Plan*. The target date or buildout timeframe for many of these plans has passed or is fast approaching, as shown by Table 1-2, which raises concerns about whether they are still valid. It is difficult to determine the population of unincorporated communities since many of the communities are not Census Designated Places (CDPs) and are thus not disaggregated from the overall County population by the U.S. Census. Therefore, the population estimates provided reflect the most recent data available.

Constraints that May Limit Community Plan Buildout

The primary constraint that could limit the buildout of the unincorporated areas to a lower level than anticipated by the community plans is the availability of funding for needed infrastructure improvements; the availability of a sustainable water supply; air quality regulations; flooding and other natural hazards; topography (especially in mountain communities) and other physical limitations such as rivers or political boundaries; and local and regional policies that seek to preserve productive agricultural land. Another factor that could limit growth in the unincorporated communities is the extent to which the incorporated cities absorb the projected increase in developmental pressures expected within the county.

Public services for the community plan areas are provided mainly by community services districts (County service areas) and other special purpose districts that provide a variety of services including fire protection, sewage disposal, water, parks and recreation, and schools. Where the districts exist, each parcel within a district pays an assessment and/or monthly fee to help cover the costs of providing desired services. New development is also sometimes required to construct additional facilities and/or pay impact fees for the expansion of facilities to cover the cost for new services generated by the development, in addition to the annual assessment on existing property.

Growth Policies

Development within community plan areas is expected to be market driven and continue into the future at a similar pace as in the past.

TABLE 1-2
SUMMARY OF UNINCORPORATED COMMUNITY PLANS
Fresno County
1997

Community Plan	Year of Adoption	Target Year/Time-Frame For Plan	Most Recent Revision	General Location	Population (year)	Buildout Population (year)
Biola	1976	1996	1990	East of Fresno, south of Shaw Avenue	702 (1980)	745 (1990)
Caruthers	1959	1979	1993	West of SR 41 at Mtn. View and Henderson Road	1,603 (1990)	1,940 (2010)
Del Rey	1976	1996	1990	East of Fowler, southwest of Sanger	1,150 (1990)	1,235 (1990)
Friant	1964	1984	1983	South of Millerton Lake	372 (1990)	None stated
Lanare	1977	1997	1982	North of NAS Lemoore, west of Riverdale	265 (1982)	220 (1990)
Laton	1969	1989	1981	East of SR 41 on Mt. Whitney Ave.	1,415 (1990)	1,600 (1995)
Riverdale	1960	1980	1992	West of SR 41, north of Co. line	1,980 (1990)	2,691 (2010)
Shaver Lake	1978	1998	1986	SR 168 at Shaver Lake	770 (1980)	9,300 (2000)
Tranquillity	1967	1987	1984	Junction of James Road and Colorado Avenue	515 (1981)	None provided

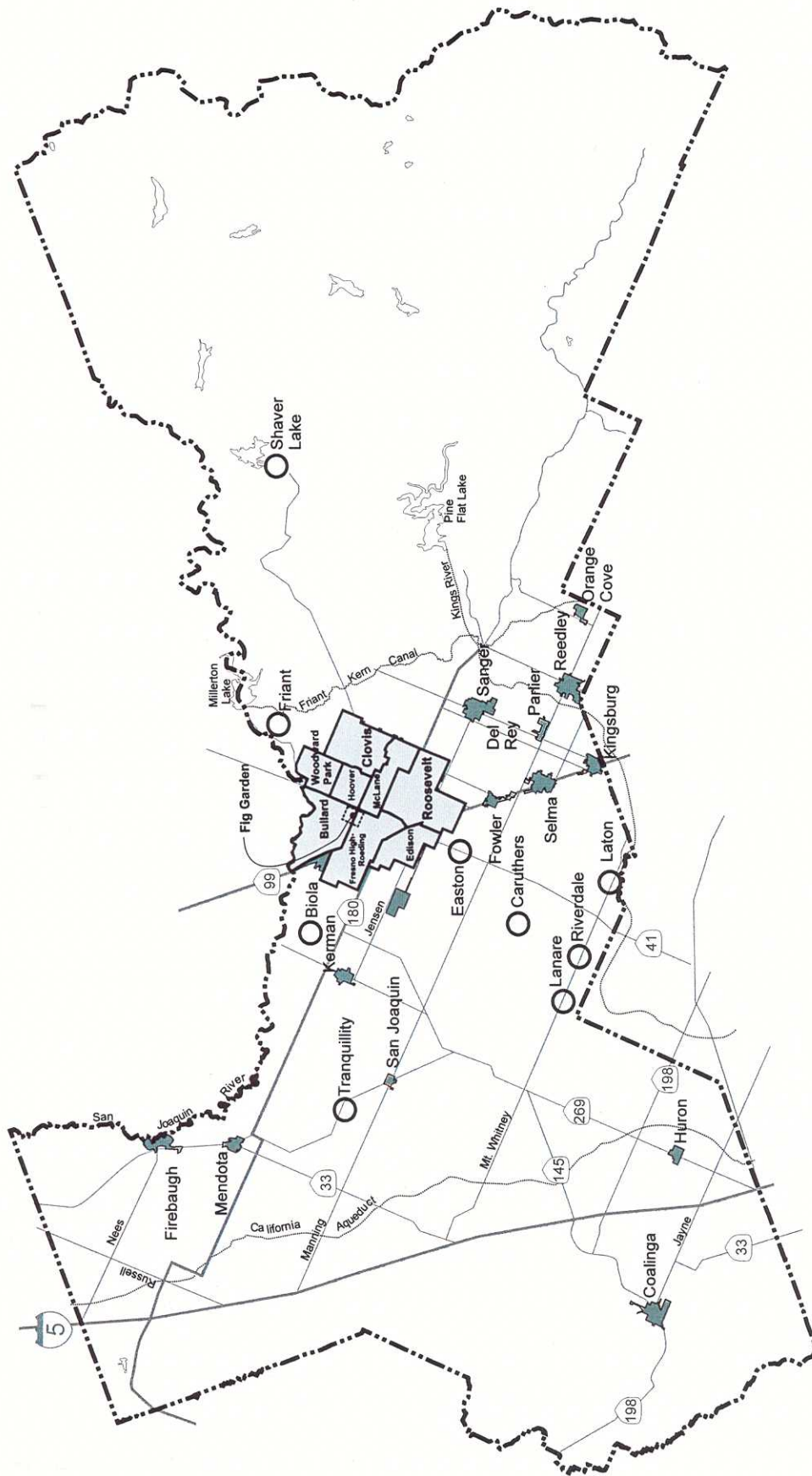
Source: *Fresno County General Plan, 1976*

NOTE:

1. Population estimates for 1990 are from the 1990 US Census, Summary Statistical File 3A. All other estimates are from Fresno County Public Works and Development Services Department, unless otherwise indicated.

FRESNO-CLOVIS AREA PLANS

The cities of Fresno and Clovis and the County have adopted Community Plans to provide more specific guidance for land use within the planning area and/or sphere of influence for the corresponding city (Fresno or Clovis). Planned urban development within these is expected to occur within the cities (see Figure 1-3, Community Plan Areas for the Fresno-Clovis Metro Area). Areas within the County's *Fresno-Clovis Community Plan* will experience an increase in population of about 130,000 residents during the next 25 years, according to the *Draft Plan*.



Fresno County General Plan

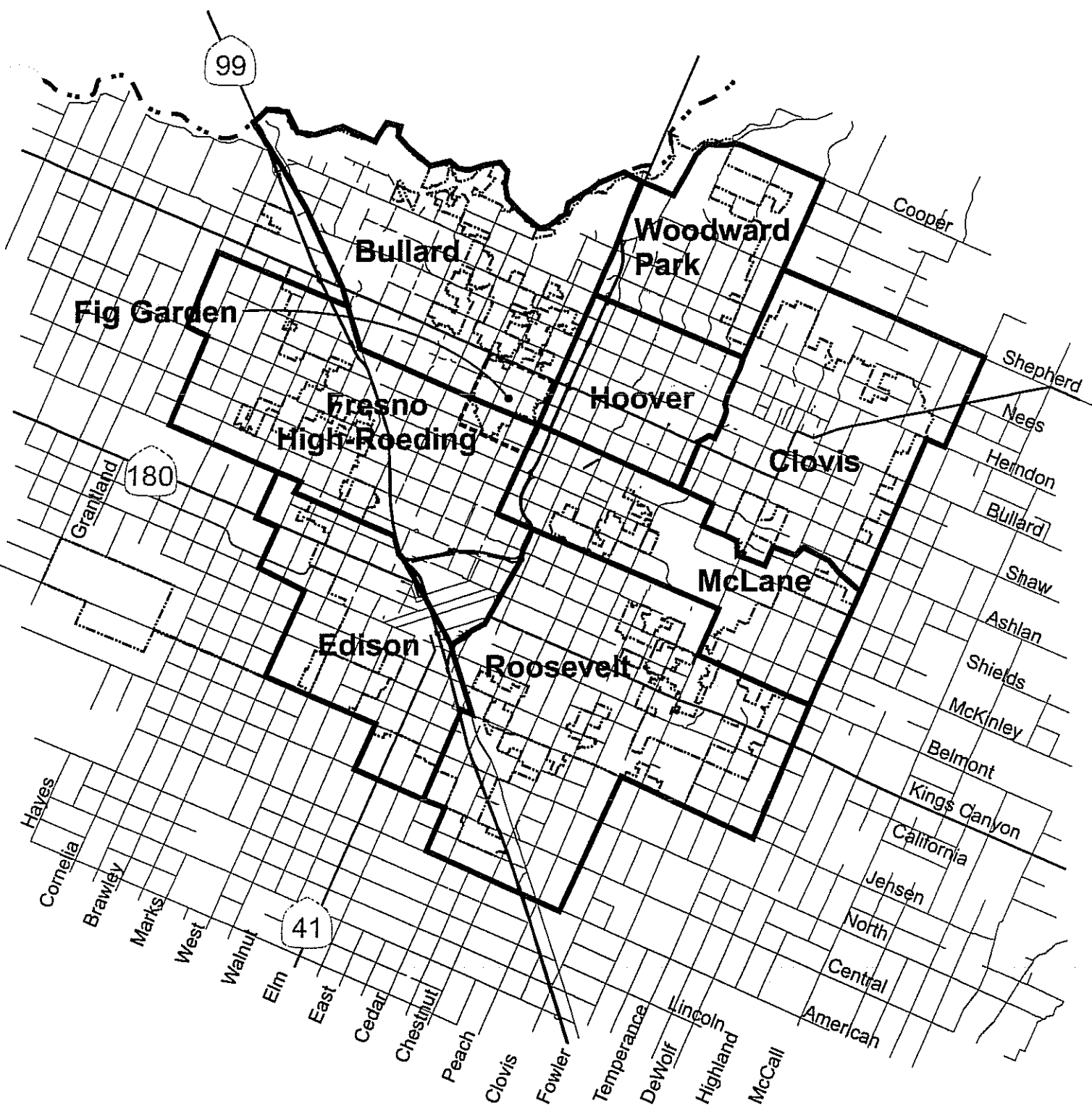
Community Plan Areas

Figure 1-2

 Incorporated Community
  Unincorporated Community

 Fresno Clovis Area Plan Boundary

Source: Fresno County General Plan, 1997; Fresno County GIS Database, 1997



<p>NORTH</p> <p>0 Miles 3</p>	<p>--- Fresno/Clovis City Limits</p> <p>— Community Plan Boundary</p>	<p>Fresno County General Plan</p> <p>Community Plan Areas for the Fresno Clovis Metro Area</p> <p>Figure 1-3</p>
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Source: Fresno County General Plan, 1978

Since most of these neighborhoods/communities are within the City of Fresno Sphere of Influence and are expected to ultimately be annexed to the city of Fresno, the Preferred Alternative for the *City of Fresno General Plan* (Alternative 10Z) provides population estimates for 1997 and a forecast of future population accommodated by the various communities and neighborhoods, as summarized in Table 1-3.

TABLE 1-3 POPULATION CAPACITY BY COMMUNITY City of Fresno General Plan Land Use Alternative 10Z, 1997		
Community	1997 Population Estimate	Buildout Population Accommodated By Land Use Alternative 10Z
Bullard	88,300	124,002
Edison	22,500	96,877
Fresno High	58,000	59,249
McLane	47,200	54,974
Roosevelt	111,000	154,167
Woodward Park	39,000	63,868
Hoover	N/A	N/A
Central Fresno	N/A	N/A
Source: <i>City of Fresno General Plan Land Use Alternative No. 10Z</i> , February, 1997		

Table 1-4 shows information on the Fresno-Clovis Area Community/Neighborhood Plans including year adopted, time frame of the plan, latest revision, location of the plan area. In addition, Table 1-4 compares the most recent estimate of the population of the community plan area to the build-out population and year (the year that the plan reaches its theoretical build-out capacity).

TABLE 1-4

SUMMARY OF FRESNO-CLOVIS AREA
COMMUNITY/NEIGHBORHOOD PLANSFresno County
1997

Community Plan	Year of Adoption	Target Year/ Time-Frame For Plan	Most Recent Revision	General Location	Population (year)	Buildout Population (year)
Bullard	1963	1983	1994	Northwest Fresno, west of SR 41, south of the San Joaquin River	64,300 (1987)	98,100 (2005)
Clovis	1976	1996	1991	City of Clovis and surrounding area	50,323 (1990)	91,531 (2010)
Edison	1980	2000	1984	Southwest Fresno, west of SR 99	24,152 (1974)	44,800 (2010)
Fresno High-Roeding	1979	1999	1993	Area bounded by SPRR, Ashlan Ave., Hayes Ave, Blackstone Ave.	67,251 (1974)	66,740 (1995)
Fig Garden*	1980	None stated	1985	South of Shaw, east of Fruit, north of Garland, west of Blackstone Avenues	7,000 (1979)	None stated
McLane	1981	2001	1995	East-central Fresno	37,862 (1974)	38,625 (1995)
Roosevelt	1979	1999	1993	Southeast Fresno	105,000 (1990)	203,400 (2005)
Woodward Park	1979	1983	1995	Northeast Fresno, south of San Joaquin River	5,754 (1980)	75,880 (2010)

Source: Fresno County General Plan, 1976, as amended

* Neighborhood Plan

NOTES:

1. Population estimates for 1990 are from the 1990 US Census, Summary Statistical File 3A. All other estimates are from Fresno County Public Works and Development Services Department, unless otherwise indicated.
2. Hoover Community Plan Area is entirely within the City of Fresno.

COMMUNITY PLANS FOR INCORPORATED CITIES

To insure that development administered by Fresno County in the unincorporated areas complements, rather than competes with, planned growth within the cities, the *Fresno County General Plan* includes land use plans for land surrounding the incorporated cities. These plans consist mainly of a land use map and very general policies which are intended to provide consistency between the general plans for the cities and the *Fresno County General Plan*. The community plans are the result of a cooperative effort among the County and the cities to develop a consistent framework for land use primarily within the sphere of influence of each city. The community plans are based on the city general plan that was in effect at the time the community plan was prepared and are shown on Figure 1-2.

Each community plan provides a projection of future population growth (including growth within the city), and provides standards for land use, circulation, and public services. Table 1-5 compares the date of adoption of the city general plans (including Fresno and Clovis) with the last recorded revision to the corresponding community plan. Table 1-5 shows that many of the corresponding city general plans have been updated since the last major revision to the community plan, raising questions of consistency between the two.

TABLE 1-5		
DATE OF ADOPTION OF CITY GENERAL PLANS AND INCORPORATED COMMUNITY PLANS		
Community	Last Revision to Incorporated Community Plan	Year of Adoption of City General Plan
Coalinga	September, 1991	1993
Fresno	March, 1997	1984
Clovis	July, 1991	1993
Firebaugh	December, 1989	1992
Fowler	December, 1984	1976
Kerman	May, 1983	1993
Kingsburg	January, 1989	1992
Huron	September, 1981	1992
Mendota	December, 1983	1992
Orange Cove	September, 1981	1979
Parlier-West Parlier	December, 1985	1985
Reedley	November, 1990	1994
Sanger	December, 1989	1988
San Joaquin	November, 1981	1996
Selma	March, 1994	1997
Sources:		
<div> City of Clovis General Plan, April, 1993 City of Fresno General Plan Update Land Use Alternative 10Z, February, 1997 City of Firebaugh General Plan City of Huron General Plan, Housing Element, 1992 City of Kingsburg General Plan, July, 1992 City of Sanger General Plan, September, 1988 City of San Joaquin General Plan, 1996 </div> <div> City of Coalinga General Plan, 1993 City of Fowler General Plan, 1976 City of Kerman General Plan, 1993 City of Mendota General Plan, 1991 City of Parlier General Plan, 1985 City of Reedley General Plan, August, 1994 City of Orange Cove General Plan, 1979 City of Selma 1997 General Plan Land Use Element Public Draft, January, 1997 </div>		

SPECIFIC PLANS

Specific Plans have been prepared for six areas of the County where more precise development guidance is required to address unique physical constraints and developmental pressures. The specific plans were prepared to address the requirements of Government Code Section 65450. Thus, each plan contains elements that correspond to those in the overall *Fresno County General Plan*: land use, conservation, open space, seismic safety, circulation, scenic highways, noise, and

housing, and include a separate element relating to public services and facilities. Most of the plans were prepared in the 1980s and have been amended several times since. Each specific plan element contains policies that guide development and preservation of resources within the planning area that supercede the County *General Plan*. In this sense, each specific plan is the general plan for a particular area. Specific plan areas are shown on Figure 1-4.

Shaver Lake Forest Specific Plan

The *Shaver Lake Forest Specific Plan* consists of about 2.6 square miles adjacent to Shaver Lake in eastern Fresno County about 50 miles east of the city of Fresno. The *Specific Plan* is designed to accommodate limited residential, commercial, recreation and public/quasi public land uses within the planning area of about 1,681 acres. The *Plan* accommodates a population of about 1,700 year-round residents and a peak summer population of about 8,600. A projected target date for buildout is 1985.

Constraints to full development include slope and topography; traffic; sewer and water supply limitations; wildfire hazard; and air quality.

Bretz Mountain Village Specific Plan

The *Bretz Mountain Village Specific Plan* was adopted in 1982 and governs an area south of Shaver Lake just east of Highway 168. The Village is intended to be developed as a recreation residential area with 977 dwelling units on 610 acres. Buildout population is expected to be about 2,500 residents, of which 635 will be year-round and 1,906 would be seasonal. Lot sizes range in size from 12,500 square feet to 31,000 square feet. In addition to residences, the *Plan* provides for limited local-serving commercial uses, open space, and public/quasi public development such as recreational facilities. About 330 acres, or 54 percent of the planning area, is designated as open space.

New development is required to connect to a community sewer and water system and served by County Service Area No.31. Expansion of the sewage treatment plant serving CSA No. 31 will be needed to accommodate additional development.

Wildflower Village Specific Plan

Wildflower Village is located about two miles southwest of Shaver Lake and abuts the *Shaver Lake Community Plan* area. Similar to the other mountain community specific plans, Wildflower Village is intended to accommodate primarily seasonal residential and recreational land uses on lots ranging in size from 19,000 square feet to about 29,000 square feet. The *Plan* designates a substantial amount of open space (340 acres, or 54 percent). The *Plan* will accommodate about 1,600 residents at buildout, of which about 435 will be year-round residents.

The *Plan* calls for the construction of community water and sewer systems to serve the project and to be annexed into County Service Area No. 41.

Limitations to development would include infrastructure capacity and financing of improvements, in addition to the other constraints affecting mountain communities.

Millerton Specific Plan

The *Millerton Specific Plan* area consists of 820 acres located two miles east of the community of Friant along both sides of Millerton Road just south of Millerton Lake State Recreation Area. The Plan was adopted in 1984 to accommodate an expected buildout population of between 8,000 to 10,000 residents. Land is designated for limited residential, commercial, public/quasi public and open space land uses.

A community water and sewer system is required for new development. Other services and utilities will be provided by the County or other service provider through a County Service Area, community services district or other mechanism. Limitations to development include the ability to finance infrastructure improvements; water supply limitations; air quality; and local and regional efforts to preserve open space.

Del Rio Specific Plan

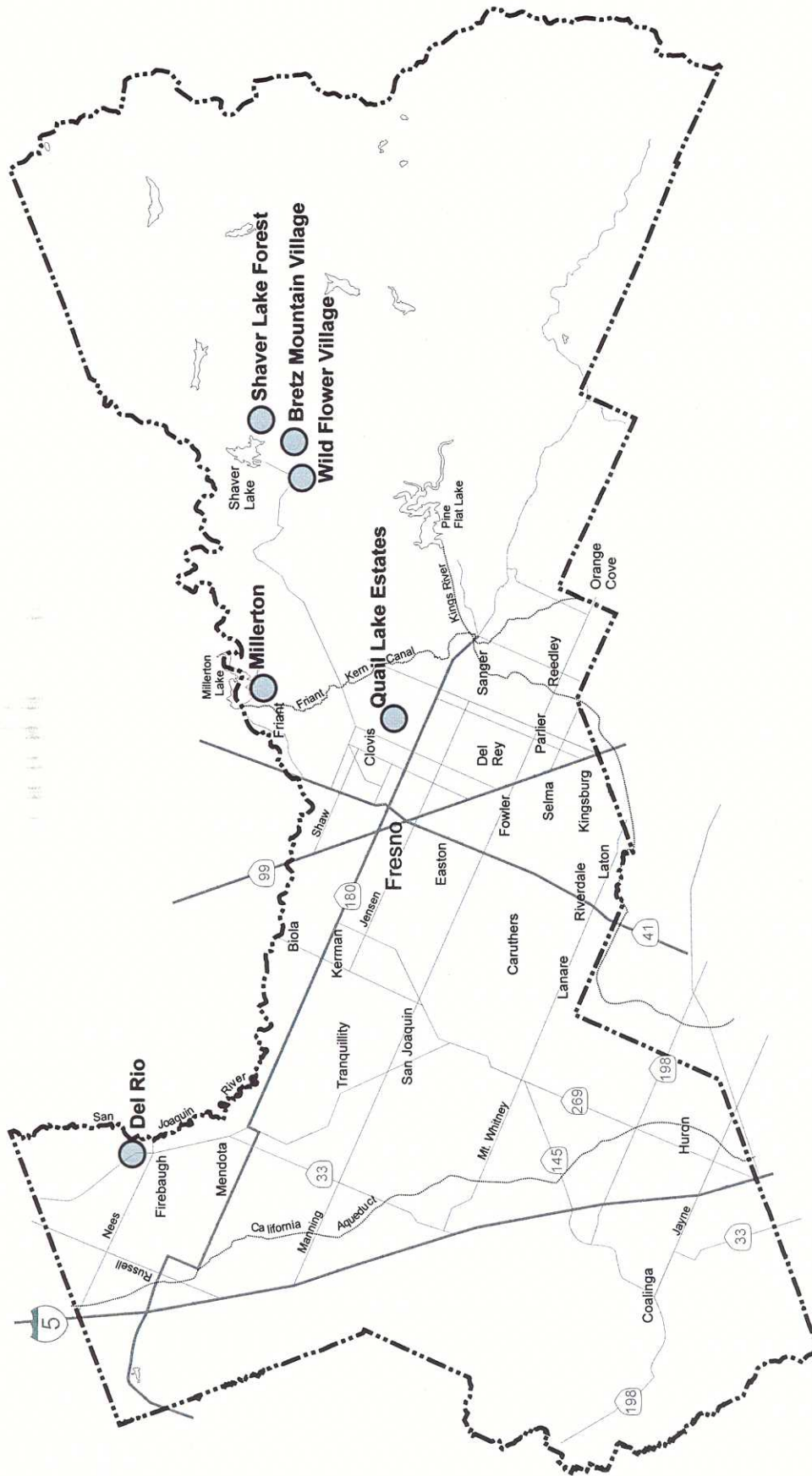
The *Del Rio Specific Plan* consists of about 91 acres located adjacent to the northerly boundary of the city of Firebaugh along State Route 33. The Plan was adopted in 1989 and is intended to be the final phase of a four-part County program to improve living conditions in the Del Rio area which has suffered from a lack of infrastructure, poor drainage, expansive soils, and inadequate water supply. Many of the structures in the area are substandard and will require substantial renovation and rehabilitation.

In 1986, the population of the Del Rio community was estimated to be about 350. However, the demolition of substandard housing over the years has caused the population to decline. The long-term goal of the Plan is to limit new development so that the problems facing the community can be solved. To alleviate water and sewer problems, the Plan calls for the extension of water and sewer service from the city of Firebaugh.

Quail Lake Estates Specific Plan

The *Quail Lake Estates Specific Plan* is the most recent of the specific plans adopted by the County (1994). The Plan addresses land use, circulation, housing, environmental resources, public facilities, and community design. The planning area is located east of the city of Clovis on 375 acres. Land use is primarily residential, although limited commercial and public/quasi public land uses are also designated in the *Specific Plan*. Densities range from 4,000 square foot "patio style" homes to estate lots of 20,000 square feet or more. The Plan could accommodate as many as 2,000 residents at buildout.

The community is proposed to be served by a community water and sewer system. Financing infrastructure improvements appears to be a major constraint to development. Other constraints include the availability of a reliable water supply, the presence of vernal pools and wetlands, traffic and air quality concerns.



Specific Plan Area



TABLE 1-6						
ADOPTED SPECIFIC PLANS LAND USE AND HOLDING CAPACITIES						
Specific Plan	Land Use Categories					Buildout Population
	Residential	Commercial	Public- Quasi Public	Open Space	Total Plan Area	
Quail Lake Estates	176	2	9	145	375	2,000
Del Rio	91	—	—	—	91	350
Millerton	612	51	40	44	820	8,000-10,000
Wildflower Village	254	5	—	340	607	1,600*
Bretz Mountain Village	277	3	—	330	610	2,500**
Shaver Lake Forest	1,594	87	17	468	1,681	8,600***
TOTAL	3,004	148	66	1,327	4,184	23,050-25,050
Sources: <i>Quail Lake Estates Specific Plan, 1994</i> <i>Del Rio Specific Plan, 1989</i> <i>Millerton Specific Plan, 1984</i> <i>Wildflower Village Specific Plan, 1982</i> <i>Bretz Mountain Village Specific Plan, 1982</i> <i>Shaver Lake Village Specific Plan, 1973</i> *435 year round **635 year round ***1,700 year round						

1.4 EXISTING ZONING SUMMARY

Fresno County's first zoning ordinance was adopted in 1938 as Ordinance 322. The current *Fresno County Zoning Ordinance* (Division VI of Part VII of the *Ordinance Code of the County of Fresno*) was adopted in 1960 and covers all of the unincorporated county. The *Code* has been amended several times since, but has not undergone a comprehensive update since 1960.

This *Background Report* discusses the *Fresno County Zoning Ordinance* because zoning regulations clearly indicate the extent and type of development that can occur in the unincorporated areas (and hence holding capacity and buildout potential). A major difference between the general plan and zoning is that the *General Plan* provides guidance on the location, type, density, and timing of new growth and development over the long-term, while zoning determines what development can occur on a day-to-day basis. Both the land use designations of the general plan and the zoning classifications and development standards of the zoning ordinance have the effect of determining the holding capacity and buildout potential of the county. Holding capacity and buildout potential

are measures of the ultimate population size and extent of development that could be allowed by the County based on current policies and regulations. Knowledge of what is possible under existing zoning is important in formulating the new general plan because the consequences of new land use proposals can best be understood when compared to the type and extent of development that is now possible.

FRESNO COUNTY ZONING ORDINANCE

The *Zoning Ordinance* establishes eleven residential designations, ten commercial, three industrial zones, and twelve other zones that are mainly related to agriculture, timber and other resource-related land uses. The purpose of the zones is to translate the broad land use categories established by the *Fresno County General Plan* into detailed land use classifications that are applied to property with much greater precision than the *General Plan*. The zoning classifications follow specific property lines and road alignments that correspond to the applicable *General Plan* categories. Working with the zoning classifications, the text of the *Zoning Ordinance* provides detailed regulations for the development and use of land.

Table 1-7 lists each of the zoning classifications, together with the minimum lot area allowed by the zone for new subdivisions of land, and the acreage of land in the unincorporated areas to which each zone is applied. The minimum lot area requirements are expressed in acreage or square footage, and represent the smallest lot size that could be approved in a new subdivision in the applicable zone. However, it is important to note that some zone districts have requirements for specific land uses that establish minimum lot areas larger than the minimum allowed in the zone. The *Zoning Ordinance* should be consulted for more information.

TABLE 1-7
ZONING CLASSIFICATIONS, MINIMUM PARCEL SIZE
AND ACRES ZONED
Fresno County
1997

	Zone District	Map Code	Purpose of District	Characteristic Uses Permitted in District	Dwelling Units Permitted Per Lot	Minimum Parcel Size	Acres Zoned
1	Rural Residential	R-R	Provide for rural residential and limited agricultural activity	Homes, crops and certain farm animals	One	2 acres	31,832
2	Single Family Residential Agricultural	R-A	Provide for single family residential homes in a semi-rural environment	Homes, Farming, cows, horse, goats, sheep, poultry and rabbits, schools, churches, kennels	One	36,000 sq. ft.	1,020
3	Single Family Residential	R-1-A (H)	Provide for single family residential homes on large suburban lots	Homes, crops, schools, churches, horses included in R-1-AH	One	20,000 sq. ft.	261
4	Single Family Residential Estate	R-1-E+ R-1-EH	Provide for single family homes at a semi-rural density	Homes, crops, schools, churches, horses included in R-1-GH	One	37,500 sq. ft.	241
5	Single Family Residential	R-1-B	Provide for single family homes in a suburban setting	Homes, home occupations, schools, churches, parks	One	12,500 sq. ft.	8,553
6	Single Family Residential	R-1-C	Provide for single family homes in a non-intensive environment	Homes, home occupations, schools, churches	One	9,000 sq. ft.	809
7	Single Family Residential	R-1	Provide for single family homes on small urban lots	Homes, home occupations, schools, churches, parks	One	6,000 sq. ft.	1,922
8	Low Density Multiple Family Residential	R-2 + R-2-A	Provide for multiple family residences, 1 story in height limitation in R-2A	Homes, duplexes, triplexes, etc. day nursery (limit 12 children), sanitariums, hospitals	1 du/ 2,400 sq. ft.	6,600 sq. ft.	205
9	Medium Density Multiple Family Residential	R-3 R-3-A	Provide for multiple family residences, 1 story in height limitation in R-3-A	Homes, multi-dwellings, fraternities, clubs, nursery schools, rest homes, hospitals	1 du/1,500 sq. ft.	7,500 sq. ft.	0
10	High Density Multi-Family Residential	R-4	Provide for multiple family residences	Homes, multi-dwellings, fraternities, clubs, nursery schools, rest homes (limit 24 patients), hospitals, lodges	1 du/1,000 sq. ft.	10,000 sq. ft.	0

TABLE 1-7
ZONING CLASSIFICATIONS, MINIMUM PARCEL SIZE
AND ACRES ZONED
Fresno County
1997

	Zone District	Map Code	Purpose of District	Characteristic Uses Permitted in District	Dwelling Units Permitted Per Lot	Minimum Parcel Size	Acres Zoned
11	Trailer Park Residential	T-P	Provide exclusive mobile home development	Mobile home parks and mobile home planned developments	1 trailer/2,400 sq. ft.	3 acres	135
12	Residential and Professional Office	R-P	Provide a transitional district between residential and other districts	Single and multiple family dwellings, business and professional offices, studios, libraries	1 du/ 2,400 sq. ft.	7,500 sq. ft.	9
13	Off-Street Parking	P	For permanent parking areas and parking structures	Boat and RV storage and off-street parking	None.	No minimum required.	108
14	Administrative and Professional Office	C-P	Provide an integrated professional district with multiple housing, offices and public institutions	Multiple dwellings, business and professional offices, studios, clubs, lodges, laboratories, pharmacies, banks, S&Ls	1 du/ 2,400 sq. ft.	10,000 sq. ft.	6
15	Neighborhood Shopping Center	C-1	Provide for small unified centers for neighborhood shopping	Grocery stores, drug stores, barber, beauty, cafe, clothing, hardware, gas station, nursery, cleaners, self-serve laundry	None	No minimum required.	49
16	Community Shopping Center	C-2	Provide for larger unified shopping centers serving a community of several neighborhoods	All C-1 uses, appliance sales, banks, bars, bowling, furniture, pets	None	No minimum required.	57
17	Regional Shopping Center	C-3	Provide for regional shopping centers serving a wide area usually more than one community	All C-1 and C-2 uses, auto parts, auto sales, hotels, and motels	None	No minimum required.	25
18	Central Trading District	C-4	Provide commercial activity for the downtown areas of unincorporated communities	All C-1, C-2 and C-3 uses, mortuaries, second hand stores, auto repair, boat sales	Min. of a triplex, mobile home for caretaker	No minimum required.	158

TABLE 1-7
ZONING CLASSIFICATIONS, MINIMUM PARCEL SIZE
AND ACRES ZONED
Fresno County
1997

	Zone District	Map Code	Purpose of District	Characteristic Uses Permitted in District	Dwelling Units Permitted Per Lot	Minimum Parcel Size	Acres Zoned
19	General Commercial	C-6	Provide for many commercial uses which do not belong in shopping centers or downtown areas and which are usually found along major thoroughfares	Most C-1, C-2, C-3, and C-4 uses, animal hospitals, drive-in restaurants, truck sales, body and fender, equipment rentals, feed and fuel stores	Mobile home for caretaker	No minimum required.	620
20	Agricultural Commercial Center	AC	Provide for commercial centers serving the agricultural communities	Agricultural equipment and supplies, grocery stores, drug stores, bars, service stations, restaurants	Caretaker residence plus one dwelling	60,000 sq. ft.	119
21	Rural Commercial Center	RCC	To provide locations for commercial centers serving rural residential communities	Service station, barber, grocery stores, hardware, plant nurseries, restaurants	Caretaker residence	1 acre	28
22	Commercial Recreation	C-R	Provide for planned integrated recreation centers including related service and commercial	Bowling, skating, miniature golf, swimming, clubs, lodges, bars, restaurants	None	No minimum required.	11
23	Commercial and Light Manufacturing	C-M	To permit a close relationship between warehousing, wholesaling, general retailing, and light manufacturing	Automotive work, warehousing, machinery shop, retail lumber, contractor, storage yards, light manufacturing, cabinet shops, welding	Mobile home for caretaker	9,000 sq. ft.	302
24	Light Manufacturing	M-1	Light industries which are generally not noisy or obnoxious	Most C-M uses, truck terminals, light manufacturing, used materials yards, blacksmiths, sheet metal, electric motor rebuilding, bulk petroleum	Caretaker home only	9,000 sq. ft.	1,125
25	General Industrial	M-2	Provide for a wider range of manufacturing and storage, including heavier uses	All M-1 uses, cotton compress and storage, ready mix concrete, wholesale limber	Caretakers home only	9,000 sq. ft.	223

TABLE 1-7
ZONING CLASSIFICATIONS, MINIMUM PARCEL SIZE
AND ACRES ZONED
Fresno County
1997

	Zone District	Map Code	Purpose of District	Characteristic Uses Permitted in District	Dwelling Units Permitted Per Lot	Minimum Parcel Size	Acres Zoned
26	Heavy Manufacturing	M-3	To provide for all manufacturing including heaviest and most intensive uses.	Heavy industrial uses, auto wrecking, rubble, solid waste disposal facilities.	Caretakers home only	9,000 sq. ft.	2,804
27	Resource Conservation	R-C	Provide for the conservation and protection of natural resources and natural habitat areas.	Grazing, growing and harvesting of timber, watershed management, wildlife preserves, low intensity parks.	One	40, 80, 160 acres	1,390,662
28	Timberland Preserve	TPZ	Preserve timberland for timber production.	Timber production, temporary lodging camps, sawmills, timber products processing plants.	Caretakers home only	40 acres	17,300
29	Recreation	RE	Provide for the proper development of recreational areas.	Forest stations and lookout stations, grazing and other agricultural uses	Caretakers home only	2 acres	2,779
30	Mountain Overlay	M	To be applied to all zoning districts except Open Conservation and Exclusive Agriculture. Uses are compatible with Mountain Residential and Mountain Commercial.	Uses are those of the underlying zoning district.	Requirements of underlying zone district apply	Requirements of underlying zone district apply	nd
31	Open Conservation	O	Provide permanent open space or to limit development in dangerous areas such as floodplains.	Agriculture, freeways, ponding basins, quarries (including sand and gravel), recreation areas.	Caretakers residence only	5 acres	3,787
32	Exclusive Agriculture	AE	Protect farming areas by permitting agricultural uses only and preserving agricultural lot sizes.	Farming, livestock, processing of agricultural products, agricultural related businesses, labor camps.	Depends on lot size or type of residential use	5, 20, 40, 80, 160, 320, or 640 acres	2,158,604
33	Limited Agriculture	AL	Preserve existing non-urban areas planned for urban expansion.	Farms and other non-intensive agricultural uses, labor camps, public buildings, churches.	Depends on lot size or type of residential use	20, 40, 80, 160, 320, or 640 acres	67,365

TABLE 1-7
ZONING CLASSIFICATIONS, MINIMUM PARCEL SIZE
AND ACRES ZONED
Fresno County
1997

	Zone District	Map Code	Purpose of District	Characteristic Uses Permitted in District	Dwelling Units Permitted Per Lot	Minimum Parcel Size	Acres Zoned
34	Agriculture	A1	Provide for the development of those unincorporated lands which are not included in other District classifications	Various	One residence per 5 acres	100,000 sq. ft.	410
35	General Agricultural	A-2	Protect farming areas but does permit industry or golf course, etc., allows division of land for non-farm residential purposes	Farming and livestock, homes, stables, feed lots, limited processing of agricultural products, golf courses, private clubs and lodges	One plus homes for farm help	100,000 sq. ft.	106
36	Rural Settlement	R-S	To provide for the basic living needs of the county's rural settlement areas	Homes, agriculture, churches, public facilities, grocery stores, service stations, restaurants, general merchandise	One	2 acres	245
TOTAL							3,691,880

Source: Fresno County Zoning Ordinance, 1960 as amended; County Ordinance Code Zoning Districts Generalized Chart (For Illustrative Purposes), Public Works and Development Services Department, 1997

The information on zoning acreage was developed through the use of a geographic information system (GIS). The polygons (rectangles and other multi-sided geometric forms) representing areas of specific zoning on the County's zoning maps were digitized (converted from lines on paper to digital information that can be understood by a computer), and the GIS was used to calculate the area of each zone.

Zoning Ordinance Text

The text of the Zoning Ordinance contains the regulations that govern development and land use in the zoning classifications shown on the zoning maps. The Ordinance text includes three main components: detailed descriptions of each zoning classification in terms of the type of land uses that are allowed in each zone; standards for the development of new land uses within each zone (building height limits, setback requirements, off-street parking and sign requirements, minimum parcel size, etc.); and procedural requirements for the processing of land use permit applications and the administration of the ordinance itself. The minimum parcel size determines the density of residential development (i.e., the number of dwellings per acre), and establishes a direct relationship between the size of commercial and industrial parcels and the extent of development that may be allowed on them. The minimum parcel sizes allowed in each zoning category are shown on Table 1-7.

1.5 EXISTING LAND USE

This section describes where existing land uses are located and how they are distributed throughout the unincorporated county. The method for mapping the location of different types of land uses employs Fresno County's geographic information system (GIS) to produce maps for this Background Report that highlight specific land use characteristics.

Data on existing land use were derived from land use codes used by the Fresno County Assessor for property tax assessment purposes. The property use codes are designated by a seven-digit alpha-numeric code. The first digit is alphabetic and reflects the general highest and best use of the land (residential, commercial, industrial, et set). The second, third and fourth digits are alpha-numeric and reflect the actual primary use of the total property. The third and fourth numeric values for a residential use code denote the number of units on the given parcel. For example, S,S01 denotes single family residential as the highest and best use, and that the parcel is developed with one single family residence. For purposes of summarizing and mapping existing land use, the primary use code was used.

Existing land use by acres for generalized land use categories is summarized on Table 1-8.

TABLE 1-8 SUMMARY OF EXISTING LAND USE BY GENERALIZED LAND USE CATEGORIES Fresno County 1997		
Generalized Land Use Category	Square Miles	Percent
Residential	152	2.50%
Commercial	7	0.12%
Industrial	11	0.18%
Agriculture	2,911	48.00%
Resource Conservation (including national forests and parks, timber preserves)	2,691	44.80%
Unclassified (includes streets and highways, rivers, etc.)	11	0.18%
Incorporated Cities	154	2.60%
TOTAL	6,005	100.00%
Source: <i>Fresno County Assessor, 1997</i>		
Note: Individual figures do not exactly total 6,005 square miles because of the Assessor's classification system.		

Residential Uses

The types of residential uses reviewed by this Background Report include: detached single-family homes; multi-family housing including duplexes, apartments, and all structures containing two or more housing units regardless of whether they are individually owned or rented; planned unit developments and condominiums; and mobile homes. Assessor use codes for residential land uses are summarized on Table 1-9 by acres in the unincorporated county. The generalized location of housing units is shown on Figure 1-5. Figure 1-5 shows that existing residential land is located primarily at the periphery of the Fresno-Clovis area, along the Highway 99 corridor and in the Sierra foothills near Auberry, Shaver Lake and Miramonte.

While Figure 1-5 shows unincorporated areas with the largest concentrations of housing units, it is by no means intended to show the location of all housing within unincorporated Fresno County. Many of the zoning districts established by the Fresno County Zoning Ordinance allow some residential use; however, the density permitted in non-residential districts is such that the primary use identified by the County Assessor is usually not residential.

Rural Residential Uses

Fresno County contains a relatively high amount of rural residential development. The County contains approximately 36,000 acres of existing rural residential land with a total of approximately 6,300 dwelling units. Nearly all this development exists in three geographics areas: Eastside Valley, Sierra Foothill, and Sierra Nevada Mountain Areas. Within the Eastside Valley, the majority of the rural residential areas occur just outside the Fresno-Clovis metropolitan area on the west and east sides. The Sierra Foothills have the largest percentage of rural residential land with large clusters of this development near the northern (near Auberry) and southern (near Squaw Valley) county border. The Sierra Nevada Mountain Area contains the third largest amount of rural residential development with a large cluster just west of Shaver Lake. See Figure 1-5 for the location of rural residential lands.

TABLE 1-9 ASSESSOR'S USE CODES AND CORRESPONDING ACREAGE FOR RESIDENTIAL LAND USES Fresno County 1997		
Use Code	General Description	Acres
S	Single family residential	84,071
M	Multi-family residential	178
P	Planned Unit Development and condominiums	17
SM	Single family and mobile home together on the same lot	2,806
OM	Mobile home only	9,332
MH	Mobile home on permanent foundation	505
MHP	Mobile home park	305
TOTAL		97,214
Source: Fresno County Assessor, 1997		

Commercial and Industrial Land Uses

Commercial and industrial land uses can be differentiated into a variety of specific uses. For purposes of this analysis, however, commercial uses will include offices, retail establishments, and outdoor uses such as car sales, lumber yards, and plant nurseries. Industrial uses include light industrial establishments such as warehouses and mini-storage businesses, and heavy industrial uses involved in the manufacturing of large items and/or using large manufacturing equipment. Selected Assessor land use codes representative of commercial and industrial land uses are summarized on Table 1-10 with the corresponding acreage devoted to each general category.

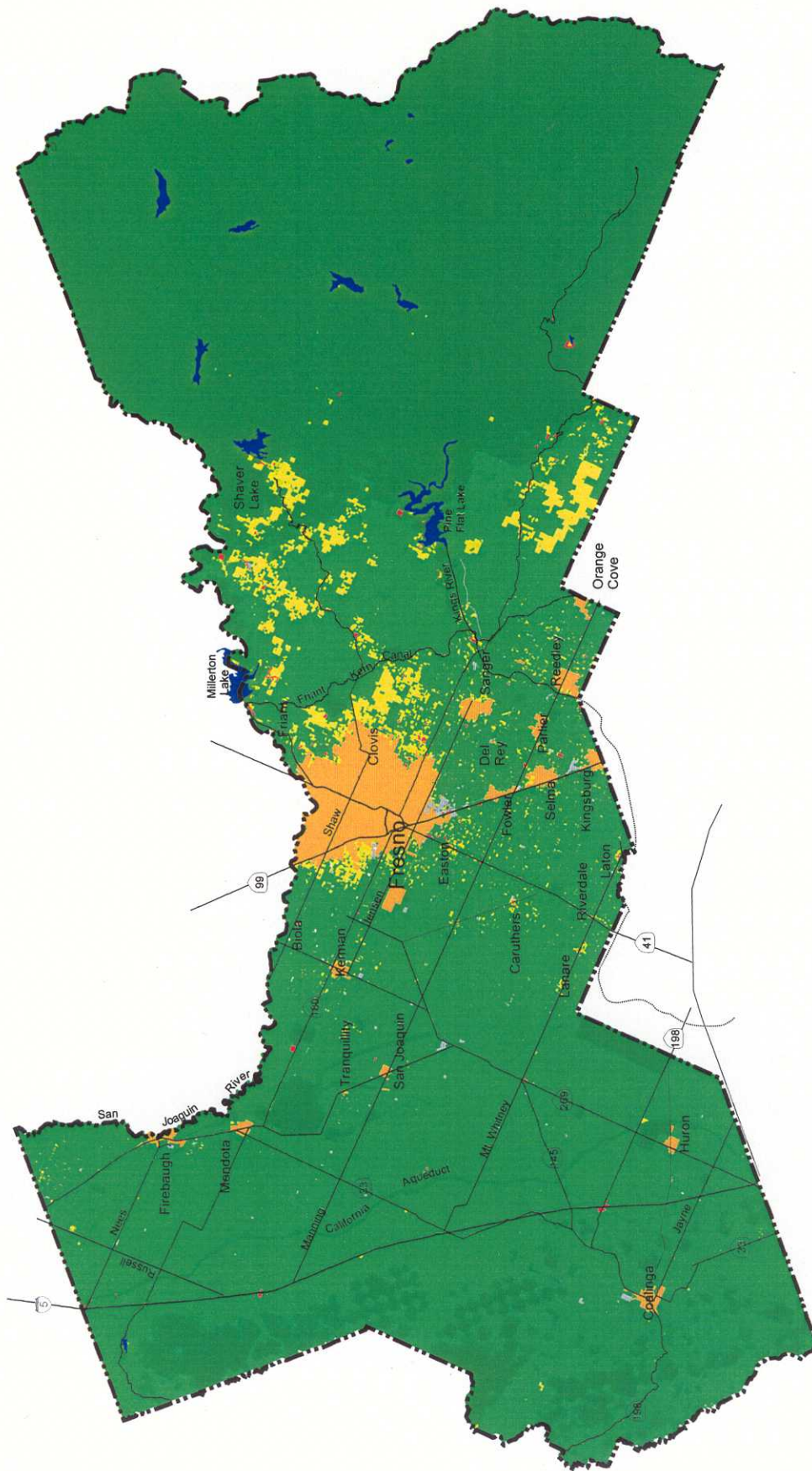
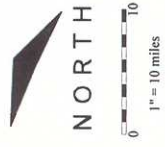


Figure 1-5

- Agriculture/Open Space
- Public Lands
- City
- Lake
- Commercial
- Rural Residential
- Residential
- Industrial

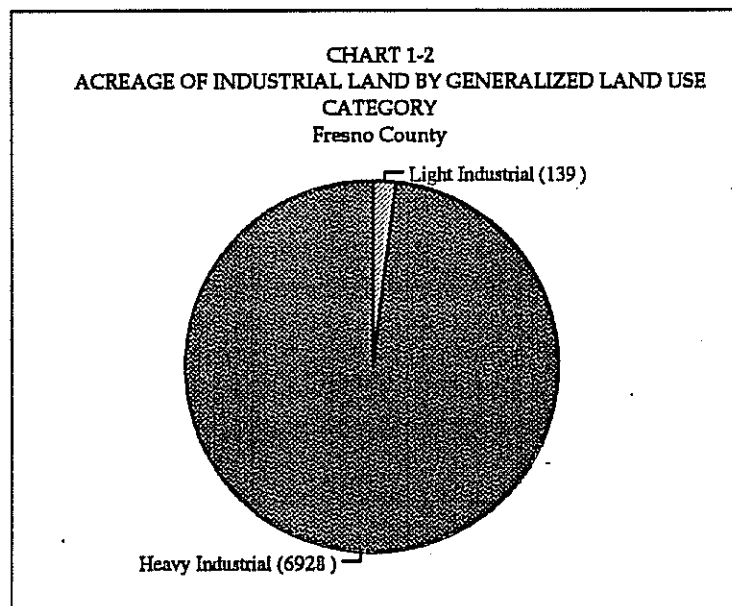
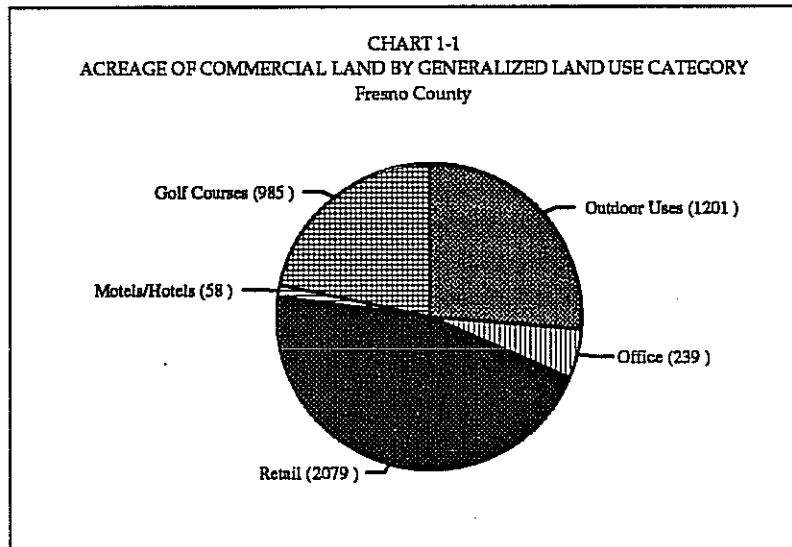


Source: Fresno County GIS Database

Charts 1-1 and 1-2 graph the distribution of types of commercial and industrial land uses by acreage in the unincorporated county according to the County Assessor's use codes. The majority of commercial enterprises are retail establishments, followed by outdoor sales and golf courses. Most industrial land is devoted to heavy industrial operations in support of agricultural operations.

The spatial distribution of commercial and industrial land uses in the unincorporated county is shown in generalized terms by Figure 1-5. This Figure indicates that commercial businesses in the unincorporated county are distributed along major transportation corridors (I-5 and State Route 99), and near the incorporated cities of Fresno, Clovis and Sanger. Limited commercial land uses are also located within the small, rural communities in the Sierra foothills. Industrial uses are located along the State Route 99 corridor with a major concentration at the southerly border of the city of Fresno. Industrial land uses are also distributed throughout the agricultural land between the Sierra foothills and I-5.

TABLE 1-10 ASSESSOR'S USE CODES AND CORRESPONDING ACREAGE FOR COMMERCIAL AND INDUSTRIAL LAND USES Fresno County 1997		
Representative Use Codes	General Description	Acres
Commercial		
ASC, LUY, NUR, PSL	Outdoor uses such as auto service center and new car sales, lumber yards, nurseries, cold storage	1,201
GO	Offices	239
CS, SS, SCN, RES	Retail stores, shopping centers, restaurants	2,079
M, H	Motels and hotels	58
GOC	Golf courses	985
TOTAL COMMERCIAL		4,562
Industrial		
GRA, LII, WAH	Light industrial, including granary and rice mills, and warehouses	139
COG, COS, PAH, SGP, WIN	Heavy industrial, including cotton gins, packing houses, sand and gravel pits and wineries	6,928
TOTAL INDUSTRIAL		7,067
Source: Fresno County Assessor, 1997		



Agricultural Land Uses

As with residential, commercial and industrial uses, land uses that are related to agriculture, forestry, mining, or other activities involving the preservation, use, extraction, or processing of natural resources can be differentiated into a number of specific land use categories. For example, the general category of agriculture includes such activities as irrigated row crop production, dry land farming, orchards and vineyards, and grazing of livestock. Each activity is important and distinct because they have different characteristics of operation and resource consumption. Row crop production consumes more water than dry land farming, which will have implications related to the capacity of area water supplies and any urban land uses that may also need to use that resource. Agricultural practices related to the use of fertilizers or pest control measures may cause conflicts with other land uses, either agricultural uses, residential, or urban.

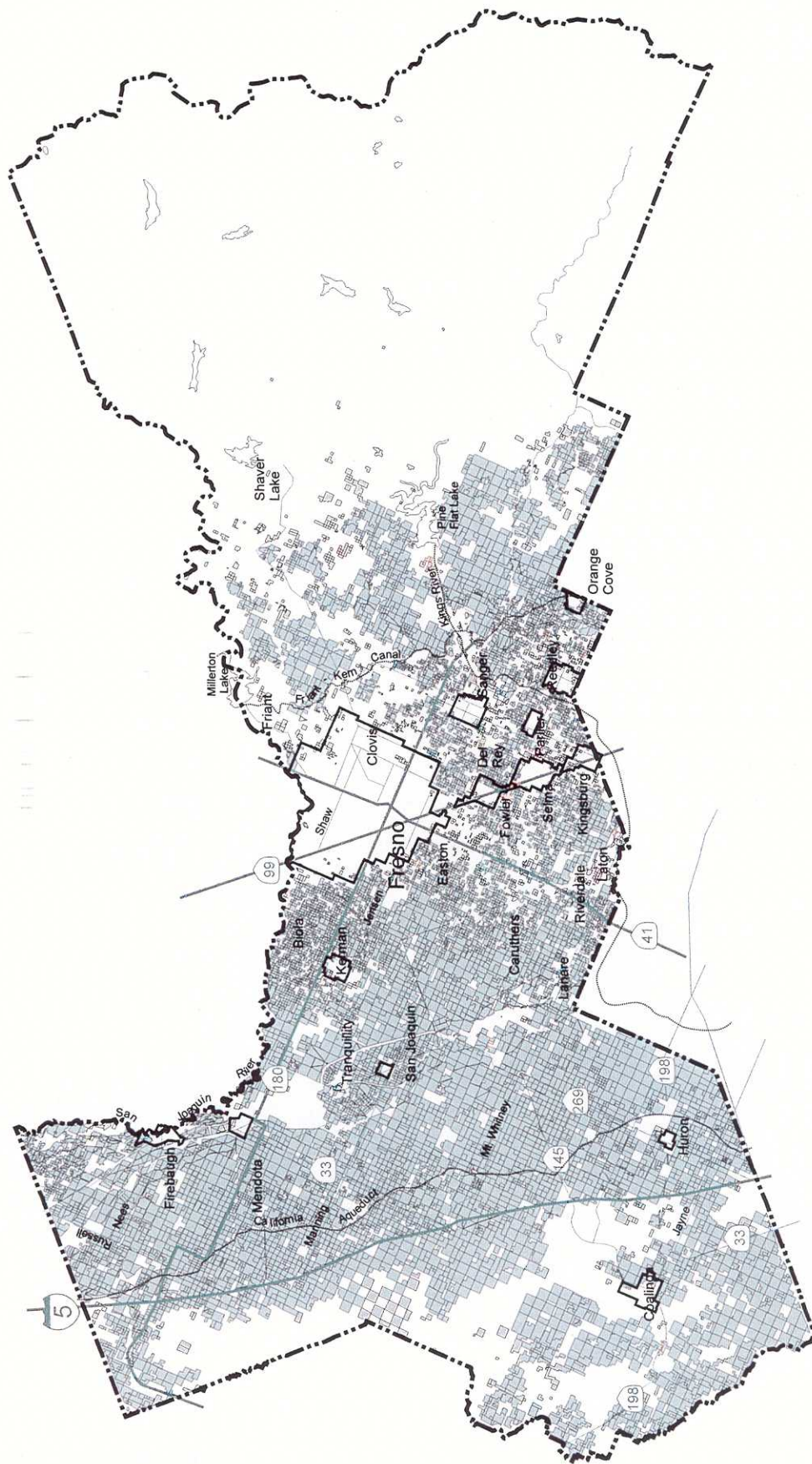
Selected Assessor use codes representative of the principal agricultural uses in Fresno County are summarized on Table 1-11 with the corresponding acreage. According to Table 1-11, the County has 1,231,318 acres of irrigated agricultural land and 631,829 acres of non-irrigated agricultural land -- totaling 1,863,147 acres of agricultural-related land use. It should be noted that Assessor data may not reflect the actual crop or agricultural use in 1997 since crop patterns change in response to market demands and the land use data compiled by the Assessor for property tax purposes may not be current. Nonetheless, the data provide a 'snapshot' of crop patterns that are representative of Fresno County. Land devoted to an agricultural use is shown on Figure 1-5. The figure shows that agriculture is the principal land use in the western two-thirds of the county. Figure 1-6 shows the parcels that are governed by a Land Conservation Act (LCA) contract. Acreage of LCA contract land is summarized in Chapter 2 of this *Background Report*, which provides a more complete discussion of agriculture in Fresno County.

TABLE 1-11 ASSESSOR'S USE CODES AND ACREAGE OF AGRICULTURAL-RELATED LAND USES Fresno County 1997		
Representative Use Codes	General Description	Acres
Irrigated Land		
ALM, APP, APR, AVO, LEM, NEC, PIS	Orchards, including almonds, apples, apricots, avocados, lemons, nectarines, pistachios	1,025,025
BUS, CHE	Berries, including bushberries, cherries	624
VIR	Vines for raisins	141,797
VIT, VIW, VIX	Vines other than raisins	63,872
<i>Irrigated Land Subtotal</i>		1,231,318
Non-Irrigated Land		
DAI	Dairies	13,455
FEE	Feed lots	1,173
HOH	Hot houses	214
PAS	Pasture, grazing land	611,007
POU	Poultry farming	5,980
<i>Non-Irrigated Land Subtotal</i>		631,829
TOTAL		1,863,147
<i>Source: Fresno County Assessor, 1997</i>		

Vacant Land

Vacant acreage and subdivided, smaller parcels of land designated by the general plan and zoned for specific uses are the areas of the county that can most readily change. Some vacant land designated for development have resource, infrastructure, or public services deficiencies that may inhibit their planned use for an indefinite period of time, and may need to be re-examined to determine whether the development potential conferred by prior planning is realistic based on current information.

The acreage of vacant commercial, industrial and residential land is summarized on Table 1-12. This vacant land is located primarily in the Sierra Nevada foothills and consists largely of rural residential parcels.



Land Conservation Act Contracts



City Spheres of Influence



NORTH

0 10
1" = 10 miles

TABLE 1-12 VACANT COMMERCIAL, INDUSTRIAL, AND RESIDENTIAL LAND Fresno County 1997	
Generalized Land Use Category	Acres
Residential	7,103
Commercial	215
Industrial	509
TOTAL:	7,827
Source: <i>Fresno County Assessor, 1997</i>	

1.6 CITY GENERAL PLANS

The 15 incorporated cities in Fresno County together contain about 596,700 residents according to 1996 Department of Finance (DOF) figures, about 77 percent of the total county population. Most are small, farming-service towns surrounded by ongoing agricultural operations. Consequently, one of the biggest issues facing the expansion of such communities is the conversion of prime agricultural land to support additional housing, businesses, and other urban land uses, and the inevitable tension that arises between urban and agricultural land uses.

Each city has an adopted general plan that addresses land use and development goals, policies and programs that guide land use decisions within its jurisdiction. This section summarizes the aspects of each city general plan that are of greatest relevance to *Fresno County's General Plan* update. This section describes the area covered by each city general plan, local constraints on future development, and the policies in each plan about the issues of city growth, annexation, and ultimate physical size and population. Following the summary is a section that summarizes the key issues that may affect land use in the unincorporated county.

Table 1-13 compares 1997 land use for each city and Table 1-13a breaks down the land uses for each city by percentage. The individual plans are discussed in more detail below.

TABLE 1-13
SUMMARY OF LAND USE CATEGORY ACREAGES
WITHIN CITY GENERAL PLANS

City	Land Use Categories									TOTAL ACRES
	Res.	Com. ¹	Indus.	Open Space	Public	Mixed Use	SUB- TOTAL	Streets	Urban Reserve	
Clovis	32,227	811	1,049	--	2,221	1,331	37,639	3,580	—	47,473
Coalinga	2,500	640	1,200	1,630	550	—	4,890	—	3,328	6,144
Fresno	53,530	6,507	12,226	25,377	7,549	—	79,812	15,872	36,000	121,000
Firebaugh	311	18	110	300	194	—	633	370	1,842	3,409
Fowler	259	26	10	157	92	—	387	187	3,213	4,886
Huron	600	33	174	—	23	—	830	—	450	1,280
Kerman	1,004	164	183	1,145	257	—	1,608	431	11,648	23,872
Kingsburg	558	101	457	—	152	—	1,268	419	300	1,689
Mendota	585	59	568	391	246	—	1,458	—	974	1,856
Orange Cove	198	31	48	—	59	—	336	205	888	1,476
Parlier	591	60	36	50	—	—	687	—	68	737
Reedley	2,289	213	934	414	956	—	4,392	21	2,343	5,206
San Joaquin	106	6	39	—	32	—	183	110	855	1,147
Sanger	1,353	25	200	65	350	—	1,928	—	2,000	4,161
Selma	3,671	479	1,148	246	215	—	5,513	—	3,894	9,674
TOTAL:	99,782	9,173	18,382	29,775	12,896	1,331	141,564	21,195	67,803	234,010

Sources: *City of Clovis General Plan, April, 1993*
City of Fresno General Plan Update Land Use
Alternative 10Z, February, 1997
City of Firebaugh General Plan
City of Huron General Plan
City of Kingsburg General Plan, July, 1992
City of Orange Cove General Plan, 1979
City of Sanger General Plan, September, 1988

City of Coalinga General Plan, 1993
City of Fowler General Plan, 1976
City of Kerman General Plan, 1993
City of Mendota General Plan, 1992
City of Parlier General Plan, 1985
City of San Joaquin General Plan, 1996
City of Reedley General Plan, August, 1994
City of Selma 1997 General Plan Land Use
Element Public Draft, January, 1997

¹Includes single family and multi-family.

TABLE 1-13a
PERCENTAGE OF LAND USES
WITHIN CITY GENERAL PLANS

	Residential	Commercial	Industrial	Open	Public	Mixed	SUBTOTAL
Clovis	86%	2%	3%	0%	6%	4%	37,639
Coalinga	38%	10%	18%	25%	8%	0%	6,520
Fresno	51%	6%	12%	24%	7%	0%	105,189
Firebaugh	33%	2%	12%	32%	21%	0%	933
Fowler	48%	5%	2%	29%	17%	0%	544
Huron	72%	4%	21%	0%	3%	0%	830
Kerman	36%	6%	7%	42%	9%	0%	2,753
Kingsburg	44%	8%	36%	0%	12%	0%	1,268
Mendota	32%	3%	31%	21%	13%	0%	1,849
Orange Cove	59%	9%	14%	0%	18%	0%	336
Parlier	80%	8%	5%	7%	0%	0%	737
Reedley	48%	4%	19%	9%	20%	0%	4,806
San Joaquin	58%	3%	21%	0%	17%	0%	183
Sanger	68%	1%	10%	3%	18%	0%	1,993
Selma	64%	8%	20%	4%	4%	0%	5,759
TOTAL	58%	5%	11%	17%	8%	1%	17,133
Sources: <i>City of Clovis General Plan, April, 1993</i> <i>City of Fresno General Plan Update Land Use</i> <i>Alternative 10Z, February, 1997</i> <i>City of Firebaugh General Plan</i> <i>City of Huron General Plan</i> <i>City of Kingsburg General Plan, July, 1992</i> <i>City of Orange Cove General Plan, 1979</i> <i>City of Sanger General Plan, September, 1988</i> <i>City of Coalinga General Plan, 1993</i> <i>City of Fowler General Plan, 1976</i> <i>City of Kerman General Plan, 1993</i> <i>City of Mendota General Plan, 1992</i> <i>City of Parlier General Plan, 1985</i> <i>City of San Joaquin General Plan, 1996</i> <i>City of Reedley General Plan, August, 1994</i> <i>City of Selma 1997 General Plan Land Use</i> <i>Element Public Draft, January, 1997</i>							

City of Clovis General Plan

Clovis is the second most populous city in Fresno County (after the city of Fresno) and an emerging center for employment. The city is located immediately east of Fresno on State Route 168 (Shaw Avenue) which provides the primary link between Clovis and the Fresno urban area.

The *Clovis General Plan* was updated in April 1993 and covers a timeframe of about 20 years. The Plan projects a fairly aggressive rate of growth during the period to a buildout population of about 176,680 residents and over 60,000 dwelling units. This translates into an average annual population increase of about six percent. The Plan concentrates the expansion of the city to areas east and north of the present corporate boundaries (generally north of Shields and east of Willow). Much of the land within the city's planning area outside the current (1997) city limits is rural residential and productive agriculture land.

Policies of the *General Plan* foresee the expansion of the city through a network of urban villages comprised of neighborhoods of about 160 acres. A mixed-use village center would provide public services and neighborhood shopping needs. The Plan also emphasizes mixed-use development to help mitigate potential traffic and air quality impacts. The Plan also identifies three urban center specific plan areas where major new development is proposed. Together, these three specific plan areas comprise about 12,000 acres, or about 26 percent of the city's planning area.

Factors that could constrain continued development of the city include water supply; sewer capacity; air quality; competition for jobs and housing from other urban areas (especially the city of Fresno); local and regional efforts to preserve prime agricultural land; and traffic congestion.

City of Coalinga General Plan

Coalinga is located in western Fresno County between Interstate 5 and the Coast Range. The city is a regional service center for oil production operations in the area, and provides shopping and housing for area residents, as well as the employees of the two State correctional institutions near Coalinga. The General Plan was adopted in 1994 and covers a timeframe of 20 years (to the year 2015). The Plan is organized into three sections: the *Coalinga Plan 2015*, Special Plan Documents, and the Planning Context. The *Coalinga Plan 2015* describes the planning area and the principles upon which the Plan was prepared. Buildout population is projected to be about 16,300 residents. The planning area (existing city plus sphere of influence) includes about 8.3 square miles. Most of the land outside the city limits and within the sphere of influence is designated for single family residential development, business parks, and open space.

The Plan does not contain specific policies to manage the pace and direction of new development. It appears to respond to projected growth in the area demand for additional housing brought about by the expansion of government, institutional and oil-related activities. Constraints to development include water supply and other infrastructure capacity; air quality; traffic; policies to preserve sensitive habitat and other resources.

City of Firebaugh General Plan

The city of Firebaugh is located on State Route 33 at the northwestern edge of Fresno County, about 29 miles west of the Fresno-Clovis Metropolitan Area. The *Firebaugh General Plan* was adopted in 1992 and covers a planning area of about 5.3 square mile and a time frame of about twenty years. The Plan projects a buildout population of about 6,700 residents in the year 2011.

Policies of the General Plan do not specifically regulate the timing and location of new development, except that the annexation of land designated for urban development will not be considered until the property can be efficiently served by water, wastewater, drainage, and other municipal services.

Potential limitations to future development include water supply; air quality; and policies that seek to protect productive agricultural land.

City of Fowler General Plan

Fowler is a small farming community located on SR 99 between Fresno and Selma. The *Fowler General Plan* was adopted in 1976 to guide the growth and development of the city through the year 1995. The Plan designates additional land for future residential and commercial development and provides guidance for the annexation of land designated for urban development.

Buildout population in the plan is projected to be about 3,100 residents in 1995. However, the State Department of Finance estimated the city's 1996 population at about 3,700 which is well above the buildout population.

City of Fresno General Plan

The city of Fresno is by far the largest city in Fresno County, and one of California's major metropolitan areas. Fresno is the center of employment, higher education, commerce and government for the central San Joaquin Valley, and is home to over 400,000 residents. Fresno is nearing completion of a comprehensive update of its general plan. A number of land use alternatives are being considered. The following discussion is based on the most probable land use alternative, *Alternative 10Z*, published in February, 1997.

The present sphere of influence covers 90,000 acres (141 square miles) of which about 54,000 acres (60 percent) are occupied by the current city limits. According to the *Draft Plan*, about nine percent of land within the city's sphere is vacant and another 24 percent is designated open space and used primarily for agriculture and recreation. Commercial and industrial land uses within the sphere of influence account for about four percent and 6.2 percent, respectively. *Alternative 10Z* proposes to substantially increase the amount of land designated for residential and industrial uses, with a corresponding decrease in the amount remaining as agriculture. The *Draft Plan* calls for an expansion of the city's sphere of influence to the south of the city of Clovis, to the southwest, and to the north along the San Joaquin River.

By the year 2020, the population of the Fresno sphere of influence is expected to nearly double to between 800,000 and 960,000 residents. This corresponds to an annual growth rate of between 2.1 percent and 2.9 percent. The bulk of this new growth is expected to occur in the Edison, Roosevelt, West Area, Woodward Park, and SR 41 corridor, Northeast Study Area and Southeast Study Area community areas.

Factors that could limit buildout in accordance with the proposed Plan include traffic and air quality issues; water supply and quality and the funding of other needed infrastructure;; local and regional efforts to preserve prime agricultural land; and the proximity of the city of Clovis and the San Joaquin River.

City of Huron General Plan

Huron is a small farming community located in southwest Fresno County on SR 269. The city's population is expected to grow modestly in the future, according to the Fresno Council of Governments (COFCG), who project a year 2000 population of about 5,530 residents. Policies of the General Plan encourage infill of existing vacant or underutilized properties before annexing the productive farm land that surrounds the city. The city's sphere of influence is large (450 acres)

in comparison to the existing city limits and will accommodate a substantial amount of new development. However, the city has sufficient vacant residential land within the existing city limits to accommodate 55 years of residential development, based on the historical rate of construction. With this in mind, it appears unlikely that additional annexations will be needed in the near future or that the sphere of influence will be expanded. Land within the sphere is zoned for large-lot agricultural use by Fresno County.

City of Kerman General Plan

Kerman is located west of the city of Fresno on SR 145. The *Kerman General Plan* was adopted in 1993 and includes the required seven elements and an optional parks and recreation section. The timeframe for the Plan is 20 years (until the year 2013) and covers a planning area of about 2,374 acres. At buildout of the Plan, the city's population is expected to grow to about 15,000 residents, assuming an average annual growth rate of about 4 percent. To achieve this goal, the Plan designates about 990 acres for urban development and proposes to expand the city's sphere of influence accordingly.

The General Plan includes two growth boundary lines, one for the year 2003 and another for buildout at 2013. Policies in the Plan state that land beyond each growth boundary shall not be annexed into the city until more than 80 percent of the residential land within the existing corporate limits has been developed or until the boundary line year has been surpassed. The city's proposed sphere of influence extends beyond the 2013 growth limit in the north and south-west portions of the planning area, suggesting that the City anticipates additional urban development beyond that envisioned by the 1993 *General Plan*. The Plan also encourages infill of existing vacant and underutilized land before annexing new land for development.

Factors that may constrain the full buildout of the city in accordance with the proposed plan relate to funding for the provision of needed infrastructure; water supply; air quality; and local and regional efforts to preserve prime agricultural land.

City of Kingsburg General Plan

Kingsburg is located south of the city of Fresno on SR 99. The city last completed a comprehensive update of its *General Plan* in July, 1992. The Plan proposes to expand the city's sphere of influence to the east and west by about one-half mile into productive agricultural land.

Policies in the Plan limit the rate of population growth to three percent when factored over a continuous five year period. Using this policy as a guide, the Plan projects a buildout population of about 13,800 residents in the year 2012. To achieve this goal, the Plan calls for the preparation of a 10 year annexation program that details how the orderly expansion of the city will be accomplished concurrently with the provision of needed infrastructure. An *Urban Service Delivery Plan* will accompany the annexation program which will be submitted to the Local Agency Formation Commission (LAFCO) for approval.

Factors that could constrain the Plan's buildout projections include the timing and funding of needed infrastructure; air quality and traffic considerations; and local and regional efforts to preserve prime agricultural land.

City of Mendota General Plan

The city of Mendota is located about ten miles south of the city of Firebaugh and about 35 miles west of the city of Fresno. The Mendota airport is located about three miles east of the central business district and lies within the city limits. The population in 1990 was about 7,000 residents. The DOF projects a buildout population of between 10,000 and 13,000 residents in the year 2010.

The *Mendota General Plan* was last updated in 1991 and includes policies to guide the growth and development of the city for twenty years. The Plan designates a substantial amount of land within the sphere of influence for additional medium density residential and heavy industrial land uses.

Policies of the Plan seek to maintain an orderly pace of development through the timeframe of the *General Plan* by annexing new land as needed to accommodate anticipated residential and industrial demand. The Plan appears to be market driven; there are no specific policies that regulate the pace, location, or amount of new development to be accommodated. Potential constraints to development include water and sewer service limitations and regional policies to preserve productive agricultural land.

City of Orange Cove General Plan

Orange Cove is a small farming community located near the foothills of the Sierra Nevada. The town covers about 1,500 acres of mostly flat agricultural land along the Friant-Kern Canal. No timeframe or projected buildout population is suggested in the *General Plan*, which is a modest compilation of policies accompanied by a map of land use designations. Since 1990, the city's population grew by 1,000 from about 5,600 to about 6,700 in 1996, or about 2.5 percent per year.

City of Parlier General Plan

The *Parlier General Plan* was adopted in 1985 and covers a planning area of about 1,650 acres located between the cities of Selma and Reedley in east-central Fresno County. The Plan provides guidance for buildout of the community with a population of about 14,000 in the year 2005. The Plan appears to be market driven and expects the most recent pace of development to continue into the future.

Constraints to development include air quality; water supply; policies intended to preserve productive agricultural land; and funding for needed infrastructure improvements.

City of Reedley General Plan

Reedley is situated along the Kings River in southeast Fresno County about 12 miles east of SR 99. The *Reedley General Plan* was adopted in 1993 and covers a timeframe of about 20 years (to the year 2012). The total area within the current (1992) corporate limits is about 2,500 acres; the *General Plan* proposes to expand the sphere of influence to include about 2,500 acres for a total planning area of just over 5,000 acres. Areas within the sphere and outside the city limits are designated primarily for medium density residential and industrial land uses. The *General Plan* anticipates an annual average population growth of about four percent during the timeframe of the Plan, for a buildout population between 30,000 to 40,000 residents.

Policies of the *General Plan* describe the process through which future annexations will be considered. The Plan emphasizes the need to provide infrastructure for new annexations, and encourages infill of existing land before new annexations will be considered.

Factors that may limit the continued development of the city include the Kings River and the Tulare County line which act as barriers to the expansion of the city to the northwest and south, respectively; flood hazards associated with the River; and efforts to preserve productive agricultural lands.

City of San Joaquin General Plan

The city of San Joaquin completed a comprehensive update of its *General Plan* in 1996. The Plan covers a timeframe of twenty years and a planning area of about 1,200 acres. The *General Plan* assumes a rate of population growth averaging between four percent to six percent per year through the year 2014 for a buildout population of about 7,000 residents, which is more than double the city's 1997 population.

One of the main objectives of the General Plan is to promote additional commercial and industrial development to help provide jobs and stabilize the city's economy.

One of the goals of the *General Plan* is the "phased expansion" of the city as depicted by the *Land Use Element* map. However, no phasing is indicated on the Plan which appears to be market driven. Similar to the city of Kingsburg, the *San Joaquin General Plan* calls for the preparation of a Comprehensive Annexation Program to guide the orderly expansion of the city and to ensure needed infrastructure is provided concurrently or in advance of such development. The City plans to expand to the west and south onto unincorporated land within the sphere of influence which is currently used for agricultural production.

Factors that could constrain buildout of the city include funding for the provision of needed infrastructure; water supply; air quality; and local and regional efforts to preserve prime agricultural land.

City of Sanger General Plan

The *Sanger General Plan* was adopted in September, 1988 but has been amended numerous times since. The Plan projects an annual average growth rate of about 2.3 percent to the year 2000. At that time, the city is projected to have a population of about 19,800 residents. No specific growth management policies are included in the Plan. However, the *General Plan* calls for the phased annexation of land within its sphere of influence and encourages infill of existing vacant land before such annexations are considered. Urban services will not be extended to properties unless they are annexed into the city. No expansion of the city's sphere of influence is foreseen in the near future.

Factors that could constrain future development include groundwater quality and quantity; sewage treatment and collection capacity; air quality; and local and regional efforts to preserve prime agricultural land.

City of Selma General Plan

The City of Selma is nearing completion of a comprehensive update of the *Selma General Plan*. The discussion that follows is based on the *Public Draft Land Use Element* published in January, 1997. The *Draft Element* covers a timeframe of about 20 years (to the year 2015) and projects a buildout population of about 37,630 residents, which translates into an annual rate of growth of about 3.8 percent. The *Draft Element* proposes about 5,700 acres for urban development and about 3,800 acres as "reserves" within the proposed expanded sphere of influence which consists primarily of agricultural land and the Selma Aerodrome.

No specific policies are proposed to manage the pace and location of new development. However, policies of the *Draft Land Use Element* encourage the preservation of agricultural land and discourage the extension of urban services into lands that will not be annexed within one year.

Factors that may constrain expansion of the city into the proposed sphere include the configuration and capacity of interchanges on SR 99 and efforts to preserve prime agricultural land.

<p align="center">TABLE 1-14</p> <p align="center">COMPARISON OF EXISTING POPULATION WITH BUILDOUT POPULATION OF CITY GENERAL PLANS</p>					
	1996 Population	Buildout Population	Population Added	Target Year for Buildout	Average Annual Growth Rate
Clovis	65,000	188,000	111,680	2030	5.57%
Coalinga	9,925	16,000	6,075	2015	2%
Fresno	400,400	880,000	480,600	2020	2.8%
Firebaugh	5,825	6,700	875	2011	2%
Fowler	3,740	3,160	—	1995	—
Huron	5,525	5,530	5	2000	—
Kerman	6,725	15,000	8,275	2013	4%
Kingsburg	8,450	13,800	5,350	2012	3%
Mendota	7,400	12,000	4,600	2010	2.5%
Orange Cove	6,700	7,000	300	1997	1%
Parlier	9,450	14,000	4,550	2005	2%
Reedley	19,100	35,000	15,900	2012	4%
San Joaquin	2,920	7,000	4,000	2014	5%
Sanger	18,300	19,800	1,500	2000	2.3%
Selma	17,300	37,630	20,330	2015	3.8%
TOTAL	586,700	1,249,300	664,040	2008	3.1% (avg.)
<p>Sources: <i>City of Clovis General Plan, April, 1993</i> <i>City of Fresno General Plan Update Land Use Alternative 10Z, February, 1997</i> <i>City of Firebaugh General Plan, 1992</i> <i>City of Huron General Plan, Housing Element, 1992</i> <i>City of Kingsburg General Plan, July, 1992</i> <i>City of Orange Cove General Plan, 1979</i> <i>City of Sanger General Plan, September, 1988</i></p> <p><i>City of Coalinga General Plan, 1993</i> <i>City of Fowler General Plan, 1976</i> <i>City of Kerman General Plan, 1993</i> <i>City of Mendota General Plan, 1991</i> <i>City of Parlier General Plan, 1985</i> <i>City of San Joaquin General Plan, 1996</i> <i>City of Reedley General Plan, August, 1994</i> <i>City of Selma 1997 General Plan Land Use Element Public Draft, January, 1997</i></p>					

1.7 SPHERES OF INFLUENCE

This section discusses the spheres of influence for the cities and other special service districts in Fresno County. A "sphere of influence" is a boundary surrounding cities and special service districts that is intended to represent the ultimate area into which the city or district may expand and extend public services. The adoption of spheres of influence and changes to existing sphere boundaries must be approved by the Fresno County Local Agency Formation Commission

(LAFCO). The LAFCO is a state-mandated regulatory body that oversees changes in jurisdictional boundaries that may include annexations, detachments, formations, dissolutions, consolidations, mergers, incorporations and disincorporations. LAFCO is directed by state law (the Cortese/Knox Local Government Reorganization Act of 1985) to establish and periodically review the spheres of influence for each agency under its jurisdiction.

The Fresno County LAFCO has promulgated a set of rules, policies and standards to regulate changes in local government boundaries, in addition to the requirements of State law. The policies require a plan for the extension of services to be submitted with every application for a boundary change. The LAFCO policies also require a development plan to be submitted with an application for annexation. Other policies discourage the annexation of farmlands when significant areas of non-prime farmland are already available, and encourage the development of vacant areas within cities before the annexation and development of fringe areas.

CITY SPHERE OF INFLUENCE

The Fresno County Local Agency Formation Commission (LAFCO) has adopted spheres of influence for the 15 incorporated communities in the county. Twelve of the 15 spheres are located in the Eastside Valley area, while the other three are located in the Westside Valley. The city spheres of influence for the 15 incorporated cities in Fresno County are shown on Figure 1-7.

CITY/COUNTY MEMORANDA OF UNDERSTANDING

Fresno County has entered into memoranda of understanding with all 15 incorporated cities regarding land use and tax sharing for the development and annexation of lands within the city's adopted spheres of influence. In general, the memoranda state that the county will consult with the affected city regarding growth management policies and when new development is proposed within the city's sphere of influence. In most cases the memoranda say that such development will be referred to the city for annexation before the county will consider approval, and that such development must be consistent with the city's general plan and development standards. Table 1-15 provides a summary of memoranda of understanding and the status of the city's adopted sphere of influence.

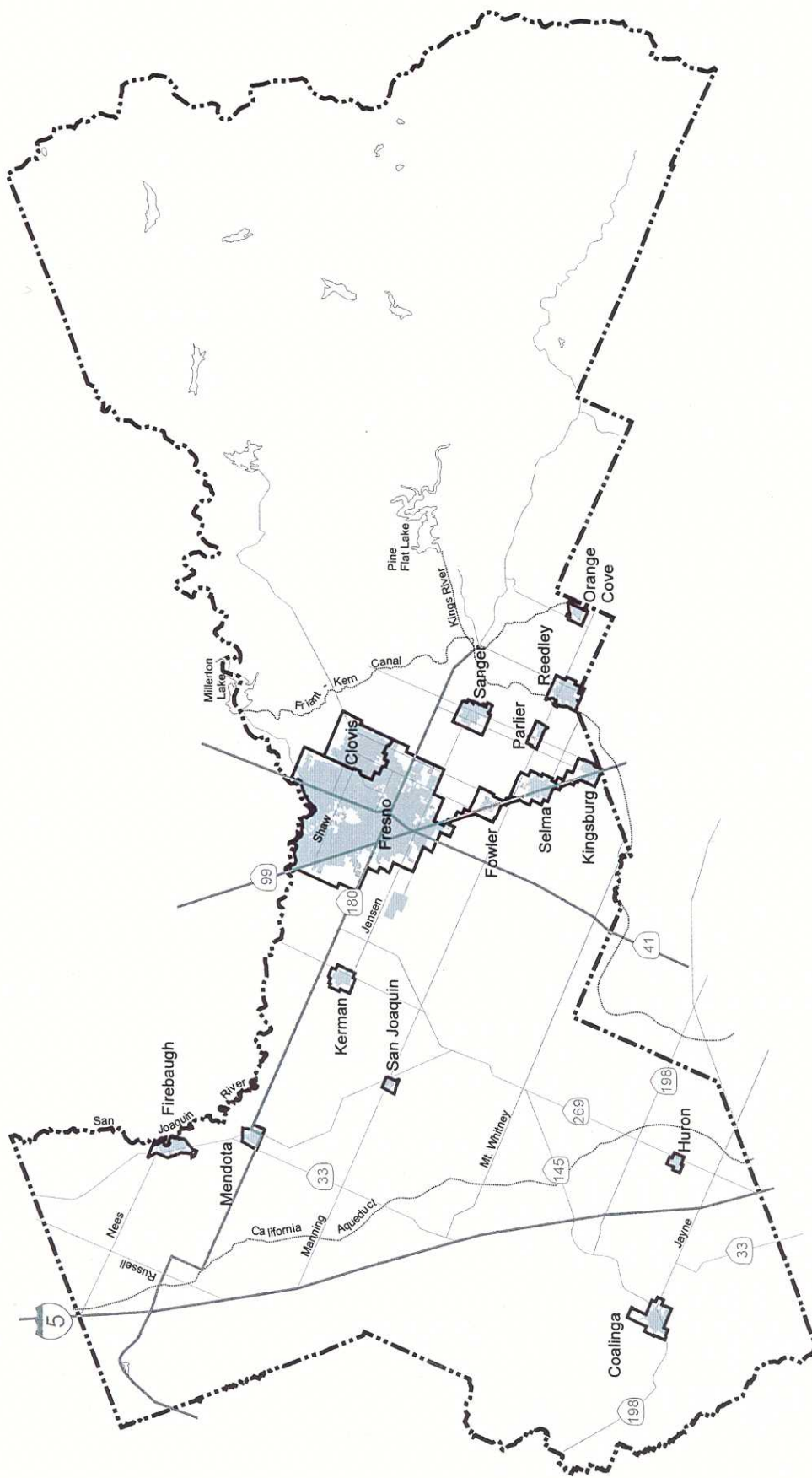


TABLE 1-15

SUMMARY OF CITY SPHERES OF INFLUENCE AND
MEMORANDA OF UNDERSTANDINGFresno County
1997

City	Acres	Square Miles	Memorandum With Fresno County?	Terms/Description
Clovis	14,592	22.8	Yes	Staff of both agencies will consult regarding policy changes affecting new development within sphere. An EIR will be required if determined by the City.
Coalinga	5,248	8.2	Yes	County will refer new development in sphere to city for consideration of annexation.
Fresno	90,880	142.0	Yes	City will consult with county regarding new development within city and within 1/4 mile of city
Firebaugh	3,200	5.0	Yes	County will refer new development in sphere to city for consideration of annexation.
Fowler	4,544	7.1	Yes	County will refer new development in sphere to city for consideration of annexation.
Huron	1,344	2.1	Yes	County will refer new development in sphere to city for consideration of annexation.
Kerman	3,072	4.8	Yes	County will refer new development in sphere to city for consideration of annexation.
Kingsburg	3,648	5.7	Yes	City will consult with county regarding land use and policies within sphere of influence of Selma-Kingsburg-Fowler Sanitation District; county will require EIR for new urban development 2 miles beyond sphere.
Mendota	2,240	3.5	Yes	County will consult with city regarding development within sphere and 2 miles beyond.
Orange Cove	1,664	2.6	Yes	County will refer new development in sphere to city for consideration of annexation.
Parlier	1,664	2.6	Yes	Staff of both agencies will consult regarding land use policies within sphere and 2 miles beyond; city will change fees for county capital improvements.
Reedley	4,672	7.3	Yes	Staff of both agencies will consult regarding land use policies within sphere and 2 miles beyond.
San Joaquin	960	1.5	Yes	Staff of both agencies will consult regarding land use policies within sphere and 2 miles beyond; city will change fees for county capital improvements.
Sanger	4,672	7.3	Yes	Staff of both agencies will consult regarding land use policies within sphere and 2 miles beyond.

TABLE 1-15

SUMMARY OF CITY SPHERES OF INFLUENCE AND
MEMORANDA OF UNDERSTANDINGFresno County
1997

City	Acres	Square Miles	Memorandum With Fresno County?	Terms/Description
Selma	6,528	1.5	Yes	City will consult with county regarding land use and policies within sphere of influence of Selma-Kingsburg-Fowler Sanitation District; county will require EIR for new urban development 2 miles beyond sphere.
Sources: City General Plans, Fresno County LAFCO, Fresno County, 1997				

SPECIAL DISTRICT SPHERES OF INFLUENCE

There are numerous special districts that provide a variety of public services in the incorporated and unincorporated areas of Fresno County, in addition to the cities. Special districts can be formed to provide one or multiple types of public services, facilities or infrastructure within a prescribed boundary, ranging from a small-scale district providing street lights in a particular neighborhood, to a school district providing educational services to both incorporated and unincorporated areas, to a community services district providing public water, sewer, fire protection, road maintenance, and other services. Special districts play an important role in the management of growth and development within the county, because the services they sometimes provide (e.g., water, sewer, etc.) can strongly influence the location and timing of new development.

Special districts are empowered to tax the properties within their boundaries to pay for the installation, operation and maintenance of the facilities necessary to provide the particular services for which they are formed. In addition to collecting taxes to help pay for the services, such districts may also collect a monthly fee to cover the costs of providing the service.

HOLDING CAPACITY AND BUILDOUT

Each of the major components of the *Fresno County General Plan* (the county-wide general plan and community plans) apply various land use designations to the areas they cover. The land use designations determine not only the types of land use that can be allowed (such as residential, commercial, industrial, etc.) But also the density and intensity of such land uses (such as the number of housing units that are allowed per acre). Collectively, the land use designations of the general plan work together to determine the holding capacity of the Plan. Holding capacity is normally expressed as the number of people that could theoretically be accommodated in a planning area if all of the land were developed to the maximum potential allowed by the land use designations of the general plan. Buildout is the point at which the land in the planning area is being used to the maximum extent allowed by the plan. Recognizing that the buildout of any planning area to its maximum holding capacity will never occur for a variety of reasons (among which are limitations on the capacities of the resources, public infrastructure and public services

necessary to support such development, and choices made by individual property owners about the desired extent of development on each parcel), holding capacity is usually expressed as some percentage of the theoretical maximum. Based on the county's past experience with development, this general plan study will consider holding capacity at buildout of the *General Plan* to be 80 percent of the theoretical maximum holding capacity.

Besides simply identifying the maximum population that could be accommodated in a planning area at buildout, holding capacity also indicates other important characteristics of growth that must be considered in the planning process. The size of the population implies the number of dwelling units that will be required to house the people, how much water will be consumed annually, how much solid waste and sewage effluent will be generated, how many school children will need classrooms and how many cars use are roads.

Continuing development in areas covered by the community plans, specific plans and rural/agricultural areas could result in a population at buildout of about 317,000 in the unincorporated areas of the county. The buildout population of the unincorporated areas would constitute about 20 percent of the total county population at that time.

Most of the remaining development potential in the unincorporated areas lies within the specific plans and in rural areas and farms. The Shaver Lake Forest, Bretz Mountain, Millerton and Wildflower Village specific plans could accommodate as many as 22,000 residents at buildout. Within the community plan areas, Shaver Lake has the greatest remaining development potential. New dwellings on farms could account for a substantial increase in the population of the unincorporated county, assuming a portion of land zoned for agricultural use is subdivided in accordance with the minimum lot sizes allowed. The farm population could reach as high as 273,000, if all such land were subdivided and a dwelling was built on each parcel. Realistically, this development potential will never be achieved due to farming practices, lot patterns and restrictions related to Land Conservation Act contracts that collectively act to limit the subdivision of agricultural land.

Buildout of the fifteen incorporated cities consistent with their respective general plans will result in a population of about 1,249,300 in the incorporated areas at buildout. The total county population at buildout of the county general plan (including the community plans) and the cities would be about 1,565,821 people.

Table 1-16 shows the existing population of each of the cities and community plan areas of Fresno County, and the future population (holding capacity) that could be accommodated in each area based on buildout of each jurisdiction's general plan, and applying an 80 percent factor to the holding capacities to account for limitations due to market conditions, development restrictions on individual parcels and choices made by individual property owners.

The analysis of general plan holding capacity indicates that a total population of about 289,235 people could be accommodated in the unincorporated county at 80 percent buildout of the existing general plan. Therefore, about 114,735 more people than the 1996 population of 174,500 could be accommodated at buildout. If the average annual growth rate of three percent that occurred between 1990 and 1995 were to continue, the buildout population of the unincorporated county would be reached in the year 2014. If the growth rate were a more moderate two percent, buildout would occur in the year 2022.

TABLE 1-16
(continued)
POPULATION HOLDING CAPACITY
CURRENT GENERAL PLAN
Fresno County

Community	Existing Population	Holding Capacity	Percent Built-Out	Remaining Population Capacity	Remaining Population Capacity At 80% of Holding Capacity
Rural/Farming Population	101,050	272,853	37%	171,803	117,232
Community Plan Areas					
Biola	702	745	94%	43	34
Caruthers	1,603	1,940	83%	337	270
Del Rey	1,150	1,235	93%	85	68
Friant	372	372	100%	0	0
Lanare	265	220	120%	(45)	(36)
Laton	1,415	1,600	88%	185	148
Riverdale	1,980	2,691	74%	711	569
Shaver Lake	770	9,300	8%	8,530	6,824
Tranquility	515	515	100%	0	0
TOTAL	8,772	18,618		9,331	7,464
Specific Plan Areas					
Quail Lake Estates	0	2,000	0%	2,000	1,600
Del Rio	350	350	N/D	N/D	N/D
Millerton	0	8,000-10,000	0%	9,000	7,200
Wildflower Village	N/D	1,600	N/D	N/D	N/D
Bretz Mountain Village	N/D	2,500	N/D	N/D	N/D
Shaver Lake Forest	N/D	8,600	N/D	N/D	N/D
TOTAL	N/D	25,050	N/D	N/D	N/D
TOTAL UNINCORPORATED	---	316,521	---	---	---

TABLE 1-16
(continued)
POPULATION HOLDING CAPACITY
CURRENT GENERAL PLAN
Fresno County

Community	Existing Population	Holding Capacity	Percent Built-Out	Remaining Population Capacity	Remaining Population Capacity At 80% of Holding Capacity
Cities					
Clovis	65,000	176,680	37%	111,680	89,344
Coalinga	9,925	16,000	62%	6,075	4,860
Fresno	400,400	880,000	46%	479,600	383,680
Firebaugh	5,825	6,700	87%	875	700
Fowler	3,740	3,160	118%	(580)	(464)
Huron	5,525	5,530	100%	5	4
Kerman	6,725	15,000	45%	8,275	6,620
Kingsburg	8,450	13,800	61%	5,350	4,280
Mendota	7,400	12,000	62%	4,600	3,680
Orange Cove	6,700	7,000	96%	300	240
Parlier	9,450	14,000	67%	4,550	3,640
Reedley	19,100	35,000	55%	15,900	12,720
San Joaquin	2,920	7,000	42%	4,080	3,264
Sanger	19,300	19,800	98%	500	400
Selma	17,300	37,630	46%	20,330	16,264
TOTAL INCORPORATED	587,760	1,249,300	47%	661,540	529,232
TOTAL COUNTY	760,900	1,565,821	45%	N/D	N/D
Source: Fresno County General Plan, 1976					
Note: N/D = no data available					

1.8 POPULATION

HISTORICAL POPULATION GROWTH

The California State Department of Finance (DOF) provides population estimates for cities and counties throughout California. According to DOF population estimates, between 1980 and 1990 Fresno County, including the incorporated cities, grew by 29 percent from 514,621 to 661,400 persons. Over the next six years the county experienced an overall population growth of 15 percent, for a total current (1996) population of 760,900. Combined, the county experienced an overall growth rate of 48 percent since 1980. Table 1-17 shows the cumulative population distribution and growth rates between the incorporated cities and the unincorporated area of the county over the last 16 years, in five year increments.

Overall, growth in the incorporated areas of Fresno County was vigorous during the 1980s. The unincorporated areas of the county experienced a decrease in population of eight percent from 1980 to 1996. More people live in incorporated cities than in the unincorporated area of the county. The population in the unincorporated areas of the county have approximately 30 percent of the total population of the county. People have primarily been moving to the cities of Fresno and Clovis. Clovis is contiguous to the east side of Fresno, with integrated urban boundaries. The combined population of Fresno and Clovis is 61 percent of the total county population, and 82 percent of the population of incorporated cities combined. The growth in Clovis and Fresno represents a significant amount of population increase. The city of Fresno is the most populous city within the county, with a population of more than 400,000 persons, and it is 53 percent of the total county population. Clovis, the next largest city, has a population of approximately 65,000 persons. Table 1-18 provides the average annual growth rates for the county for 1980-1990 and 1990 to 1996.

While the change in population over the last 16 years for several of the other cities has been steady, a few cities have experienced significant growth since 1980. Between 1980 and 1996, Parlier has grown 250 percent; Huron has grown 102 percent; Clovis increased 100 percent; and Kingsburg increased 67 percent. However, since Parlier, Huron and Kingsburg are relatively small cities, they only represent four percent of the population residing in incorporated cities. Some of these large growth rates are a result of annexations. Parlier, for example, in 1982 annexed an area that doubled its population.

TABLE 1-17
PERCENT GROWTH, FIVE YEAR INCREMENTS
Fresno County

	1980 Population	1980 - 1985 Percent Growth	1985 Population	1985 - 1990 Percent Growth	1990 Population	1990 - 1995 Percent Growth	1995 Population	1995 Population	1995 - 1996 Percent
Clovis	32,500	22%	39,700	25%	42,650	27%	63,200	65,000	3%
Coalinga	6,550	10%	7,200	12%	8,050	20%	9,625	9,925	3%
Firebaugh	3,740	6%	3,980	6%	4,200	33%	5,600	5,825	4%
Fowler	2,500	14%	2,850	11%	3,150	17%	3,700	3,740	1%
Fresno	215,700	33%	286,400	15%	350,700	13%	395,500	400,400	1%
Huron	2,730	47%	4,010	24%	4,600	18%	5,450	5,525	1%
Kerman	4,010	8%	4,340	23%	5,375	21%	6,500	6,725	3%
Kingsburg	5,050	14%	5,775	3%	7,125	16%	8,300	8,450	3%
Mendota	5,075	32%	6,700	3%	6,875	8%	7,400	7,400	0%
Orange Cove	3,960	28%	5,050	10%	5,550	13%	6,275	6,700	7%
Parlier	2,680	117%	5,825	36%	7,900	15%	9,050	9,450	4%
Reedley	11,000	22%	13,400	17%	156,500	19%	18,700	19,100	2%
Sanger	12,350	14%	14,050	19%	16,650	9%	18,150	18,300	1%
San Joaquin	1,930	11%	2,140	8%	2,310	22%	2,810	2,920	4%
Selma	10,900	17%	12,800	14%	14,650	15%	16,900	17,300	2%
Incorporated	320,700	29%	414,200	21%	502,400	15%	577,200	586,700	2%
Unincorporated	190,100	-14%	163,200	-3%	159,000	7%	169,400	174,200	3%
Total County	510,800	13%	577,300	15%	661,400	13%	746,500	760,900	2%

Source: Department of Finance

Note: Subtotals are rounded to the nearest hundredth.

TABLE 1-18
AVERAGE CITY AND COUNTY GROWTH RATES
Fresno County
1980 - 1996

	1980 - 1985 Average % Growth Rate	1985 - 1990 Average % Growth Rate	1990 - 1995 Average % Growth Rate	1995 - 1996 Growth Rate
Clovis	4%	2%	5%	3%
Coalinga	2%	5%	4%	3%
Firebaugh	1%	1%	6%	4%
Fowler	3%	2%	3%	1%
Fresno	6%	4%	2%	1%
Huron	8%	3%	4%	1%
Kerman	2%	4%	4%	3%
Kingsburg	4%	5%	5%	3%
Mendota	6%	1%	1%	0%
Orange Cove	5%	2%	3%	7%
Parlier	22%	6%	3%	4%
Reedley	4%	3%	4%	2%
Sanger	3%	3%	2%	1%
San Joaquin	2%	2%	4%	4%
Selma	3%	3%	3%	2%
Incorporated	5%	4%	3%	2%
Unincorporated	-3%	-1%	1%	3%
Total County	2%	3%	2%	2%

Source: Department of Finance

POPULATION CHARACTERISTICS

The following sections describe the population characteristics of Fresno County. It includes identifying the distribution of age groups, including senior citizens and children, gender, and ethnicity.

Age

Table 1-19 shows the distribution of age groups and compares them between the incorporated and unincorporated areas of the county, and to the total county population. Table 1-20 provides a breakdown of the distribution of children among each of the incorporated cities. A few of the cities

have approximately 40 percent of the population under the age of 18 (Orange Cove, Parlier, and Firebaugh). The unincorporated area of the county has a significantly higher percentage of children (41 percent) than the incorporated area average (28 percent). Children are approximately a third of the county population.

Table 1-19 suggests that Fresno County has a significant portion of the population between the ages of 18 and 64. The incorporated areas have a somewhat higher percentage of the population in this age group at 61.53 percent, than the unincorporated area, which has 49.38 percent between 18 and 64.

<p>TABLE 1-19</p> <p>POPULATION BY AGE</p> <p>Fresno County</p> <p>1990</p>						
Age Group	Incorporated Cities		Unincorporated Areas		Fresno County Total	
0 - 4	50,263	10%	11,864	7%	62,127	9%
5 - 17	91,753	18%	55,248	33%	147,001	22%
18 - 64	306,092	62%	83,959	49%	390,051	58%
65 and Older	49,357	10%	18,954	11%	68,311	11%
Total	497,465	100%	170,025	100%	667,490	100%
Source: 1990 Census						

TABLE 1-20 CHILDREN (0 - 17) Fresno County			
Cities	Children (0-17)	Population	Percent Children
Clovis	15,444	50,323	31%
Coalinga	2,639	8,212	32%
Firebaugh	1,754	4,429	40%
Fowler	—	—	—
Fresno	92,024	354,202	26%
Huron	1,672	4,766	35%
Kerman	1,947	5,448	36%
Kingsburg	2,115	7,205	29%
Mendota	2,470	6,821	36%
Orange Cove	2,314	5,604	41%
Parlier	3,153	7,938	40%
Reedley	4,967	15,791	31%
Sanger	5,753	16,839	34%
San Joaquin	791	2,311	34%
Selma	4,898	14,757	33%
Incorporated	141,941	504,646	28%
Unincorporated	67,187	162,844	41%
Total County	209,128	667,490	31%
Source: 1990 Census			

Table 1-21 compares the elderly population to the total county population. The three cities with the largest proportion of elderly persons are: Kingsburg (18 percent); Clovis (16 percent); and Selma (15 percent).

<p>TABLE 1-21</p> <p>ELDERLY POPULATION</p> <p>Fresno County</p>			
Cities	60 and Older	Population	Percent Elderly
Clovis	8,206	50,323	16%
Coalinga	1,209	8,212	15%
Firebaugh	413	4,429	9%
Fowler	—	—	—
Fresno	47,479	354,202	13%
Huron	230	4,766	5%
Kerman	699	5,448	13%
Kingsburg	1,330	7,205	18%
Mendota	514	6,821	8%
Orange Cove	500	5,604	9%
Parlier	569	7,938	7%
Reedley	2,340	15,791	15%
Sanger	2,344	16,839	14%
San Joaquin	193	2,311	8%
Selma	2,258	14,757	15%
Incorporated	68,284	504,646	14%
Unincorporated	24,166	162,844	15%
Total County	92,450	667,490	14%
Source: 1990 Census			

Gender

The percentage of men and women in the county are approximately equal, with 49 percent men and 51 percent women. This is also true for the incorporated and unincorporated areas. However, a few of the incorporated cities have a higher proportion of men to women. As shown in Table 1-22, men are 59 percent in Huron, 54 percent in Mendota, and 54 percent in Orange Cove.

TABLE 1-22 POPULATION BY GENDER Fresno County				
Cities	Male	Percent	Female	Percent
Clovis	24,434	45%	25,889	51%
Coalinga	4,011	49%	4,201	51%
Firebaugh	2,277	51%	2,152	49%
Fowler	—	—	—	—
Fresno	171,599	48%	182,603	52%
Huron	2,805	59%	1,961	41%
Kerman	2,643	49%	2,805	51%
Kingsburg	3,443	48%	3,762	52%
Mendota	3,709	54%	3,112	46%
Orange Cove	3,022	54%	2,582	46%
Parlier	4,205	53%	3,733	47%
Reedley	8,176	52%	7,615	48%
Sanger	8,278	49%	8,561	51%
San Joaquin	1,204	52%	1,107	48%
Selma	7,226	49%	7,531	51%
Incorporated	247,032	49%	257,614	51%
Unincorporated	82,502	51%	80,342	49%
Total County	329,534	49%	337,956	51%
Source: 1990 Census				

Ethnicity

According to the 1990 U.S. Census, Caucasian (51 percent) and Hispanic (35 percent) are the largest ethnic groups in Fresno County. The remaining four ethnic group categories represent 15 percent of the total population of the county, with African Americans at five percent, Asians/Pacific Islanders at eight percent, and American Indians at one percent. Table 1-23 shows the ethnic composition in the county.

TABLE 1-23 TOTAL POPULATION BY ETHNICITY Fresno County		
Ethnicity	Persons	Percent
White (Not Hispanic)	338,595	51%
Hispanic Origin (of any race)	236,634	35%
Asian (Not Hispanic)	54,110	8%
African American (Not Hispanic)	31,311	5%
American Indian (Not Hispanic)	5,070	1%
Source: 1990 Census		

The average of the Hispanic population in the incorporated and unincorporated areas are similar, 35.88 and 34.12 percent respectively. However, there are five incorporated cities that have over 80 percent Hispanic population, including: Parlier (97.06 percent); Huron (96.45 percent); Mendota (93.90 percent); Orange Cove (86.01 percent); and Firebaugh (80.67 percent). Table 1-24 shows the distribution of Hispanic persons in county and compares it to the county's total population.

TABLE 1-24 HISPANIC POPULATION Fresno County 1990			
Cities	Hispanic Population	Total Population	Percent
Clovis	8,206	50,323	16%
Coalinga	2,593	8,212	32%
Firebaugh	3,573	4,429	81%
Fowler	—	—	—
Fresno	105,787	354,202	30%
Huron	4,597	4,766	96%
Kerman	2,871	5,448	53%
Kingsburg	2,265	7,205	31%
Mendota	6,405	6,821	94%
Orange Cove	4,820	5,604	86%
Parlier	7,707	7,938	97%
Reedley	9,196	15,791	58%
Sanger	12,269	16,839	73%
San Joaquin	1,743	2,311	75%
Selma	9,043	14,757	61%
Incorporated	181,075	504,646	36%
Unincorporated	55,559	162,844	34%
Total County	236,634	667,490	35%
Source: 1990 Census			

POPULATION PROJECTIONS

This section provides two estimates and methods of population projections. It includes population projections from the DOF and a Trend Line Projection prepared by Mintier & Associates.

Department of Finance Population Estimates

The DOF prepares population projections of all counties in California. The DOF uses a baseline cohort-component method to project population. A baseline projection assumes people have the right to migrate where they choose and no major natural catastrophes or war will befall the State or the nation. A cohort-component method traces people born in a given year through their lives.

As each year passes, cohorts change due to the mortality and migration assumptions. New cohorts are formed by applying the fertility assumptions to the women of childbearing age.

Life tables were developed using deaths from the Department of Health Services by gender, race/ethnicity, and age for the period 1970 to 1990. Age-specific, general, and period fertility rates were developed by race/ethnicity and county annually for the period 1970 to 1990. Births to women under 15 and over 44 were added to the births of the youngest and the oldest age groups when computing the fertility rates.

Migration proportions were developed for the two decades between 1970 and 1990 by a survived population method. The 1970 population was aged forward in time to 1980 by adding recorded births to form new cohorts and subtracting deaths to form existing cohorts. The survived population was compared to the 1980 population and differences were assumed to be migration. The ten-year migration was annualized and divided by the total to derive a proportion. The same process was used for the period 1980 to 1990. The migration proportions for the two decades were then averaged and smoothed using a none-cohort average.

The DOF population projections for Fresno County are presented in Table 1-25. It provides a 30 year projection, starting in 1990 with a population estimate of 673,608 persons, and concluding in 2020 with a population projection of 1,114,403 persons. This is an increase of 440,795 persons or a 1.69 percent annual compound growth rate. Chapter 3 "Existing Employment Projections" analyzes the various data sources, including DOF and the Employment Development Department's Labor Market Information Division (LMID), regarding employment projections associated with population data.

TABLE 1-25 DEPARTMENT OF FINANCE POPULATION GROWTH PROJECTION Fresno County			
Year	Total County	Total Change	Percent Change
1980	514,621	--	--
1990	673,608	158,987	31%
2000	811,179	137,571	20%
2010	953,457	142,278	18%
2020	1,114,403	160,946	17%
Source: Department of Finance, 1998			

TABLE 1-26			
POPULATION TREND LINE PROJECTIONS Fresno County			
Year	5 Year Trend (1994-1999)	10 Year Trend (1989-1999)	15 Year Trend (1984-1999)
1999	793,766	793,766	793,766
2000	806,030	811,239	812,081
2005	870,254	9,045	910,197
2010	939,595	1,008,583	1,020,166
2020	1,095,293	1,253,934	1,281,569
Average Annual Compound Growth Rate	1.55%	2.20%	2.31%
Source: Department of Finance, 1999, and Mintier & Associates			

Trend Line Projections

Mintier & Associates prepared three trend line population projections using DOF population estimates. As an alternative to the DOF estimates in assessing future population growth, these trend line projections compare the county's historical growth rates from the previous five, ten and fifteen years. The annual compound growth rates for these periods were applied to the 1999 population until 2020. The DOF projections are most similar to the growth rate for the previous five-year period, while the ten- and fifteen-year growth rates are higher. The results of the trend line projections are in Table 1-26.

1.9 SURROUNDING COUNTY GENERAL PLANS

Fresno County borders eight other counties: Tulare, Kings, Monterey, San Benito, Merced, Madera, Mono, and Inyo. Although land use decisions in other counties are beyond Fresno County's direct control, close coordination of the general plan update process with the general plans of these surrounding counties can help minimize potential conflicts with land use designations and policies in the *Fresno County General Plan*.

Kings County General Plan

Kings County borders Fresno County to the south and west. The county is almost entirely prime agricultural land outside of the two incorporated cities and four unincorporated communities. The General Plan was last updated in 1993 and projects modest growth in the unincorporated areas over the timeframe of the plan (about twenty years). The Plan encourages urban development within cities and existing urban areas and maintains large (40 acres or more) parcel sizes outside

city expansion areas. There do not appear to be any new or expanded developments proposed in Kings County that could adversely affect the *Fresno County General Plan*.

Madera County General Plan

Madera County borders Fresno County to the north and shares a common boundary of over one hundred miles. Madera County shares many common attributes with Fresno County. Madera County stretches from the eastern slopes of the coast ranges to the crest of the Sierra Nevada, with fertile agricultural lands in between. Madera County is more rural, with just under 109,000 residents. The policies of *Madera County General Plan* are designed to preserve the rural, agricultural character of the county while improving the county's economy.

Madera County adopted a comprehensive update of its general plan in October 1995. Of particular concern to the update the *Fresno County General Plan* is the designation of three new major growth areas along the Fresno County border in the vicinity of Millerton Lake and SR 41. Specific plans for these three areas, known as Rio Mesa, Gunner Ranch, and Castle-Cook, will be prepared in the future which will designate the range of allowable land uses and the method of providing needed facilities and services. However, it is expected that all three plans will accommodate housing and local-serving commercial land uses.

Merced County General Plan

Merced County borders Fresno County on the northwest. The *Merced County General Plan* was adopted in 1990 and projects a year 2000 population of about 238,200 residents, concentrated in the county's urban areas and cities. Merced County is also an agricultural county and has adopted policies that encourage urban development in cities and existing urban areas where services are available. The plan designates areas adjacent to Fresno County for agricultural use. There do not appear to be major new or expanded urban developments proposed near the shared border with Fresno county. However, the designation of the San Joaquin Branch of the University of California will likely affect Fresno County residents. The County is embarking on an update of the *General Plan* to address issues that have arisen from the closure of Castle Air Force Base. The revisions to the Plan are expected to be complete within the next year.

Monterey County General Plan

Monterey County borders Fresno County to the west in the coast ranges west of the city of Coalinga. The *Monterey County General Plan* was adopted in 1980 and includes policies applicable on a county-wide basis, as well as more specific policies and programs that govern eight sub-regional planning areas. The Plan covers a timeframe of about 20 years and projects a population of about 419,000 in the year 2000. Unincorporated Monterey County, as with Fresno County, is composed primarily of agricultural lands and open space. According to the *General Plan*, 57 percent of the county is designated for agricultural uses which constitutes the largest sector of the county's economy. Not surprisingly, policies and programs of the Plan encourage the preservation of productive farm land by concentrating new urban development within existing urban areas and where urban services are available. The County's growth management policy establishes criteria for the location of new urban development and discourages such development outside of urban service areas.

The portion of Monterey County that shares a border with Fresno County is designated entirely for grazing and agricultural use. The area does not appear to meet the criteria established by the County for new urban development. Thus, the potential for conflicts with the *Fresno County General Plan* appear small.

Inyo County and Mono County General Plans

Fresno County borders a small portion of Inyo and Mono counties, which are located in the eastern portion of the State along the Nevada/California border. Both counties are largely rural and consist primarily of public lands managed by the U.S. Forest Service, Bureau of Land Management, National Park Service, and other federal and state agencies. The border shared with Fresno County is located in a remote portion of the Sierra Nevada and consists largely of public lands, such as Sierra and Sequoia National Forests and Kings Canyon National Park. The General Plans for both counties reflect the public ownership and rural, open space nature of the lands within the jurisdiction. Over 80 percent of lands within the counties are designated as open space.

The potential for conflict between the Plans for Fresno County and those for Inyo and Mono Counties appears small. One area of potential concern relates to the need for coordination among the counties with the U.S. Forest Service and National Park Service regarding national forest and park plans especially as they relate to the preservation of wilderness areas, watersheds, and cultural resources.

San Benito County General Plan

San Benito County borders Fresno County on the west in the coast ranges which form the western boundary of the San Joaquin Valley. The area consists of range land and grazing and has little potential for other types of development; there are no cities or unincorporated communities in the area.

The *San Benito County General Plan* was last updated in July, 1992 and includes policies for the preservation of productive agricultural and grazing land which apply to the areas where Fresno and San Benito Counties meet. The General Plan does not appear to allow "new towns" through a specific plan, for example, and encourages new urban development to occur within the two incorporated cities. The potential for incompatible land uses at the border of the two counties does not appear to be high.

Tulare County General Plan

Tulare County shares the southern border of Fresno County. The *Tulare County General Plan* was adopted in 1963 and provides very general land use and development guidance for the unincorporated areas. No specific timeframe is indicated, although the year 1980 is mentioned often. The main goals of the Plan are to preserve the agricultural economy, promote business and retail trade, and provide housing and jobs.

Tulare County has also adopted a number of area plans that affect lands near Fresno County. These plans include the *Rural Valley Lands Plan* (revised 1995), the *Kings River Plan* (1982), and the *Foothill Growth Management Plan* (1981). Each of these plans provides more precise guidance for land use management in specific areas of the county. The primary goal of these plans is to preserve

sensitive resources, especially agricultural land. New development is encouraged to locate in areas that do not contain prime farm lands or other sensitive resources, and where services are already available. No significant new urban development is proposed near Fresno County's border.

1.10 REGIONAL PLANS AND POLICIES

State law requires Fresno County and various regional agencies to undertake special planning efforts to address certain issues that are either not required to be addressed in the General Plan or cover a larger area than can be addressed within a single community general plan. This section discusses plans affecting land use, growth, and development in Fresno County that are either regional in nature or that deal with a particular governmental function.

LAND USE AND POPULATION

The Council of Fresno County Governments (COFCG) provides population projections based on DOF estimates to use in regional transportation and housing planning.

As required by State law, the COFCG administers the apportionment of housing allocation requirements for various income and housing categories for all communities in the county. These are based on DOF and census data, and also on data received from each city and the County.

The COFCG also prepares and coordinates numerous regional transportation planning services and studies including: the *Fresno Regional Traffic Monitoring Report*; I-5 Business Development Corridor; Central Valley Ridesharing; and Traffic and Air Quality Modeling. They are currently conducting an East-West Corridor Study, which will analyze appropriate areas for east-west traffic flow.

Fresno County participates in several Memoranda of Understanding, (MOU) with all 15 cities located in the County. The MOU, entitled Joint Resolution of Metropolitan Planning, is between the County and the cities, whereby the agencies have an agreement on land use and annexation policies. The County and cities are engaged in several other MOUs containing policies to encourage urban development within incorporated cities with a tax agreement to return tax revenues to the County.

FLOOD CONTROL

There are several flood control and storm drainage systems and programs within incorporated cities, unincorporated areas, and between certain cities. They address flood control issues at the sub-regional and city level. There are currently no county-wide flood control management systems, programs, or policies in place.

The cities of Fresno and Clovis participate in a "special act" district, entitled the Fresno Metropolitan Flood Control District (District). The district manages a comprehensive storm water management program and related services on a regional basis through a quasi-joint powers agreement between the cities of Fresno and Clovis, and the County. The objectives of the District are to provide flood management and control, urban storm water drainage, management of surface and ground water resources of the area, prevent flood related injury and property damage, conserve water, and to provide programs relating to storm water quality management, rural

streams and wildlife management. The storm water quality management program was developed as a result of the National Pollutant Discharge Elimination System (NPDES) permit programs. The rural streams program was created in conjunction with the federal Redbank-Fancher Creeks Flood Control Project to preserve the District's natural streams and to convey through those streams the storm flows originating in the foothills and eastern rural areas. The wildlife program was initiated by the District to protect and enhance wildlife resources wherever possible.

District engineering function includes system master planning, design, construction, development review, and facility operations and maintenance. District staff review and comment on development entitlement applications within the District boundaries, and direct the master planning and design engineering of the urban storm drainage systems performed by the District's consultants. Staff administers the Drainage Fee Ordinance of the three land use entitlement agencies (city of Fresno, County of Fresno, and the city of Clovis) and administers a system of reimbursements for developers who advance facility construction in excess of the drainage fee obligation.

The Department of Water Resources, U.S. Army Corps of Engineers, and the Bureau of Reclamation manages several flood control facilities in the unincorporated area of the western portion of the County, from the Coastal Mountain Range to Fresno Slough. These facilities include: Little Panoche Reservoir; Little Panoche Creek; Turney Gulch & Arroyo Ciervo; Cantua Creek; and Arroyo Pasajero. Most of this area is unpopulated land. These facilities and waterbodies are managed because during storm events they affect flooding in/or near: Interstate Highway 5, the California Aqueduct; the city of Mendota; the city of Coalinga; the city of Huron; and the Mendota Wildlife Management Area and surrounding lands.

The central Fresno County area is located between the Fresno Slough and the Sierra Nevada foothills, near Millerton Lake and Pine Flat Lake. Two major rivers, the San Joaquin River and the Kings River flow from east to west through the Central Valley area. The Fresno Slough and James Bypass connects these two rivers to direct river floodwater. Many flood control facilities are located along these waterways to control flooding including: the Friant and Mendota Dams on the San Joaquin River and the Pine Flat Dam on the Kings River, several smaller reservoirs and detention basins, and the Redbank-Fancher Creeks Flood Control Project. These facilities are managed by several agencies including: U.S. Army Corps of Engineers; Bureau of Reclamation; Fresno Metropolitan Flood Control District; Kings River Conservation District; Friant-Kern Water Users Authority; and other local irrigation districts. Details of the facilities, waterbodies and jurisdictions of each agency are discussed in detail in Chapter 5, Public Facilities and Services. Flood waters from the major waterways in the Central Valley are generally controlled through a system of levees, which are under jurisdiction of local reclamation or irrigation districts. In addition, the Redbank-Fancher Creeks Flood Control Project has assisted with downstream flood problems resulting from the San Joaquin River and the Kings River. Flood control problems still remain for areas affected by creeks within the Kings River system.

Land use developments in these areas are reviewed by the managing State and local agency(s) and are required to incorporate development standards as determined through the development review process.

WATERSHEDS

There are at least seven major watersheds that contribute to the water supply for Fresno County. The watersheds and management agencies are listed below:

Watershed

- Orange Cove Stream Group
- Fresno Stream Group
- Kings River Service Area
- San Joaquin River System
- Arroyo Pasajero Stream System
- Cantua Creek System
- Panoche-Silver Creek Stream System

Management Agency

- Natural Resource Conservation Service
- Fresno Metropolitan Flood Control District
- Kings River Conservation District
- Dept. of Water Resources

A large number of waterways originate in the eastern portion of the county, in the Sierra Nevada Mountain Range. The Sierra Resource Conservation District includes a large portion of the county; almost one-third of the total acreage of Fresno County. The District has two primary watersheds, the San Joaquin River and the Kings River, which greatly affect the foothill and valley floor. These two watersheds have comprehensive management plans. They are the *Master Plan for the Kings River Service Area*, and the *San Joaquin River Management Plan*.

The San Joaquin River System (SJRS) includes a very large geographical area, extending up to Sacramento. The SJRS is divided into 10 study areas, based on similarities in hydrology and environmental conditions. Three of the study areas are in Fresno County including Friant Dam to just upstream of Gravelly Ford, Gravelly Ford to just upstream of Mendota Pool, and North Fork of the Kings River. Eight major streams and twenty-two minor streams flow into the San Joaquin River. The San Joaquin River flows west, then north to the Sacramento-San Joaquin Delta. The Kings River contributes to the San Joaquin River system only during extremely wet water years. Floodwaters flow to the North Fork of the Kings River (also known as Fresno Slough) then north to the San Joaquin River. The San Joaquin River Management Program was authorized by AB 3603. Recommendations of the San Joaquin River Management Program fall into three categories: projects, studies, and acquisitions.

The *Master Plan Study for the Kings River Service Area* presents the results of a study of the services area and makes recommendations regarding a course of action to supply water, minimize flood damages, and conserve and develop water and power resources. The Kings River Service Area comprises approximately 1.1 million acres of land partly in Fresno, Kings and Tulare Counties. The Plan identifies future water demands and anticipated shortages, and provides alternative management scenarios to meet water supply needs for agricultural and non-agricultural uses.

The Fresno Stream Group is managed by the Fresno Metropolitan Flood Control District and the Orange Cove Stream Group is managed by the Natural Resource Conservation Service. The Arroyo Pasajero Stream System, Silver-Panoche Stream System, and Cantua Creek System are all located on the west side of Fresno County, and are all in the process of developing management plans.

The Fresno Metropolitan Flood-Control District is authorized to control storm waters within an urban and rural foothill watershed of approximately 400 square miles, known as the Fresno County Stream Group (FCSG). The District controls and manages flood, storm, and surface and groundwater resources of the area to prevent damage, and to conserve waters for local domestic and agricultural use. The watershed extends eastward into the Sierra Nevada to an elevation of approximately 4,500 feet above sea level. The FCSG drains a part of the west slope of the Sierra Nevada between the San Joaquin and Kings Rivers. The system includes several major flood control facilities and many related streams and channel features.

AIRPORT LAND USE POLICY PLANS

As stated in policy 303-03:1.00 of the *Fresno County General Plan*, the County's role in air transportation is strictly limited to land use considerations in support of State and Federal regulations. California Public Utilities Code, Sections 21670-21679.5 (Chapter 4, Article 3.5) provides the statutory authority for establishment of the Fresno County Airport Land Use Commission and its adoption of procedures and policies. Section 21675 requires that the Commission adopt a land use compatibility plan for each public airport and for the surrounding area. These plans are important to the *Fresno County General Plan* update process because the general plan of any city or county must be consistent with the applicable airport land use plan in areas covered by the land use plan.

Airport land use plans regulate land around airports to insure the continued viability of each facility. The plans each contain policies and regulations that discourage land uses that would be inconsistent with safe airport operations. The plans prohibit high-occupancy land uses (such as apartments, hospitals and schools) and land uses sensitive to noise (such as residences) within zones around each airport based on the expected noise exposure and the likelihood of an accident.

There are eight public and private airports within Fresno County. These include six public airports (Fresno Air Terminal, Fresno Chandler Downtown Airport, Coalinga Airport, Firebaugh Municipal Airport, Mendota Municipal Airport and Reedley Municipal Airport) and three private airports (Harris Ranch Airport, and Sierra Sky Park). Within Fresno County, there are a total of 672 based aircraft and the public use airports combine to handle a total of about 400,700 operations per year.

Fresno-Yosemite International

The busiest airport in the county and the region is Fresno-Yosemite International (FYI) which is owned and operated by the city of Fresno. Located approximately 6 miles northeast of Fresno City Hall in the Roosevelt Community Plan area, FYI is the county's primary passenger airport. The *Fresno Air Terminal Land Use Policy Plan* (Adopted June 23, 1986; Revised May 21, 1990) guides land use decisions within the vicinity of the Airport to insure compatibility.

Fresno Chandler Downtown Airport

Fresno-Chandler Downtown Airport (FCH) is located west of the State Highway 99 in the city of Fresno. The Airport is guided by the *Fresno Chandler Downtown Environs Specific Plan* (City of Fresno, 1981). Acting as a reliever airport to the FAT, FCH occupies a 200-acre site in the Edison Community Plan, one and one-half miles southwest of downtown Fresno. According to the 1981

Plan, the major land uses in the vicinity of FCH are agriculture, residential (mostly single-family), public, and industrial.

Coalinga Airport

The *Coalinga Airport Land Use Policy Plan* was adopted in November 1994. Coalinga Airport is on 1,080 acres located northwest of the intersection of Calaveras and Phelps Avenues. The Coalinga City Council adopted the *Airport Master Plan* for the Coalinga Airport in January 1990. Surrounding county land is designated for agriculture and wildlife conservation area uses that prohibit urban development which could conflict with airport operations. The Federal Aviation Administration (FAA) and the U.S. Fish and Wildlife Service have developed a formal agreement which accepts the city of Coalinga's *Mitigation Plan* and the *Pleasant Valley Habitat Conservation Plan* as acceptable means for ensuring that airport or urban development does not encroach on lands adjacent to the airport.

Other Fresno County Airports

The *Fresno County Airports Land Use Policy Plan* (January 1983) guides development around Firebaugh Municipal Airport, Mendota Municipal Airport, Reedley Municipal Airport, and the Selma Aerodrome.

Firebaugh Municipal Airport, owned and operated by the city of Firebaugh, is located on the north side of Nees Avenue, west of the Main Canal. The *Fresno County Firebaugh Community Plan* designates unincorporated land around the airport for agricultural use, industrial use, and open space reserve. The open space designation has been applied at areas at both ends of the Airport because they are considered to be hazardous areas.

Reedley Municipal Airport is located on a 138-acre site approximately five miles north of the city. The Airport property is a noncontiguous portion of the city of Reedley; the surrounding area is unincorporated portions of Fresno County. Uses surrounding Reedley Municipal Airport are generally agricultural land (including orchards and vineyards) and rural residential in all directions. The Great Western School, an elementary school, is located on the south side of American Avenue. Although the Airport abuts the Great Western School on the south, according to the *Reedley Municipal Airport Master Plan (1992)*, potentially adverse impacts of the airport are mitigated by:

- The south end alignment of the runway approximately 2,400 feet from the school; and
- The flight pattern is away from the school by an established right-hand traffic pattern.

The Selma Aerodrome is a privately owned and operated facility located approximately two miles west of State Route 99 between Huntsman Avenue and Floral Avenue. According to the city of Selma's 1997 *General Plan*, it is the City's intent to acquire and develop the airport as a municipal facility and proposes that the airport and surrounding lands be placed within the city's Sphere of Influence.

Development around Harris Ranch Airport is guided by the *Harris Ranch Airport Land Use Policy Plan* (October 1995). This Airport is located in the southeast quadrant of the intersection of the Interstate 5 Freeway and State Route 198 (Doris Avenue) interchange. The city of Coalinga is

located ten miles to the southwest along State Route 198. The Fresno-Clovis area is located 35 miles to the northeast. Harris Ranch Airport is outside of any incorporated city's sphere of influence.

Sierra Sky Park is located in northern portion of the county near the Fresno/Madera County line. Development in the vicinity of the Airport is guided by the *Sierra Sky Park Land Use Policy Plan* (Revised October 16, 1995).

HAZARDOUS WASTE MANAGEMENT

The *Fresno County Hazardous Waste Management Plan* (CHWMP) was approved in November of 1988 and accepted by the State Department of Health Services (DHS) in May 1989. The Plan contains descriptive background information and policy guidance for: current hazardous waste generation, projected hazardous waste generation to the year 2000, capacity analyses, hazardous waste reduction, siting of hazardous waste management facilities, hazardous waste transportation, underground storage tank regulations, disclosure information on contaminated sites, and asbestos and infectious waste. The Plan also includes programs for hazardous waste management, enforcement, inspection and monitoring, small quantity generators, household hazardous wastes, and implementation. In 1992, the CHWMP was, for a second time, submitted to the State but it was not approved.

The Fresno CHWMP also identifies a comprehensive set of siting criteria for hazardous waste facilities and identifies areas of the county where such criteria might be applicable upon more detailed site-specific investigations. Siting criteria reflect four broad categories: high hazard areas, public safety, physical limitations of the site area, and site-specific features.

SOLID WASTE MANAGEMENT

Fresno County and its 15 cities worked together in a countywide effort to prepare a *Countywide Integrated Waste Management Plan* (CIWMP). The CIWMP includes a *Source Reduction and Recycling Element* (SRRE), *Household Hazardous Waste Element* (HHWE) and *Nondisposal Facility Element* (NDFE). The CIWMP is required by Assembly Bill 939, the California Integrated Waste Management Act of 1989 (AB 939). AB 939 mandates that all cities and counties in California meet waste diversion goals of 25 percent and 50 percent be met at the local level by 1995 and 2000, respectively.

Three multi-jurisdictional agencies within the county deal with solid waste management issues:

1. Fresno-Clovis Metropolitan Solid Waste Commission includes the county and the cities of Fresno and Clovis;
3. Southeast Regional Solid Waste Commission includes the county and the cities of Fowler, Kingsburg, Orange Cove, Parlier, Reedley, Sanger, and Selma,
3. West County Solid Waste Planning Committee includes the county and the cities of Coalinga, Firebaugh, Huron, Kerman, San Joaquin, and Mendota.

The County's SRRE includes four main components: source reduction, recycling, composting, and special waste. Each identifies existing diversion programs and examines, evaluates, and selects future diversion programs. Additionally, the SRRE includes goals and objectives and sections on education and public information, disposal facility capacity evaluation, funding, and integration.

According to the *Fresno County Integration Summary Plan*, approximately 829,000 tons of solid waste were generated in the county in 1990. About 64,600 tons were diverted through source reduction, recycling, and composting activities. Waste projections indicate approximately 902,000 tons of waste will be generated and 180,400 tons diverted in 1994. As of January 1994, there were nine operating landfills in the county. Five of the facilities accept municipal solid waste (MSW): American Avenue, Coalinga, Clovis, Chateau Fresno, and Orange Avenue Landfills. Two facilities accept only construction, demolition, and/or other inert waste: Craycroft Brick and Gentz Construction. There is one transformation facility for the incineration of urban wood waste and agricultural wastes: Mendota Biomass Power.

According to the Solid Waste Generation Study, the unincorporated areas of Fresno County generated 143,135 tons of solid waste in 1990. Of the total solid waste generated, 6,108 tons of solid waste were diverted from the landfill through curbside programs, buy-back and drop-off centers, and construction and demolition debris recycling activities. The remaining solid waste, 137,027 tons, was disposed. Disposal facilities utilized by the unincorporated areas of the County include the American Avenue, Clovis City, Coalinga, Southeast Regional, Gentz Construction, and Craycroft Brick Company Landfills, and Mendota Biomass Facilities.

According to disposal needs projections in the SRREs of the cities and unincorporated area, the permitted MSW landfills are projected to provide combined disposal capacity to the County until approximately 2036, assuming implementation of selected SRRE programs. Table 1-27 lists the quantity of waste collected in each jurisdiction in the county as well as the landfill used by each jurisdiction.

TABLE 1-27

WASTE QUANTITIES COLLECTED
Fresno County Jurisdictions

Jurisdiction	Waste Quantity Collected per Day		Waste Quantity Collected per Year ²		Landfills Used ⁴
	Tons	Cubic Yards ¹	Tons	Cubic Yards ³	
Clovis	245	408	63,717	106,195	Clovis Landfill
Coalinga	27	45	7,057	11,762	Coalinga
Firebaugh	15	25	3,805	6,342	American Avenue
Fowler	11	18	2,757	4,595	American Avenue
Fresno	1,828	3,047	475,227	792,045	American Avenue, Chateau Fresno
Huron	16	27	4,095	6,825	Coalinga
Kerman	18	30	4,682	7,803	American Avenue
Kingsburg	24	40	6,192	10,320	American Avenue
Mendota	23	38	5,862	9,770	American Avenue
Orange Cove	19	32	4,816	8,027	Exported to Tulare County
Parlier	26	43	6,822	11,370	American Avenue
Reedley	52	87	13,571	22,618	American Avenue
Sanger	43	72	11,076	18,460	American Avenue
San Joaquin	8	13	1,987	3,312	American Avenue
Selma	49	82	12,682	21,137	American Avenue
Unincorporated Area	528	880	137,189	228,648	American Avenue, Clovis, Coalinga, Chateau Fresno, Orange Avenue

Source: *Fresno County Integration Summary Plan*, February, 1996

¹ Using 260 days per year.

² Source: Fresno County SWGS (1991), updated by the City of Sanger Staff (1995)

³ Conversion factor: 1,200 lb./cubic yard

Source: Fresno CoSWMP (1985), updated by Resources Division Staff (1994)

WATER QUALITY

Fresno County is located within the jurisdiction of the Central Valley Regional Water Quality Control Board (Regional Board). Fresno County is included in the *Water Quality Control Plan* for the Tulare Lake Basin. This Basin comprises the drainage area of the San Joaquin Valley south of the San Joaquin River. This Basin only drains north into the San Joaquin River in years of extreme rainfall. The Basin is enclosed by five different mountain ranges, giving it a horseshoe shape. It comprises approximately 10.5 million acres, of which 3.25 million acres are in federal ownership. The maximum length and width are 170 miles and 140 miles, respectively. The Basin encompasses numerous surface water features including lakes, rivers, streams, canals, and subsurface waters. Aquifers and ground water comprise all subsurface waters that occur in fully saturated zones and fractures within soils and other geologic formations. The closed nature of the Tulare Lake Basin allows for little subsurface outflow. This restricted outflow can lead to an accumulation of salts within the Basin due to importation and evaporative uses of water. The largest water quality problem of the Basin is the accumulation of salts. This problem can be compounded by

overdrafting ground water for municipal, agricultural, and industrial purposes. The use of deeper formations and outside sources can further concentrate the salts in ground water.

The Central Valley Regional Water Quality Control Board attempts to maintain water quality through control of waste water discharge types. Point source waste water in Fresno County includes: municipal wastewater; oil field wastewater; winery discharges; solid waste sites and other industrial uses. Point source discharges must meet waste water discharge requirements, or obtain a waste water waiver. Nonpoint sources, include drainage and percolation from a variety of activities including: agriculture; forestry; recreation; and storm runoff. Nonpoint sources are difficult to identify, but can be mitigated by state management practices.

These different discharge types are created by different land uses. These land uses are effected by the standards set forth by the Regional Board. The Board attempts to maintain water quality through the implementation of standards in the following categories: agriculture; overdraft, salinity, silviculture, mineral exploration and extraction, erosion, recreation; well standards; controlled burning; municipal and domestic waste water; industrial wastewater; storm water; hazardous and non-hazardous waste disposal; and other discharge activities. Each of these categories is directly related to a type of land use that has generated it. Agriculture is a prime example of a nonpoint source of waste water. Agriculture uses many types of fertilizers, pesticides and large amounts of water. The fertilizers and pesticides may increase the salinity and toxicity of water quality. The large amounts of water used for irrigation also increases the salinity of the water supply and can lead to overdrafting ground water.

AIR QUALITY

Fresno County is located within the San Joaquin Valley Air Basin which is made up of eight counties: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare. The basin is bordered by mountains on the west, south, and east; to the north, the basin extends to the Sacramento Valley Air Basin. For purposes of regulating and monitoring air quality, Fresno County is under the jurisdiction of the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD).

The SJVUAPCD was formed in August 1992 in an effort to further regional air quality planning and monitoring. Air districts have the primary responsibility to control air pollution from all sources other than emissions directly from motor vehicles which are the responsibility of the EPA and California Air Resources Board. Air districts regulate air quality through their permit authority for most types of stationary emission sources and through their planning and review activities for other sources. Further, air districts adopt and enforce rules and regulations to achieve State and Federal ambient air quality standards and enforce applicable State and Federal laws.

The San Joaquin Valley Air Basin is highly susceptible to pollutant accumulation over time due to its warm Mediterranean climate combined with restricting topography. Significant factors accelerating the decline of air quality in the basin are the Valley's significant population growth and associated increase in traffic, urbanization, and industry. All of these factors contribute to non-attainment for ozone and particulate matter. The California Clean Air Act requires each non-attainment area to reduce pertinent air contaminants by at least five percent per year until State Air Quality Standards are met.

The SJVUAPCD prepared and adopted the *San Joaquin Valley Air Quality Attainment Plan* (AQAP) in response to requirements of the California Clean Air Act. The AQAP was adopted on January 30, 1992 and, in accordance with CCAA requirements, updated in 1994. The AQAP includes a section on Transportation Control Measures (TCM). This section provides strategies to reduce air pollution from traffic related emissions. Specific strategies that may affect land uses include enhanced district CEQA participation program, and strategies to reduce vehicle trips, miles traveled, vehicle idling, or traffic congestion. The enhanced CEQA participation program allows APCD review of new development projects for residential and non-residential, and transportation projects, for stationary, indirect and areawide sources. The intent is to minimize air quality impacts by site design, and onsite and offsite mitigation measures by the project proponent. The TCM strategies include diversifying transportation programs such as the rideshare program, and alternative transportation modes. The SJVAB was designated in 1994 as having "severe" air quality problems. The TCM is required by the CCAA to achieve an average vehicle ridership of 1.5 persons per vehicle by 1999. Land use and development project planning would be required to incorporate aspects of these programs into their design to reduce mobile, stationary, direct and indirect emissions.

The APCD also has a document entitled the *Air Quality Guidelines for General Plans*, adopted October 1994. The purposes of the document are to provide local governments in the *San Joaquin Valley District Air Quality Goals and Policies* intended to help reduce vehicle trips, miles traveled, and development-related emissions. It also provides justification and rationale for the goals and policies that will convince decision makers and the public that they are appropriate and necessary.

1.11 FEDERAL AND STATE PLANS AND POLICIES

The nature of any land use policies or plans adopted for federal or state-owned land within the county are important to the *Fresno County General Plan* update process because the management and use of such public lands can have significant effects on surrounding land uses. Because federal and state agencies are generally not subject to the policies and plans adopted by local governments such as Fresno County, an understanding of the concerns of federal and state agencies is vital to ensure effective interjurisdictional cooperation and coordination during the County's planning process.

The most significant public land holdings in Fresno County managed by other than the County or the Cities are the lands subject to the jurisdiction of the United States Forest Service (USFS), National Park Service, and the State of California. Figure 1-8 shows the location of National Forest and Park lands in Fresno County.

NATIONAL FOREST LAND RESOURCE MANAGEMENT PLANS

Fresno County contains portions of two national forests: Sierra National Forest which makes up much of the eastern portion of the county north of the Kings River, and Sequoia National Forest which makes up a small portion of the county south of the Kings River. National forests are managed by the United States Forest Service (USFS) which is part of the U.S. Department of Agriculture.

Land use decisions and resource management within National Forests are outside the jurisdiction of Fresno County, although the USFS seeks County input on major land use and policy decisions.

However, activities and land use decisions within the National Forests can affect Fresno County in a number of ways, especially to the extent that economic use and enjoyment of the Forest contributes to the economy and quality of life in Fresno County.

In an effort to establish long-range planning and management of the national forests, Congress passed the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), and the National Forest Management Act of 1976 (NFMA), that amended the RPA. These laws require comprehensive, long-range forest plans to be prepared for each national forest that details, among other things, how the resources within the forest will be managed, used, and preserved for the next 10 to 15 years. The management plans stress "multiple use" strategies that encourage the economic use of resources within the forest. Such resources include timber, water, and mineral resources, as well as recreation.

Sierra National Forest

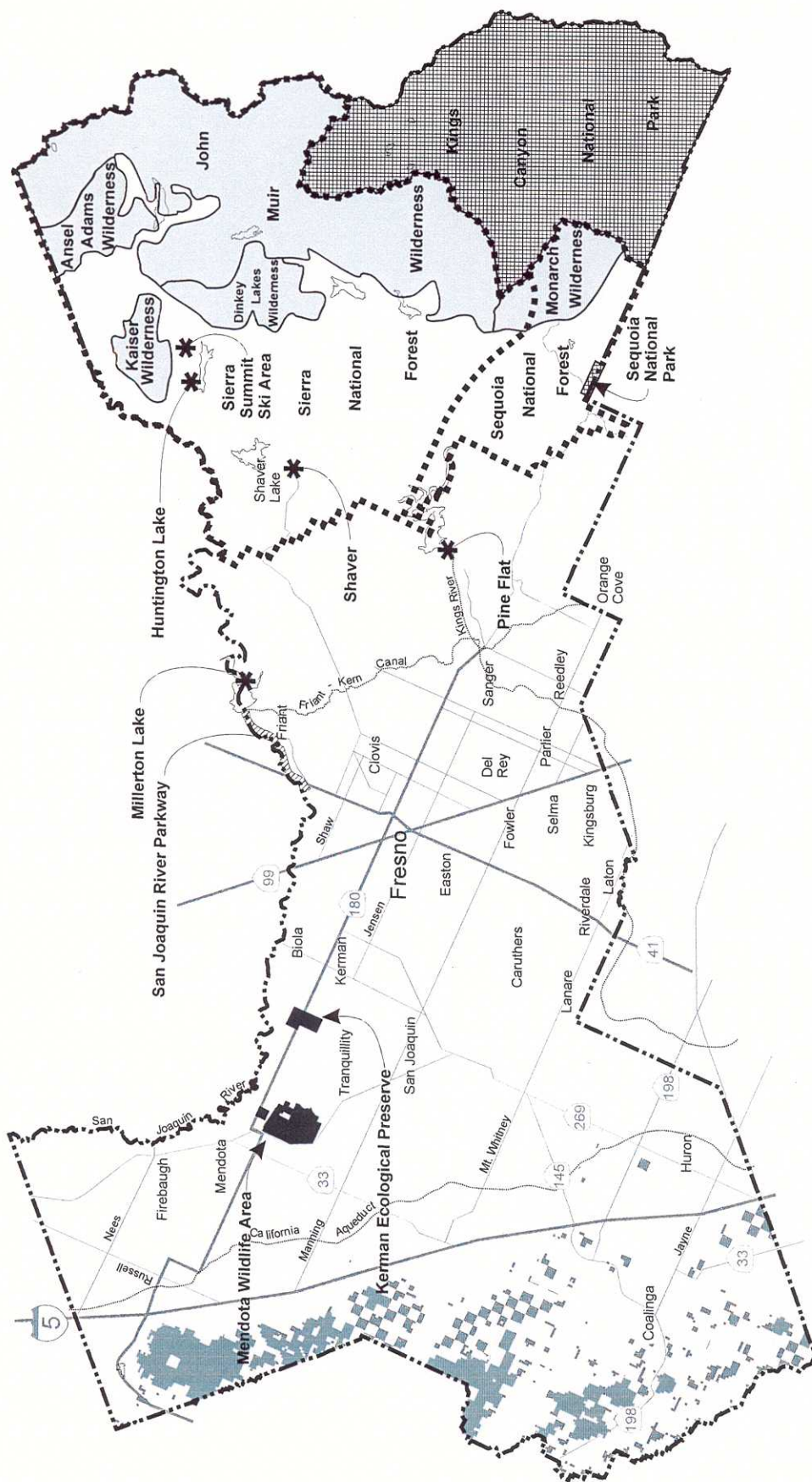
Sierra National Forest is located on the west side of the central Sierra Nevada Range in Fresno, Madera, and Mariposa Counties. The forest's administrative boundary encloses 1,395,553 acres of which 109,493 acres are non-federal. The private holdings were patented under various laws such as the Timber and Stone Act, Homestead Act, or 1872 Mining Act. The pattern of private holding is generally irregular and scattered along the forest's western boundary at the lower and mid-elevations.

Several small communities are located within the Forest boundary. These include:

- Pine Ridge
- Mono Hot Springs
- Vermillion Valley
- Florence Lake
- Balch Camp
- Wishon Village
- Trimmer
- Camp Sierra
- Mountain Rest
- Sierra Cedars
- Cedar Chest
- Lakeshore
- Big Creek
- Huntington Lake
- Chawanakee
- Shaver Lake
- Alder springs
- Meadowlakes

Management of the Sierra National Forest is guided by the *Forest Land and Resource Management Plan (1991)*. The goal of the *Forest Plan* is to provide a management program reflecting a mix of activities, allow use and protection of Forest resources, and fulfill legislative requirements while addressing local, regional and National issues. The planning horizon is 50 years, however NFMA regulations require land and Resource Management Plans to be applicable for 10-15 years with projections for the following 40 years. Some key objectives of the Plan include:

- Manage wilderness to meet recreational, scenic, educational, conservation, and historic uses, as well as preserving wilderness character;
- Coordinate habitat management with other resource activities and programs to maintain or improve fish and wildlife habitats;



National Forests and Parks

Figure 1-8

- Wilderness Area
- National Park
- National Forest Boundary
- Bureau of Land Management
- Recreation Areas



- Emphasize habitat improvements for sensitive, threatened, endangered, and harvest species.;
- Annually market the allowable sale quantity as needed to meet local, regional, and national demand for wood products;
- Manage plant communities so as to maximize diversity for plants and animals;
- Maintain or improve soil quantity;
- Produce water of sufficiently high quality to meet or exceed user requirements;
- Encourage mineral exploration and development while minimizing adverse environmental impacts of such activities;
- Inventory and manage cultural resources to prevent loss or damage;
- Develop an efficient and environmentally sound transportation system, which provides access to Forest land and permits appropriate access to private land;
- Manage existing transportation facilities to facilitate resource management, protect wildlife, meet water quality objectives and provide recreational access; and
- Provide a cost-effective fire management program to protect forest resources, life, and property.

Sequoia National Forest

Sequoia National Forest is located at the southernmost end of the Sierra Nevada range within Tulare (62 percent), Kern (26 percent) and Fresno (12 percent) Counties. Within the Forest boundary there are 1,119,045 acres of National Forest land and 54,155 acres of other ownerships (private, county, state, etc.). Several small communities are located within the Forest boundary. These include: Hume; Etheda Springs; and Cedarbrook.

Management of the Sequoia National Forest is directed by the *Sequoia National Forest Land and Resource Management Plan* (1988). The Plan provides a management program reflecting a mix of activities which allows use and protection of Forest resources. It also fulfills the legislative requirement for the Sequoia National Forest while addressing local, regional, and national issues. To accomplish this, the Forest Plan: allocates land uses, establishes the management direction and associated goals and objectives for the Forest for the next 10-15 years, specifies the standards, approximate timing and intensity of practices necessary to achieve that direction, and establishes the monitoring and evaluation requirements needed to ensure that the direction is being carried out and to determine how well outputs and effects were predicted.

The intent of the Plan is to provide increased public benefits from the Forest while maintaining the long-term productivity of the land. Key actions highlighted in the plan are listed below:

- Manage the timber resource to produce a continuous supply of wood for industrial and nonindustrial purposes using a mix of even aged and uneven-aged management techniques;

- Manage recreation to provide a quality experience and protect the area from resource damage;
- Encourage use of wildernesses by providing support facilities such as trailhead facilities and maintaining trails at higher standards;
- Increase opportunities for dispersed recreation by expanding the Forest road and trail system;
- Provide opportunities for such diversified activities as equestrian, hiking, and off-highway vehicle use while protecting the Forest;
- Provide whitewater floating opportunities for both individual recreationists and commercial outfitters;
- Provide expanded downhill and cross-country skiing opportunities;
- Increase opportunities for the recreational use of selected giant sequoia groves through improved access and increased public information.
- Maintain an overall natural appearance along heavily traveled routes through the forest;
- Provide adequate fire protection at a cost that is commensurate with the resource values being protected;
- Allow for the use of prescribed fire in wilderness to increase vegetative diversity and to reduce the threat of damaging wildfires;
- Implement an integrated cost-effective program on rangelands to provide a wide variety of benefits including forage for livestock, wildlife, diversity of plant and animal communities, and high quality water yield;
- Manage fish and wildlife habitat to insure all native species maintain adequate population levels and distribution in order to provide for their continued existence;
- Manage riparian zones to maintain a natural appearance, and to sustain habitat for wildlife and fish;
- Encourage and facilitate the orderly exploration, development, and production of mineral and energy resources;
- Continue to inform the general public as to the nature of the Forest Service Mission.

U.S. DEPARTMENT OF INTERIOR, NATIONAL PARK SERVICE

Kings Canyon National Park encompasses a portion of southeastern Fresno County. Management of this area is by the National Park Service, an agency of the U.S. Department of the Interior. The *Natural Resource Management Plan* (National Park Service, 1976) for Sequoia and Kings Canyon

National Parks, guides overall management of the parks. The Plan addresses broad resource topics—including vegetation, wildlife, fire ecology, water resources, and impact of human use. The following objectives, contained in the Statement for Management, provide direction for the projects within the Plan:

- Restore and/or maintain the natural ecosystems of these parks as they were prior to the advent of human technology;
- Encourage and support an active research program designed to provide management with decision assistance in all aspects of planning, development, and management;
- Perpetuate wildlife populations in a natural environment while protecting visitors from harm;
- Give special consideration to the protection of those rare or endangered plant and/or animal species found in the parks;
- Allow naturally occurring fires to fulfill their role as ecosystem determinators to the fullest possible extent with particular attention given to the sequoia groves;
- Preserve and maintain the natural sequoia groves to perpetuate the prime scenic resource;
- Limit helicopter use in the backcountry to the minimum necessary to meet the needs of management to achieve the purpose of the area;
- Provide quality opportunities for visitor understanding, compatible use, and enjoyment of the parks' resources;
- Eliminate all nonconforming uses within these parks;
- Cooperate with other agencies and outside interests in the development of plans and major management programs;
- Maintain a professional level of visitor and employee protection through effective programs in law enforcement, safety management, and public health; and
- Limit National Park Service and concession development to that necessary and appropriate for the public use and enjoyment of these parks, and eliminate or relocate facilities that intrude on the primary resources.

U.S. DEPARTMENT OF INTERIOR, BUREAU OF LAND MANAGEMENT LANDS

The Bureau of Land Management (BLM), is an agency of the U.S. Department of the Interior. The BLM manages 142,085 acres of public land in Fresno County. The guiding resource management document is the *Resource Management Plan (RMP)*, 1984. BLM land in Fresno County is located in the Hollister Planning Area, and is managed by the Hollister RMP. The RMP is the basis for determining land use decisions for the planning area. Management decisions focus on discrete areas that can be separated on the basis of similar issues, problems, resources, or management

needs. The management areas are generally segregated by geographic areas for development or maintenance of resources.

The RMP has two major sections. The first describes physical characteristics, resources, management concerns, policies, etc. for the entire planning area. The second provides a more detailed description of 16 specific management areas. Discussion of the 16 management areas includes significant resources, management concerns, and support necessary to implement each decision.

The RMP provides policies, goals, and objectives which are developed to guide long-range as well as day-to-day land use decisions. The Plan assesses current authorizations and action to insure conformity with the plan, and to establish a timeline for conformance. The RMP is used to screen actions initiated by the private sector and/or other agencies to determine whether they may be permitted.

Uses of the Hollister Area BLM land includes: 143 grazing leases, mostly for cattle operations, on 243,782 acres of land; mineral exploration and development; and recreational uses. Federal oil and gas production is conducted in western Fresno County in the fields near Coalinga.

The RMP also manages paleontological resources within the planning area, including the areas of: Panoche; Griswold; Tumey; and Ciervo Hill. These areas contain fossil-bearing deposits of terrestrial and aquatic life forms from the Upper Cretaceous, Oligocene, and Miocene epochs.

UNITED STATES ARMY CORPS OF ENGINEERS

Pine Flat Lake Recreational Area

Management of the Pine Flat Lake and Dam is administered by the Sacramento District of the U.S. Army Corps of Engineers (ACE) regional office in Piedra, CA. The Pine Flat Project was authorized by the Flood Control Act approved in 1944 for flood control, irrigation, and other purposes. Pine Flat Lake is located on the Kings River in Fresno County. It lies on the western Sierra Nevada foothills, and is approximately 30 miles east of the city of Fresno. The lake is situated near the entrance to the Kings River Canyon which descends from two nearby national parks, Kings Canyon and Sequoia.

Pine Flat Lake facility includes: a 5,970 acre lake; dam; spillway; power penstocks; day use area; camping facilities; and two commercial marinas. The project also provides for downstream channel improvements on the Kings River and its tributaries.

Pine Flat Dam was authorized primarily for flood control along the Kings River and in the Tulare Lake Basin. The project provides flood protection to about 80,000 acres along the Kings River and in conjunction with other projects on the Kaweah, Kern and Tule Rivers. It also provides protection against floods to 260,000 acres of croplands in the Tulare Lake area. The project provides an average of 1,200,000 acre-feet of irrigation water annually and re-regulates upstream hydro-electric power releases. The Dam was also designed for power development. The Pine Flat Powerhouse, owned and operated by the Kings River Conservation District, which began generating power in 1984.

The ACE operates Pine Flat Lake according to the Pine Flat Lake Operational Management Plan (OMP). This document guides the use, development and management of the natural and manmade resources at Pine Flat Lake. It contains management strategies consistent with authorized project purposes, approved resource use objectives, and land use designations. The OMP is used as a working tool and includes funds, manpower, and time frames required to implement the management strategies.

STATE OF CALIFORNIA

California Department of Fish and Game

The California Department of Fish and Game (CDFG) operates the wildlife area, Mendota Wildlife Area, and two ecological areas, the Kerman Ecological Reserve and the Alkali Sink Ecological Reserve in Fresno County. The San Joaquin River (divided into four units) is also within CDFG's jurisdiction as well as other lands in Fresno County which have not yet been designated. The Mendota Wildlife Area is located approximately three miles south of the city of Mendota near Whites Bridge.

The CDFG recently accepted responsibility for management of 640 acres of the Allen Ranch. The City of Coalinga has purchased 490 acres adjacent to and near the CDFG property as a land conservation bank for the Coalinga Habitat Conservation Plan.

California State Lands Commission

The State acquired sovereign ownership of all tidelands and submerged lands and beds of navigable waterways upon its admission to the United States in 1850. The State holds these lands for the benefit of all the people of the State for statewide Public Trust purposes that include: waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation, and open space.

California holds a fee ownership in the beds of the San Joaquin and the Kings River between the two ordinary low water marks. Each of these waterways between the ordinary high water marks is subject to a Public Trust Easement. Both easement and fee owned lands are under the jurisdiction of the California State Lands Commission. The landward boundaries of the State's sovereign interests are often based upon the ordinary high water marks of these waterways as they existed prior to man-made influences such as channelization, dams, diversions, etc. Thus, such boundaries may not be readily apparent from present day site inspections. A lease from the Commission is required for any portion of a project extending onto State-owned lands that are under its exclusive jurisdiction. Use of lands underlying the State's easement must be consistent with Public Trust needs in the area.

California State Parks and Recreation Department

The California Department of Parks and Recreation administers State Park land within the San Joaquin River district. In Fresno County, the primary holding of the State Park system is Millerton Lake State Recreational Area.

San Joaquin River Parkway

In 1990, the Governor and State Legislature recognized the unique qualities of the San Joaquin River corridor by establishing a Task Force to advise in the formation of the San Joaquin River Parkway (See Figure 6-1 for the location of the parkway). The Task Force's duty was to oversee the formation a parkway plan that enhances recreational opportunities and balances the many land uses along the river, such as urban uses, wildlife habitat, mineral extraction, and agriculture.

Fresno County worked with the Task Force, non-profit organizations, Madera County, the City of Fresno, other affected local agencies, appropriate State and federal agencies, and the general public to review and provide input on the San Joaquin River Parkway Plan (San Joaquin Parkway Task Force Plan). In May 1992, the Fresno County Board of Supervisors officially adopted a resolution "accepting" the Task Force Plan (Resolution #92-418).

The San Joaquin River Conservancy is a state agency that was authorized by State legislation in 1992 and established by the Counties of Fresno and Madera and the City of Fresno in 1993. Its purpose is to acquire and manage lands within the San Joaquin River Parkway with the goals of protecting biological diversity, cultural resources, and natural resources, and providing for low-impact recreational and educational opportunities. The Conservancy has no zoning, land use, or taxing authority, but it can receive public funding and donations from all public and private sources.

The Conservancy is governed by a thirteen-member regional board that includes elected officials of Fresno County, Madera County, the City of Fresno, and the City of Madera; three citizen members; and representatives of State and local agencies.

The Conservancy is the managing entity for the San Joaquin River Parkway and as such is responsible for acquisition and management activities for the Parkway. However, Fresno County has a role to play in the development of the Parkway in terms of the exercise of its police authority for land use issues.

The Conservancy published an Interim Parkway Master Plan in 1996 and the corresponding Final Program Environmental Impact Report in 1997. The Conservancy also published a San Joaquin River Strategic Plan in 1997. As of April, 2000, the Conservancy was drafting the final San Joaquin River Parkway Master Plan.

The San Joaquin River Parkway and Conservation Trust is a non-profit benefit land trust that works in cooperation with the Conservancy, other public agencies, and the private sector to permanently preserve land along the San Joaquin River.

1.12 FINDINGS

- Constraints to continued urban and rural development in the unincorporated county include farm land preservation policies; traffic; water supply and quality; air quality; existing land use patterns; and the ability of the various service districts to fund needed infrastructure improvements.
- Buildout of all of the community plan areas could result in a buildout population of about 184,000 in the unincorporated areas of the county, an increase of about 9,846 people above the 1996 population (excluding areas governed by the Fresno Area Plans which are included in the City of Fresno Land Use Alternative No. 10Z). The buildout population of the community plan areas would constitute about 0.7 percent of the total county population at that time.
- Buildout of all of the specific plan areas could add as many as 140,000 residents in the unincorporated area of the county.
- The target buildout date for many of the adopted community plans has passed or is fast approaching. Buildout population and other projections contained in these plans may be out of date and no longer valid.
- Buildout of the 15 incorporated cities consistent with their respective general plans will result in a population of about 664,000 residents added to Fresno County by the year 2008 in the incorporated areas. The average annual growth rate in the cities under this scenario would be about 3 percent. The total county population at buildout of the Fresno County General Plan (including the community plans), and the cities would result in a population of about 1.4 million by the year 2020.
- The primary constraints to continued buildout under the city general plans is air quality and traffic; infrastructure limitations; county policies to protect farm land and grazing land; and county tax sharing agreement and annexation policies.
- Several of the community plans for incorporated cities may be out of date as a result of recent updates of the general plans for Reedley, Kerman, Selma, San Joaquin, Kingsburg and Fresno. The principal change appears to be in the amount of land designated for future urban development which has increased in the updated general plans.
- Most of the new urban development in Fresno County will occur in the Fresno-Clovis metropolitan area and along the SR 99 corridor. The Fresno-Clovis area will accommodate about 600,000 additional residents over the next twenty years.
- Fresno County contains a relatively high amount of rural residential development. The County contains 21,662 acres of existing rural residential land with a total of 5,841 dwelling units. Nearly all this development exists in three geographics areas: Eastside Valley, Sierra Foothills, and Sierra Nevada Mountain Area.
- The county has entered into memoranda of understanding regarding land use and tax sharing with all 15 incorporated cities.

- The spheres of influence for eight of the 15 incorporated cities were amended in the early 1990s in conjunction with revisions to the city general plans. The remaining seven jurisdictions have no immediate plans to amend their spheres.
- The 1980 DOF population estimate of Fresno County was 514,621 persons. By 1990, the population was estimated to be 673,608. By 1999 it was estimated to be 793,766 persons, for an overall population growth of 54 percent since 1980.
- The unincorporated county experienced a decrease in population of eight percent from 1980 to 1996. The unincorporated area of the county had approximately 30 percent of the total county population in 1996.
- Fresno had a 1996 estimated population of 400,400, or 53 percent of the total county population. Fresno and Clovis combined had approximately 61 percent of the total county population in 1996, and 82 percent of the population of incorporated cities combined. A few cities have experienced very large growth rates due to annexations, including Parlier, Huron, and Kingsburg. However, these cities only comprised four percent of the total county wide population in 1996.
- The DOF projected a population growth rate of 65 percent, or an annual compound rate of 1.69%, for Fresno County from 1990 to 2020. Trend Line Projections indicate growth for the 1999-2020 period of 1.55% to 2.31%.
- The plans of the majority of the neighboring counties do not appear to present potential land use conflicts or significant new development that would affect the Fresno County General Plan. However, growth in Madera County may influence development patterns in the northwestern part of Fresno County.

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1.15 GLOSSARY

ALUC:	Airport Land Use Commission
CEQA:	California Environmental Quality Act
CIP:	Capital Improvements Program
EIR:	Environmental Impact Report (State)
LAFCO:	Local Agency Formation Commission
LOS:	Level of Service

Air Pollution - Concentrations of substances found in the atmosphere which exceed naturally occurring quantities and are undesirable or harmful in some way.

Annex, v. - To incorporate a land area into an existing district or municipality, with a resulting change in the boundaries of the annexing jurisdiction.

Approach Zone - The air space at each end of a landing strip that defines the glide path or approach path of an aircraft and which should be free from obstruction.

Buildout; Build-out - Development of land to its full potential or theoretical capacity as permitted under current or proposed planning or zoning designations.

California Environmental Quality Act (CEQA) - A State law requiring State and local agencies to regulate activities with consideration for environmental protection. If a proposed activity has the potential for a significant adverse environmental impact, an Environmental Impact Report (EIR) must be prepared and certified as to its adequacy before taking action on the proposed project. General plans require the preparation of a "program EIR."

Caltrans - California Department of Transportation.

Capital Improvements Program (CIP) - A program, administered by a city or county government and reviewed by its planning commission, which schedules permanent improvements, usually for a minimum of five years in the future, to fit the projected fiscal capability of the local jurisdiction. The program generally is reviewed annually, for conformance to and consistency with the general plan.

Census - The official decennial enumeration of the population conducted by the federal government.

City - City, with a capital "C," generally refers to the government or administration of a city. City, with a lower case "c" may mean any city, or may refer to the geographical area of a city (e.g., the city's bikeway system.)

Clear Zone - That section of an approach zone of an airport where the plane defining the glide path is 50 feet or less above the center-line of the runway. The clear zone ends where the height of the glide path above ground level is above 50 feet. Land use under the clear zone is restricted.

Commercial - A land use classification which permits facilities for the buying and selling of commodities and services.

County Service Area - A geographic subarea of the city or county used for the planning and delivery of parks, recreation, and other human services based on an assessment of the service needs of the population in that subarea.

Density, Residential - The number of permanent residential dwelling units per acre of land. Densities specified in the general plan may be expressed in units per gross acre or per net developable acre.

Developable Land - Land which is suitable as a location for structures and which can be developed free of hazards to, and without disruption of, or significant impact on, natural resource areas.

Development - The physical extension and/or construction of urban land uses. Development activities include: subdivision of land; construction or alteration of structures, roads, utilities, and other facilities; installation of septic systems; grading; deposit of refuse, debris, or fill materials; and clearing of natural vegetative cover (with the exception of agricultural activities). Routine repair and maintenance activities are exempted.

Development Rights - The right to develop land by a land owner who maintains fee-simple ownership over the land or by a party other than the owner who has obtained the rights to develop. Such rights usually are expressed in terms of density allowed under existing zoning. For example, one development right may equal one unit of housing or may equal a specific number of square feet of gross floor area in one or more specified zone districts.

Dwelling Unit - A room or group of rooms (including sleeping, eating, cooking, and sanitation facilities, but not more than one kitchen), which constitutes an independent housekeeping unit, occupied or intended for occupancy by one household on a long-term basis.

Emission Standard - The maximum amount of pollutant legally permitted to be discharged from a single source, either mobile or stationary.

Environmental Impact Report (EIR) - A report required of general plans by the California Environmental Quality Act and which assesses all the environmental characteristics of an area and determines what effects or impacts will result if the area is altered or disturbed by a proposed action. (See "California Environmental Quality Act.")

General Plan - A compendium of a city's or a county's policies regarding its long-term development, in the form of maps and accompanying text. The general plan is a legal document required of each local agency by the State of California Government Code Section 65301 and adopted by the City Council or Board of Supervisors. In California, the general plan has seven mandatory elements (circulation, conservation, housing, land use, noise, open space, safety and seismic safety) and may include any number of optional elements (such as air quality, economic development, hazardous waste, and parks and recreation). The general plan may also be called a "city plan," "comprehensive plan," or "master plan."

Goal - A general, overall, and ultimate purpose, aim, or end toward which the County will direct effort.

Growth Management - The use by a community of a wide range of techniques in combination to determine the amount, type, and rate of development desired by the community and to channel that growth into designated areas. Growth management policies can be implemented through growth rates, zoning, capital improvement programs, public facilities ordinances, urban limit lines, standards for levels of service, and other programs.

Habitat - The physical location or type of environment in which an organism or biological population lives or occurs.

Hazardous Material - Any substance that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. The term includes, but is not limited to, hazardous substances and hazardous wastes.

Housing Element - Article 10.6 of the California Government Code requires each city and county to prepare and maintain a current housing element as part of the community's general plan in order to attain a statewide goal of providing "decent housing and a suitable living environment for every California family." Under State law, housing elements must be updated every five years.

Impact Fee - A fee, also called a development fee, levied on the developer of a project by a city, county, or other public agency as compensation for otherwise-unmitigated impacts the project will produce. California Government Code Section 66000 *et seq* specifies that development fees shall not exceed the estimated reasonable cost of providing the service for which the fee is charged. To lawfully impose a development fee, the public agency must verify its method of calculation and document proper restrictions on use of the fund.

Industrial - The manufacture, production, and processing of consumer goods. Industrial is often divided into "heavy industrial" uses, such as construction yards, quarrying, and factories; and "light industrial" uses, such as research and development and less intensive warehousing and manufacturing.

Infill Development - Development of vacant land (usually individual lots or left-over properties) within areas which are already largely developed.

Infrastructure - Public services and facilities, such as sewage-disposal systems, water-supply systems, other utility systems, and roads.

Jobs/Housing Balance; Jobs/Housing Ratio - The availability of affordable housing for employees. The jobs/housing ratio divides the number of jobs in an area by the number of employed residents. A ratio of 1.0 indicates a balance. A ratio greater than 1.0 indicates a net in-commute; less than 1.0 indicates a net out-commute.

Land Use - The occupation or utilization of land or water area for any human activity or any purpose defined in the general plan.

Land Use Classification. - A system for classifying and designating the appropriate use of properties.

Land Use Element - A required element of the general plan which uses text and maps to designate the future use or reuse of land within a given jurisdiction's planning area. The land use element serves as a guide to the structuring of zoning and subdivision controls, urban renewal and capital improvements programs, and to official decisions regarding the distribution and intensity of development and the location of public facilities and open space.

Land Use Regulation - A term encompassing the regulation of land in general and often used to mean those regulations incorporated in the general plan, as distinct from zoning regulations (which are more specific).

Level of Service (LOS) - A scale that measures the amount of traffic a roadway may be capable of handling on a roadway or at the intersection of roadways. Levels range from A to F, with A representing the highest level of service. Some communities in California are also developing levels of service standards relating to municipal functions such as police, fire, and library service.

Local Agency Formation Commission (LAFCO) - A five-member commission within each county that reviews and evaluates all proposals for formation of special districts, incorporation of cities, annexation to special districts or cities, consolidation of districts, and merger of districts with cities. Each county's LAFCO is empowered to approve, disapprove, or conditionally approve such proposals. The five LAFCO members generally include two county supervisors, two city council members, and one member representing the general public. Some LAFCO include members who are directors of special districts.

Mixed-use - Properties on which various uses, such as office, commercial, institutional, and residential, are combined in a single building or on a single site in an integrated development project with significant functional interrelationships and a coherent physical design. A "single site" may include contiguous properties.

National Ambient Air Quality Standards - The prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.

Non-attainment - The condition of not achieving a desired or required level of performance. Frequently used in reference to air quality.

Objective - A specific statement of desired future condition toward which the County will expend effort in the context of striving to achieve a broader goal. An objective should be achievable and, where possible, should be measurable and time-specific. The State Government Code (Section 65302) requires that general plans spell out the "objectives," principles, standards, and proposals of the general plan. "The addition of 100 units of affordable housing by 1995" is an example of an objective.

Office Use - The use of land by general business offices, medical and professional offices, administrative or headquarters offices for large wholesaling or manufacturing operations, and research and development.

Open Space Land - Any parcel or area of land or water which is essentially unimproved and devoted to an open space use for the purposes of (1) the preservation of natural resources, (2) the managed production of resources, (3) outdoor recreation, or (4) public health and safety.

Ordinance - A law or regulation set forth and adopted by a governmental authority, usually a city or county.

Ozone - A tri-atomic form of oxygen (O₃) created naturally in the upper atmosphere by a photochemical reaction with solar ultraviolet radiation. In the lower atmosphere, ozone is a recognized air pollutant that is not emitted directly into the environment, but is formed by complex chemical reactions between oxides of nitrogen and reactive organic compounds in the presence of sunlight, and becomes a major agent in the formation of smog.

Planning Area - The planning area is the land area addressed by the general plan. Typically, the planning area boundary coincides with a sphere of influence which encompasses land both within the city limits and potentially annexable land.

Policy - A specific statement of principle or of guiding actions which implies clear commitment but is not mandatory. A general direction that a governmental agency sets to follow, in order to meet its goals and objectives before undertaking an action program. (See "Program.")

Pollutant - Any introduced gas, liquid, or solid that makes a resource unfit for its normal or usual purpose.

Pollution - The presence of matter or energy whose nature, location, or quantity produces undesired environmental effects.

Principle - An assumption, fundamental rule, or doctrine that will guide general plan policies, proposals, standards, and implementation measures. The State Government Code (Section 65302) requires that general plans spell out the objectives, "principles," standards, and proposals of the general plan. "Adjacent land uses should be compatible with one another" is an example of a principle.

Program - An action, activity, or strategy carried out in response to adopted policy to achieve a specific goal or objective. Policies and programs establish the "who," "how" and "when" for carrying out the "what" and "where" of goals and objectives.

Residential - Land designated in the *Fresno County General Plan* and *Zoning Ordinance* for buildings consisting only of dwelling units. May be vacant or unimproved.

Riparian Lands - Riparian lands are comprised of the vegetative and wildlife areas adjacent to perennial and intermittent streams. Riparian areas are delineated by the existence of plant species normally found near freshwater.

Solid Waste - General category that includes organic wastes, paper products, metals, glass, plastics, cloth, brick, rock, soil, leather, rubber, yard wastes, and wood. Organic wastes and paper products comprise about 75 percent of typical urban solid waste.

Specific Plan - Under Article 8 of the Government Code (Section 65450 *et seq.*), a legal tool for detailed design and implementation of a defined portion of the area covered by a General Plan. A specific plan may include all detailed regulations, conditions, programs, and/or proposed legislation which may be necessary or convenient for the systematic implementation of any general plan element(s).

Sphere of Influence - The probable physical boundaries and service area of a local agency, as determined by the Local Agency Formation Commission (LAFCO).

Standards - (1) A rule or measure establishing a level of quality or quantity that must be complied with or satisfied. The State Government Code (Section 65302) requires that general plans spell out the objectives, principles, "standards," and proposals of the general plan. Examples of standards might include the number of acres of park land per 1,000 population that the community will attempt to acquire and improve, or the "traffic Level of Service" (LOS) that the plan hopes to attain. (2) Requirements in a zoning ordinance that govern building and development as distinguished from use restrictions—for example, site-design regulations such as lot area, height limit, frontage, landscaping, and floor area ratio.

Subdivision - The division of a tract of land into defined lots, either improved or unimproved, which can be separately conveyed by sale or lease, and which can be altered or developed. "Subdivision" includes a condominium project as defined in Section 1350 of the California Civil Code and a community apartment project as defined in Section 11004 of the Business and Professions Code.

Urban Limit Line - A boundary, sometimes parcel-specific, located to mark the outer limit beyond which urban development will not be allowed. It has the aim of discouraging urban sprawl by containing urban development during a specified period, and its location may be modified over time.

Use - The purpose for which a lot or structure is or may be leased, occupied, maintained, arranged, designed, intended, constructed, erected, moved, altered, and/or enlarged in accordance with the County's Zoning Ordinance and General Plan land use designations.

Vacant - Lands or buildings which are not actively used for any purpose.

Wetlands - Transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Under a "unified" methodology now used by all federal agencies, wetlands are defined as "those areas meeting certain criteria for hydrology, vegetation, and soils."

Wildlife Refuge - An area maintained in a natural state for the preservation of both animal and plant life.

Zoning - The division of a city or county by legislative regulations into areas, or zones, which specify allowable uses for real property and size restrictions for buildings within these areas; a program that implements policies of the general plan.

Zoning District - A designated section of the county for which prescribed land use requirements and building and development standards are uniform.

CHAPTER 2: AGRICULTURE



2.1 INTRODUCTION

This chapter contains background information on the existing agricultural resources in Fresno County, including information on general soil conditions, important farmlands, the location of various agricultural farming operations, crop production trends, and the status of lands under agricultural preserves. To supplement this chapter, Chapter 7 presents a detailed review of soils; Chapter 3 analyzes the economy of Fresno County's agricultural clusters; and Chapter 1 analyzes the land use implications of agriculture. Farming and agricultural related businesses comprise a significant component of the local economy and are responsible for no less than one out of every three jobs. In 1996, as California's top producing county, Fresno County grossed over \$3.3 billion dollars on harvested crop production. (Fresno County, Agriculture Commission).

2.2 FARMLAND DEFINITIONS, SOILS, AND LOCATIONS

The type of soils present in Fresno County vary widely from the Central Valley to the Sierra Nevada. The factors that influence the pattern of soils present in the county include a combination of the type of underlying rocks, local climatic conditions, local topography, type of native vegetation, and the development stage of the soil (Brandy 1974).

Farmland is identified by its suitability for agricultural production based on soil types. This chapter describes soil resources by utilizing three common classification systems for soils, including: the California State Department of Conservation Farmland Mapping and Monitoring Program (FMMP); the Storie Index Rating System (SI); and the Guide for Placing Soils in Land Capability Classes in California (LCC). This analysis also incorporates soil definitions and classifications used by the California Department of Conservation, Office of Land Conservation, Farmland Mapping and Monitoring Unit, and the U.S. Department of Agriculture, Soil Conservation Service (SCS).

FARMLAND MAPPING AND MONITORING PROGRAM DEFINITIONS

The FMMP monitors land use changes affecting the state's agricultural lands and produces maps and statistical data to be used for assessing and planning California's agricultural resources. Agricultural land is rated according to soil quality and irrigation status. The county has significant areas of prime agriculture land. Figure 2-1 shows the location of important farmlands identified by the FMMP in the valley area of Fresno County. Although some agricultural production takes place in the Coast Range and the Sierra Nevada foothills, the most favorable growing conditions and productive lands are found in the Central Valley portions of the county. Table 2-1 lists the types and acreages of soil, as determined by the FMMP.

According to the FMMP, the county has approximately 374,567 acres of prime agricultural land, and another 144,243 acres of important farmland. Although cattle grazing occurs in areas less

suitable for agricultural crop production and harvesting, it is an important component to the overall contribution of agricultural activities in the county, and uses at least 308,945 acres of land.

The FMMP classifies land according to prime farmland; farmland of statewide importance; unique farmland; farmland of local importance; grazing land; urban and built-up land; other land; and water, defined below:

TABLE 2-1 FARMLAND MAPPING AND MONITORING PROGRAM SOILS AND ACREAGE Fresno County 1997	
Soil Category	Acres
Prime Farmland	374,567.41
Farmland of Statewide Importance	144,243.26
Unique Farmland	96,724.53
Farmland of Local Importance	29,663.10
Grazing Land	308,945.71
Urban and Built-Up Land	86,175.43
Water	4,110.14
Other Land	79,386.50
Source: Department of Conservation, 1997.	

Prime Farmland

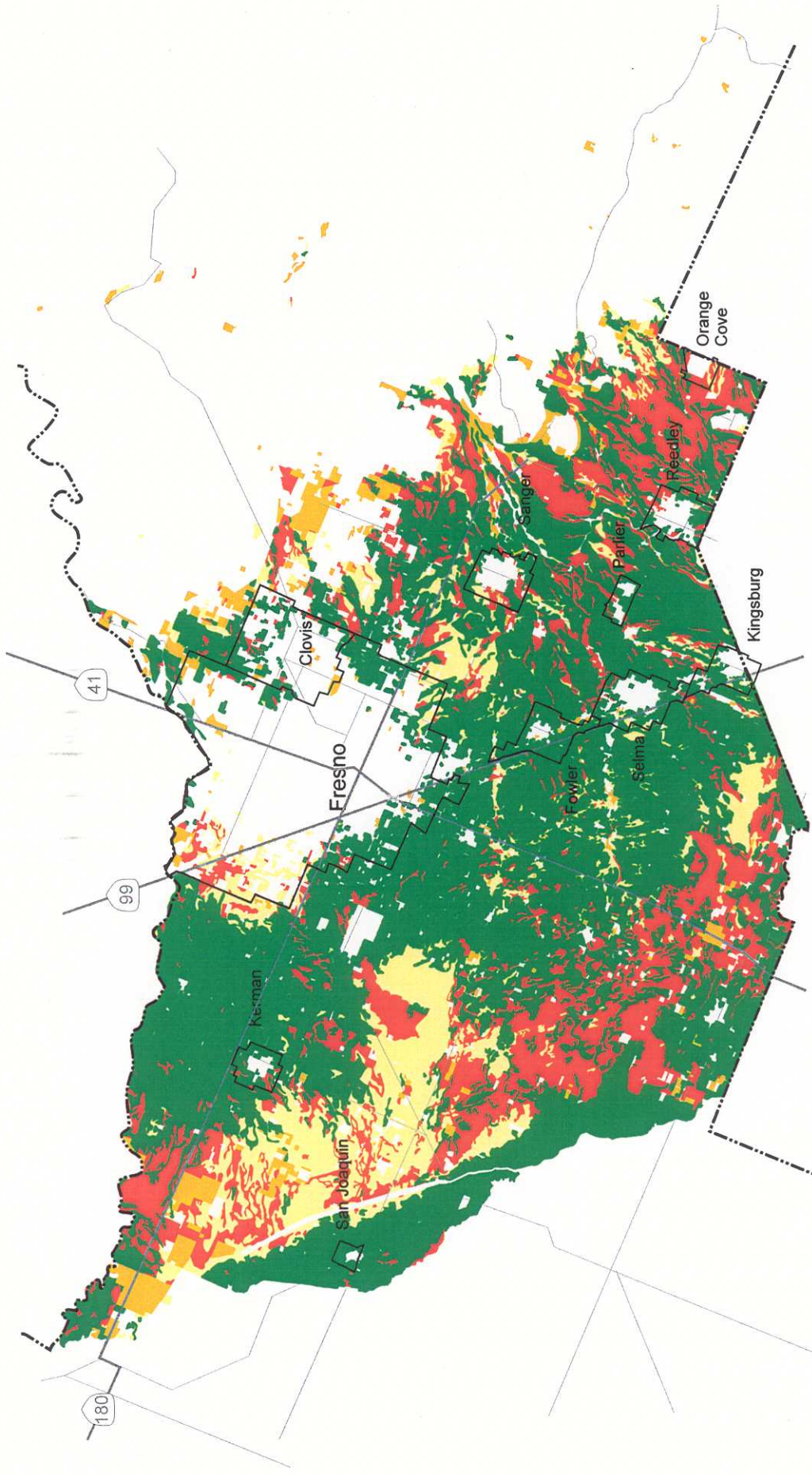
Prime farmland is land best suited for producing seed, feed, forage, fiber, and oilseed crops. It is also available for cropland, pasture land, rangeland, forest land or other land not characterized by urban build-up or water areas. When located in an area with a long growing season, this soil produces high crop yields when treated and managed according to modern farming methods.









Farmland of Statewide Importance

Farmland of statewide importance is land other than prime farmland that has a good combination of physical and chemical characteristics or produce of seed, feed, forage, fiber, and oilseed crops. It is also available for cropland, pasture land, rangeland, forest land, or land other than built-up or water areas.

Unique Farmland

Unique farmland is land other than prime and farmlands of statewide importance that is used for the production of specific high-value food and fiber crops. The combination of soil quality,



Fresno County General Plan		Important Farmland	
 NORTH		 0 8	
 Prime Farmland	 Unique Farmland	 Other	 Sphere of Influence
 Farmland of Statewide Importance	 Farmland of Local Importance		

Source: Department of Conservation, Farmland Mapping Program, 1997

Figure 2-1

location, growing season, and moisture supply produces sustained high quality and/or high crop yields of a specific crop when treated and managed according to modern farming methods. Examples of such crops are citrus, olives, cranberries, fruit, and vegetables.

Farmland of Local Importance

Farmland of local importance is either crops that are currently in production, or crops that are capable of production. Farmland of local importance is land other than prime farmland, farmland of statewide importance, and unique farmland and may be important to the local economy due to its productivity.

Grazing Land

Grazing land is defined as land on which the existing vegetation, whether grown naturally or through management, is suitable for grazing or browsing livestock. The minimum mapping unit for grazing land is 40 acres.

Urban and Built up Land

Urban and built-up land is land occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures to a 10-acre parcel.

Water

Water includes land with an area of at least 40 acres.

Other Land

Other land is land which does not meet the criteria of any other category.

Irrigated Farmland

Irrigated farmland is cropped land with a developed irrigation water supply that is dependable and of adequate quality. (Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date to be included in the Farmland Mapping and Monitoring Program.)

Non-irrigated Farmland

Non-irrigated farmland is land on which agricultural commodities are produced on a continuing or cyclic basis utilizing stored soil moisture from periodical rainfall.

Land Committed to Nonagricultural Use

Land committed to nonagricultural use usually consists of existing farmland, grazing land, and vacant areas which have a permanent commitment for development.

Soil Survey

Soil information is primarily limited to reports and soil maps prepared by the U.S. Soil Conservation Service (SCS). The SCS soil classification system is concerned primarily with differentiating soils according to their capacity for cultivation.

The SCS classification system organizes soils into eight major capability classes by Roman numbers I through VIII. Class I and II soils have few limitations, the widest range of use, and the least risk of soil deterioration. The other soil classifications have progressively greater natural limitations. Generally, the land with soil Classes I and II is considered prime agricultural land. This land is highly productive because it requires little or no special treatment besides normal, good soil management.

Class III land is suitable for cultivated crops but requires additional attention to offset or overcome inherent soil limitations. Class IV soils are considered suitable for limited cultivation. The lands in Classes V, VI, and VII are best adapted to pasture or range, woodland, or wildlife habitat. Class VIII soils and landforms have severe limitations that preclude their use from crop production and restrict their use to recreation, wildlife habitat, water supply, or aesthetic purposes.

GEOGRAPHIC AREAS AND GENERAL SOIL CONDITIONS

Besides the FMMP, agricultural land is defined by other criteria including: topography; the presence of water and drainage characteristics; the depth of the water table; and other specific soil characteristics. *The Fresno County General Plan, Recreation and Park Plan* (1964) identifies topographic and drainage characteristics, which relate to the presence of certain soil conditions. As previously shown in Figure 1 in the Introduction, the *Park Plan* divides the county into the following five geographic areas.

- Sierra Foothill Area
- Eastside Valley Area
- Westside Valley Area
- Sierra Nevada Mountain Area
- Coast Range Foothill Area

Sierra Foothills

Located between the national forests and Friant-Kern Canal, the Sierra foothills rise gradually from the Valley floor, approximately 500 foot in elevation and to the west slope of the Sierra Nevada, about 2,500 feet high. The area's topography is characterized by sloping hills, dissected by steep canyons dropping into narrow winding stream channels

Eastside Valley

The Eastside Valley is located between the Friant-Kern Canal and the Fresno Slough. The Eastside Valley averages approximately 35 miles wide.

Westside Valley

The Westside Valley is located between the Fresno Slough and the Coast Range (500 ft. elevation). For planning purposes, the Westside Valley is divided into two parts. The line establishing the Northwest and Southwest area is generally Mt. Whitney Avenue. The area averages approximately 20 miles in width measured from the Fresno Slough to the 500 foot elevation of the Coast Range. The slope of the valley floor is considered to be flat for general planning purposes. The most significant topographic relief is in the river bottom, riparian habitat areas of the San Joaquin and Kings Rivers. Runoff is controlled through the use of levees, ditches, and flood control reservoirs.

Sierra Nevada Mountains

Comprising approximately one-third of the county, the Sierra Nevada Mountains are located eastside from the Sierra foothills to the Great Western Divide. The region is primarily in public lands under the jurisdiction of the U.S. Department of Interior or the U.S. Department of Agriculture.

Coast Range Foothills

The Coast Range foothills form the western boundary of Fresno County and reach a height of over 4,000 feet northwest of Coalinga. The foothill terrain is highly erosive since sheet and gully erosion are common. Slopes are not as steep as in the Sierra.

GENERAL SOIL CHARACTERISTICS

Soil characteristics and their respective quality are determined by several specific criteria. The most useful measures for determining the location and potential of soil are the Storie Index Rating System (SI) and the Guide for Placing Soils in Land Capability Classes in California (LCC), prepared by the U.S. Department of Agriculture, Soil Conservation Service. The SI is based on soil characteristics that govern the land's potential utilization and productive capacity. The SI characterizes soil by identifying: the soil profile; the texture of the surface soil; the slope; and conditions of the soil exclusive of these conditions, such as, drainage, alkali content, nutrient level, erosion, and microrelief. (A soil rating chart and key to terminology are provided in Appendix 2-A of this Chapter.) In general, the most favorable or ideal conditions with respect to each factor are rated at 100 percent. The percentage values or ratings for the four factors are then multiplied, the result being the Storie Index rating of the soil.

The LCC places soils into different land capability classes which are determined by criteria similar to the SI. (See Appendix 2-B for information on the LCC.) Prime agricultural soils achieve their status based on its consistency with the criteria found in the SI and LCC. For instance, the LCC defines agricultural land in classes I and II while the SI rates agricultural land with a rating of ± 80 to be prime agricultural land.

Another important criterion affecting soil conditions is climate. Climate conditions are factored into determining the land capability classification and SCS soil types for Fresno County. In 1970, the U.S. Department of Agriculture, Soil Conservation Service prepared a study in cooperation with the University of California and the State Climatologist, U.S. Weather Bureau which observed that climate affects the placement of soils in the land capability classification in areas having

limited rainfall, short growing seasons, and high wind velocities during critical seasons of the year. Limited rainfall in most areas of the state has been offset by irrigation and relatively few areas of arable land are affected by either short seasons or high winds.

FRESNO COUNTY SOIL CHARACTERISTICS

The characteristics of soil generally follow topographic, drainage, and climatic characteristics. The upland areas above the 500-foot contour on the westside and the portions of the eastside, generally east of the Friant-Kern Canal, are best suited for forestry and grazing purposes. Pervasive erosion is common due to steep slopes. Soils are generally very shallow in much of the Sierra foothills and mountains with granite extrusions commonly occurring.

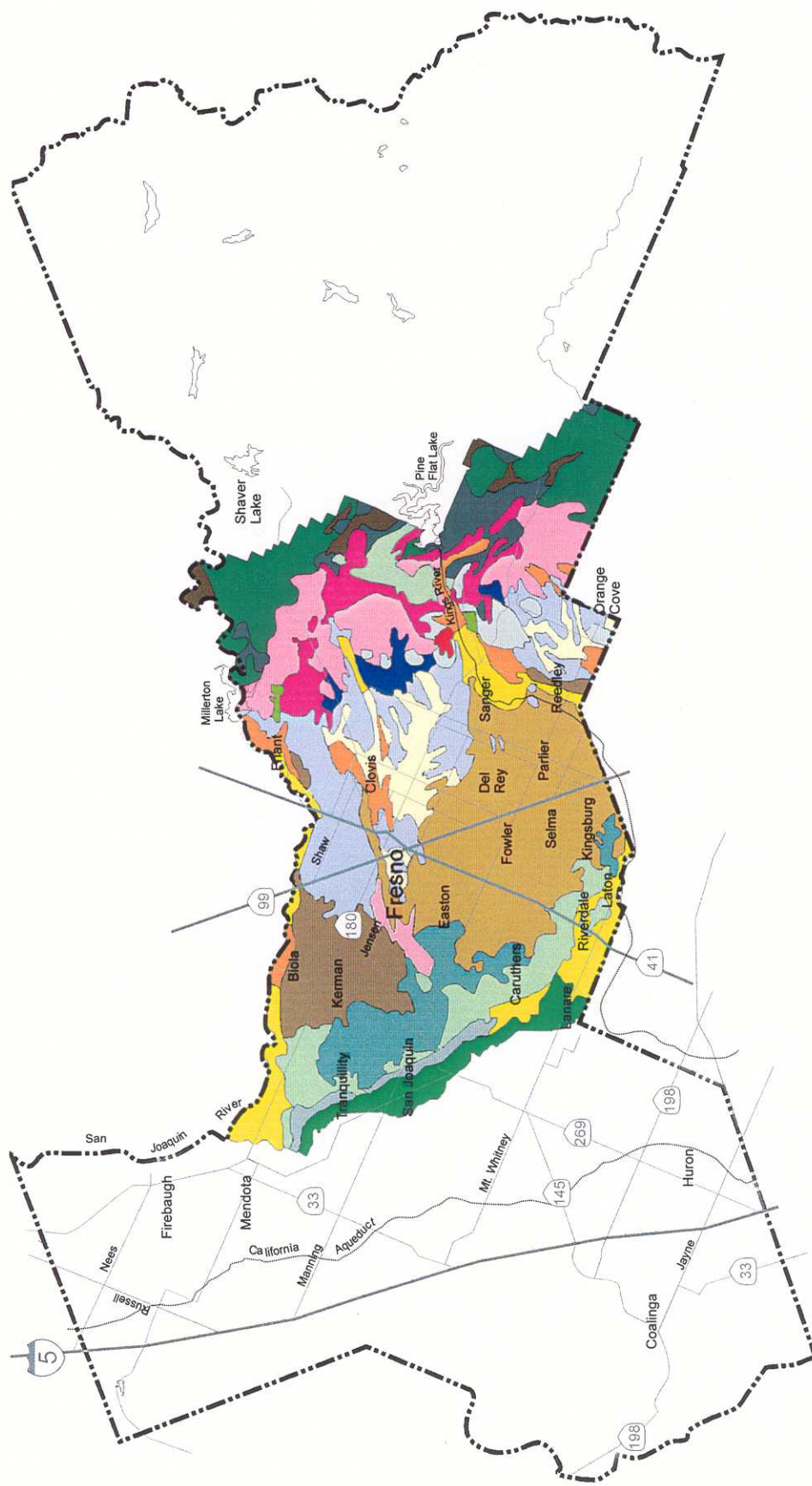
The alluvial fan areas of the county lie below the foothills on both the east and west sides and slope toward the central drainage channel, the Fresno Slough. The most productive agricultural soils are located in these areas. The best soils on the westside are found on a north-south band between Madera and Kings Counties varying in width between eight and twenty miles. This includes the largest single concentration of Class I soils in the state. The eastside alluvial soils extend in a somewhat wider band of about 25 miles from about the Friant-Kern Canal to roughly a line connecting Riverdale, Caruthers, and Kerman. The major exceptions are the Fresno-Clovis and Reedley-Orange Cove terraces. Most of the alluvial soils are Class II with the only Class I soils found in the Parlier-Reedley-Del Rey area east of State Route 99.

The valley's poorest soils are the alkali soils that can be found on either side of the Fresno Slough. On the west side, these soils extend about five miles wide in the area north of the Lemoore Naval Air Station and narrow's northward toward Mendota. A wider band of these soils can be found on the east side of the Slough, beginning north of Laton and Riverdale where it is about two miles wide and growing to ten miles wide at Manning Avenue. It continues to widen further near the San Joaquin River. A three mile wide band of soils then runs eastward toward south Fresno at North Avenue.

The basin soils found in the four mile wide band along the Fresno Slough between Mendota, Tranquility, San Joaquin, and Riverdale are moderate quality, Class III, non-alkali in character.

The general soil types, associations, and locations are shown in Figures 2-2 and 2-3, for east and west Fresno County. Soil associations refer to soil characteristics in the map legend. The soil associations are described in the Legend Key below.

Figure 2-1 shows the locations of the most valuable agricultural land in Fresno County. However, it should be noted that some soils that are not Class I - III or otherwise in the "prime" soil classification can be altered through various techniques which raise their productivity quality. For instance, if water is added via irrigation, certain soils can be improved to qualify as prime soil. Also, the quality of water available and the depth of water table affects the quality of soil characteristics. Some soil that is a lower quality can be reclaimed by leaching out certain chemical imbalances. Finally, farm management practices can also affect the quality of soil.



NORTH

0 10
1" = 10 miles

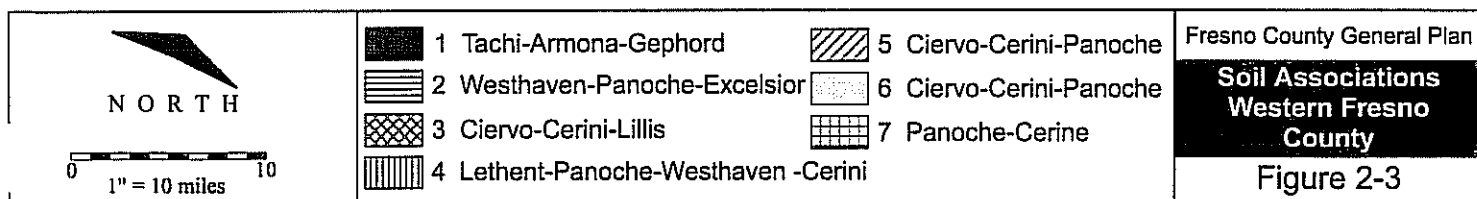
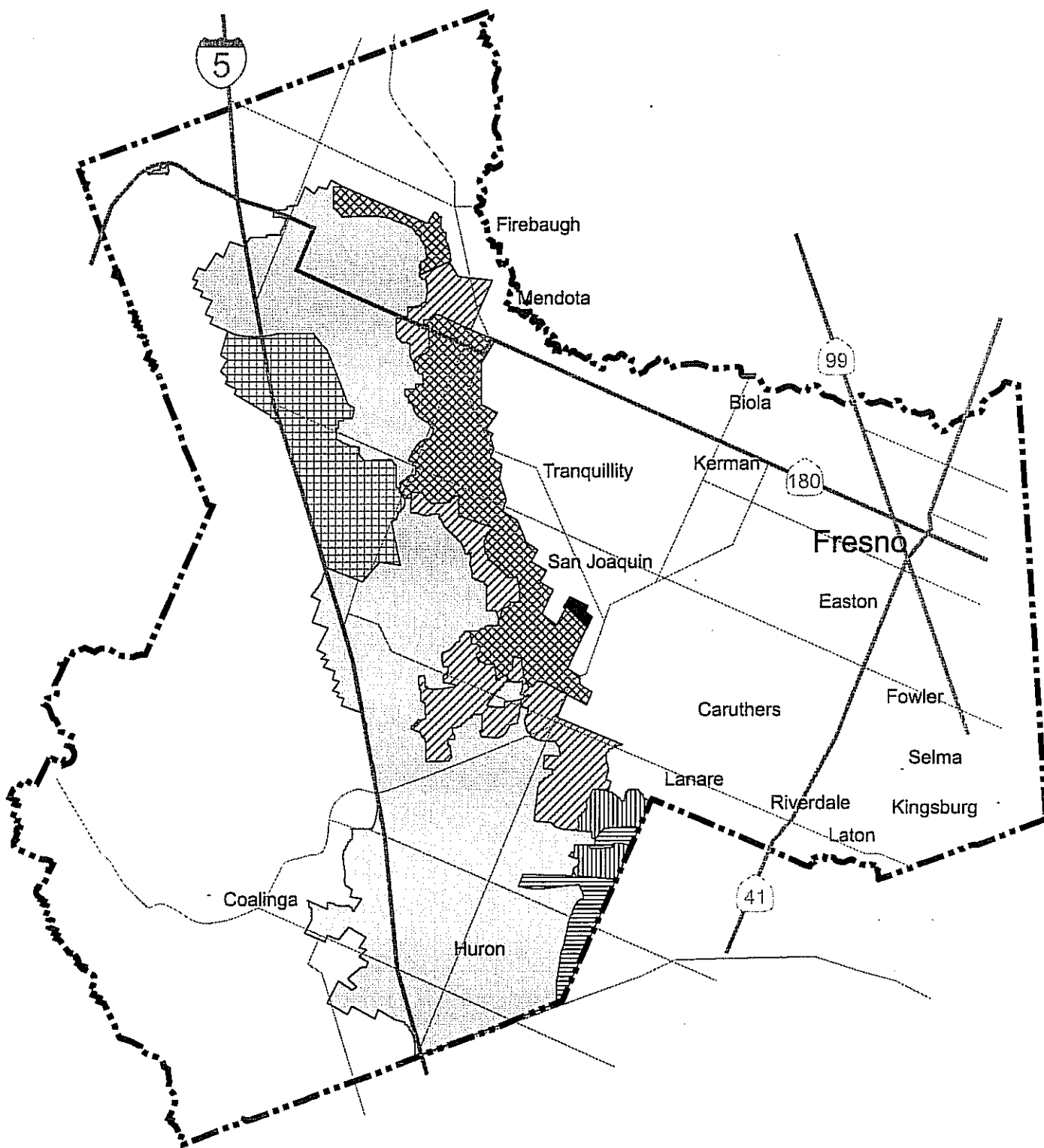
<p>1 Merced - Temple</p> <p>2 Rossi - Waukena</p> <p>3 Fresno - El Peco</p> <p>4 Traver - Calhi</p> <p>5 Grangeville - Chino</p> <p>6 Hanford - Tujunga</p>	<p>7 Hanford - Hesperia</p> <p>8 Hanford - Delhi - Hesperia</p> <p>9 Pachappa - Hesperia</p> <p>10 Greenfield - Atwater</p> <p>11 San Joaquin - Exeter - Ramona</p> <p>12 Academy - Yokoh</p>	<p>13 Centerville - Keyes</p> <p>14 Positas - Redding</p> <p>15 Vista - Fallbrook</p> <p>16 Blasingame - Millerton - Tivy</p> <p>17 Cibo - Porterville</p> <p>18 Fancher - Delplera</p>	<p>19 Auberry - Ahwahnee</p> <p>20 Coarsegold</p> <p>21 Trimmer - Trubuco</p>
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Fresno County General Plan

Soil Associations

Figure 2-2

Source: U.S. Department of Agriculture Soil Conservation Service



Source: U.S. Department of Agriculture Soil Conservation Service
Westlands Water District

SOIL ASSOCIATIONS LEGEND KEY**West Fresno County***Soils of the Valley Basin**Poorly Drained Soils of the Basin Flood Plain*

1. Merced-Temple association: Deep and very deep clay loams and clays

Somewhat Excessively Drained to Poorly Drained Soils of the Basin Rim

2. Rossi-Waukena association: Deep, somewhat poorly drained and poorly drained, dominantly fine sandy loams that are saline-alkali
3. Fresno-El Peco association: Somewhat poorly drained fine sandy loams that are saline-alkali and that are shallow or moderately deep to a hardpan
4. Traver-Calhi association: Somewhat poorly drained to somewhat excessively drained fine sandy loams to loamy sands that are saline-alkali and that are moderately deep or deep to compact silt

*Soils of the Eastside Valley Alluvial Plains**Excessively Drained to Somewhat Poorly Drained Soils of Recent Alluvial Fans and Flood Plains*

5. Grangeville-Chino association: Deep and very deep, somewhat poorly drained sandy loams to loams
6. Hanford-Tujunga association: Deep, well-drained to excessively drained, dominantly loamy sands to fine sandy loams

Somewhat Excessively Drained to Moderately Well Drained Soils of Yong Alluvial Fans

7. Handford-Hesperia association: Well-drained sandy loams and fine sandy loams that are moderately deep or deep to compact silt
8. Handford-Delhi-Hesperia association: Deep, somewhat excessively drained and well-drained sands to fine sandy loams; partly wind modified
9. Pachappa-Hesperia association: Well drained and moderately well drained fine sandy loams or loams that are moderately deep or deep to compact silt
10. Greenfield-Atwater association: Well-drained loamy sands and sandy loams that are moderately deep or deep to compact sandy material; partly wind modified

Well-Drained Soils of Low Alluvial Terraces

11. San Joaquin-Exeter-Ramona association: Sandy loams to loams that are shallow or moderately deep to a hardpan and deep sandy loams and loams
12. Academy-Yokohl association: Loams that are moderately deep to compact sandy material layer and soils of similar texture that are shallow to a cemented hardpan

Well-Drained Soils of High Alluvial Terraces

13. Centerville-Keyes association: Clays that are moderately deep to compact sandy material and cobbly clay loams that are shallow to a cemented hardpan
14. Positas-Redding association: Gravelly loams that are moderately deep to a compact layer or a compact layer or cemented hardpan

Soils of the Uplands of the Sierra Nevada Foothills

Excessively Drained to Well-Drained Soils of the Lower Foothills

15. Vista-Fallbrook association: Well-drained sandy loams that are shallow to moderately deep over granitic rock
16. Blasingame-Millerton-Tivy association: Well-drained and somewhat excessively drained fine sandy loams to clay loams that are over basic igneous rock
17. Cibo-Porterville association: Well-drained and somewhat excessively drained clays that are moderately deep to deep over basic igneous rock and permeable sediment
18. Fancher-Delpidra association: Well-drained to excessively drained loams that are shallow to moderately deep over serpentine rock

Somewhat Excessively Drained and Well-Drained Soils of the Upper Foothills

19. Auberry-Ahwahnee association: Well-drained and somewhat excessively drained sandy loams that are moderately deep over granitic rock
20. Coarsegold association: Somewhat excessively drained fine sandy loams that are deep over metasedimentary rock
21. Trimmer-Trabuco association: Well-drained and somewhat excessively drained sandy loams that are moderately deep over basic igneous rock

Soil Association Definitions in West Fresno County***Tachi-Armona-Gepford association***

Very deep, poorly drained, saline-sodic soils on flood plains and in flood basins. Tachi and Gepford soils have clayey textures with a high shrink-swell potential. Armona soils have loamy textures and are stratified.

Westhaven-Panoche-Excelsior association

Very deep, well drained and moderately well-drained soils on low lying alluvial fans and low fan terraces. Westhaven soils are stratified and have silty textures. Panoche soils have loamy textures. Excelsior soils are stratified and have coarse-loamy textures.

Ciervo-Cerini-Lillis association

Very deep, moderately well-drained to poorly drained, saline-sodic soils with a high perched water table on distal alluvial fans and low stream terraces. Ciervo soils have clayey textures which usually become coarser with depth. Cerini soils are stratified and have fine-loamy textures. Lillis soils are clayey with a high shrink-swell potential.

Lethent-Panoche-Westhaven-Cerini association

Very deep, moderately well-drained and well-drained, saline-sodic soils on distal alluvial fans and flood plains. Lethent soils have clayey textures. Panoche soils have loamy textures. Westhaven soils are stratified and have silty textures. Cerini soils are stratified and have fine-loamy textures.

Ciervo-Cerini-Panoche association

Very deep, moderately well-drained and well-drained, saline-sodic soils on mid alluvial fans and flood plains. Some have developed a high perched water table within six feet of the surface. Ciervo soils have clayey textures which usually become coarser with depth. Cerini soils are stratified and have fine-loamy textures. Panoche soils have loamy textures.

Ciervo-Cerini-Panoche association

Very deep, moderately well-drained and well-drained soils on alluvial fans and flood plains. Ciervo soils have clayey textures which usually become coarser with depth. Cerini soils are stratified and have fine-loamy textures. Panoche soils have loamy textures.

Panoche-Cerini association, Subsided, 0 to 5 Percent Slopes

Very deep, moderately well-drained and well-drained soils on alluvial fans and flood plains which have subsided unevenly across the landscape due to near-surface subsidence. Panoche soils have loamy textures. Cerini soils are stratified and have fine-loamy textures.

2.3 IMPORTANT FARMLAND INVENTORY

This section analyzes crop and agricultural land data from the Fresno County Agriculture Commissioner (AC) and the Department of Water Resources (DWR). The AC prepared a report with comparative data from 1986 and 1994. This report shows changes in the amount of harvested acreages of specific irrigated crops. The AC prepares Agricultural Crop and Livestock Reports every year. The AC reports tabulate the harvested acreage of individual crops, the total production per acre, the value of crops per unit, and the total harvested crop values.

LAND IN AGRICULTURAL PRODUCTION

In general, the foothill area of the Sierra Nevada mountains provides rangeland for cattle. The lower elevations of the Sierra foothills is conducive to growing citrus trees. The west side of the cities of Fresno, Clovis, Sanger, and Reedley, in the Eastside Valley, farms generally grow tree fruits, almonds, and raisin grapes. On the east side of SR 99, farms mostly grow grapes, with some almonds, apples, and alfalfa. Near the Fresno Slough area of the Eastside Valley, row crops are predominant. Near I-5, as well as on the north and south valley areas, almonds, row crops, apples, and some grapes are grown.

As noted above, data from the Fresno County Agriculture Commissioner provides the amount of irrigated land devoted to certain crops. Since the data compares 1986 to 1994, trends in the amount of land used for various agricultural purposes can be determined. For instance, the total acreage for irrigated crops decreased by approximately 11 percent over the eight year period. However, some crop acreages, primarily row crops and nut trees, increased more dramatically. Table 2-2 shows the leading crop acreage increases.

TABLE 2-2 HARVESTED CROP ACREAGE Fresno County 1986 to 1994			
Crop	Acreage 1986	Acreage 1994	Percent Acreage Increase from 1986 to 1994
Lettuce	14,300	19,820	39%
Onions & Garlic	21,300	34,300	61%
Tomatoes	68,820	110,550	61%
Almonds	30,685	42,016	37%
Other Deciduous Fruits	237,612	241,737	2%
Peaches and Nectarines	23,718	27,424	16%
Citrus and Olives	21,839	25,388	16%
Source: Fresno County Agriculture Commissioner, 1999.			

All other crops indicate a decrease in the gross acreage of irrigated land used. DWR data indicates that during the same time period the amount of land that produces double crops increased by 17 percent. This indicates that less land is under cultivation, and that some land is being used more productively. The acreage of urban land has increased by approximately 23 percent, and the amount of land with native vegetation has been reduced by about 72 percent.

SUMMARY OF CROP TRENDS IN CROP ACREAGES

The Fresno County Agriculture Crop and Livestock Reports provide information on the amount of crops and livestock harvested and their values. Crops were analyzed comparing harvested crop acreage and values from 1985, 1990, and 1995. Discussions with staff from the University of California Cooperative Extension Program in Fresno County noted that crop trends are highly responsive to market demands. Some crops are cyclical in nature, and others such as specialty crops, and crops with demand over seas are reflective of niche markets. The county's leading crops in dollar value for 1995, by rank were: cotton; grapes; poultry; tomatoes; milk; head lettuce; almonds; cattle & calves; nectarines; and oranges. The largest harvested crop acreage was field crops. Table 2-3 provides a comparative breakdown of the acreage and dollar value of aggregated harvested crop types and other agricultural products for 1985, 1990, and 1995. The table indicates that certain crops such as field crops, vegetable crops, and nursery products are producing less harvested crop acreage, but have increased in value. Table 2-4 provides a similar comparison for livestock, poultry, apiary, and industrial crops. Several items in Table 2-4 indicate a decrease in production, however the total value of these products has remained stable.

TABLE 2-3
HARVESTED CROP ACREAGE
Fresno County
1985 to 1996

Crop	1985		1990				1996		
	Harvested Acreage	Total Value	Harvested Acreage	% Change in Acres	Total Value	Harvested Acreage	% Change in Acres	Total Value	
Field Crops	1,758,497	\$545,842,000	1,538,140	-12.5%	\$597,457,000	1,513,560	-1.6%	\$674,854,000	
Seed Crops	60,550	\$40,314,000	66,310	9.5%	\$53,078,000	30,920	-53.4%	\$28,011,000	
Vegetable Crops	154,950	\$343,493,000	228,980	47.8%	\$605,544,000	229,640	0.3%	\$692,178,000	
Fruits and Nuts	322,153	\$684,976,400	315,921	-1.9%	\$940,919,000	360,039	14.0%	\$1,200,374,000	
Nursery Products	274	\$7,882,000	500	82.5%	\$18,194,000	603	20.6%	\$16,846,500	
Total	2,296,424	\$1,622,507,400	2,149,851	-6.4%	\$2,215,192,000	2,134,762	-0.7%	\$2,612,263,500	

Source: Fresno County Agriculture Reports, 1985-1996

Source: Fresno County Agriculture Reports, 1985-1996

TABLE 2-4
LIVESTOCK, POULTRY, APIARY AND INDUSTRIAL PRODUCTS
Fresno County
1985-1996

Products	1985		1990			1996		
	Units	Total Value	Units	% Unit Change	Total Value	Units	% Unit Change	Total Value
Livestock and Poultry	7,557,100 head	\$288,383,000	14,921,268 head	97.4%	\$554,289,000	5,476,600 head	(63.3%)	\$483,404,000
Livestock and Poultry Products	801,000 tons 9,955,440 cwt. 518,000 lbs. 5,132,000 doz.	\$131,946,000	725,000 tons 12,672,000 cwt. 680,000 lbs. 1,740,000 doz.	-9.5% 27.3% 31.5% -66.1%	\$162,179,000	553,000 tons 14,737,000 cwt. 478,000 lbs. 1,086,000 doz.	-23.7% 16.3% -29.7% -37.6%	\$209,718,000
Subtotal	N/A	\$420,329,000	N/A	N/A	\$716,468,000	N/A	N/A	\$693,122,000
Apiary Products	1,677,300 lbs. 264,200 colonies	\$6,029,000	2,352,000 lbs. 245,900 colonies	40.2% -6.9%	\$6,844,000	1,860,800 lbs. 223,700 colonies	-20.9% 107%	\$7,988,000
Industrial Crops	87,534,000 board feet	\$5,195,000	88,774,000 board feet	1.4%	\$12,093,000	40,471,000 board feet 10,100 cords*	-54.4% —	\$11,512,300
Subtotal	N/A	\$11,224,000	N/A	N/A	\$18,937,000	N/A	N/A	\$19,500,300
Total Value	N/A	\$431,553,000	N/A	N/A	\$735,405,000	N/A	N/A	\$712,622,300

* Cords not reported until 1991.

Source: Fresno County Agriculture Reports, 1985-1996

2.4 WILLIAMSON ACT LANDS

Many areas of Fresno County have some of the most fertile soil in the world. It is a constant challenge to keep in agricultural use, and to control conversion of land to development. In many cases this is only possible by accepting an inherent opportunity cost. One method of preserving prime agricultural lands from premature conversion to development is for the landowners to enter into Williamson Act contracts. The intent of the Williamson Act, as provided in Government Code Sections 51200 et seq., is to provide incentives for continuing agricultural uses.

The California Land Conservation Act (Williamson Act) allows counties and cities to establish agricultural preserves and offer contracts to landowners for the purpose of protecting agricultural land from premature conversion to other uses.

Owners of qualified land who contract with the county or city agree to continue agricultural or compatible activities for a period of at least ten years. In return, the county or city agrees to assess the property at its agricultural rather than market value.

Typically, as development approached an agricultural area the price of land is driven upward by owners and buyers speculating on the future development potential of the land. The increase in prices lead to a corresponding increase in the assessed value of the land and to the owner's property taxes.

Under the Williamson Act, development on prime farmland is discouraged by allowing the property owner to pay a reduced property tax rate for undeveloped agricultural land. This increases the ability of property owners to maintain viable farming operations. Approximately 1,494,454.14 acres of farmland are under Williamson Act preserve contracts in Fresno County (See Figure 1-6 of the previous chapter). There are 14,450 parcels of land under contract. By the end of 1996, there were 162 Williamson Act contracts in a non-renewal status. When a property files a notice of non-renewal, the property may not be developed for ten years. The property tax rate gradually rises to the market rate value on an annual basis until the tenth year when it has reached the full market tax rate. Table 2-5 indicates the number of years remaining in contract for properties with a non-renewal status. By the year 2006, 7,571.06 acres of land will be taken out of Williamson Act contracts from the stock of properties currently in contract.

TABLE 2-5 WILLIAMSON ACT NON-RENEWAL CONTRACT STATUS Fresno County 1996		
Year Property Ended Contract	Number of Properties	Property Acreage
1988	19	1,642.81
1989	15	347.82
1990	28	1,175.41
1991	31	1,324.40
1992	22	1,231.03
1993	15	323.98
1994	18	509.25
1995	9	894.60
1996	5	121.76
Total	162	7,571.06
Source: Fresno County Assessor, 1997		

2.5 FINDINGS

- The County grossed over \$3.3 billion dollars on harvested crop production in 1996. This represents a 5.79 percent increase from the 1995 gross production values.
- According to the Farmland Mapping and Monitoring Program, the County has approximately 374,567 acres of prime agricultural land and another 144,243 acres of important farmland. Grazing uses at least 308,945 acres of land. The upland areas above the 500-foot contour on the westside and the portions of the eastside generally east of the Friant-Kern Canal, are typically used for forestry and grazing purposes. Grasslands on the Valley floor west of the Friant-Kern Canal have been, and can continue to be, very productive for grazing, and can support this use at high (when irrigated) or seasonally high (un-irrigated) stocking levels without undue soil erosion (whereas, overgrazed hilly areas are very prone to erosion). Well-managed grazing also does not disturb sensitive vernal pool habitats that exist in this area. There may not be sufficient groundwater or surface water supplies to bring all the Valley Floor areas west of the Friant-Kern Canal into cultivation and/or urbanization.
- The county's alluvial fan areas are located between the foothills of the Sierra Nevada on the east side and the foothills of the Coast Range on the west side. The Valley slopes from the foothills toward the central drainage channel, the Fresno Slough. The best soils on the west side are found on a north-south band between Madera and Kings Counties varying in width between eight and twenty miles. This area includes the largest single concentration of Class I soils in the State. East side alluvial soils extend in a somewhat wider band of about 25 miles from about the Friant-Kern Canal to roughly a line connecting Riverdale, Caruthers, and Kerman.
- Some soils that are not Class I-III or otherwise in the "prime" soil classification can be altered through various techniques which raise their productivity quality. For instance, if water is added via irrigation, certain soils can be improved to qualify as prime soil. Also, the quality of water available and the depth of water table affects the quality of soil characteristics. Some soil that is a lower quality can be reclaimed by leaching out certain chemical imbalances. Finally, farm management practices can also affect the quality of soil.
- From 1986 to 1994 the total acreage used for irrigated crops decreased by approximately 11 percent over the eight year period. However, some crop acreages, primarily row crops, and nut and fruit trees, increased dramatically.
- The amount of land that produced double crops increased by 17 percent from 1986 to 1994. The acreage of urban land has increased by approximately 23 percent, and the amount of land with native vegetation has been reduced by about 72 percent.
- The County's leading crops in dollar value for 1996, by rank were: grapes; cotton; poultry; tomatoes; milk; almonds; peaches; garlic; cattle & calves; and nectarines.
- The largest harvested crop acreage for 1996 was field crops with 1,513,560 acres harvested.
- Approximately 1,494,454 acres of farmland and 14,561 parcels of land are under Williamson Act contracts. By the end of 1996, there were 162 Williamson Act contracts that were a non-

renewal status. By the year 2006, 7,571 acres of land will be taken out of Williamson Act contracts from the stock of properties currently in contract.

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- Fred Stumpf, California Department of Water Resources
- Tom Hawkins, California Department of Water Resources
- Kerry Arroues, Soil Conservation Service
- Tom Rice, Cal Poly San Luis Obispo
- Bruce Clayton, Agriculture Commissioner Office
- Richard Smith, Montgomery Watson
- Harry L. Andris, U.C. Cooperative Extension-Fresno County
- Emily Kishi, State Department of Conservation, Office of Land Conservation, Farmland Mapping and Monitoring Unit

2.8 GLOSSARY

AC - Agriculture Commission

DWR - Department of Water Resources

Farmland of Local Importance - Land that is either currently producing crops, or has the capability of production. Farmland of local importance is land other than prime farmland, farmland of statewide importance, and unique farmland. This land may be important to the local economy due to its productivity.

Farmland of Statewide Importance - Farmland other than prime farmland that has a good combination of physical and chemical characteristics for production of seed, feed, forage, fiber, and oilseed crops and also available for these uses (the land could be cropland, pasture land, rangeland, forest land, or other land but not urban built-up land or water).

FMMP - Farmland Mapping and Monitoring Program

LCC - Guide for Placing Soils in Land Capability Classes in California

Prime Farmland - Farmland is land best suited for producing seed, feed, forage, fiber and oilseed crops and also available for these uses (the land could be cropland, pasture land, rangeland, forest land or other land but not urban built-up land or water). It has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

SCS - U.S. Soil Conservation Service

SI - Storie Index Rating System

Unique Farmland - Land that is other than prime and farmlands of statewide importance, that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season and moisture supply needed to produce sustained high quality and/or high yields of a specific crop when treated and managed according to modern farming methods. Examples of such crops are citrus, olives, cranberries, fruit and vegetables.

Williamson Act - Known formally as the *California Land Conservation Act of 1965*, it was designed to be an incentive to retain prime agricultural land and open space in agricultural use, thereby slowing its conversion to urban and suburban development; the program entails a 10-year contract between the City or County and an owner of land whereby the land is taxed on the basis of its agricultural use rather than the market value; the land becomes subject to certain enforceable restrictions, and certain conditions must be met before approval of agreement.

APPENDIX 2A

SOIL RATING CHART - STORIE SOIL INDEX RATING

APPENDIX 2A - STORIE INDEX

SOIL RATING CHART

(Storie Soil Index rating=factor A x factor B x factor C x factor X)

<u>Factor A - Rating on character of Physical profiles</u>		<u>Percent</u>
I.	Soils on recent alluvial fans, flood plains, or other secondary deposits having undeveloped profiles	100
	x-shallow phases (on consolidated material), 2 feet deep	50-60
	x-shallow phases (on consolidated material), 3 feet deep	70
	g-extremely gravelly subsoils	80-95
	s-stratified clay subsoils	80-95
II.	Soils on young alluvial fans, flood plains, or other secondary deposits having slightly developed profiles	95-100
	x-shallow phases (on consolidated material), 2 feet deep	50-60
	x-shallow phases (on consolidated material), 3 feet deep	70
	g-extremely gravelly subsoils	80-95
	s-stratified clay subsoils	80-95
III.	Soils on older alluvial fans, alluvial plains, or terraces having moderately developed profiles (moderately dense subsoils)	80-95
	x-shallow phases (on consolidated material), 2 feet deep	40-60
	x-shallow phases (on consolidated material), 3 feet deep	60-70
	g-extremely gravelly subsoils	60-70
IV.	Soils on older plains or terraces having strongly developed profiles (dense clay subsoils)	40-80
V.	Soils on older plains or terraces having hardpan subsoil layers at less than 1 foot	5-20
	at 1-2 feet	20-30
	at 2-3 feet	30-40
	at 3-4 feet	40-50
	at 4-6 feet	50-80
VI.	Soils on older terraces and upland areas having dense clays subsoils resting on moderately consolidated or consolidated material	40-80
VII.	Soils on upland areas underlain by hard igneous bedrock	
	At less than 1 foot	10-30
	at 1-2 feet	30-50
	at 2-3 feet	50-70
	at 3-4 feet	70-80
	at 4-6 feet	80-100
	at more than 6 feet	100
VIII.	Soils on upland areas underlain by consolidated sedimentary rocks	
	At less than 1 foot	10-30
	at 1-2 feet	30-50
	at 2-3 feet	50-70
	at 3-4 feet	70-80
	at 4-6 feet	80-100
	at more than 6 feet	100

IX. Soils on upland areas underlain by softly consolidated material	
At less than 1 foot	20-40
at 1-2 feet	40-60
at 2-3 feet	50-70
at 3-4 feet	70-80
at 4-6 feet	80-100
at more than 6 feet	100

Factor B - Rating on Basis of surface texture**Percent****Medium-textured:**

very fine sandy loam	100
fine sandy loam	100
loam	100
silt loam	100
sandy loam	95
loamy fine sand	90
silty clay loam	90
clay loam	85

Heavy-textured:

silty clay	60-70
clay	50-60

Light-or coarse-textured:

coarse sandy loam	70-90
loamy sand	80
very fine sand	80
fine sand	65
sand	60
coarse sand	30-60

Gravelly:

gravelly fine sandy loam	70-80
gravelly loam	60-80
gravelly silt loam	60-80
gravelly sandy loam	50-70
gravelly clay loam	60-80
gravelly clay	40-70
gravelly sand	20-30

Stony:

stony fine sandy loam	70-80
stony loam	60-80
stony silt loam	60-80
stony sandy loam	50-70
stony clay loam	50-80
stony clay	40-70
stony sand	10-40

<u>Factor C - Rating on basis of slope</u>	<u>Slope</u>	<u>Percent</u>
A - Nearly level	0-2%	100
AA - Gently undulating	0-2%	95-100
B - Gently sloping	3-8%	95-100
BB - Undulating	3-8%	85-100
C - Moderately sloping	16-30%	80-95
CC - Rolling	9-15%	80-90
D - Strongly sloping	16-30%	70-80
DD - Hilly	16-30%	70-80
E - Steep	30-45%	30-50
F - Very steep	45% and over	5-30

Factor X - Rating of conditions other than those in factors A, B, and C

Drainage:

well-drained	100
fairly well drained	80-90
moderately waterlogged	40-80
badly waterlogged	10-40
subject to overflow	Variable

Alkali:

alkali-free	100
slightly affected	60-95
moderately affected	30-60
moderately to strongly affected	15-30
strongly affected	5-15

Nutrient (fertility) level:

high	100
fair	95-100
poor	80-95
very poor	60-80

Acidity: according to degree

80-95

Erosion:

none to slight	100
detrimental deposition	75-95
moderate sheet erosion	80-95
occasional shallow gullies	70-90
moderate sheet erosion with shallow gullies	60-80
deep gullies	10-70
moderate sheet erosion with deep gullies	10-60
severe sheet erosion	50-80
severe sheet erosion with shallow gullies	40-50
severe sheet erosion with deep gullies	10-40
very severe erosion	10-40
moderate wind erosion	80-95
severe wind erosion	30-80

	<u>Percent</u>
Microrelief:	
smooth	100
channels	60-95
hogwallows	60-95
low hummocks	80-95
high hummocks	20-60
dunes	10-40

Soil Grading:

For simplification, six soil grades have been set up in California by combining soils having ranges in index rating as follows:

Grade 1 (excellent): Soils that rate between 80 and 100 percent and which are suitable for a wide range of crops including alfalfa, orchard, truck, and field crops.

Grade 2 (good): Soils that rate between 60 and 79 percent and which are suitable for most crops. Yields are generally good to excellent.

Grade 3 (fair): Soils that rate between 40 and 59 percent and which are generally of fair quality, with less wide range of suitability than grades 1 and 2. Soils in this grade may give good results with certain specialized crops.

Grade 4 (poor): Soils that rate between 20 and 30 percent and which have a narrow range in their agricultural possibilities. For example, a few soils in this grade may be good for rice, but not good for many other uses.

Grade 5 (very poor): Soils that rate between 10 and 19 percent are of very limited use except for pasture, because of adverse conditions such as shallowness, roughness, and alkali content.

Grade 6 (nonagricultural): Soils that rate less than 10 percent include, for example, tidelands, riverwash, soils of high alkali content, and steep broken land.

Rating the Soil for a Tract of Land

The index for each soil type in the tract is calculated separately, and then a rating for the entire tract is obtained by weight each soil index according to the proportion of the acreage of that soil in the tract. As an example, using the soil map on the back page the rating of the tract is determined as follows:

1. Index for the area Y1-A (Yolo loam, nearly level): This is a recent alluvial soil, deep, smooth, well drained.

	<u>Percent</u>
Factor A: Yolo series, profile group I	100
Factor B: loam texture	100
Factor C: slope A, nearly level	100
Factor X: no other modifying factors	100
Index rating=100% x 100% x 100% x 100% x 100% x =100%	

2. Index for Ac-BB (Antioch clay loam, undulating): This is claypan terrace soil with undulating topography.

	<u>Percent</u>
Factor A: Antioch series, profile group IV	60
Factor B: clay loam texture	85
Factor C: undulating topography	95
Factor X: no other modifying factors	100
Index rating=60% x 85% x 95% x 100%=48%	

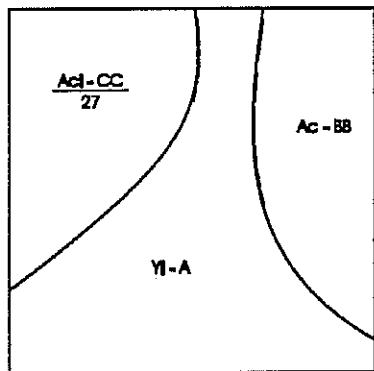
3. Index Acl-CC (Altamount clay loam, rolling): This is a brown upland soil from shale parent material; redrock at a depth of 3 feet. Rolling topography, moderate sheet erosion, with occasional gullies.

	<u>Percent</u>
Factor A: Altamount series, profile group VIII	70
Factor B: clay loam texture	85
Factor C: rolling topography	90
Factor X: moderate sheet erosion with shallow gullies	70
Index rating=70% x 85% x 90% x 70%=37%	

4. The index for the entire tract shown on the map below may then be calculated according to the acreage of each soil, as follows:

	<u>Index</u>		<u>Acreage</u>	
Yolo loam	100	x	10	= 1,000
Antioch clay loam	48	x	5	= 240
Altamount clay loam	37	x	<u>5</u>	<u>=185</u>
			20	1,425

Index rating for the tract= 1,425/20=71%



Not to Scale

MAP SYMBOL	SOILS	ACREAGE	INDEX
Y1-A	Yolo Loam	10	100
Ac-BB	Antioch Clay Loam	5	48
<u>Acl-CC</u> 27	Altamount Clay Loam	5	37

APPENDIX 2B

GUIDE FOR PLACING SOILS IN LAND CAPABILITY CLASSES IN CALIFORNIA

Appendix 2B

GUIDE FOR PLACING SOILS IN LAND CAPABILITY CLASSES IN CALIFORNIA

Capability Class	Effective Soil Depth (inches)1/	Frost Free Season (days)	4ETA Dryland	Surface Texture	Permeability 3/	Drainage Class 4/	Available Water Capacity	Slope (percent)	Erosion Hazard	Flooding Hazard	Salinity (inches/cm)	Sedicty ESP 5/	Toxic Substances 6/
I	>=40	>=140	N/A 2/	sandy loam through clay loam	mod. rapid through mod slow	well or mod. well w.t.> 60"	>=6.5 inches average AWC >=0.11 in/in	<2	none or slight	none or rare	< 4 (none)	none	none
II	>=40	>=100	N/A 2/	loamy sand through clay, may be gravelly	rapid through slow	somewhat poorly through somewhat excessively w.t. 36"	>=5.0 inches average AWC >=0.08 in/in	<5	none through moderate	none through occasional	< 8	<25	none or slight
III	>=20	>=80	>=12	any, may be gravelly or cobbly	rapid through very slow	poorly through excessively w.t. 20"	>=3.5 inches average AWC >=0.06 in/in	<15	none through severe	none through occasional	<16	<50	none through moderate
IV	>=10	>=50	>=9	any, may be very gravelly, very cobbly or stony 7/	any	poorly through excessively w.t.> 20"	>=2.5 inches average AWC >=0.04 in/in	<30	any	none through frequent 8/	<16	<50	none through moderate
V	>=20	any	>=9	any, may be extremely gravelly, extremely cobbly or very stony	any	any	>=3.0 inches average AWC	<2	none or slight	any	< 8	<25	none or slight
VI 9/	>=10	any	>=6	any, may be extremely gravelly, extremely cobbly or very stony	any	any	>=2.0 inches average AWC	<50	any	any	dryland-<16 irrigated-any	dryland-<25 irrigated-<50	dryland-slight irrigated-slight through moderate
VII 10/	any	any	>=3	any	any	any	>=1.0 inches average AWC	any	any	any	any	any	any
VIII 11/	any	any	any	any	any	any	any	any	any	any	any	any	any

1/ Claypans with permeabilities of less than 0.06 in/hr will be treated as limiting the effective depth.

2/ The highest dryland capability is class III.

3/ Permeability of the least permeable surface horizon.

5/ For salts and sodium to be a major limitation, there should be other soil limitations such as slow permeability or a high water table.

Source: United States Department of Agriculture Soil Conservation Service, December 1988

6/ Such as boron and magnesium that leach with difficulty.

7/ Coarse fragments interfere with tillage, but do not prevent cropping.

8/ Frequent flooding that does not prevent cropping.

9/ Range and woodland mechanical practices can be applied to class VI land.

10/ Range and woodland mechanical practices are impractical on class VII land.

11/ Class VIII lands have limitations that preclude their use for commercial plant production and restrict their use to recreation, water supply or esthetic purposes.

CHAPTER 3: ECONOMIC AND FISCAL CONSIDERATIONS



3.1 INTRODUCTION

Chapter 3 is divided into two major sections, Economic Overview and Fiscal Considerations. Section 3.2, Economic Overview, presents an analysis of economic conditions and fiscal considerations for Fresno County, including an extensive analysis of the county's economic base and the trends influencing fiscal revenues and expenditures. The primary focus of the economic analysis is Fresno County. Economic information is used to identify trends in employment and earnings growth by detailed industrial categories and to identify and analyze the leading industrial clusters located in Fresno County. Since economic transactions and linkages frequently go beyond politico-administrative boundaries, this analysis uses the eight-county San Joaquin Valley as a comparative region. This region includes the following counties: Fresno, San Joaquin, Stanislaus, Merced, Madera, Kings, Tulare, and Kern Counties (see Figure 3-1). To a lesser extent, the economy of California as a whole is also used as a benchmark. These points of reference provide a sense of scale and perspective, and serve to highlight the distinctive qualities of Fresno County's economic base.

This report does not address the organizational infrastructure associated with economic development efforts in the county, but concentrates instead on describing market trends in Fresno County. Local efforts to collaborate on economic development marketing and services to businesses such as the I-5 Business Development Corridor, as well as planning efforts to create or improve business sites, such as the I-5 Interchange Planning Study, are discussed in the County's Economic Development Strategy.

Section 3.3, Fiscal Considerations, describes the fiscal conditions of the general fund, special funds, and enterprise funds of Fresno County. Historical per capita service levels for revenues and expenditures are highlighted along with explanations of what factors have produced these trends. Section 3.3 also explains the function of each budget unit, the sources of funding, and the function of each fund.

3.2 REGIONAL ECONOMIC OVERVIEW

Regional economies are in a constant state of change with businesses growing or declining as a result of market trends. The economy is composed of two types of businesses, each responding to different primary markets. One type consists of businesses that are largely local-serving. In other words, they draw most if not all of their customers from the community. Business expansion in this case is primarily a function of larger household incomes. In contrast, export businesses are those that sell most of their goods and services to customers outside the region. These businesses bring new dollars into the region which, in turn, have multiplier effects that ripple throughout the economy. For this reason, economic development strategies tend to focus on the expansion of export-oriented or "basic" jobs that increase a community's wealth and support the local-serving business sector.

To enhance the vitality and competitiveness of the economic base requires information that provides accurate, timely, and detailed views of the economy and the changes underway. An economic diagnostic can provide insights about which elements of the economy are expanding or declining, which industries have the greatest potential to lead future economic growth, and what types of interventions are most likely to assist existing businesses and attract new ones.

ECONOMIC TRENDS IN FRESNO COUNTY

A Decade of Mixed Economic Performance

In the decade between 1985 and 1995, the civilian labor force in Fresno County grew at a relatively rapid clip, averaging three percent per year; increasing from a total of 286,200 in 1985 to 371,800 in 1995 (Table 3-1). The number of employed persons within the labor force, however, did not expand at the same rate. The slight lag resulted in a 1995 unemployment rate (14.1 percent) that was a full percentage point higher than in 1985 (12.9 percent). What is significant about Figure 3-2 is the widening gap between the total labor force and the number of employed workers.

TABLE 3-1
TOTAL LABOR FORCE, EMPLOYED, AND EMPLOYMENT
Fresno County
1985 to 1995

Year	Total Labor Force		Employed Labor Force		Unemployed Labor Force			Non Farm Employment	
	Number	Average Annual Growth	Number	Average Annual Growth	Number	Average Annual Growth	Unempl. Rate	Number	Average Annual Growth
1985	286,200	—	249,200	—	37,000	—	12.9%	n.a.	—
1986	292,200	2.1%	256,100	2.8%	36,100	-2.4%	12.4%	n.a.	---
1987	295,700	1.2%	264,200	3.2%	31,500	-12.7%	10.7%	n.a.	—
1988	307,400	4.0%	274,300	3.8%	33,100	5.1%	10.8%	206,800	—
1989	313,200	1.9%	281,800	2.7%	31,400	-5.1%	10.0%	212,900	2.9%
1990	327,300	4.5%	289,100	2.6%	38,200	21.7%	11.7%	224,300	5.4%
1991	334,200	2.1%	289,500	0.1%	44,700	17.0%	13.4%	227,100	1.2%
1992	348,200	4.2%	293,500	1.4%	54,700	22.4%	15.7%	229,800	1.2%
1993	359,800	3.3%	304,400	3.7%	55,400	1.3%	15.4%	233,500	1.6%
1994	369,200	2.6%	318,300	4.6%	50,900	-8.1%	13.8%	236,900	1.5%
1995	371,800	0.7%	319,200	0.3%	52,600	3.3%	14.1%	242,200	2.2%

Source: California Labor Market Information Division, 1985-95

n.a. = not available

Figure 3-3 shows another pervasive characteristic of the Fresno economy. The county's unemployment rate has hovered within a fairly consistent range that is 4.9 to 6.6 percent higher than the state's unemployment rate. The same phenomenon is also seen throughout the San Joaquin Valley. In 1992, with the labor force growing at four percent and employment increasing by just over one percent, the unemployment rate reached a ten-year high of 15.7 percent. Over the next two years, the unemployment rate fell as the economic recovery took hold. Then in 1995,

FIGURE 3-1

*Fresno County
and the
San Joaquin Valley Region*

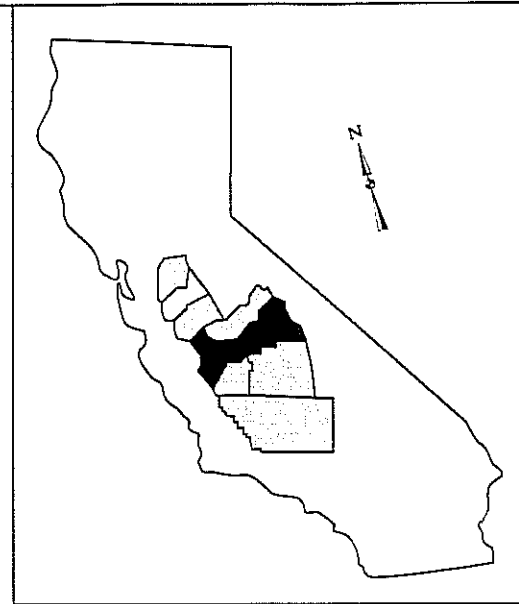
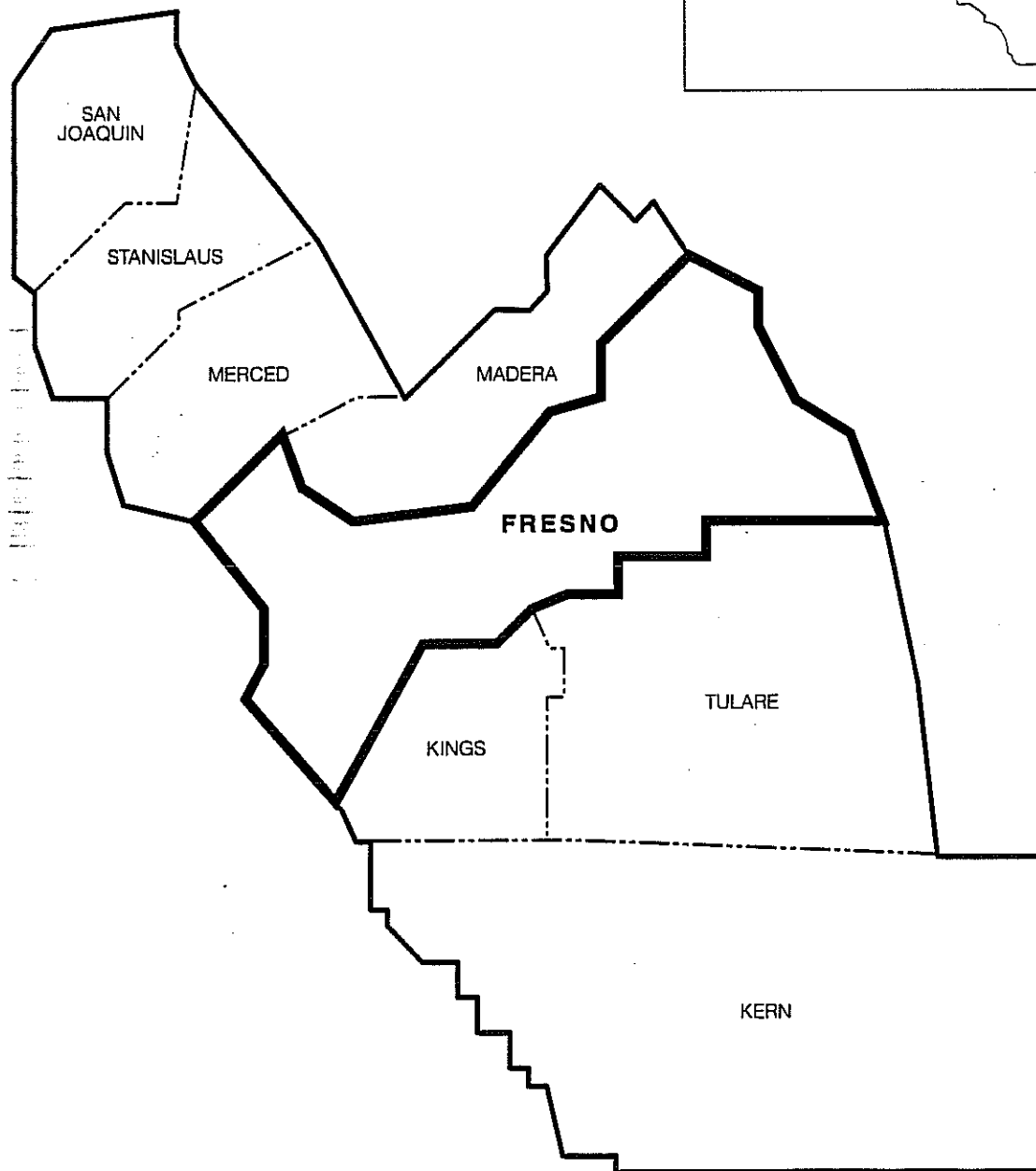


FIGURE 3-2
FRESNO COUNTY LABOR FORCE AND EMPLOYMENT, 1988-95

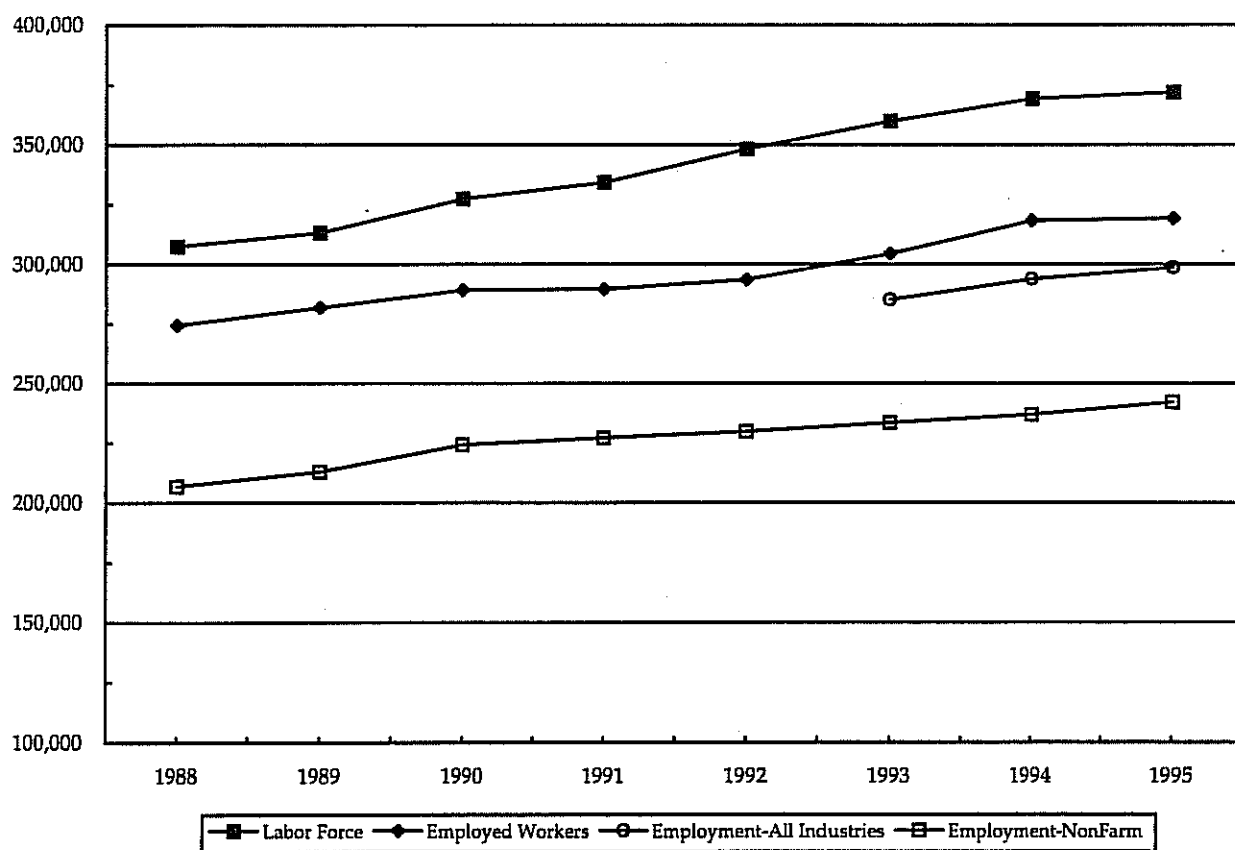
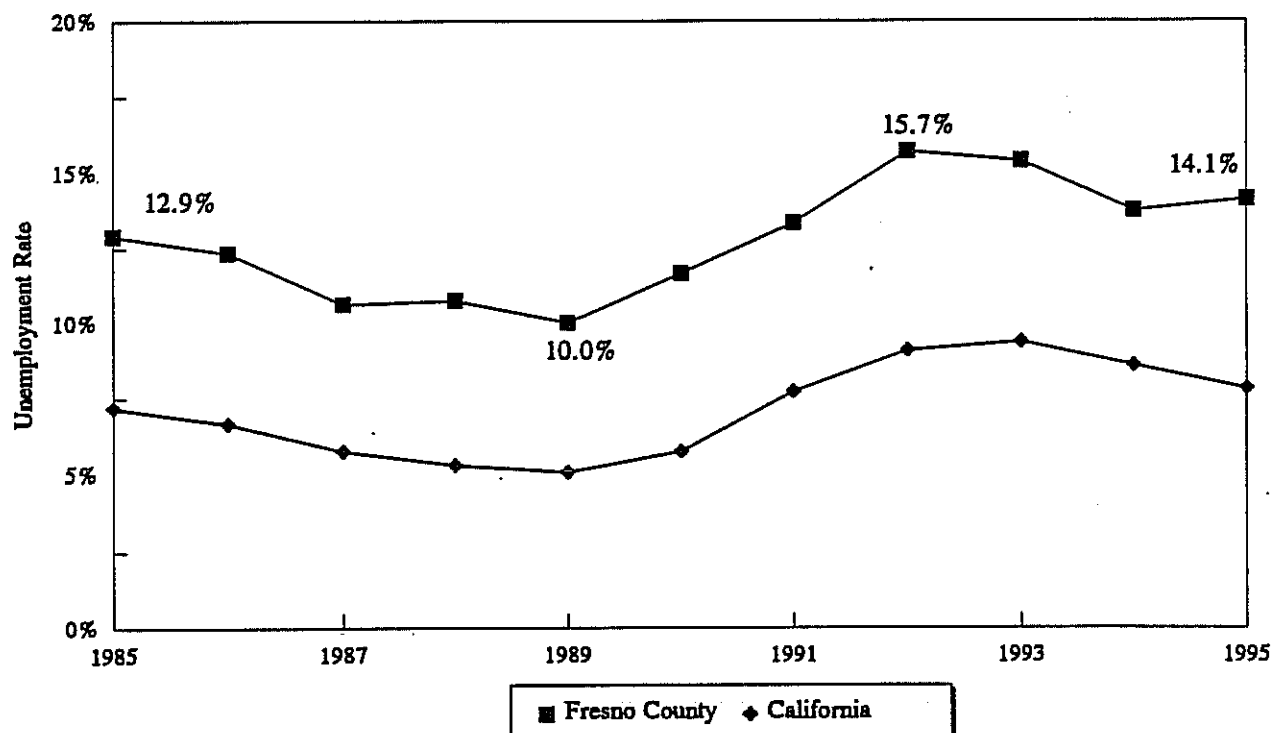


FIGURE 3-3
COMPARISON OF ANNUAL AVERAGE UNEMPLOYMENT RATES
FRESNO COUNTY AND CALIFORNIA, 1985-95



Source: California Labor Market Information Division, 1985-95

lf-tab2.wk4

unemployment nosed up again even though the state economy was well into an expansion period.

What should not be overlooked in this picture is the steady increase in employment. Fresno County continued to add net new jobs even during the recession of the early 1990s, which has been characterized as the most severe in California's history since the Great Depression. Between 1990 and 1993, California lost some 454,600 jobs. At the same time, employment in Fresno County increased by 9,200 jobs. In 1990, the last year before the recession, Fresno County employment grew by 5.4 percent. In the most recent year for which data are available (1995), annual growth was 2.2 percent.

Employed Labor Force vs. Employment

The distinction between "employed labor force" and "employment" is significant because these two concepts approach the issue of jobs from two different perspectives. The employed labor force is a residence-based measurement, while employment counts people at their workplace. In other words, employment figures include people who commute into Fresno County, and exclude residents who work in other counties. By comparing the two categories, it is possible to assess the pool of workers and the pool of jobs.

According to ES202 data from the California Labor Market Information Division (LMID), there were 318,300 employed persons in Fresno County in 1994 and a total of 293,800 jobs in all industries. In other words, if employed Fresno residents held local jobs, there would be a deficit of 24,500 jobs. However, the LMID data excludes workers who are self-employed (proprietors) or in business not covered by unemployment insurance laws. A data source that addresses this information gaps is in the Regional Economic Information System, maintained by the U.S. Bureau of Economic Analysis (BEA). According to BEA, Fresno County's full- and part-time employment totaled 361,357 in 1994, of which 54,108 (or 15 percent) were proprietors. From this perspective, there is a net surplus of 43,000 jobs. Some of the "surplus" is accounted for by people who hold more than one job. However, it also implies that Fresno County is a net labor importer.

Although the BEA data are more comprehensive, they do not contain the level of industrial disaggregation necessary for more detailed employment analysis. Therefore, the balance of the employment analysis in this report is based primarily on ES202 data. Most of the self-employment is concentrated in four sectors: finance, insurance, and real estate (FIRE); services; construction; and retail trade. These sectors are largely comprised of local-serving businesses. Since employment analysis and the economic development strategy focus on export-oriented employment, the reliance on ES202 is not seen as a significant problem.

Comparing the Economies of Fresno County, the San Joaquin Valley, and California

According to the ES202 data series (See note on the ES202 database in the Glossary), the primary database used in this analysis, the total number of private-sector jobs in Fresno County was 240,816 in 1994 (Table 3-2). Given an employment base of 843,854 in the eight-county San Joaquin Valley, Fresno's share was approximately 29 percent of the larger economic region. In turn, the San Joaquin Valley comprises about eight percent of California's employment base.

As mentioned above, the number of jobs in Fresno County increased through the recession years of the early 1990s. This was also the case in the rest of the San Joaquin Valley. A total of 22,270

jobs were added to the San Joaquin economy over the three-year period from 1991 to 1994. Fresno County accounted for 44 percent of that net job growth, with the balance occurring in the other seven counties. Thus, even in the context of the robust San Joaquin Valley, Fresno County has exhibited a notable level of economic vitality.

TABLE 3-2					
COMPARISON OF ECONOMIES					
Fresno County 1991 and 1994					
Area	1991 Employ.	1994 Employ.	Net Change 1991-94	Percent Change 1991-94	Pct. of 1994 State Employment
Fresno County	230,911	240,816	9,905	4.3%	2.3%
Balance of San Joaquin Valley	590,678	603,038	12,360	2.1%	5.8%
San Joaquin Valley	821,589	843,854	22,265	2.7%	8.1%
California	10,738,600	10,454,300	(284,300)	-2.6%	100.0%
Area	1991 Earnings* (\$ Mil.)	1994 Earnings (\$ Mil.)	Percent Change 1991-94	Avg. Earnings per Employee	Pct. of 1994 Avg. State Earnings
Fresno County	\$4,781	\$4,775	-0.1%	\$19,830	68.1%
Balance of San Joaquin Valley	\$12,738	\$12,672	-0.5%	\$21,014	72.2%
San Joaquin Valley	\$17,519	\$17,447	-0.4%	\$20,676	71.0%
California	\$310,721	\$304,425	-2.0%	\$29,120	100.0%
Source: Applied Development Economics, Inc., based on ES202 data prepared by MIG, Inc.					
* Adjusted for inflation using the Consumer Price Index					

Assessment of Payroll and Earnings

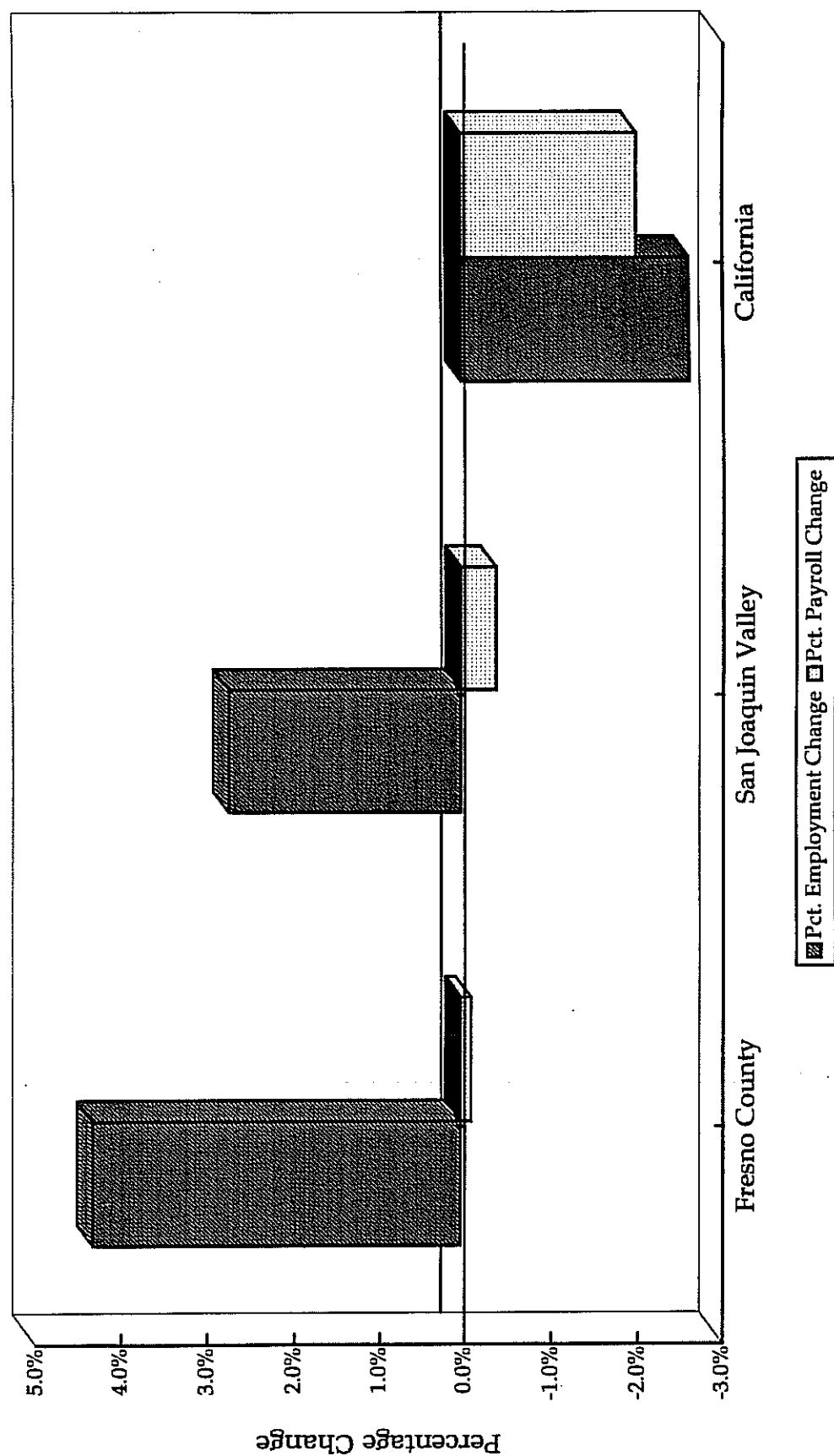
Besides examining job growth, it is also important to look at earnings and whether the expanding economy is providing for improved earnings potential as well. In contrast to job growth, earnings in Fresno County have remained relatively stagnant. Between 1991 and 1994, total payroll actually declined by a tenth of a percent after inflation. In comparison to other areas, however, Fresno County performed quite well. In the rest of the San Joaquin Valley, total payroll declined by 0.5 percent and in the state as a whole, payroll dollars dropped by two percent (Figure 3-4).

Another key income indicator is average earnings per employee. In 1994, average earnings in Fresno County were \$19,830 or about 68 percent of the statewide average (\$29,120). Fresno County's average was also \$1,180 lower than the balance of the San Joaquin Valley where average earnings stood at \$21,010.

Industrial Structure

Table 3-3 shows the basic structure of the Fresno economy in terms of how employment is allocated among the major economic activities, including the public sector. The two largest sectors—agriculture and services—are comparable in size, each comprising approximately one-fifth of the county's economy. Retail trade (15.4 percent) and local government (12.4 percent) are also major sources of employment.

FIGURE 3-4
EMPLOYMENT AND PAYROLL GROWTH, FRESNO COUNTY, SAN JOAQUIN VALLEY AND
CALIFORNIA, 1991-94



The industrial structure of Fresno County mirrors that of the San Joaquin Valley. Fresno has slightly higher percentages of employment in agriculture and services, but lower percentages in manufacturing and retail trade. Significant differences are evident when comparing Fresno County with the state. In California overall, less than four percent of the employment base is in agriculture compared to almost 20 percent in Fresno County. This overage is made up in lower Fresno employment shares in manufacturing, services, and retail trade.

Industrial Diversity

One factor in examining the stability and resilience of an economy is its diversity. Like a mixed and varied financial portfolio, industrial diversity helps to balance unevenness in market demand. When demand shrinks in a particular industrial sector, an economy is better equipped to weather the downturns and possible contractions in employment if the affected industries can find new customers in growing markets, or if there are other industries undergoing expansion at the same time. The first strategy relies on the agility of affected industries to seek untapped market niches and develop more innovative products. The latter strategy depends on the distribution of employment among a fairly large number of healthy industries. Figure 3-5 models industrial diversity in the Fresno economy by calculating the percentage of employment accounted for by its top industries. At the 3-digit SIC level, 50 percent of all workers in the private sector are employed in just 18 industries. Using California as a benchmark, it takes 35 of the state's largest industries to absorb 50 percent of the workforce. In an economy as diverse as the state of California, employment is more broadly distributed.

Employment and Payroll Dynamics

Figure 3-6 shows job and payroll growth (1991-94) for selected 2-digit SICs with more than 500 employees. Overlaid on the growth data is a set of indicators which measure the industry's contribution toward a higher standard of living (or prosperity). For each industry, there are two bars: the upper bar shows percentage change in payroll and the lower bar shows percentage change in employment. Bars extending to the right of the center line indicate growth, while bars to the left indicate decline. Among the 12 manufacturing industries, four experienced marked decline, but the majority grew over the 1991-94 time period. Similarly in services, while two industries—hotels and legal services—declined, five others were largely in an expansion mode. The most noticeable group of declining industries are related to transportation, communications and utilities and to the finance, insurance, and real estate sectors—industries that have been downsizing in the face of competitive pressures due to deregulation and mergers.

Figure 3-6 also synthesizes the relationship between payroll growth and job growth via the Prosperity Index. Where payroll growth exceeds growth (thereby raising average earnings), the Prosperity Index is greater than 1.0 and plotted to the right of the center line. Where payroll growth fails to match or exceed employment growth, average earnings fall and the Prosperity Index is plotted to the left of the center line.

The information in Figure 3-6 is presented in a matrix format in Figure 3-7. The relationship between growth and prosperity can take one of four scenarios:

- Job and Earnings Growth.

- Job Growth, but Declining Average Earnings.
- Job Loss (Downsizing), but Growth in Average Earnings.
- Jobs and Earnings Loss. In Fresno County, the industries are distributed fairly evenly among the four scenarios. There is a mix of industry types in the lower right-hand quadrant, the quadrant representing the most favorable scenario. This suggests that Fresno County has a business environment that can grow a variety of industries. Two of the industries are related to the Metalworking and Machinery Cluster, which is discussed in a later section of this report. This quadrant also contains three service industries.

Mix of Growth Industries

Table 3-4 shows an assessment of industries using the more detailed 3-digit SIC categories. The list shows industries ranked by the size of net employment gains between 1991 and 1994. It is not a comprehensive list of Fresno County's industrial base, but it highlights the mix of industries that are contributing to the region's growth. The list omits construction, retail, and personal services. It also includes major industries (over 1,000 employees) that experienced job losses.

In addition to net growth in employment, the analysis evaluated each industry on the basis of three other criteria. The industries listed in Table 3-4 met at least two of the following criteria:

- Concentration—industries that are concentrated in Fresno County as measured by a location quotient equal to or greater than 1.10.
- Regional growth advantage—industries whose growth in Fresno exceeded the state's growth rate.
- High average wage—industries with higher than average earnings per employee in 1994 (i.e., greater than \$19,830).

Finally, the table shows how each industry scored on a National Competitiveness Index. This index was constructed to assess the industry's growth prospects at the national (as opposed to the regional) scale. Scores range from 1 to 5 stars, with 5 stars indicating the most competitive national industries. (Due to lack of comparable data, scores are available only for manufacturing, wholesale, and service industries.)

FIGURE 3-5

INDUSTRIAL DIVERSITY: PERCENT OF TOTAL EMPLOYMENT ACCOUNTED FOR
BY TOP INDUSTRIES, Fresno County, San Joaquin Valley, and California, 1991-94

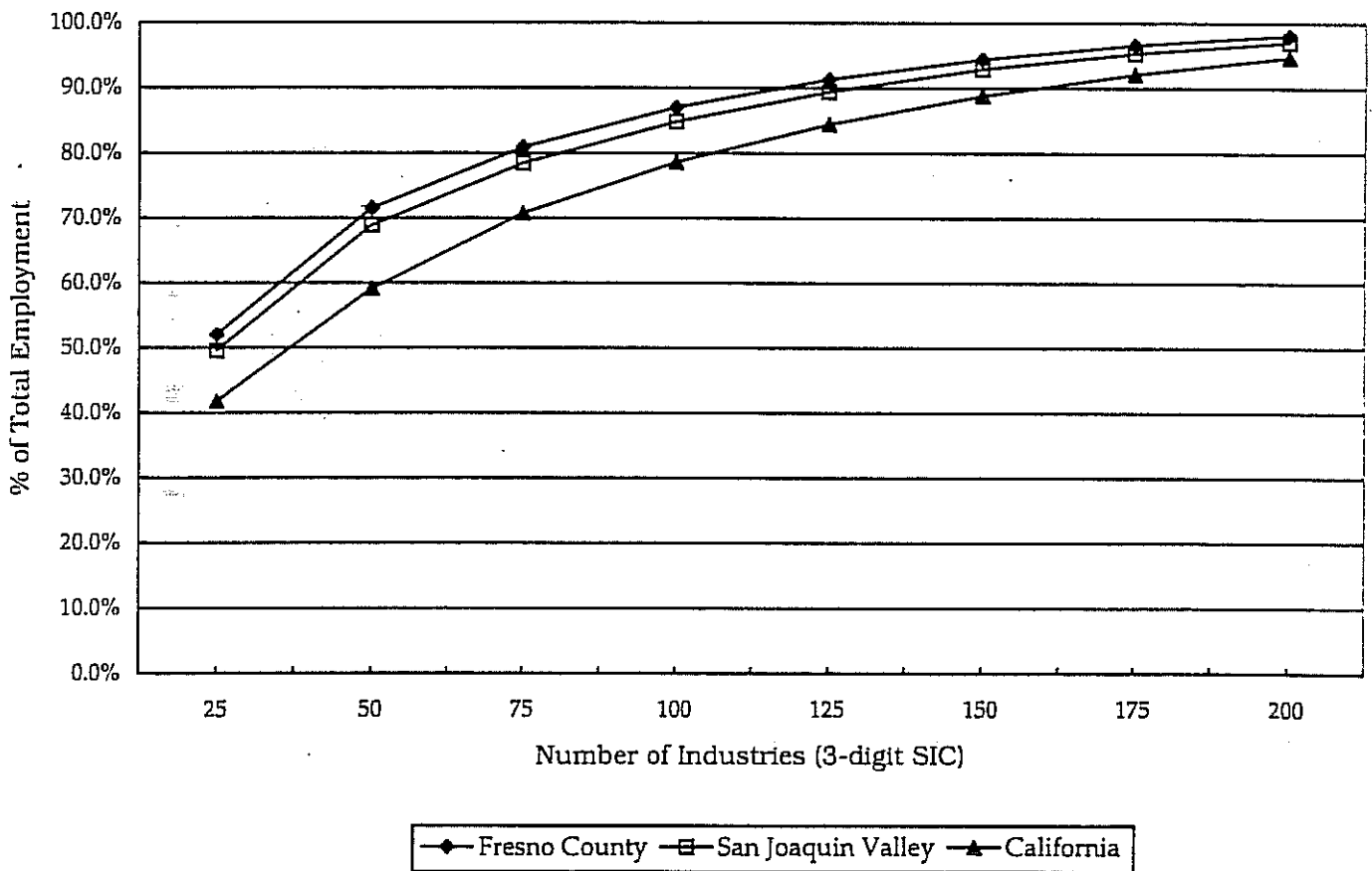
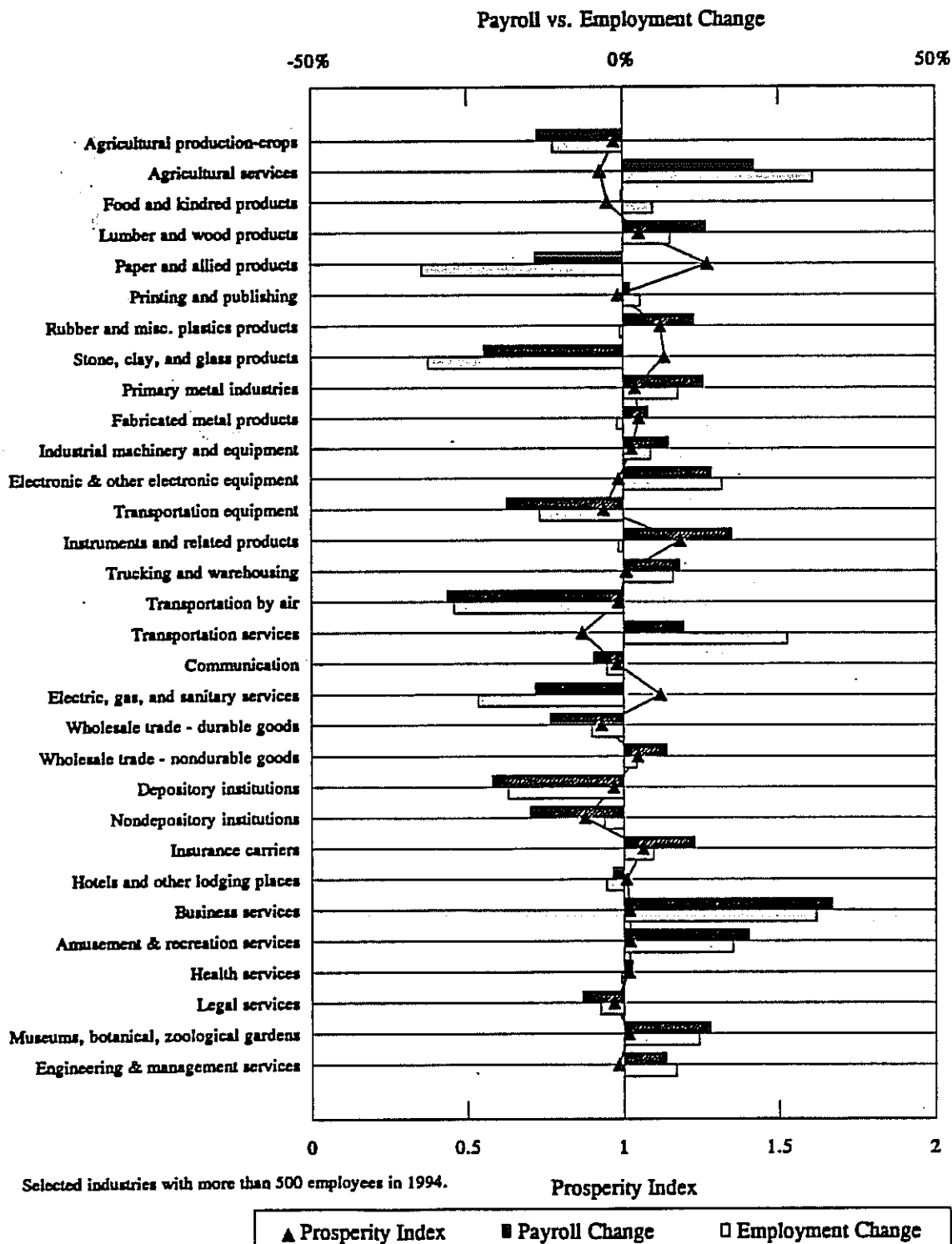


FIGURE 3-6
EMPLOYMENT AND PAYROLL DYNAMICS IN FRESNO COUNTY, 1991-94



Source: Applied Development Economics, Inc.

Tables wk4 from c02chart

FIGURE 3-7

INDUSTRY* GROWTH AND PROSPERITY MATRIX

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<p><i>Loss of Jobs and Lower Average Earnings</i></p> <p>Agricultural Crop Production Food and Kindred Products Transportation Equipment Air Transportation Communications Wholesale Trade-Durable Goods Depository Institutions Nondepository Financial Institutions Legal Services</p>	<p><i>Downsizing with Growth in Average Earnings (higher paying jobs remain)</i></p> <p>Paper and Allied Products Rubber and Misc. Plastics Products Stone, Clay and Glass Products Fabricated Metal Products Instruments Electric, Gas, and Sanitary Services Hotels and Lodging Places Health Services</p>
GROWTH (+)	<p><i>Growth in Jobs, with Decline in Average Earnings (however, total income rises)</i></p> <p>Agricultural Services Printing and Publishing Electronics and Electronic Equipment Transportation Services Insurance Agents, Brokers & Service Engineering & Management Services</p>	<p><i>**Job and Earnings Growth**</i></p> <p>Lumber and Wood Products Primary Metals Industries Industrial Machinery and Equipment Trucking and Warehousing Wholesale Trade-Nondurable Goods Insurance Carriers Business Services Amusement & Recreational Services Museums, Botanical Gardens & Zoos</p>

* Among industries (2-digit SICs) with at least 500 employees

Source: ADE, based on ES202 data series prepared by MIG, Inc. 1991, 1994

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TABLE 3-4

KEY INDUSTRIES IN FRESNO COUNTY
Analysis of Economic Performance Indicators
(Industries Ranked in Order of Employment Growth)

SIC	Industry Group	1994 Empl.	Net Empl. Change 1991-94	Fresno County Performance Indicators				National Competitive Index
				Leading Growth Industry	Concentration	Regional Growth Advantage	High Average Wage	
076	Farm labor and management services	22,947	6,624		x	x		---
736	Personnel supply services	3,355	1,207	x		x		---
072	Crop services	7,309	1,019		x	x		---
738	Miscellaneous business services	3,641	677	x		x		---
674	Management and public relations	1,357	492	x		x	x	---
799	Misc. amusement, recreation services	1,562	412	x		x		---
201	Meat products	3,371	409	x	x			---
808	Home health care services	486	334	x			x	---
395	Pens, pencils, office, & art supplies	349	310	x	x	x		---
653	Real estate agents and managers	1,752	268	x		x	x	---
421	Trucking & courier services, ex. air	4,259	273	x	x	x	x	---
737	Computer and data processing services	578	270	x		x		---
631	Life insurance	975	261	x		x	x	---
751	Automotive rentals, no drivers	777	211	x	x	x		---
824	Vocational schools	336	161	x	x	x	x	---
514	Groceries and related products	3,552	141	x	x	x	x	---
515	Farm-product raw materials	327	129	x	x	x	x	---
336	General industrial machinery	1,191	123	x	x	x	x	---
478	Miscellaneous transportation services	116	116	x	x		x	---
801	Offices & clinics of medical doctors	4,357	109	x		x	x	---
483	Radio and television broadcasting	759	106	x	x	x	x	---
366	Communications equipment	672	105	x		x	x	---
505	Metals and minerals, except petroleum	309	100	x		x	x	---
422	Public warehousing and storage	662	94		x		x	---
205	Bakery products	517	93			x	x	---
802	Offices and clinics of dentists	1,530	65			x	x	---
204	Grain mill products	433	65		x	x		---
262	Paper mills	105	64		x	x		---
673	Trusts	498	63		x	x		---
203	Preserved fruits and vegetables	4,166	62		x	x		---
252	Office furniture	137	62			x		---
078	Landscape and horticultural services	1,109	60			x		---
131	Crude petroleum and natural gas	234	60			x		---
734	Services to buildings	1,561	76			x		---
278	Blankbooks and bookbinding	76	75			x		---
244	Wood Containers	530	65		x	x		---
606	Credit unions	408	65			x		---
637	Pension, health, and welfare funds	271	64		x	x		---
267	Misc. converted paper products	154	62			x		---
221	Broadwoven fabric mills, cotton	79	62		x	x		---
359	Industrial machinery, nec	353	61			x		---
501	Motor vehicles, parts, and supplies	1,461	59		x	x		---
286	Industrial organic chemicals	103	57		x	x		---
735	Misc. equipment rental & leasing	588	56			x		---
641	Insurance agents, brokers, and service	1,556	30			x		---
344	Fabricated structural metal products	1,008	30			x		---
519	Misc. nondurable goods	1,743	7			x		---
271	Newspapers	1,105	(43)			x		---
871	Engineering & architectural services	1,075	(56)			x		---
811	Legal service	1,958	(76)			x		---
872	Accounting, auditing, & bookkeeping	1,463	(92)			x		---
602	Commercial banks	2,417	(110)			x		---
806	Hospitals	7,694	(153)		x	x		---
493	Combination utility services	1,206	(166)		x			---
508	Machinery, equipment, and supplies	2,039	(194)		x	x		---

Notes:

(1) Key industries are those experiencing net growth during the period 1991-94 and meeting at least two of the four criteria below. Industries that lost equipment during the period 1991-94 were also included if they had more than 1,000 employees and also met two of the performance criteria.

Leading Growth Industry = Net employment increase 1991-94 equal to or greater than 100

Concentration = Location quotient equal to or greater than 1.10

Regional Growth Advantage = Employment growth in Fresno County exceeded the growth rate for the state as a whole

High Average Wage = Average earnings in 1994 exceeded the overall Fresno County average of \$19,630

(2) National Competitive Index is a composite measure of the industry's growth prospects at the national scale. Ratings range from 1 to 5 stars indicating the most competitive national industries. Due to lack of comparable data, rankings are available only for the Manufacturing, Wholesale, and Service Industries.

(3) The list excludes Agricultural Production, Construction, Retail, and Personal Service industries.

Continued on next page

Among the top twenty industries, the two highest ranking industries are involved in human resources: farm labor and management services for fieldwork and personnel supply services for the office and factory. Growth in these industries reflects the sporadic nature of agricultural work, as well as a broader national trend toward flexible, contractual labor arrangements. Two of the top 20 industries are related to health care, including home health care services and the offices and clinics of medical doctors. In part the growth in these industries reflects trends in aging demographics, increased spending on health services, and the diversity of channels providing health care. In metropolitan areas, these national trends usually have a greater influence in determining the key growth industries and it is common to find a larger number high-growth health-related industries. The top 20 also includes several distribution-related industries, some of which are closely related to agriculture. Finally, there are several industries that can be classified as providing various services which support businesses in general. Within this group of industries is an emerging specialization in information processing.

Summary of Top 20 Growth Industries in Fresno County

Agriculture Related	Distribution	Health Care	Business Support
<ul style="list-style-type: none"> • Farm labor & management svcs (1) • Crop services (3) • Meat products (7) 	<ul style="list-style-type: none"> • Trucking & courier service (11) • Wholesale-groceries (16) • Wholesale-farm product raw materials (17) • Misc. transportation services (19) 	<ul style="list-style-type: none"> • Home health care services (8) • Offices & clinics of medical doctors (20) 	<ul style="list-style-type: none"> • Personnel supply services (2) • Misc. business services (4) • Management & public relations (5) • Computer & data processing (12) • Vocational schools (15)

The key industry list provided the basis for determining industry clusters in Fresno County (discussed in the next section). In formulating industry clusters, consideration was given to identifying groups of industries that are the “drivers” of the economy—those with a combination of characteristics, including:

- Employment growth, with the potential to lead future expansion.
- Large regional presence (critical mass).
- Export orientation (sales outside the region which bring in new dollars).
- Depth of linkages to regional suppliers.

Based on statistical information related to these characteristics, a constellation of industry clusters was identified. Dominant within the Fresno economy is Agriculture mega cluster. It, in turn, is comprised of an Agriculture Infrastructure and several commodity-specific clusters: the Fruit, Nut, and Vegetable Cluster; Livestock, Dairy, and Poultry Cluster, Cotton Cluster; and Other Agricultural Crops. In addition, two non-agricultural clusters were identified: the Metalworking and Machinery Cluster and the Information Processing Cluster. Each is discussed in more detail below.

INDUSTRY CLUSTER ANALYSIS

The Logic of Industry Clusters

Regions that have high-performing and sustainable economies have an industrial base that is diverse and deep. Diversity contributes to the resilience of an economy so that economic cycles negatively affecting one industry sector are offset by stability or growth in other sectors. Depth arises from having similar industries in the same region which share many of the inputs they use to compete. It refers to the “capture” of economic value that occurs when industries can purchase locally a substantial amount of the special inputs they use to produce their final products. Diversity and depth in an economy lead to industry “clustering.” An economy that has industry clusters will be more sustainable over time, generating more jobs and wealth.

Industry clusters, then, are networks of businesses that produce a set of related goods and services. Usually these goods and services are exported outside the region or attract dollars into the region. In either case, the inflow of revenues is vital to supporting the regional economy—including a host of local-serving businesses and the tax base.

Businesses that belong to a cluster not only require similar suppliers, but they also use similar technologies and labor skills, may be subject to a common regulatory environment, or share requirements for specialized capital and services. Public and non-profit organizations are also an important part of the cluster, providing support in terms of research and development through universities and technical institutes, education and training, marketing and promotions (industry associations and economic development agencies), and even industry-specific regulatory enforcement to ensure product quality, worker safety, and environmental protection.

The cluster concept is particularly important during the current climate of restructuring and widespread downsizing by major companies. In the past, major industries were dominated by large, vertically integrated corporations. However, as markets have become more highly differentiated and fragmented, and as foreign competition has become more acute, large firms have sometimes found themselves unable to respond quickly enough to maintain their market share. Smaller firms have often shown themselves to be more flexible in meeting rapidly changing market demand. In many cases, too, companies have been able to realize cost advantages as they have become leaner by outsourcing production and administrative functions. Thus, a significant proportion of economic activity is characterized by clusters of smaller and more specialized producers that, together, serve common markets, rather than by corporate giants seeking to maximize in-house production capacity.

Industry clusters have three key features:

- *Geography.* Businesses in a cluster are located in a relatively concentrated geographic area. It is important that businesses have close contact to maintain a functioning network. In some cases, this means regular face-to-face communications. Improvements in telecommunications allow some types of relationships to develop and flourish over long distances, but cannot completely replace direct, interpersonal contact.
- *Interdependence.* The members of the cluster have mutual interests relating to the goods and services they produce, the technologies or types of labor required, and the markets they serve.

- *Public/private partnership.* Clusters involve private sector firms, as well as non-profit organizations and public agencies. Non-business participants are very important because they provide a level of support and service that the private market cannot easily provide for itself.

Cluster Size and Relationships

Figure 3-8 shows a conceptual map of the Fresno County clusters. The four commodity specific clusters—Fruit, Nut, and Vegetable; Livestock, Poultry, and Dairy; Cotton; and Other Crops—follow the conventional pattern involving a chain of production from raw materials to finished products. They are shown as vertical clusters. Of these, the largest is the Fruit, Nut, and Vegetable Cluster with approximately 28,430 workers. The Livestock, Poultry, and Dairy Cluster is another mature cluster with approximately 7,520 employees. The Cotton Cluster, as well as Other Agricultural Crops are approximately the same size, each with slightly more than 2,700 employees.

Supporting the vertical clusters is a large Agricultural Infrastructure, which is not commodity specific, but provides material inputs and services to a wide range of agriculture related products. This cross-cutting element suggests a horizontal character.

A second horizontal cluster that is emerging in the region is Metalworking and Machinery. While integrated into the Agricultural Cluster, for example, through farm machinery and parts, pumping equipment, and metal structures, this cluster also serves markets outside of agriculture and has the potential to further develop independently. Moreover, this type of horizontal cluster provides the manufacturing capacity that is critical to the vitality of other industries. To the extent that the region is capable of supplying high-quality and cost-efficient inputs, and provides a rich source of specialty parts and components, the supplier base becomes an integral part of the process which results in innovation and product refinement.

Another cluster that has begun to develop in Fresno County is information processing, also known as “back office” activity. The industry specializes in high-volume data transactions with low per-unit costs. Because today’s technology permits data transactions to occur cheaply over very large distances, clients are frequently located far away. In one sense back office operations are suppliers to industries with heavy data processing needs, such as health care, banking, and insurance, and, as such, are part of those clusters. However, information processing itself requires varied and substantial amounts of inputs, much of which is, or can be, acquired locally.

Overview of Cluster Employment

Table 3-5 summarizes employment information on Fresno County’s clusters. In 1994, they employed more than 83,600 persons in jobs that are predominantly export-oriented. Collectively, cluster employment amounted to 35 percent of employment in the county.

FIGURE 3-8
Cluster Relationships

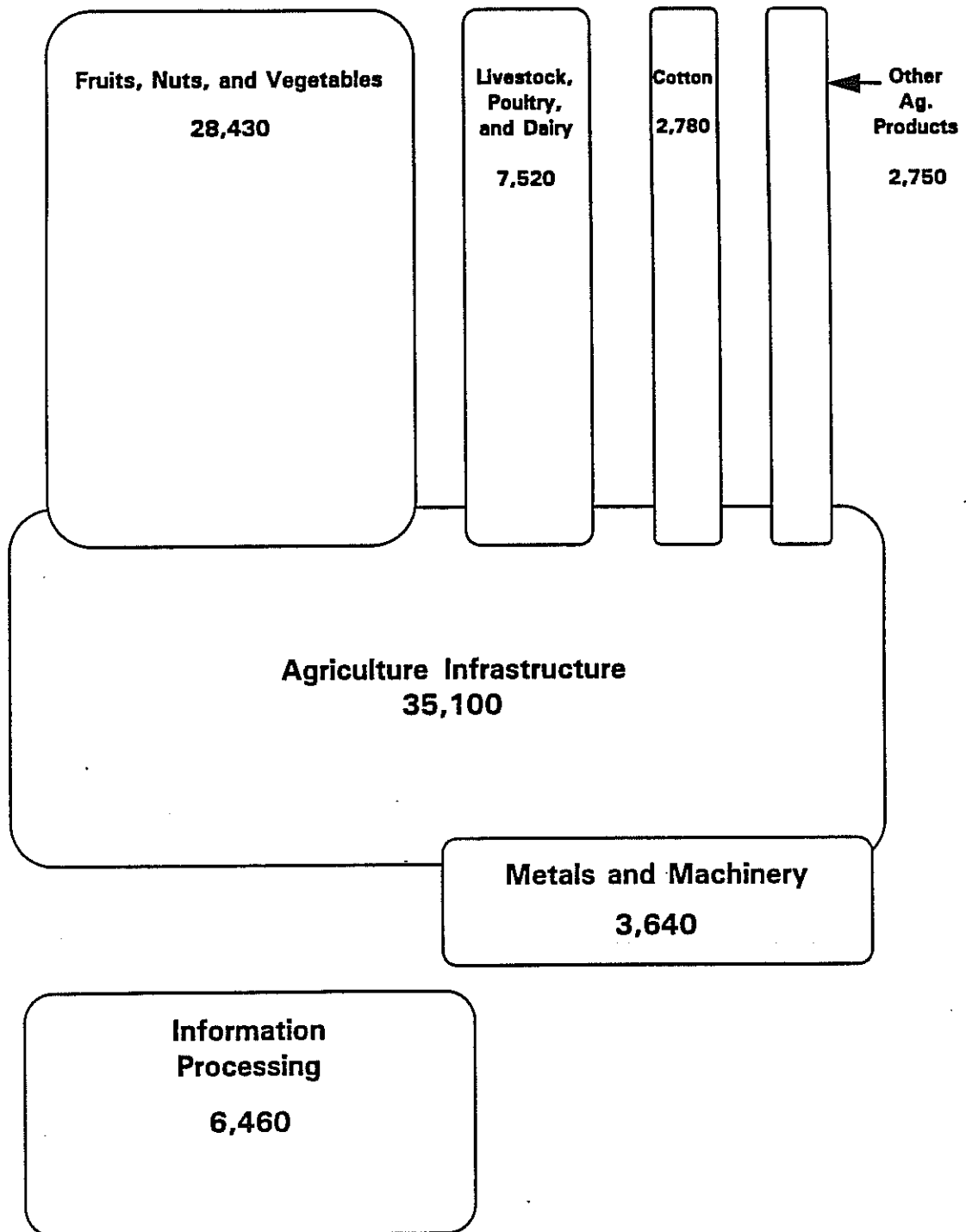


TABLE 3-5 SUMMARY OF CLUSTER EMPLOYMENT Fresno County 1997			
INDUSTRY	Fresno County 1994 Employment	Fresno County Percent of San Joaquin Valley	Concentration Factor
Agriculture Infrastructure	35,097	32%	4.14
Fruit, Nut, and Vegetable Cluster	28,430	28%	4.46
Livestock, Poultry, Dairy Cluster	6,922	21%	3.11
Cotton Cluster	2,782	31%	3.38
Other Agricultural Crops	2,751	25%	1.20
Metalworking and Machinery Cluster	3,644	26%	0.93
Information Processing Cluster	6,462	36%	0.61
TOTAL	83,628		
Cluster Employment as % of Total Empl.	35%		
Note: The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, California). Industries with a Concentration Factor greater than 1.00 are relatively more concentrated in the county than in the state as a whole. Source: ADE, based on ES202 data series prepared by MIG, Inc.			

The strength of these industry clusters is also evident in the high concentration factors seen in Table 3-5. A factor exceeding 1.0 indicates that the region has a larger proportion of employment in that industry than the state average. For example, the Fruit, Nut, and Vegetable Cluster's concentration factor of 4.46 means that this industry is four times more concentrated in Fresno County than in the state as a whole. With concentration, a region is often able to offer a higher degree of specialization, including technical sophistication of products and production processes.

Multiplier Effects of Cluster Growth

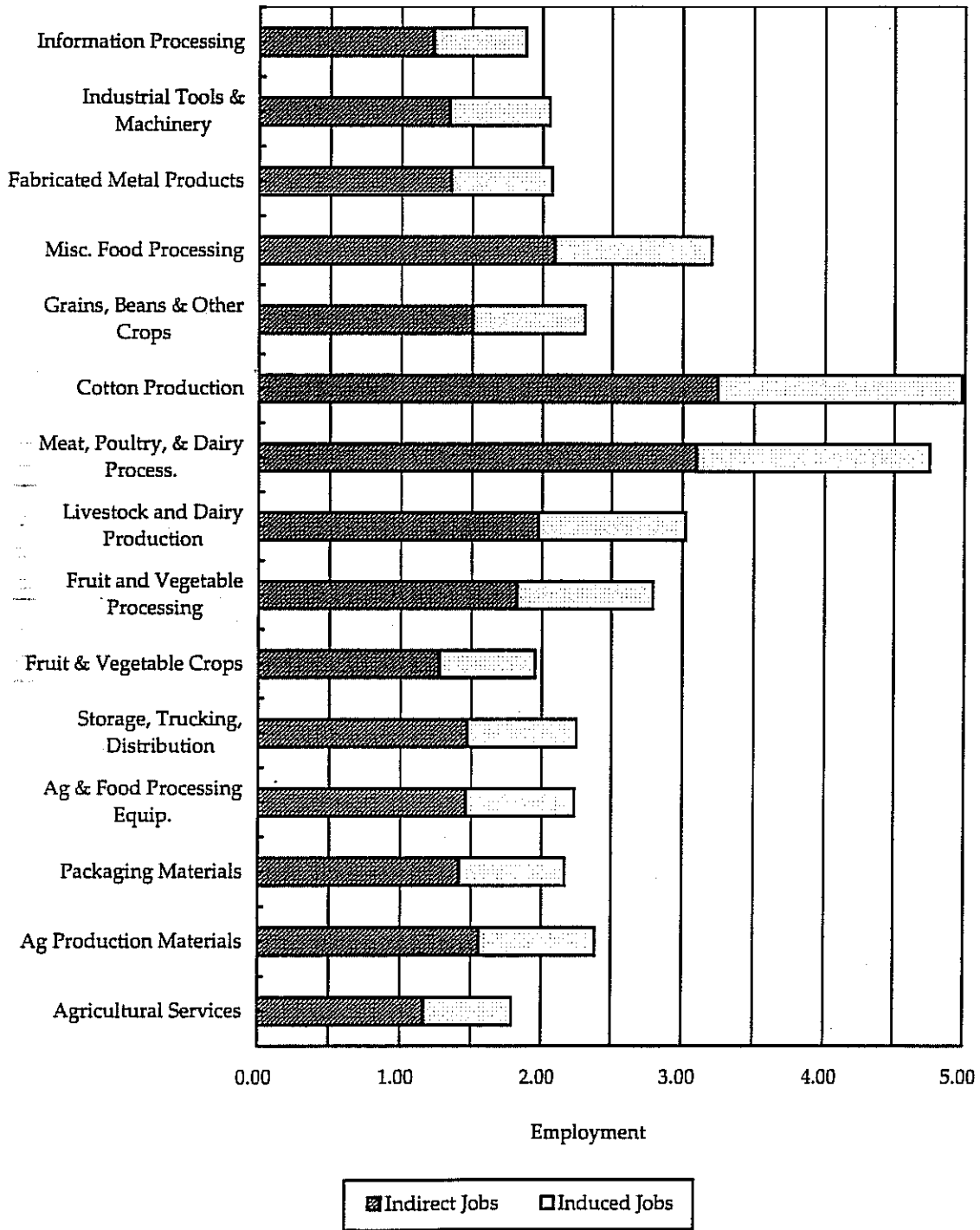
As drivers of the regional economy, cluster industries are not only major employers themselves, but also generate employment elsewhere in the economy through backward and forward linkages. When these industries grow, they produce a ripple effect of job creation. This relationship is expressed through multipliers. Table 3-6 and Figure 3-9 shows employment multipliers that were estimated with an input-output model. The model estimates the employment impacts of one additional job in a particular industry based on buyer-supplier transactions between industries, and changes in income level. There are two types of impacts. Indirect effects are the employment impacts on supplier industries, while induced effects are the employment impacts on a myriad of other local-serving industries (such as retailers, restaurants, and health care providers).

TABLE 3-6

EMPLOYMENT MULTIPLIERS-FRESNO COUNTY

Industry	Multipliers based on Employment Increase*	
	Type I Multiplier	Type II Multiplier
Agriculture Infrastructure		
Agricultural Services	1.2	1.8
Agricultural Production Materials	1.6	2.4
Packaging Materials	1.4	2.2
Agriculture & Food Processing Equipment	1.5	2.2
Storage, Trucking, Distribution	1.5	2.3
Fruit, Nut, and Vegetable Cluster		
Fruit & Vegetable Crops	1.3	1.9
Fruit and Vegetable Processing	1.8	2.8
Livestock, Poultry, Dairy Cluster		
Livestock and Dairy Production	2.0	3.0
Meat, Poultry, and Dairy Products	3.1	4.8
Cotton Cluster		
Cotton Production	3.2	5.0
Other Agricultural Crops		
Grains, Beans & Other Crops	1.5	2.3
Misc. Food Processing	2.1	3.2
Metalworking & Machinery Cluster		
Fabricated Metal Products	1.3	2.1
Industrial Tools, Supplies, and Equipment	1.3	2.0
Information Processing Cluster		
Information Processing	1.2	1.9
<p>* For each additional direct job created Type I = indirect jobs (or jobs among suppliers) Type II = indirect and induced jobs (or jobs among suppliers and other local-serving businesses, such as retailers)</p> <p>Source: ADE, based on IMPLAN Model.</p> <p>cls-mult.wk4 mult table</p>		

FIGURE 3-9
EMPLOYMENT MULTIPLIERS
Fresno County Industry Clusters



All of the basic industries examined yielded high multipliers. In terms of indirect and induced effects, multipliers ranged from 1.8 in agricultural services to 5.0 in cotton production. In other words, one additional new job in agricultural services has the total effect of creating almost two jobs elsewhere in the Fresno economy, while 1 additional new job in cotton production is estimated to create as many as five other jobs. The multipliers reflect the volume and diversity of the supplies required (indirect effects), and expanded household incomes which fuel growth among local-serving retail and service businesses (induced effects).

Fresno County's Clusters

To understand the structure and requirements of industry clusters, each industry cluster was examined in terms of its component activities and a variety of performance indicators, including the following:

- Size
- Growth
- Concentration
- Income Potential
- Spatial Distribution (Fresno County vs. the Balance of the San Joaquin Valley)
- Market Outlook and Issues Affecting the Industry

Agriculture Mega Cluster: The Economic Driving Force in Fresno County

Agriculture is the foundation for Fresno County's dominant cluster, based on the large number of export-oriented jobs, continuous expansion, and capacity to lead regional growth through dense ripple effects among local suppliers. To understand both the diversity within agriculture and to provide a more coherent structure, the overall Agriculture "mega" cluster is divided into five smaller clusters: the Agriculture Infrastructure and four commodity-specific clusters. The next section presents an overview of Fresno County's crop production output. It is followed by a discussion of each of the five clusters, beginning with the Agriculture Infrastructure.

Agricultural Production

Value of Production Output

By all accounts and measures, the primary driving force behind the Fresno County economy and the San Joaquin Valley in general, is agricultural. Primary agricultural production in Fresno County accounted for over \$3 billion in 1995, making it the most productive agricultural county in California. For the eight-county San Joaquin Valley, primary agricultural production had a total 1995 value of \$12.7 billion. Moreover, these values reflect only commodity production and do not include the manufacturing component, such as food processing. (The entire complex of agriculture-related industries is discussed in the Industry Cluster Sections.) When the downstream benefits of agricultural production are considered, the Fresno County Agricultural Commissioner estimates that every dollar of agricultural production revenue results in three and a half dollars in economic benefit to the local economy. According to the 1996 Crop and Livestock Report, over 90 percent of value of agricultural production in Fresno County comes from four commodity types: fruit and nuts (36 percent), vegetables (21 percent), field crops, primarily cotton (20 percent), and livestock and poultry (21 percent) (Table 3-7).

TABLE 3-7

**AGRICULTURAL PRODUCTION IN FRESNO COUNTY
VALUE OF CROPS AND LIVESTOCK**

1994, 1995

	1994 Value (\$ Mil.)	Percent of Total	1995 Value (\$ Mil.)	Percent of Total	Change in Value (1994-95) (\$ Mil.)
Field Crops	661.1	21%	643.6	20%	(17.4)
Seed Crops	38.4	1%	29.9	1%	(8.5)
Vegetable Crops	674.2	22%	734.7	23%	60.4
Fruit and Nut Crops	992.1	32%	1,052.1	33%	60.0
Nursery Products	23.9	1%	47.8	2%	23.9
Livestock and Poultry	673.3	22%	652.0	21%	(21.2)
Apiary Products	6.0	0%	7.0	0%	1.0
Industrial Crops	15.8	1%	7.3	0%	(8.5)
All Crops and Livestock	3,084.9	100%	3,174.5	100%	89.6
Source: Fresno County Agricultural Report frescrop.wk4.agprod					

Overall, Fresno County agricultural production grew modestly between 1994 and 1995, with a net increase of about \$90 million or three percent during this period. The largest gains were experienced in fruits and nuts (+\$60.4 million) and vegetables (+\$60 million). The largest one-year losses were experienced in livestock and poultry (-\$21.2 million) and field crops (-\$17.4 million). Over a longer time frame (1975-95), Fresno County's agricultural production has grown steadily, except for periods between 1980-82, and 1990-92 when the total value agricultural production declined. These periods of growth and decline reflect the fact that farming is subject to external market conditions, as well as weather and natural conditions, that affect the market for food and fiber products. Farming is a volatile economic activity, but one with generally strong growth prospects.

Agriculture in Fresno County in Relation to the San Joaquin Valley

Fresno County's share of commodity values in the San Joaquin Valley was slightly more than 20 percent in 1995 (Table 3-8). In other words, one out of every five dollars in Valley-wide commodity production comes from the county. Among the various crop types, Fresno County accounts for a relatively larger share of the Valley's seed crops (47.9 percent), vegetable crops (46.5 percent), and field crops (24.0 percent). On the other hand, it has a disproportionately smaller share of fruit and nut crops (17.1 percent), nursery crops (17.1 percent), and livestock and poultry (14.8 percent).

Key Economic Crops

To a large degree, the top crops in Fresno County are also abundantly produced in other San Joaquin Valley counties. What is noticeable about Table 3-9 is that nine of the top ten crops are also key crops in one or more neighboring counties. The one exception is head lettuce which is unique to Fresno County in the San Joaquin Valley. The table also reveals the county's particular strengths with a number of individual crops. For example, the top crop in Fresno County is cotton, with a production value of nearly \$500 million in 1995, accounting for over 15 percent of the total crop and livestock value. Cotton also ranks among the top five crops for all but the two northernmost counties (San Joaquin and Stanislaus) in the San Joaquin Valley. While cotton is the number one crop in Kings and Kern Counties—accounting for \$293 million and \$281 million of production value, respectively—these values are far lower than the levels reached in Fresno.

In keeping with its reputation as a dominant center for raisin production, Fresno County grape production had a total 1995 value of \$483 million, over half of which was used for raisin production. Grapes were also the number one crop type in Kern, Madera, and San Joaquin Counties, and ranked among the top ten crops in all the other San Joaquin Valley counties.

The number three agricultural commodity in Fresno County is poultry production. With \$356 million in 1995 production, Fresno County led all San Joaquin Valley counties. Indeed, poultry production claimed a larger share of the agricultural economy in Fresno County (11 percent) than in all other San Joaquin Valley counties, except for Merced County.

Tomatoes were the fourth highest-valued crop in Fresno County with \$263 million in 1995 production value. Tomato production ranked among the top ten crops in Kings, Merced, San Joaquin, and Stanislaus Counties; however, only in San Joaquin County does the prominence of tomato production approach the level found in Fresno County.

TABLE 3-8 AGRICULTURAL PRODUCTION Value of Fresno Production Relative to the San Joaquin Valley, 1995	
Industry	Fresno Pct. of San Joaquin Valley Crop Values
Field Crops	24.0%
Seed Crops	47.9%
Vegetable Crops	46.5%
Fruit and Nut Crops	17.1%
Nursery Products	17.1%
Livestock and Poultry	14.8%
Apiary Products	13.0%
Industrial Crops	17.1%
Aquaculture	0.0%
All Crops and Livestock	20.8%
Source: Agricultural Reports from Fresno, San Joaquin, Stanislaus, Merced, Madera, Kings, Tulare and Kern Counties.	

frescrop w14

TABLE 3-9
TOP 10 CROPS AND LIVESTOCK IN FRESNO COUNTY AND NEIGHBORING COUNTIES
1995

Fresno County			Merced County			Madera County			Kings County			Tulare County		
Top Crops	Value		Top Crops	Value		Top Crops	Value		Top Crops	Value		Top Crops	Value	
Cotton	497.7		Milk	359.2		Grapes	181.5		Cotton	281.5		Milk	569.3	
Grapes	483.9		Poultry	154.5		Almonds	93.0		Milk	227.5		Oranges	471.6	
Poultry	356.2		Almonds	141.0		Milk	53.7		Cattle	50.8		Grapes	401.8	
Tomatoes	263.6		Cotton	77.4		Cotton	48.2		Turkeys	25.7		Cattle	222.5	
Milk	171.1		Tomatoes	56.8		Alfalfa Hay	33.3		Grapes	18.4		Cotton	125.8	
Head lettuce	143.1		Alfalfa	56.0		Pistachios	26.5		Peaches	18.1		Plums	82.2	
Almonds	113.8		Cattle	40.1		Poultry	21.5		Pistachios	18.0		Peaches	76.0	
Cattle	107.7		Sweet potatoes	37.8		Cattle	20.7		Alfalfa Hay	17.7		Nectarines	74.0	
Nectarines	100.2		Grapes	27.4		Apples	18.8		Tomatoes	17.0		Alfalfa	59.4	
Oranges	93.3		Eggs	25.9		Oranges	12.9		Wheat	16.1		Corn	37.8	
Total, Top 10	2,330.6		Total, Top 10	976.2		Total, Top 10	510.1		Total, Top 10	690.9		Total, Top 10	2,120.3	
Total, All	3,174.4		Total, All	1,222.4		Total, All	603.3		Total, All	826.9		Total, All	2,611.1	

Shaded areas show key Fresno crops that appear in the other counties' Top 10 list; all values in millions of dollars

Source: Agricultural Reports from Fresno, Merced, Madera, Kings, and Tulare Counties.

fresno-wk4 top 10

Milk production in Fresno County ranks fifth among the top crops, but a number of other San Joaquin Valley counties are more prominent milk-producing areas. Fresno County milk production had a total 1995 value of \$171 million, which comprised 5.4 percent of the county's total commodity output. The top milk-producing county in the San Joaquin Valley is neighboring Tulare County, which had a production value of \$569 million. In addition, milk ranks as either the first- or second-highest agricultural commodity in Kings, Merced, San Joaquin, and Stanislaus Counties. All of these counties had milk production values greater than Fresno County.

One crop where Fresno County has a clear advantage over other San Joaquin Valley counties is head lettuce production, in which crop value was \$143 million in 1995. Lettuce did not rank among the top crops for any of the other San Joaquin Valley counties. Rather, it is the Central Coast region that is better known for lettuce farming, especially Monterey County where lettuce is the top agricultural commodity.

Almonds are the seventh largest crop in Fresno County, with about \$114 million in 1995 production. This crop also ranked among the top ten crops in all other San Joaquin Valley counties, except for Kings and Tulare Counties. Kern, Merced, and Stanislaus Counties all had higher almond production than Fresno County, and the commodity was ranked the number two crop in Madera County.

Fresno County produced \$107 million in cattle and calves in 1995. This includes both beef and dairy cattle. Except for Merced County, every San Joaquin Valley county had cattle among the top ten commodity types. Counties where cattle farming shows particular strength include Kings and Tulare Counties, where cattle ranks among the top four commodities.

Approximately \$100 million worth of nectarines was grown in Fresno County in 1995. Neighboring Tulare County is the only other Central Valley county where this crop ranked among the top ten crops. And rounding out the top ten Fresno County crop types is oranges, which had a total 1995 production value of \$93 million. This crop also ranked among the top ten crops in Kern, Madera, and Tulare Counties.

With \$472 million in 1995 production, Tulare County is clearly the dominant orange producing region in the San Joaquin Valley, while Kern County produces about twice as much orange crop as Fresno County.

Agricultural Employment

In 1994, agriculture employed approximately 58,000 persons and made up approximately 24 percent of Fresno County's private-sector employment base (Table 3-10). Of this total, approximately 25,900 are engaged in commodity-specific production, while approximately 32,000 are involved in more general agricultural services. In the former category, the production of fruits and tree nuts employed the largest number of workers—approximately 15,500 in 1994. Another 4,000 were employed by general farms that cultivate more than one type of crop. Significant numbers of workers were also employed in cotton production (1,951), vegetables and melons (1,756), and dairy farms (997).

TABLE 3-10 EMPLOYMENT IN AGRICULTURAL PRODUCTION Fresno County 1994	
Commodity Type	Number of Employees
Agricultural Production	
Cash Grains	100
Cotton	1,951
Field Crops, except Cotton	426
Vegetables and Melons	1,756
Fruits and Tree Nuts	15,502
Horticultural Specialties	289
General Farms, Primarily Crop	3,916
Livestock, except Dairy and Poultry	633
Dairy Farms	997
Poultry and Eggs	196
Animal Specialties	59
General Farms, Primary Livestock	81
Agricultural Services	
Soil Preparation Services	138
Crop Services	7,309
Veterinary Services	267
Animal Services, except Veterinary	285
Farm Labor and Management Services	22,947
Landscape and Horticultural Services	1,109
TOTAL	57,961
Source: ADE, ES202 data series prepared by MIG, Inc., 1994 Agemploy.wk4	

Of all the agricultural classifications, (contract) farm labor and management services has, by far, the largest concentration of employment. In 1994, almost 23,000 jobs were found in this category. Crop services—which includes planting, protecting, mechanical harvesting, and preparation for market—also generate sizeable employment with some 7,300 workers engaged in 1994.

Agricultural Infrastructure

The competitiveness of Fresno County's agricultural clusters depends on the depth of the agriculture infrastructure. This infrastructure refers to a host of specialized suppliers and service providers. With the infrastructure in place, agriculture-oriented businesses have ready access to the types of inputs required or can obtain information about how to locate those inputs. Moreover, the agriculture infrastructure provides a dense network of organizations and people who have relevant information and knowledge. This technical capacity makes firms in the region better able to spot new commercial opportunities and to find the resources necessary to act on them.

Components of the Agriculture Infrastructure

Figure 3-10 shows the major components of the agriculture infrastructure. The largest component is services supplying seasonal contract laborers, as well as a variety of services required for crop production, such as soil preparation, aerial dusting and spraying, bracing of orchard trees and vines, fertilizing, irrigation system operation, pruning orchard trees, and weed control. It is a labor-intensive part of the agriculture infrastructure and, in 1994, employed approximately 30,400 workers.

Another component of the agriculture infrastructure includes suppliers of various production materials and equipment: seeds, chemicals (fertilizers, pesticides, and herbicides), farm machinery and tools, and pumping equipment for irrigation systems. This component employed approximately 1,150 people in 1994.

Post-harvest handling is as important as all the effort that goes into producing healthy crops. Produce quality begins to decline once it is harvested, but careful handling and appropriate packaging can retard degradation and prolong marketable life. In taking products from the fields to the final user, a variety of packaging materials are used. The provision of these materials employed an estimated 2,370 people in 1994. There were an additional 360 jobs in the manufacture of equipment used to package and process agricultural products.

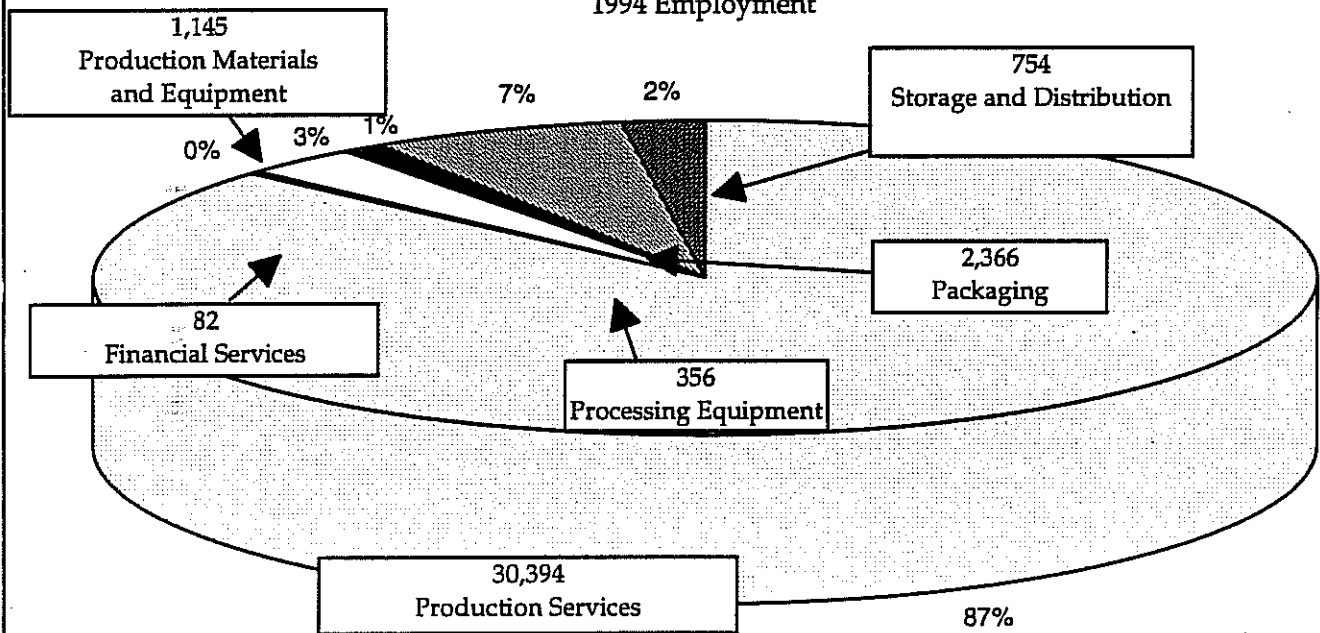
Warehousing and freight transportation make up another component of the infrastructure. In 1994, some 750 people were employed in providing these services. Agriculture also relies on specialized financial services, such as those provided by commodity contract brokers and dealers and commodity exchanges. They employed approximately 80 people in Fresno County.

In total, there were an estimated 35,100 jobs in the agriculture infrastructure. This number is conservative since it excludes other businesses scattered throughout the economy that are wholly or primarily involved in agriculture, such as the Fresno-based Western Agricultural Publishing Co.

In addition to industries and firms, non-profit organizations and government agencies are also integral components of the cluster. Various commodity-specific cooperatives have long histories of collaborative relationships among Central Valley growers, for example, the California Table

FIGURE 3-10

**COMPONENTS OF THE AGRICULTURE INFRASTRUCTURE
1994 Employment**



Source: ADE, Inc., from ES202 data prepared by MIG, Inc., 1994

Grape Commission, California Almond Growers Exchange, and the California Milk Advisory Board. Typically, farmers pay a fee (based on their production volume) and the organizations fund generic advertising, promotional campaigns, lobbying, research, and educational activities—both domestically and abroad (See Recent Litigation in Glossary). Other organizations, such as the Fresno County Farm Bureau and the Fresno County Economic Development Corporation, also work closely with this cluster.

Educational institutions, including California State University, Fresno (Fresno State University) and Kings River Community College, serve the research and training needs of Fresno County's agricultural clusters. Labor unions, such as the United Farm Workers and the International Brotherhood of Teamsters (representing food processing plant workers) may be considered part of the agricultural clusters. As are government agencies, including health and safety inspectors, that regularly interact with the production and processing industries.

Growth of the Cluster

Between 1991 and 1994, the production services grew considerably from 22,715 to 30,394 (Table 3-11). Farm labor and management services added more than 6,600 jobs, thus accounting for most of this growth. However, employment in crop services also surged, adding more than 1,000 net new jobs. In comparison, employment in the production materials component was relatively stable. Pumps and pumping equipment registered the largest employment growth with the addition of almost 40 jobs for a total of 533 in 1994. This industry is highly concentrated in Fresno County with a concentration factor of 5.19. Another significant industry—farm machinery and equipment—added 10 new jobs.

The packaging materials component was hit hardest by declining employment. In particular, the losses were concentrated in paperboard containers and boxes which dropped from 943 employees in 1991 to 434 in 1994 for a loss of more than 500 jobs.

In warehousing and trucking, most of the change occurred in refrigerated warehousing and storage. This industry gained almost 140 jobs during the three-year period.

Income Generation in the Cluster

With the exception of the production services component, most industries that compose the agriculture infrastructure enjoy relatively high average earnings. In production services, the average payroll per employee is slightly more than \$10,000, and in farm labor services, it is only \$7,900. This low figure reflects not only the seasonal nature of the work, but also the low skills required. And because so much of the employment is in this industry, it brings down the average earnings of the overall cluster to \$12,140, even though many industries have average earnings that are twice as high.

TABLE 3-11
AGRICULTURE INFRASTRUCTURE -- FRESNO COUNTY
Cluster Trends and Performance

SIC	Industry Name	1991 Employ.	1994 Employ.	Net Change 1991-94	Change 1991-94	Concentration Factor	Payroll per Employee
071	Soil preparation services	102	138	36	11.8%	5.19	\$19,669
072	Crop services	6,290	7,309	1,019	5.4%	6.55	\$16,714
076	Farm labor and management services	16,323	22,947	6,624	13.5%	9.61	\$7,891
	Production Services	22,715	30,394	7,679	11.3%	8.61	\$10,067
0151	Nursery products	n.a.	233	233	---	0.36	\$16,074
287	Agricultural chemicals	100	93	(7)	-2.3%	1.13	\$32,438
3423	Hand and edge tools, nec	6	8	2	11.1%	0.15	\$27,997
3523	Farm machinery and equipment	262	272	10	1.3%	3.57	\$26,953
3524	Lawn and garden equipment	3	3	0	0.0%	0.59	\$21,767
3561	Pumps and pumping equipment	497	533	36	2.4%	5.19	\$22,915
497	Irrigation systems	73	3	(70)	-32.0%	0.31	\$22,050
	Production Materials & Equipment	---	1,145	---	---	1.17	\$27,541
244	Wood containers	465	530	65	4.7%	4.58	\$15,657
265	Paperboard containers and boxes	943	454	(509)	-18.0%	0.96	\$26,600
275	Commercial Printing	542	505	(37)	-1.5%	0.62	\$22,577
3051	Unsupported plastics film & sheet	121	72	(49)	-13.5%	1.35	\$26,029
3056	Plastics foam products	102	73	(29)	-9.5%	0.55	\$23,413
3059	Plastics products, nec	357	421	64	2.9%	0.53	\$25,059
3221	Glass containers	0	0	0	---	0.00	---
341	Metal cans and shipping containers	0	31	31	---	0.23	\$37,659
3466	Crowns and closures	0	0	0	---	0.00	---
	Packaging Material	2,860	2,366	(494)	-5.5%	0.77	\$23,666
3555	Conveyors & conveying equipment	0	0	0	---	0.00	---
3556	Food products machinery	115	132	17	4.9%	2.24	\$36,305
3565	Packaging machinery	246	224	(22)	-3.0%	4.06	\$25,511
	Processing Equipment	361	356	(5)	-0.5%	2.40	\$31,401
4221	Farm product warehouse & storage	57	46	(11)	-6.4%	4.53	\$31,207
4222	Refrigerated warehouse & storage	181	318	137	25.2%	4.36	\$19,731
473	Freight transportation arrangement	251	274	(7)	-0.8%	0.48	\$29,392
475	Miscellaneous transportation services	n.a.	116	116	---	1.54	\$18,691
	Storage and Distribution	---	754	---	---	1.05	\$23,782
622	Commodity contract brokers, dealers	40	11	(29)	-24.2%	1.29	\$47,773
623	Security and commodity exchanges	40	71	31	25.8%	5.27	\$31,912
	Financial Services	80	82	2	0.8%	3.73	\$34,040
	Cluster Total	---	35,097	---	---	4.14	\$12,135

Source: Applied Development Economics, Inc., from ES202 data series prepared by MIG, Inc., 1991, 1994

Notes: n.a. = data not available nec = not elsewhere classified

The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, California). Industries with a Concentration Factor greater than 1.00 are relatively more concentrated in the county than in the state as a whole.

Figure 3-11 shows that average earnings are rising for most industries in the agriculture infrastructure. In a few cases (those industries shown in the top right-hand quadrant), the income growth is associated with downsizing. Industries—such as paperboard boxes, commercial printing, plastics and foam packaging materials, and packaging machinery—contracted in 1991-94, but the higher-paying jobs remained. Industries in the lower right-hand quadrant fared even better. These industries expanded both in terms of employment and average earnings. They include soil preparation services, crop preparation for market, farm management services, pumping equipment, wood and plastics containers, and food product machinery.

Spatial Distribution of the Cluster

As shown in Table 3-12, Fresno County contains a disproportionately large share of the agriculture infrastructure within the San Joaquin Valley. The county has 29 percent of the Valley's total employment, but more than 32 percent of the employment in the agriculture infrastructure. The concentration is particularly high in financial services (the commodity brokers), as well as storage and trucking services. Also noteworthy is the county's 35 percent share of employment in production services, a category that includes a large number of the low-paying farm labor jobs. Indeed, residing in or near a major urban area may help this group of workers to offset some of their earnings limitations by providing more avenues for part-time employment (for themselves or other household members) or better access to support services.

Fresno County also has a lower than average share of employment in some sectors of the agriculture infrastructure. This deficiency is particularly noticeable in packaging materials, where Fresno's share of the Valley's employment is 19 percent. It is also slightly smaller than expected—24 percent—in both the production materials and equipment sectors.

Cluster Evolution

It is possible to see how the agriculture infrastructure evolves and deepens, for example in the growth of a service like custom harvesting. An establishment providing this service may have started out as a regular grower. Having purchased expensive, specialized machinery, the next logical step is to enter into agreements with other local farmers to harvest their crops. Over time, the harvesting service might become the primary business with expansion into other regions. This type of spinoff activity could occur as well in other dedicated services. The infrastructure also develops as national companies locate in the region to be closer to their existing customers and to further expand their market.

TABLE 3-12
AGRICULTURE INFRASTRUCTURE
Spatial Distribution of Employment

	Fresno County		Balance of Region		San Joaquin Valley	
	Employ.	%	Employ.	%	Employ.	%
Production Services	30,394	34.6%	57,475	65.4%	87,869	100.0%
Production Materials & Equipment	1,145	23.7%	3,690	76.3%	4,835	100.0%
Packaging Material	2,366	19.0%	10,111	81.0%	12,477	100.0%
Processing Equipment	356	23.7%	1,143	76.3%	1,499	100.0%
Storage and Distribution	754	37.2%	1,271	62.8%	2,025	100.0%
Financial Services	82	63.1%	48	36.9%	130	100.0%
Cluster Total	35,097	32.2%	73,738	67.8%	108,835	100.0%

Source: Applied Development Economics, based on 1994 ES202 data prepared by MIG, Inc.

FIGURE 3-11

**AGRICULTURE INFRASTRUCTURE
Growth and Prosperity Matrix**

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<p><i>Job and Avg. Earnings Loss</i></p> <p>Crop Harvesting, Primarily by Machines Agricultural Chemicals Farm Product & Refrigerated Warehousing and Storage Freight Transportation Arrangement</p>	<p><i>Downsizing with Avg. Earnings Growth</i></p> <p>Crop Planting, Cultivating, Protecting Paperboard Containers & Boxes Commercial Printing Plastics & Foam Packaging Materials Packaging Machinery</p>
GROWTH (+)	<p><i>Job Growth, but Declining Avg. Earnings</i></p> <p>Farm Labor Contractors Farm Machinery and Equipment</p>	<p>** Job and Earnings Growth **</p> <p>Soil Preparation Services Crop Preparation Services for Market Farm Management Services Pumps & Pumping Equipment Wood Containers Plastics Containers Food Products Machinery Commodity Contracts Brokers & Commodity Exchanges</p>

Notes: Industries with 50 or more employees

Matrix does not include industries related to crop and livestock production.

Growth measures net employment change.

Prosperity measures change in average earnings per employee.

General Issues and Market Trends in Agriculture and Food Processing

The agriculture cluster is constantly undergoing technological change with implications for the economics of the industry. By its nature, improved technology affects the number of people needed to perform various tasks, the time required to perform a task, and/or the quality of the job done. Moreover, these impacts are felt as employment tradeoffs in different parts of the cluster. For example, innovations that create a faster, high-performance food processing machine might enable its manufacturer to sell more machines and expand his workforce to fill the orders, but this efficiency has a direct impact on the number of workers needed downstream at the processing plant.

Equipment changes open up another question: whether older plants can be adapted to house new processing equipment, or whether constructing a new facility is more cost effective. Companies could very well opt to go with a new plant design and a new site. Modern structures of pre-cast concrete, for example, are easier to clean and more tightly constructed, therefore better able to control the atmosphere through air conditioning or refrigeration.

One of the key aims of improved technology is to conserve environmental resources. For example, newer spray equipment is able to control the application of chemicals so they stay where needed, rather than drifting into unwanted territory or running off. This means that lower amounts of chemicals are used and fewer applications required. Precision has become one of the watchwords of state-of-the-art agriculture. Computer-guided equipment, coupled with accurate, satellite-based targeting enable farmers to manage their fields according to differences in soil characteristics and productivity.

On the demand side, growers continue to respond to the large American and overseas appetite for high value-added specialty crops, such as radicchio and a rainbow of brightly colored bell peppers, as well as produce favored by different ethnic groups. Product differentiation is also occurring through new technology that is better able to grade and sort the harvested crop. This technology is being applied to fruits and uses a high-resolution television camera and high-speed computer. Each piece is scanned for size, weight, and color, then a sorting decision is made based on preset standards. With fine sorting gradations, each piece can be packaged in the fashion that maximizes its value.

A challenge facing the industry is the rising cost of agricultural production (caused by rising fuel and labor costs, among others) and pressures on food producers and processors to pass these costs onto consumers. Already, many U.S. food processors are looking for ways to cut the fat from their operations by shortening production and delivery times. It is estimated that more than 100 days elapse for a product to make its way from food processors to consumers. During this time, the processor bears most of the cost of inventory. Cutting production and delivery time by a third (an industry goal) could result in large savings. Changes are already being demanded by large retailers, such as Wal-Mart, that want more efficient delivery systems from food processors. In response to such pressure, some processors (including New Jersey's Campbell Soup) are "re-engineering" their information management systems to integrate sales order processing, customer service, order fulfillment, and transport management.

Greater efficiency in the product delivery system is also being achieved through more interaction between food product developers and the manufacturers of food processing equipment. Computer simulations now permit product recipes and plant operations to be tested during the earlier design stage. This reduces start-up problems and shortens the time to market.

Continued consolidation within the food processing (and production) sectors will remain an area of concern for Fresno County (and other Valley) agricultural firms, as large companies are enveloped by yet-larger corporations, making it increasingly difficult for moderate-sized firms to compete. While cooperative agreements among agricultural producers (such as Sun-Maid Raisin Growers) have been around for years, there is a relatively new trend for cooperative marketing and labeling agreements that align such food giants as the Lipton Company and SunKist.

The shift to fewer and larger integrated wholesale-retailer buyers and the rise in consolidated buying within food service channels has furthered the development of large-scale shippers based in crop-growing regions. Retailers and food service users are demanding more services today: information on product characteristics, merchandising, ripening and other forms of special handling and packaging, and year-around availability of a wide line of quality fruits and vegetables. Many shippers obtain products from other countries during the off-season to maintain a market presence throughout the year. These demands have spurred the growth of multi-location, multi-commodity firms and increased integration of the California-Arizona-Mexico producing regions.

The food industry in the U.S. is well regarded for its high standards of quality and sanitation. Nevertheless, the recent outbreak of E. coli poisonings linked to Odwalla juices (made in neighboring Tulare County) highlight consumers' concerns over the safety of food products and suggests that food safety inspections may be increased throughout the Central Valley's food processing industry. Already, Odwalla has responded to the rash of poisonings by adding a step to its production process (thereby increasing its costs) to ensure greater safety.

Fruit, Nut, and Vegetable Cluster

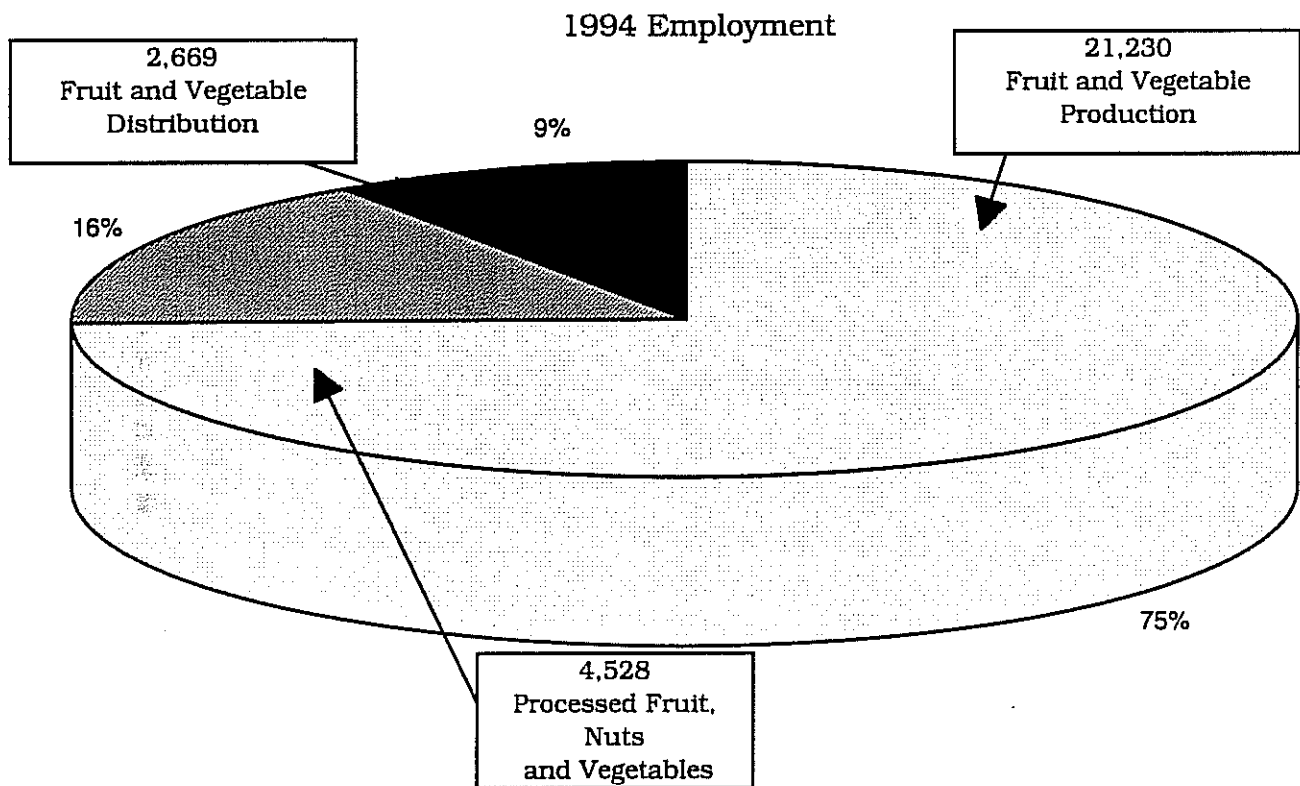
The Fruit, Nut, and Vegetable Cluster is the largest of the commodity-specific clusters. The cluster as a whole employed approximately 28,430 persons in 1994 or about 12 percent of all private-sector jobs in the county. Moreover, the county's image as an agricultural community is intertwined with its landscape of fruit and nut trees. Large, nationally recognized brands, such as the private cooperative Sun-Maid Growers of California (located in Kingsburg) also give prominent exposure to this cluster.

Components of the Fruit, Nut, and Vegetable Cluster

Components of this cluster include commodity or crop production; processing of the fruit, nut, and vegetable crops into both intermediate and finished food products; storage and distribution of raw commodities and food products; and a multitude of supplier industries. As shown in Figure 3-12, crop production is the largest single segment of the cluster, employing 21,230 persons or 75 percent of total cluster employment. Another 4,528 workers are employed in industries that process the crop and 2,669 are employed in distribution activities.

FIGURE 3-12

COMPONENTS OF THE FRUIT, NUT, AND VEGETABLE CLUSTER



Source: ADE, Inc., from ES202 data prepared by MIG, Inc., 1994

Growth of the Cluster

Fresno County's fruit and nut crops, like most California crops, continue their steady growth, as evident in the latest production figures for 1995. Fruit and nut crops are the highest valued crop type in Fresno County. The 1995 production value was \$1.05 billion, which is six percent higher than the 1994 total of \$992 million. Clearly, the primary fruit and nut crop is grapes, with \$483 million in production value and over 1 million tons of volume. Half of this production total is in the raisin producing varieties. The two other major fruit and nut crops (over \$100 million) in Fresno County are almonds and nectarines. In addition, Fresno County produced more than \$60 million each in oranges, peaches, and plums. The other fruit and nut crops with a production value of at least \$10 million are apples and pistachios. The fruit and nut crops with a 1995 volume over 10,000 tons include almonds, almond hulls, apples, lemons, oranges, nectarines, peaches, and plums.

The most lucrative value-added sectors in Fresno County's food processing industry are the processing of fruits and vegetables into canned, dehydrated, and frozen food products, as well as the processing of grapes into wines. Between 1991 and 1994, the food processing sector in this cluster increased slightly (+30 jobs). Employment growth was concentrated in the processing of fruits, nuts, and vegetables, while employment in the wine and brandy industry declined by almost 100 employees. Contraction of the wine-making industry also affected wine distribution which lost almost 80 jobs. Overall, however, the distribution of fruit, nut, and vegetable products grew at a brisk clip, adding 580 jobs in the three-year period.

Income Generation in the Cluster

Average earnings per employee for the cluster as a whole are fairly low. In 1994, the average was \$15,283 or 77 percent of average earnings for the county's overall economy (Table 3-13). The average is greatly affected by low earnings in the production sector where the average payroll per employee is only \$11,613. The average jumps to \$23,756 in the processing sector and to \$30,101 in the distribution sector.

The Growth and Prosperity Matrix (Figure 3-13) shows differences in the growth pattern among the particular industries that make up the cluster. Between 1991 and 1993, three industries—frozen fruits and vegetables, salted and roasted nuts and seeds, and distribution of fresh fruits and vegetables—added net new jobs while also increasing average earnings. Two industries—dehydrated fruits and nuts and wine and brandy—lost jobs, but average earnings increased for the remaining jobs. The situation was reversed in three other industries—canned fruits and vegetables and distribution of general line groceries and raw farm materials. These particular industries experienced growth, but because payroll increases did not keep pace, average earnings declined. Finally, three industries—pickles and sauces, distribution of packaged frozen foods, and wine distribution—lost ground in terms of both employment and payroll.

TABLE 3-13
FRUIT, NUT, AND VEGETABLES CLUSTER -- FRESNO COUNTY
Cluster Trends and Performance

SIC		1991 Employ.	1994 Employ.	Net Change 1991-94	Av. Annual Change 1991-94	Concentration Factor	Average Payroll per Employee
016	Vegetables	n.a.	1,756	1,756	--	2.43	\$13,425
017	Fruits and tree nuts	n.a.	15,502	15,502	--	7.66	\$10,726
0182	Food crops grown under cover	n.a.	56	56	--	0.72	\$14,421
019	General farms, primarily crop	n.a.	3,916	3,916	--	5.35	\$14,272
	Vegetable & Fruit Production	n.a.	21,230	21,230	--	5.97	\$11,613
203	Preserved fruits and vegetables	4,084	4,166	82	0.7%	3.59	\$23,192
2068	Salted and roasted nuts and seeds	78	124	46	19.7%	1.97	\$24,522
2084	Wines, brandy, and brandy spirits	334	238	(96)	-9.6%	0.73	\$33,217
	Processed Vegetables, Fruits, Nuts	4,496	4,528	32	0.2%	2.92	\$23,756
5141	Groceries, general line	245	723	478	65.0%	1.46	\$32,257
5142	Packaged frozen foods	140	56	(84)	-20.0%	0.49	\$22,147
5148	Fresh fruits and vegetables	1,447	1,558	111	2.6%	3.43	\$24,839
5159	Farm-product raw materials, nec	67	215	148	73.6%	4.91	\$61,489
5182	Wine and distilled beverages	193	117	(76)	-13.1%	0.72	\$32,975
	Distribution-Fruit & Vegetable	2,092	2,669	577	9.2%	2.10	\$30,101
	Cluster Total	--	28,427	--	--	4.46	\$15,283

Source: ADE, from ES202 data series prepared by MIG, Inc., 1991, 1994

Notes: n.a. = data not available nec = not elsewhere classified

The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, California). Industries with a Concentration Factor greater than 1.00 are relatively more concentrated in the county than in the state as a whole.

data not available

FIGURE 3-13

FRUIT, NUT, AND VEGETABLE CLUSTER
Growth and Prosperity Matrix

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<p><i>Job and Avg. Earnings Loss</i></p> <p>Pickles, Sauces, Salad Dressing Distribution-Packaged Frozen Food Distribution-Wine & Distilled Beverages</p>	<p><i>Downsizing with Avg. Earnings Growth</i></p> <p>Dehydrated Fruits, Vegetables, Soups Wines, Brandy, Brandy Spirits</p>
GROWTH (+)	<p><i>Job Growth, but Declining Avg. Earnings</i></p> <p>Canned Fruits & Vegetables Distribution-General Line Groceries Distribution-Farm Product Raw Materials</p>	<p>** Job and Earnings Growth **</p> <p>Frozen Fruits & Vegetables Salted & Roasted Nuts and Seeds Distribution-Fresh Fruits & Vegetables</p>

Notes: Industries with 50 or more employees

Matrix does not include industries related to crop and livestock production.

Growth measures net employment change.

Prosperity measures change in average earnings per employee.

Spatial Distribution of the Cluster

Fresno County has 28.7 percent of all jobs in the San Joaquin Valley, but 31.7 percent of the Valley's fruit, nut, and vegetable cluster, thus indicating a slight concentration in Fresno (Table 3-14). The distribution sector is even more highly concentrated in Fresno. However, the county has a disproportionately small share of the processing sector. Only 18.7 percent of the Valley's fruit, nut, and vegetable processing occurs in Fresno County, which means the more than 80 percent takes place in the other counties.

Evolution of the Cluster

Technological advances have brought productivity enhancements and market advantages to this and the other agricultural clusters in Fresno County. Hybrid seeds and genetically engineered products have been especially important to fruit, nut, and vegetable production by improving disease and pest resistance and reducing spoilage and handling costs. Labor-saving automation in food processing plants has enabled manufacturers (including several in Fresno County) to increase worker efficiency. Sun-Maid Growers, for example, now has 25 automated packing lines handling 30 different types and sizes of packages, enabling it--the world's largest raisin producer--to ship 1,000 tons of raisins each day to over 25 countries.

Such productivity gains as well as the steady pace of industry mergers and acquisitions has reduced employment in the U.S. food processing industry over the past 20 years. But the strong domestic and international demand for California food products has been able to counter this downward employment trend, according to a recent report by the California Trade and Commerce Agency. Further mechanization, however, may eventually lead to job losses.

Historically, the bulk of Fresno County's fruit, nut, and vegetable crops have been exported as fresh products to both domestic and international markets or have been shipped to outside processors for manufacture into an array of food products. Raisins and bulk wines are a significant exception to this pattern, however. Of the five leading U.S. companies producing dried and dehydrated fruits and vegetables, two are headquartered in Fresno County (Dole Food of Fresno and Sun-Maid Growers of Kingsburg), while five other Fresno County firms are among the top 33 producers. In the sector producing wine, brandy, and brandy spirits, Fresno County boasts three firms among the country's top 30 producers.

TABLE 3-14
FRUIT, NUT, AND VEGETABLE CLUSTER
Spatial Distribution of Employment

	Fresno County		Balance of Region		San Joaquin Valley	
	Employ.	%	Employ.	%	Employ.	%
Vegetable & Fruit Production	21,230	31.7%	45,795	68.3%	67,025	100.0%
Processed Vegetables, Fruits, Nuts	4,528	18.7%	19,710	81.3%	24,238	100.0%
Distribution-Fruit & Vegetable Products	2,669	34.3%	5,106	65.7%	7,775	100.0%
Cluster Total	28,427	28.7%	70,611	71.3%	99,038	100.0%
Source: Applied Development Economics, Inc., based on 1994 ES202 data prepared by MIG, Inc.						

Until quite recently, only limited processing of other fruit, nut, and vegetable crops was done within Fresno County. According to the Fresno County EDC, most non-fresh market tomatoes are now processed into intermediate products (such as base juice) within Fresno County, then shipped to outside manufacturers for further processing into such finished products as tomato sauce, ketchup, and packaged meals. Some Fresno County growers recently have added preliminary processing to their commodities to add value to them. The Fresno County EDC also notes that a local melon grower who used to sell only in bulk now packages melon slices in individual servings for sale to major wholesale outlet stores.

Market Trends and Issues

Many Americans, over the past two decades, have shifted their diets from high-fat, high-meat consumption to lower-calorie, lower-cholesterol foods. Consumers are eating (and buying) less beef, but more chicken and turkey; fewer eggs, though higher volumes of cheese; and larger amounts of fruits and vegetables. These dietary changes are evidenced by the plethora of fat-free foods in supermarkets, trendy juice bars in metropolitan areas, and vegetarian offerings in more and more restaurants. A recent study (reported in *Food Review*) found that foods with improved nutritional profiles (e.g., "reduced fat," "high fiber," and "lower salt") showed sharper sales increases between 1988 and 1993 compared to unimproved versions, despite the fact that they were generally more expensive.

Organic foods are still a small but growing segment in the U.S. food market. The number of acres certified as organic more than doubled between 1991 and 1994, and natural food store sales of organic produce, dairy products, eggs, and a range of processed food grew 21 percent in 1994.

Americans' interest in healthy foods translates into solid domestic demand for Fresno County fruits and vegetables. Nuts, which may be less popular in some health-conscious diets due to their relatively high fat content, enjoy a steady level of domestic per capita consumption, due to their pleasing texture and flavor. They remain a favored ingredient in breakfast foods, snacks, ice cream, cookies, and candies. Pistachios (a Fresno County crop) are enjoying a renaissance among gourmet chefs in U.S. restaurants and in specialty foods, while almonds remain the favorite among tree nuts, capturing about a quarter of the American market.

Besides health, convenience is another major thrust of the food industry. Consumers' desire for convenience has stimulated the creation of "heat and serve" foods, while growing ethnic populations have driven the increase in ethnic-oriented food products. Overall, the sheer number of food products available in supermarkets has doubled over the last decade.

In recent years, U.S. consumption of jug wine and wine coolers has declined, thereby reducing prices for Fresno County wine grapes and causing some acreage to be removed from wine grapes. Grape juice concentrate, however, enjoys a growing market for use in an array of non-alcoholic beverages, as natural sweeteners in cookies, jams, jellies, and breakfast cereals. The production of grapes for concentrate has risen from 200,000 tons to between 400,000 and 500,000 tons in recent years, according to the Fresno County EDC report.

Demand from abroad for California fresh fruits, nuts, and vegetables and various products made from them fuels much of Fresno County's production and processing. The increase in almond and pistachio production in the last 20 years has been driven primarily by strong and growing export demand. California almonds are prized worldwide for their uniform size and low breakage.

Grapes, almonds, and oranges (three of Fresno County's top ten crops) are among California's top five agricultural exports. The export value of grapes in 1995 was \$674 million, a 14 percent increase over the 1994 export value. Oranges saw an eight percent increase in export value between 1994 and 1995. Overseas demand for California nuts (including almonds) is strong, particularly in Germany and Japan. Growing export markets for Fresno County agricultural products are Hong Kong, Taiwan, China, Japan, Korea, and Singapore. The prominence of Asian markets has prompted some Fresno growers to respond, for example, in the planting of white-flesh peaches which can command premium prices overseas.

Livestock, Poultry, and Dairy Cluster

The Livestock, Poultry, and Dairy Cluster is the second largest commodity cluster. In 1994, the cluster employed approximately 7,520 persons.

Components of the Livestock, Poultry, and Dairy Cluster

This cluster consists of the producers, processors, packers, and distributors of meat, poultry, eggs, and dairy products, as well as the array of businesses that supply inputs into and support services to each of these segments of the cluster. Inputs include animal feed and veterinary services. The cluster also draws on the agriculture infrastructure for machinery and equipment (including computers) to process, package, and label the meat and dairy products, as well as food additives, packing material, electricity and other energy sources, labor contracting services, food safety testing services, and a broad range of supportive business and financial services.

In Fresno County, the Livestock, Poultry, and Dairy Cluster employed 6,920 persons in 1994, representing a relatively small percentage (three percent) of total jobs. As shown in Figure 3-14, about one-quarter of the cluster's workers (1,966) are involved in livestock and poultry production. More than half of the cluster's workforce (3,965) are engaged in processed animal products. This is in marked contrast to the Fruit, Nut, and Vegetable Cluster where Fresno specializes in production. Several hundred workers are employed in each of three other sectors: feed and pasture (600), livestock services (552), and distribution (439).

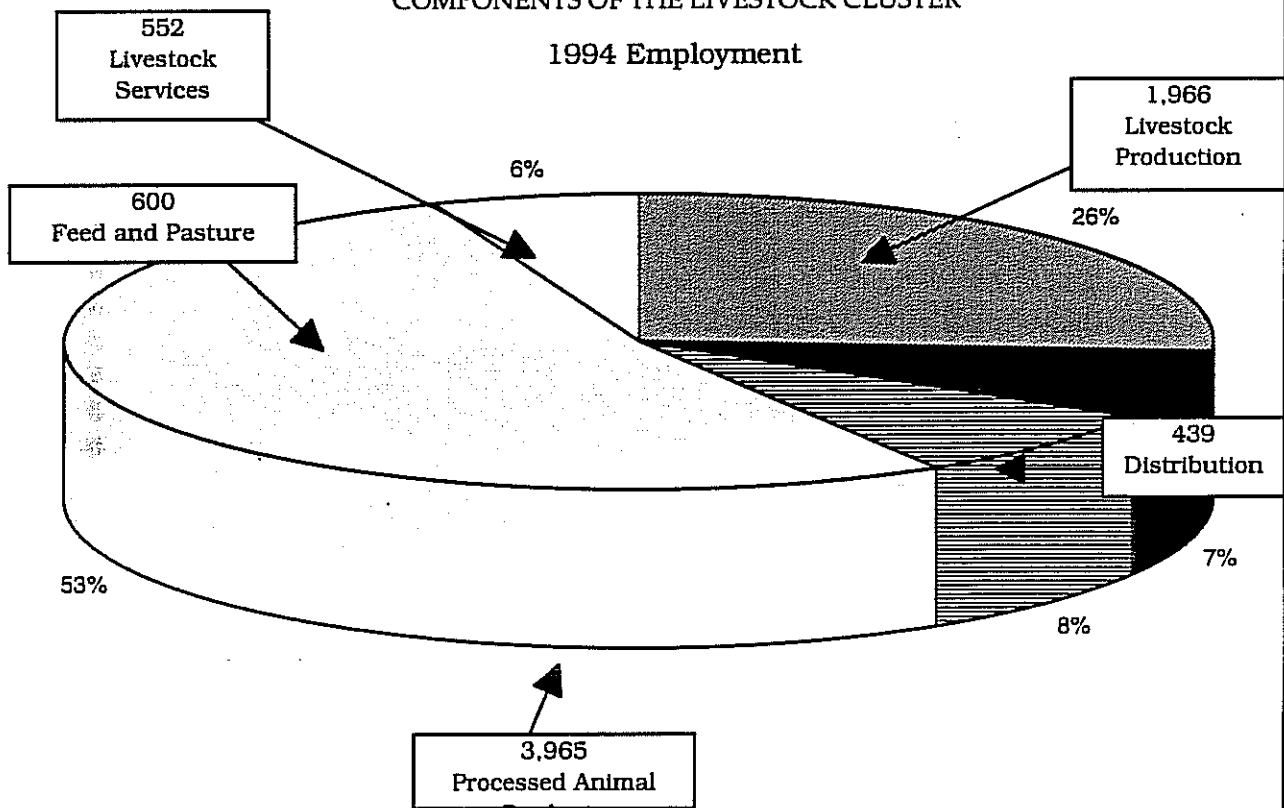
Growth of the Cluster

In 1995, Fresno County produced \$470 million in livestock and poultry, which represents a \$23 million or five percent decrease from 1994 levels. Most of the production in this category is defined as "other livestock and poultry," which is nearly all chickens. As a combined category (including turkeys), poultry is the third most productive agricultural category with a value of \$356 million. The other high value (over \$10 million) livestock categories are beef cattle and dairy cattle. In terms of volume, the highest head count is turkeys at 4.6 million. Beef cattle production totaled 359,030 head in 1995. Head counts are not available for chickens.

FIGURE 3-14

COMPONENTS OF THE LIVESTOCK CLUSTER

1994 Employment



In the livestock and poultry products category, milk products are the primary commodities. Other products include manure and eggs. With six percent of total agricultural production, livestock and poultry products do not constitute a particularly large proportion of Fresno County's production, whereas livestock and poultry products make up seventeen percent of the agricultural production for the San Joaquin Valley as a whole. Nevertheless, with \$181 million in production value, this sector is still a significant contributor to Fresno County's agricultural economy.

California is the top milk-producing state in the country. For several decades after World War II, Southern California was the state's leading dairy region. But increased population and land pressures drove the dairies north to the San Joaquin Valley. Today, Fresno's neighbor, Tulare County, has become the state's largest dairy producer. Tulare County's dairies tend to be big, with an average size of 900 cows; just 289 dairies produced 4.8 billion pounds of fluid milk in 1995.

Employment data on commodity production is unavailable for 1991, therefore trends cannot be calculated. However, it is possible that livestock production jobs have declined in recent years because of the drop in the value of cattle and calves and eggs in the county. In those sectors where trend analysis can be performed, the picture is mixed (Table 3-15). Animal services (except veterinary services) experienced a loss of 260 jobs between 1991 and 1994, dropping from an employment level of 816 to 552. Employment in veterinary services, meanwhile, grew from 216 to 267 for a net gain of 51 jobs. Even more significant was the net addition of over 500 jobs in the processed animal sector. Of this increase, the meat industry accounted for a net gain of 410 jobs. Smaller increases were registered in dairy products (+30 jobs), pet food (+30 jobs), and animal fats and oils (+20 jobs). Employment in the distribution sector over the 1991-94 period was largely unchanged.

Income Generation in the Cluster

The cluster as a whole has average earnings of \$20,954 per employee which is approximately five percent higher than the overall average for Fresno County's economy. Within the cluster, the feed and pasture sector has the largest income potential, followed by distribution and processing. Average earnings in the meat packing industry are exceptionally low (\$18,960); however, all of the other processing industries, including dairy products, pet food, and animal oils, have average earnings exceeding \$30,000.

The Growth and Prosperity Matrix (Figure 3-15) differentiates the performance of cluster components (during the period 1991-94) according to four development scenarios. The overall vitality of this cluster is seen in the lower right-hand quadrant which contains the largest number of industries. The industries in this quadrant expanded both in terms of net job growth and higher average earnings. They include veterinary services, prepared feeds, fluid milk, ice cream and frozen desserts, and the distribution of meats and meat products. Two industries—meat packing plants and poultry slaughtering and processing—experienced job growth, but payroll growth lagged thereby resulting in lower average earnings. And in two other industries—animal services (except veterinary) and the distribution of dairy products—both jobs and average earnings declined.

TABLE 3-15

LIVESTOCK, POULTRY, AND DAIRY CLUSTER – FRESNO COUNTY
Cluster Trends and Performance

SIC		1991 Employ.	1994 Employ.	Net Change 1991-94	Avg. Annual Change 1991-94	Concentration Factor	Average Payroll per Employee
021	Livestock, except dairy & poultry	n.a.	633	—	—	5.41	\$20,880
024	Dairy farms	n.a.	997	—	—	3.32	\$18,169
025	Poultry and eggs	n.a.	196	—	—	1.80	\$9,833
027	Animal specialties	n.a.	59	—	—	1.41	\$20,874
029	General farms, primarily livestock	n.a.	81	—	—	5.67	\$18,613
	Livestock Production	n.a.	1,966	—	—	3.37	\$18,310
074	Veterinary services	216	267	51	7.9%	0.67	\$17,953
075	Animal services, except veterinary	600	285	(315)	-17.5%	2.18	\$16,451
	Livestock Services	816	552	(264)	-10.8%	1.05	\$17,177
0139	Field crops, except cash grains	n.a.	392	—	—	3.64	\$14,294
2048	Prepared feeds	64	208	144	75.0%	4.03	\$55,855
	Feed and Pasture	n.a.	600	—	—	3.77	\$28,702
201	Meat products	2,962	3,371	409	4.6%	8.57	\$18,959
202	Dairy products	477	511	34	2.4%	1.58	\$34,818
2047	Dog and cat food	7	39	32	152.4%	1.30	\$35,587
2077	Animal and marine fats and oils	25	44	19	25.3%	3.19	\$30,882
	Processed Animal Products	3,471	3,965	494	4.7%	5.21	\$21,299
5143	Dairy products	80	79	(1)	-0.4%	0.76	\$25,917
5144	Poultry and poultry products	18	15	(3)	-5.6%	0.30	\$20,172
5147	Meats and meat products	312	316	4	0.4%	1.50	\$25,115
5154	Livestock	29	29	0	0.0%	1.37	\$6,137
	Distribution-Livestock & Prod.	439	439	0	0.0%	1.14	\$23,837
	Cluster Total	—	7,522	—	—	3.11	\$20,954

Source: ADE, from ES202 data series prepared by MIG, Inc., 1991, 1994

The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, Industries with a Concentration Factor greater than 1.00 are relatively more concentrated in the county than in the state as a whole)

FIGURE 3-15

LIVESTOCK, POULTRY, AND DAIRY CLUSTER
Growth and Prosperity Matrix

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<i>Job and Avg. Earnings Loss</i> Animal Services, except Veterinary Distribution-Dairy Products	<i>Downsizing with Avg. Earnings Growth</i>
GROWTH (+)	<i>Job Growth, but Declining Avg. Earnings</i> Meat Packing Plants Poultry Slaughtering & Processing	<i>** Job and Earnings Growth **</i> Veterinary Services Prepared Feeds Fluid Milk Ice Cream & Frozen Desserts Distribution-Meats & Meat Products

Notes: Industries with 50 or more employees

Matrix does not include industries related to crop and livestock production.

Growth measures net employment change.

Prosperity measures change in average earnings per employee.

Spatial Distribution of the Cluster

The Livestock, Poultry, and Dairy Cluster is one that spans the entire San Joaquin Valley and, in this larger region, some 33,673 persons were employed in 1994 (Table 3-16). Fresno's cluster employment of 7,522 accounts for 22 percent, or slightly smaller proportion than its overall share of Valley employment (29 percent). Fresno County contains particularly small shares of employment in livestock production (15 percent) and feed and pasture (19 percent). On the other hand, Fresno's shares of employment in processed animal products (28 percent), livestock services (27 percent), and distribution (26 percent) are roughly proportional to the size of its economy. In these three industries, more than one in four San Joaquin Valley jobs are located in Fresno County.

Evolution of the Cluster

Like all manufacturing industries, the meat, poultry, and dairy products industries have undergone major technological advances in recent years, with a focus on improving raw materials, automating labor-intensive operations, and improving efficiency and productivity. Challenges have included integrating automation in the various production and storage areas of plants, overseeing inventory-control systems, improving quality control operations, and increasing the efficiency of various packaging and labeling operations. Technological innovations have also been made in genetic stock and food science, whereby consumer demand for leaner meat and dairy products have fueled the development of a wide variety of leaner animals and lower-fat, lower-cholesterol food products. Recent innovations include a process for re-texturizing poultry meat so that it looks, tastes, and feels like ground beef or pork.

This cluster has also seen the cost-effective "outsourcing" of formerly in-house operations, such as research and development of new products or ingredients. Many smaller dairies, for example, find it efficient and economical to contract for both pilot plant expertise and product development services.

Production costs for livestock and dairy products depend largely on feed costs, primarily grains. Producers tend to reduce their herds when feed prices are high (as they did in 1995 and early 1996) and to increase herds when prices go down (as in late 1996).

California, which produces 10 percent of the U.S. turkey production, is the only major poultry producer outside the so-called "broiler belt"—an area spanning Maryland, Delaware, and Virginia, along with Arkansas and Texas. Although feed costs are higher in this region (because feed needs to be shipped in from grain-producing regions), the warm climate keeps energy costs down, while the relatively low-cost labor force has aided the region's poultry development.

Economies of scale in poultry production have encouraged concentration within the industry. In the 1970s, about 19 percent of U.S. production was controlled by the top four firms; the figure grew to 42 percent by the early 1990s. In addition to increased concentration, the poultry industry is highly vertically integrated. Many of the processors own or contract for various production services and conduct much of their own product distribution. In addition, many processors own hatcheries and breeding facilities that allows them to obtain the type of birds best suited to their marketing and production systems.

TABLE 3-16
LIVESTOCK, POULTRY, AND DAIRY CLUSTER
Spatial Distribution of Employment

	Fresno County		Balance of Region		San Joaquin Valley	
	Employ.	%	Employ.	%	Employ.	%
Livestock Production	1,966	15%	10,913	85%	12,879	100%
Livestock Services	552	27%	1,506	73%	2,058	100%
Feed and Pasture	600	19%	2,537	81%	3,137	100%
Processed Animal Products	3,965	28%	9,971	72%	13,936	100%
Distribution-Livestock & Animal Products	439	26%	1,224	74%	1,663	100%
Cluster Total	7,522	22%	26,151	78%	33,673	100%

Source: ADE, based on 1994 ES202 data prepared by MIG, Inc.

The relationship between processor and producer is mutually beneficial. The large processors employ flock supervisors who check on bird flocks weekly, reducing the less experienced contract producer's risk of losing a flock. Moreover, lending institutions are more likely to lend money to contract growers for production facilities because their production risk is lower with a ready market guaranteed. On the down side, however, growers receive fixed prices for their birds and, therefore, do not benefit from subsequent market price increases.

Market Trends and Issues

As mentioned in the discussion on the Fruits, Nuts, and Vegetables Cluster, American diets have shifted over the past two decades to lower-fat, lower-cholesterol, and other nutritionally enhanced products. Concerned over the link between dietary factors and heart disease, health-conscious consumers have lowered their consumption of red meat and eggs. Lower-fat meats, such as chicken and turkey, have surged in popularity, while cheese remains a popular ingredient (despite its high-fat content) for both meat-eaters and vegetarians. Since 1993, chicken has surpassed beef and pork in U.S. per capita consumption. A product under development is the first low-cholesterol whole egg. Not only is such a product desired at grocery stores, but it is expected to be in high demand with food processors and restaurants. While cholesterol-free egg substitutes have been available for years, the reduced cholesterol whole egg remains one of the industry's goal.

Besides dietary concerns, the demand for pre-cooked and pan-ready products has contributed to the popularity of processed foods, particularly poultry. Other areas for value-added processing, according to the Fresno County EDC, are in cheese, butter fat, and ice cream products. An industry challenge is to develop and refine new ways of quickly, efficiently, and safely shipping these products over long distances.

Export demand for Fresno County products from this cluster has been strong in recent years. Statewide, beef products tops the list of agricultural exports, while dairy products are sixth and chicken and eggs are twelfth. Important overseas markets for California beef include Japan, Korea, and Mexico. U.S. exports of poultry are projected to account for 18 percent of domestic poultry production in 1996. The rise in foreign demand for U.S. poultry primarily comes from countries that have liberalized their markets, especially Russia and China.

Cotton Cluster

With \$1 billion in cotton shipments, California is the second-largest cotton-producing state in the U.S., after Texas. The state's prime cotton-growing regions lie in an area from Fresno County south to the Tehachapis, and in the southern Imperial and Palo Verde Valleys. Cotton from the San Joaquin Valley is renown for its high quality.

Components of the Cotton Cluster

There are three major components to the Cotton Cluster (Figure 3-16). Cotton production comprises over 80 percent of the cluster with 2,299 employees. In 1994, Fresno County's cotton crop had a production value of nearly \$500 million. The significance of this cluster is seen in the extremely high concentration factor of 13, which translates to employment levels that are 13 times higher than the state average (Table 3-17).

TABLE 3-17
COTTON CLUSTER – FRESNO COUNTY
Cluster Trends and Performance

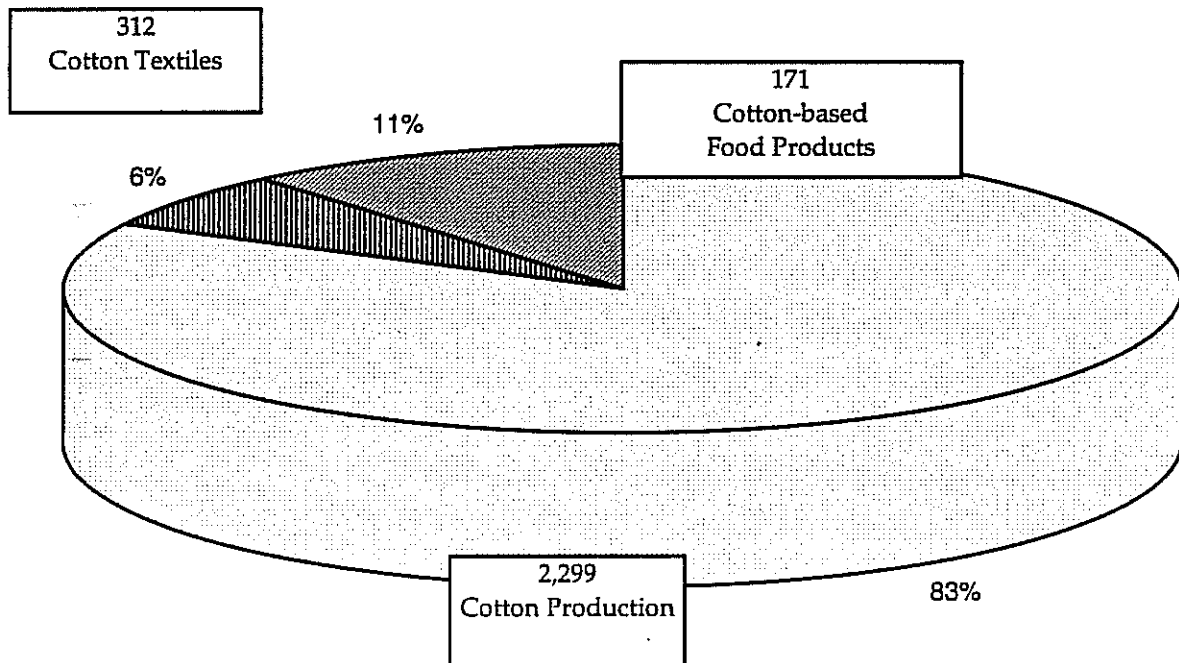
SIC	Industry Name	1991 Employ.	1994 Employ.	Net Change 1991-94	Avg. Annual Change 1991-94	Concentration Factor	Average Payroll per Employee
0131	Cotton	n.a.	1951	1,951	---	12.83	\$16,678
0724	Cotton ginning	330	348	18	1.8%	14.20	\$25,162
	Cotton Production	---	2,299	1,969	---	13.02	\$17,962
2074	Cottonseed oil mills	201	171	(30)	-5.0%	14.91	\$38,662
	Cotton-based Food Products	201	171	(30)	-5.0%	14.91	\$38,662
221	Broadwoven fabric mills, cotton	17	79	62	121.6%	4.23	\$22,012
226	Textile finishing, except wool	0	0	0	---	0.00	---
228	Yarn and thread mills	144	79	(65)	-15.0%	3.08	\$24,397
239	Misc. fabricated textile products	137	154	17	4.1%	0.31	\$12,718
	Cotton Textiles	298	312	14	1.6%	0.49	\$18,028
	Cluster Total	---	2,782	---	---	3.38	\$19,242

Source: Applied Development Economics, Inc., from ES202 data series prepared by MIG, Inc., 1991, 1994
Notes: n.a. = data not available
The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, California). Industries with a Concentration Factor greater than 1.00 are relatively more concentrated in the county than in the state as a whole.

FIGURE 3-16

COMPONENTS OF THE COTTON CLUSTER

1994 Employment



Source: ADE, Inc., from data prepared by MIG, Inc., 1994

The bulk of the cotton crop is exported from the region. A limited amount of value-added products are produced locally. In 1994, cottonseed oil mills employed 170 workers. Although this number appears to be fairly small, with a concentration factor of almost 15, it is sufficient to make Fresno County a region specializing in the manufacture of cottonseed oil.

The cotton textile sector employed another 310 persons in 1994. There is some milling and textile finishing in the county; however, the largest number of employees (150) are engaged in the fabrication of goods, such as textile bags and canvas products. There is a strong likelihood that these products are used for agricultural purposes.

Growth of the Cluster

Because employment data for the agricultural production industries was available only for one year (1994), it was not possible to calculate employment change. With so much of the cotton cluster revolving around production, there is no clear picture of growth or decline in this cluster. In the manufacturing area, cottonseed oil mills lost 30 employees between 1991 and 1994, and there was a slight net gain in cotton textiles. There was a growth spurt in cotton fabric mills. Although this industry employed only 80 persons in 1994, more than 60 of those jobs were added just in the period between 1991 and 1994.

Income Generation in the Cluster

The cluster as a whole provided average earnings of \$19,240, which is slightly lower than the countywide average for all industries. Within the cluster there is a wide variation in average earnings, ranging from cottonseed oil mills with more than \$38,600 to fabricated textile products where it was only \$12,700. For cotton production, the industry employing the most people, payroll averaged \$16,700 per employee.

The two cluster industries growing in both jobs and income are cotton ginning and broadwoven fabric mills (Figure 3-17). Yarn and thread mills, an industry that employed more than 140 workers in 1991 shrank almost by half in a three-year period and experienced a reduction in average earnings.

Spatial Distribution of the Cluster

Overall, Fresno County has slightly more than its fair share of the San Joaquin Valley Cotton Cluster. Fresno's particular strengths are in cotton production and especially the processing of cottonseed oil. Table 3-18 show the spatial distribution of the cotton cluster within the region.

Market Trends and Issues

The San Joaquin Valley is favorably situated to benefit from strong consumer preference for natural fibers. Nevertheless, cotton faces increasing competition from newer materials, such as microfibers that possess the beneficial characteristics of both natural and man-made fibers.

TABLE 3-18
COTTON CLUSTER
Spatial Distribution of Employment

	Fresno County		Balance of Region		San Joaquin Valley	
	Employ.	%	Employ.	%	Employ.	%
Cotton Production	2,299	31.1%	5,093	68.9%	7,392	100.0%
Cotton-based Food Products	171	34.9%	319	65.1%	490	100.0%
Cotton Textiles	312	25.7%	901	74.3%	1,213	100.0%
Cluster Total	2,782	30.6%	6,313	69.4%	9,095	100.0%
Source: Applied Development Economics, Inc., based on 1994 ES202 data prepared by MIG, Inc.						

FIGURE 3-17

**COTTON CLUSTER
Growth and Prosperity Matrix**

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<i>Job and Avg. Earnings Loss</i> Yarn & Thread Mills	<i>Downsizing with Avg. Earnings Growth</i> Cottonseed Oil Mills
GROWTH (+)	<i>Job Growth, but Declining Avg. Earnings</i> Misc. Fabric Textile Products	<i>** Job and Earnings Growth **</i> Cotton Ginning Broadwoven Fabric Mills

Notes: Industries with 50 or more employees

Matrix does not include industries related to crop and livestock production.

Growth measures net employment change.

Prosperity measures change in average earnings per employee.

Cotton grown in the San Joaquin Valley Quality Cotton District commands a premium price because of its fine quality and pristine whiteness. Since the 1920s, strict regulations over cultivation have safeguarded such qualities as fiber length and strength, uniformity, and color. In recent years, a market niche has emerged for naturally colored cotton. The plants themselves produce cotton in shades of brown and green which eliminates the need for dyeing and is especially appealing to consumers who desire organic products. Although colored cotton can fetch prices two to three times higher than white cotton, there has been a tremendous amount of resistance and controversy over growing colored cotton in the San Joaquin Valley. Opponents argue that the white cotton crop will be contaminated through cross-pollination or from seeds or lint which is caught in ginning, delinting, or transportation equipment.

Questions surrounding tight regulatory control over cotton production go beyond colored cotton to other plant modifications, such as bioengineering which increases resistance to pests or herbicides or flames.

Other Agricultural Crops

The agricultural diversity of Fresno County includes several crops that do not fall in any of the three commodity clusters discussed previously. Other crops with \$10 million or more in 1995 production are beans, corn, and sugar beets. In terms of volume, the most productive of these crops is sugar beets, with a 1995 production volume of 665,000 tons. Another relatively high volume crop is corn, of which 465,230 tons were produced in 1995.

Components of the Other Agricultural Crop Cluster

As shown in Figure 3-18, this cluster includes three components with total employment of 2,751. Production is actually the smallest component with only 133 employees. In addition, there are more than 1,746 employees in a variety of food processing industries that are outside the scope of the other agricultural clusters. This includes grain milling and the manufacture of bakery products, sugar and confectionery products, snack foods, macaroni products, and miscellaneous prepared foods. The distribution component of this cluster employs more than 872 persons.

Several of these industries have high concentration factors, especially prepared flour mixes and dough, snack foods, and macaroni products (Table 3-19). Even though Fresno County is not a major grain-growing region, the prominence of these industries attests to the infrastructure that supports food processing in general.

Growth of the Cluster

Between 1991 and 1994, several industries in the cluster experienced significant job losses. This was especially true in prepared flour mixes (-120 jobs), miscellaneous prepared foods (-400 jobs), and the distribution of groceries and related products (-400 jobs). The leading growth industries in this cluster were snack foods which added 380 jobs and bakery products which gained 90 jobs.

TABLE 3-19
OTHER AGRICULTURAL CROPS -- FRESNO COUNTY
Cluster Trends and Performance

SIC	Industry Name	1991 Employ.	1994 Employ.	Net Change 1991-94	Annual Avg. Change 1991-94	Concentration Factor	Average Payroll per Employee
011 0133	Cash grains Sugar beets Other Crops	n.a. n.a. n.a.	100 33 133	-- -- --	-- -- --	1.53 4.29 1.41	\$22,601 \$16,939 \$21,196
2041	Flour and other grain mill products	0	38	38	--	2.27	\$30,128
2043	Cereal breakfast foods	7	0	(7)	-33.3%	0.00	--
2044	Rice milling	0	0	0	--	0.00	--
2045	Prepared flour mixes and doughs	264	143	(121)	-15.3%	5.92	\$25,785
2046	Wet corn milling	7	4	(3)	-14.3%	1.39	\$33,229
205	Bakery products	424	517	93	7.3%	1.03	\$31,574
206	Sugar and confectionery products	262	252	(10)	-1.3%	1.01	\$28,279
2075	Soybean oil mills	0	0	0	--	0.00	--
2076	Vegetable oil mills, nec	0	0	0	--	0.00	--
2096	Potato chips and similar snacks	43	425	382	296.1%	3.88	\$23,185
2098	Macaroni and spaghetti	150	143	(7)	-1.6%	4.45	\$30,203
2099	Food preparations, nec	631	224	(407)	-21.5%	0.88	\$17,166
	Misc. Processed Food Products	1,788	1,746	(42)	-0.8%	1.38	\$26,594
5145	Confectionery	226	256	30	4.4%	2.21	\$23,210
5149	Groceries and related products, nec	939	534	(405)	-14.4%	0.68	\$24,757
5153	Grain and field beans	102	82	(20)	-6.5%	3.28	\$56,894
	Distribution-Other Food Products	1,267	872	(395)	-10.4%	0.94	\$27,325
	Cluster Total	--	2,751	--	--	1.20	\$26,565

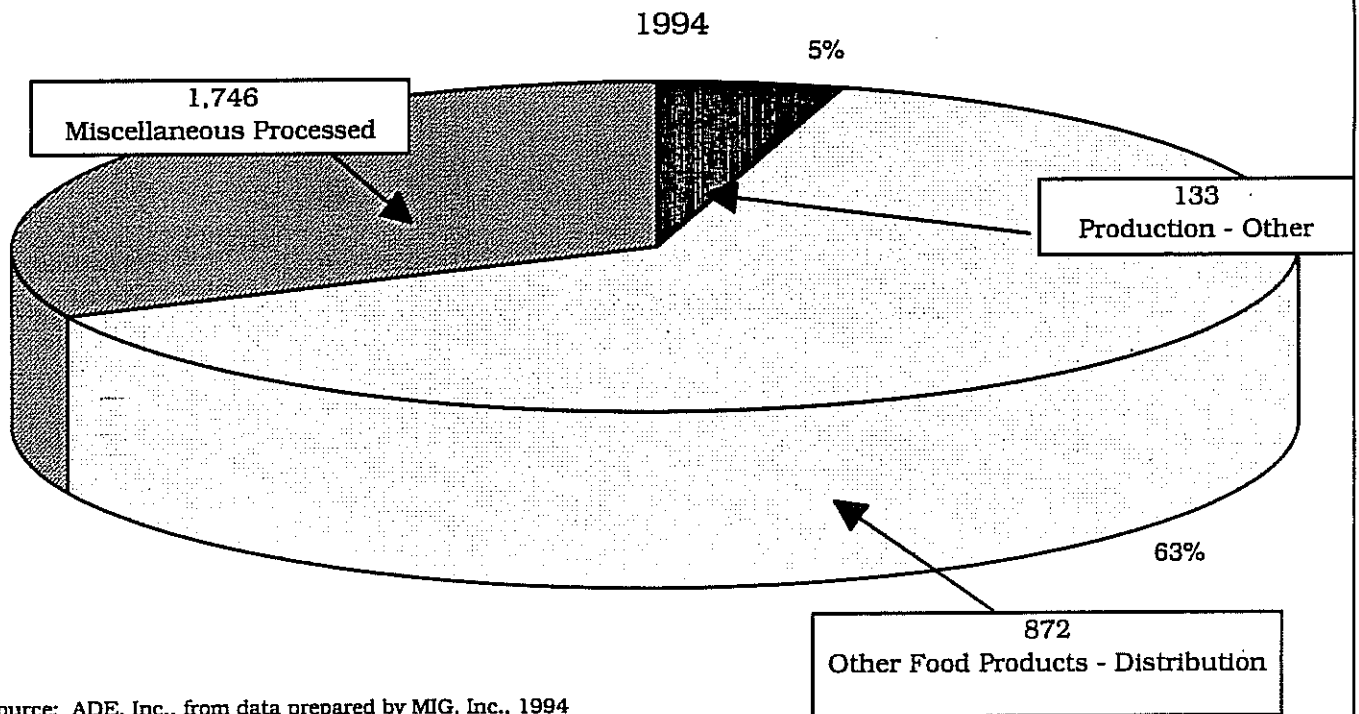
Source: Applied Development Economics, from data supplied by MIG, Inc., 1991, 1994

Notes: n.a. = data not available nec = not elsewhere classified

The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, California). Industries with a Concentration of greater than 1.00 are relatively more concentrated in the county than in the state as a whole.

FIGURE 3-18

COMPONENTS OF OTHER AGRICULTURAL CROP CLUSTER



Source: ADE, Inc., from data prepared by MIG, Inc., 1994

Income Generation in the Cluster

Average earnings in this cluster amounted to \$26,570 in 1994 or about a third higher than the countywide average for all industries. The higher income potential is not surprising given the large number of employees in the value-added food processing sector.

Figure 3-19 reveals a less sanguine picture. None of the industries in this cluster combined both employment and income growth, at least for the period between 1991 and 1994. Three industries—bakery products, snack foods, and the distribution of confectionery products—experienced employment growth, but average earnings declined. Three other industries—sugar and confectionery products, macaroni products, and the distribution of grains and beans—lost employment, but average earnings grew.

Spatial Distribution of the Cluster

Among the San Joaquin Valley counties, Fresno has about 25 percent of the employment in this cluster, i.e., slightly less than its share of total Valley employment (Table 3-20). However, almost 33 percent of the employment in distribution is based in Fresno County. The concentration of this particular activity reinforces Fresno's position as one of the distribution and shipping hubs of the Central Valley.

Market Trends

There is a natural complementarity between the types of food processing industries included in this cluster and the other commodity clusters. One example is a recent \$14 million promotional effort by five cooking-ingredient brands to join efforts in creating a "united dessert front" in grocery stores. The team members included: Sun-Maid Raisins, Sun-Diamond Walnuts, Sunsweet Dates, Borden's Eagle Condensed Milk, and Keebler Ready Pie Crust.

Examples of capital investments during the period 1993-96 illustrate the wide range of food processing activities that are attracted to Fresno County: a new Corn Nuts snack manufacturing plant, Miller Milling Company's first flour operation on the West Coast, and a major Gruma Corporation tortilla factory.

TABLE 3-20
OTHER AGRICULTURAL CROPS
Spatial Distribution of Employment

	Fresno County		Balance of Region		San Joaquin Valley	
	Employ.	%	Employ.	%	Employ.	%
Other Crops	133	26.7%	365	73.3%	498	100.0%
Misc. Processed Food Products	1,746	22.4%	6,040	77.6%	7,786	100.0%
Distribution-Other Food Products	872	32.9%	1,781	67.1%	2,653	100.0%
Cluster Total	2,751	25.2%	8,186	74.8%	10,937	100.0%
Source: Applied Development Economics, Inc., based on 1994 ES202 data prepared by MIG, Inc.						

FIGURE 3-19

OTHER AGRICULTURAL CROPS
Growth and Prosperity Matrix

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<p><i>Job and Avg. Earnings Loss</i></p> <p>Prepared Flour Mixes & Dough Misc. Food Preparations Distribution-Misc. Groceries</p>	<p><i>Downsizing with Avg. Earnings Growth</i></p> <p>Sugar & Confectionery Products Macaroni & Spaghetti Products Distribution-Grains & Beans</p>
GROWTH (+)	<p><i>Job Growth, but Declining Avg. Earnings</i></p> <p>Bakery Products Potato Chips & Similar Snacks Distribution-Confectionery Products</p>	<p>** Job and Earnings Growth **</p>

Notes: Industries with 50 or more employees

Matrix does not include industries related to crop and livestock production.

Growth measures net employment change.

Prosperity measures change in average earnings per employee.

Metalworking and Machinery Cluster

Historically, the growth of metalworking in places like Chicago was fueled by burgeoning demand for agricultural implements. With agriculture flourishing in the San Joaquin Valley, contemporary metals and metalworking companies are taking advantage of a growth market. Copper & Brass Sales, Inc., a major nonferrous distributor, opened a facility in Fresno in 1992. Further north, in Stockton, Western Flat Rolled Steel & Processing is building a facility to provide slit steel coils to agricultural consumers, as well as to builders and computer cabinet makers.

Components of the Metalworking and Machinery Cluster

The three main components in this cluster are fabricated metal products, mechanical equipment, and the distribution of machinery (Figure 3-20). Of these, the smallest appears to be mechanical equipment with just over 800 employees in 1994. However, because machinery and mechanical equipment is a major input in agriculture, some industries were counted as part of the Agriculture Infrastructure. To avoid double-counting employment, the industries are allocated to one cluster or another, but the reality (as previously depicted in Figure 3-8) is considerable overlap. If the agriculture-related machinery—such farm machinery, food processing and packaging machinery, pumping equipment, and conveyor equipment—is also considered, this cluster would increase by another 1,200 jobs.

As defined in Figure 3-20, the largest component is distribution with approximately 1,500 employees in 1994. The fabricated metals component is almost as large with 1,337 employees. As seen in Table 3-21, most of the fabricated metals employment is concentrated in SIC 344, which includes fabricated structural metal; metal doors, sash, and trim; sheet metalwork; and architectural metal work.

The cluster as a whole does not have a concentrated presence in Fresno County. However, certain industries within the cluster have very high concentration factors (Table 3-21), including general industrial machinery (SIC 3569) and the distribution of farm and garden machinery (SIC 5083). And, as discussed earlier, the level of activity in agricultural equipment manufacturing is much higher than average (see Table 3-11).

Growth of the Cluster

Over the three-year period from 1991 to 1994, the Metalworking and Machinery Cluster grew slightly, adding fewer than 100 net new jobs. Nevertheless this growth is noteworthy since it occurred in the midst of a deep recession during which the same type of employment was shrinking at a national scale.

Income Generation in the Cluster

Average earnings for the Metalworking and Machinery Cluster is \$29,327, almost \$9,500 higher than the average for the Fresno economy in general. Likewise, each of the component industries also contains a large number of well-paid jobs. Indeed, this cluster has the highest average earnings of all the clusters examined.

TABLE 3-21
METALWORKING & MACHINERY CLUSTER
Cluster Trends and Performance

SIC	Industry Name	1991 Employ.	1994 Employ.	Net Change 1991-94	Avg. Annual Change 1991-94	Concentration Factor	Average Payroll per Employee
344	Fabricated structural metal products	978	1,008	30	1.0%	1.33	\$29,630
347	Metal services, nec	172	170	(2)	-0.4%	0.39	\$20,625
349	Misc. fabricated metal products	173	159	(14)	-2.7%	0.47	\$31,094
	Fabricated Metal Products	1,323	1,337	14	0.4%	0.87	\$28,659
354	Metalworking machinery	23	22	(1)	-1.4%	0.07	\$34,954
3562	Ball and roller bearings	0	0	0	—	0.00	—
3563	Air and gas compressors	29	24	(5)	-5.7%	1.64	\$28,097
3564	Blowers and fans	3	6	3	33.3%	0.12	\$31,446
3566	Speed changers, drives, and gears	0	0	0	—	0.00	—
3567	Industrial furnaces and ovens	9	0	(9)	-33.3%	0.00	—
3568	Power transmission equipment, nec	0	0	0	—	0.00	—
3569	General industrial machinery, nec	284	404	120	14.1%	3.69	\$31,402
359	Industrial machinery, nec	292	353	61	7.0%	0.43	\$27,658
	Mechanical Equipment	640	809	169	8.8%	0.58	\$29,767
5083	Farm and garden machinery	662	666	4	0.2%	3.88	\$29,250
5084	Industrial machinery and equipment	626	522	(104)	-5.5%	0.94	\$31,392
5085	Industrial supplies	306	310	4	0.4%	1.13	\$27,747
	Distribution-Machinery	1,594	1,498	(96)	-2.0%	1.50	\$29,686
	Cluster Total	3,557	3,644	87	0.8%	0.93	\$29,327

Source: ADE, from 1992 data series prepared by MIG, Inc., 1991, 1994

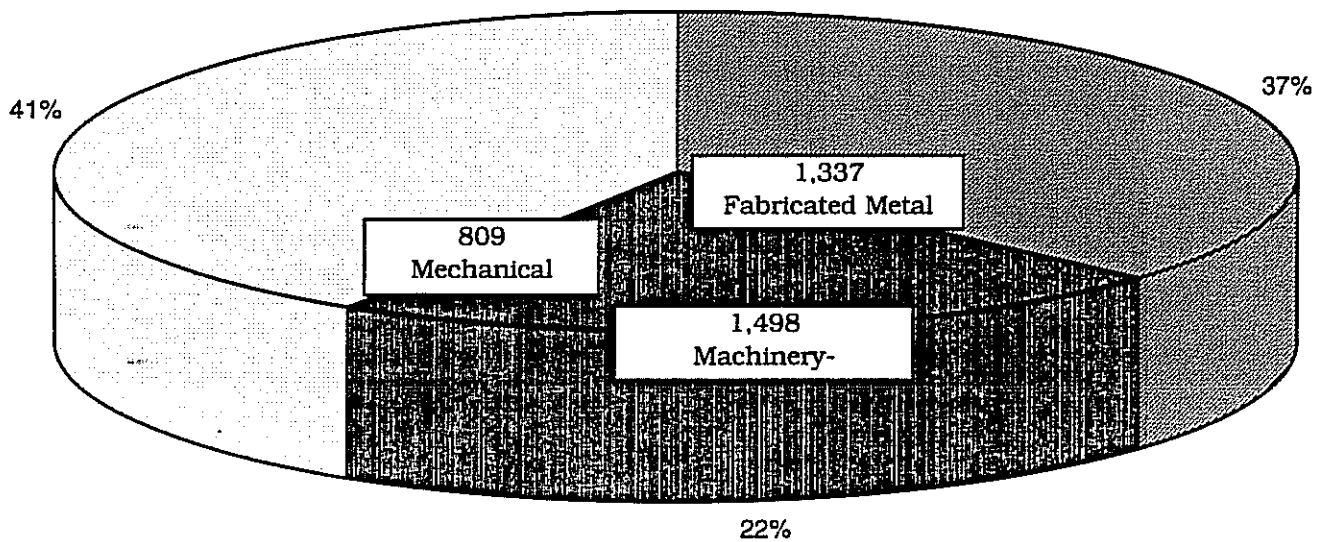
Note: nec = not elsewhere classified

The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, California). Industries with a Concentration Factor greater than 1.00 are relatively more concentrated in the county than in the state as a whole.

FIGURE 3-20

COMPONENTS OF THE METALWORKING & MACHINERY CLUSTER

1994 Employment



Source: Applied Development Economics, Inc., from data prepared by MIG, Inc.,
1994

Figure 3-21 compares employment growth with changes in average earnings. The lower right-hand quadrant contains industries that are growing both in terms of jobs and income. The two manufacturing industries in this quadrant--architectural metalwork and metal doors, sash, and trim--suggests that an area with further growth opportunities is metalwork for the construction and design markets.

Spatial Distribution of the Cluster

Table 3-22 shows a breakdown in the distribution of cluster employment between Fresno County and the balance of the region. Fresno County has 26 percent of the cluster's employment, which is slightly smaller than its proportional share of total employment in the San Joaquin Valley. The county has a relatively larger share of employment in the mechanical equipment component. Fabricated metal products and machinery distribution, however, have a larger employment base elsewhere in the Valley.

Market Trends and Issues

The Metalworking and Machinery Cluster tends to trail the economy: as manufacturers produce and generate higher profits, they purchase more equipment. Now that the state and national economy have been on the upswing for several years, machinery manufacturers have largely satisfied pent-up demand after years of recession-induced cutbacks. On the other hand, after several years of profitability, many processors have the financial reserves to invest in plant upgrades and are looking to make these investments before the economy undergoes the next cyclical downturn.

While there are a handful of large companies with more than 500 employees, many of the firms in this cluster are small job shops. These types of businesses tend to be slower in adopting automation and other new technology and, consequently, lag behind in productivity growth. A related issue is the supply of qualified engineers and technicians. Increasingly firms must be able to respond quickly and flexibly to changes in supply and demand which, in turn, requires adaptive technology and a skilled workforce. Suppliers of metal parts and components are also required more frequently to become involved in their customers' production process and provide enhanced services, such as design and testing.

A key factor affecting short-term growth is the price for steel and other primary metals, including copper, aluminum, and nickel. The future cost of metals is a potentially significant issue in a manufacturing region like Fresno which does not produce its own basic metals and must transport these supplies over long distances. In a competitive market, it is difficult to pass on higher material costs to customers.

TABLE 3-22
METALWORKING & MACHINERY CLUSTER
Spatial Distribution of Employment

	Fresno County		Balance of Region		San Joaquin Valley	
	Employ.	%	Employ.	%	Employ.	%
Fabricated Metal Products	1,337	25.5%	3,901	74.5%	5,238	100.0%
Mechanical Equipment	809	29.0%	1,978	71.0%	2,787	100.0%
Distribution-Machinery	1,498	25.2%	4,435	74.8%	5,933	100.0%
Cluster Total	3,644	26.1%	10,314	73.9%	13,958	100.0%

Source: ADE, based on 1994 ES202 data prepared by MIG, Inc.

FIGURE 3-21

METALWORKING & MACHINERY CLUSTER
Growth and Prosperity Matrix

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<p><i>Job and Avg. Earnings Loss</i></p> <p>Fabricated Structural Metal Distribution-Industrial Machinery & Equipment</p>	<p><i>Downsizing with Avg. Earnings Growth</i></p> <p>Sheet Metalwork Plating & Polishing</p>
GROWTH (+)	<p><i>Job Growth, but Declining Avg. Earnings</i></p> <p>Fabricated Plate Work (Boilershops) Misc. General Industrial Machinery Distribution-Farm & Garden Machinery</p>	<p>** Job and Earnings Growth **</p> <p>Metal Doors, Sash, & Trim Architectural Metalwork Distribution-Industrial Supplies</p>

Notes: Industries with 50 or more employees

Growth measures net employment change.

Prosperity measures change in average earnings per employee.

Information Processing Cluster

The Information Processing Cluster is a relatively small, but rapidly growing element of the Fresno County economy. Between 1991 and 1994, the employment base grew by 34 percent, increasing from 4,840 to 6,462. However, in comparison with the state as a whole, the local concentration of industries in this cluster is well below average.

Components of the Information Processing Cluster

The Information Processing Cluster consists of service industries related to information and data processing. Information processing encompasses a diverse group of companies, some of which specialize in narrowly defined tasks, while others provide multiple services. Companies that provide data processing services generally use their own computers and proprietary software to process their clients' transactions and data. Economies of scale are achieved by spreading the cost of hardware, software development and maintenance of large databases. Some firms specialize in transaction processing: they take over a company's high-volume, back-office routines, such as payroll or claims processing, and base their fees on the number of transactions performed.

Industries included in this cluster and represented in Fresno County are computer and data processing services, miscellaneous business services, accounting, management consulting, and life insurance (Figure 3-22). Of these industries, the largest is miscellaneous business services, a category that includes telemarketing. This industry accounts for nearly one-third of the jobs in the cluster. Accounting, and management consulting are the two other services sectors with more than 1,000 jobs in 1994.

Industries in the finance, insurance, and real estate (FIRE) sector frequently have large information processing divisions that provide centralized clerical, accounting, and record-keeping services. However, much of the activity in the FIRE sector is also local-serving, such as the neighborhood bank or insurance agent. The concentration factor was used to differentiate between regional and local FIRE activity. Life insurance was the only industry with a higher than average concentration in Fresno County. Its concentration factor of 1.62 suggests that employment in the county exceeds the level necessary to service the local population. Therefore, life insurance was included in the cluster.

Growth of the Cluster

Although the employment concentration in the Information Processing Cluster in Fresno County is low, it is also growing rapidly. Between 1991 and 1994, all of the individual industries in the cluster grew, except for accounting, which lost close to 100 jobs during this period. Moreover, all of these growth industries had an average annual job growth rate of at least 12 percent. Computer and data processing services had the highest growth rate between 1991 and 1994, with an annual average of 29 percent (Table 3-23).

Numerically, business services had the largest employment increase between 1991 and 1994, with nearly 700 new jobs. Management consulting added nearly 500 jobs, while life insurance and computer and data processing added 261 and 270 jobs, respectively.

TABLE 3-23
INFORMATION PROCESSING CLUSTER -- FRESNO COUNTY
Cluster Trends and Performance

SIC	Industry Name	1991 Employ.	1994 Employ.	Net Change 1991-94	Avg. Annual Change 1991-94	Concentration Factor	Average Payroll per Employee
631	Life insurance	714	975	261	12.2%	1.62	\$26,621
737	Computer and data processing services	308	578	270	29.2%	0.19	\$40,500
7389	Business services, nec	1,398	2,089	691	16.5%	0.87	\$11,746
872	Accounting, auditing, & bookkeeping	1,555	1,163	(92)	-2.0%	0.83	\$31,757
874	Management and public relations	865	1,357	492	19.0%	0.50	\$27,267
	Cluster Total	4,840	6,462	1,622	11.2%	0.61	\$24,352

Source: ADE, from ES202 data series prepared by MIC, Inc., 1991, 1994

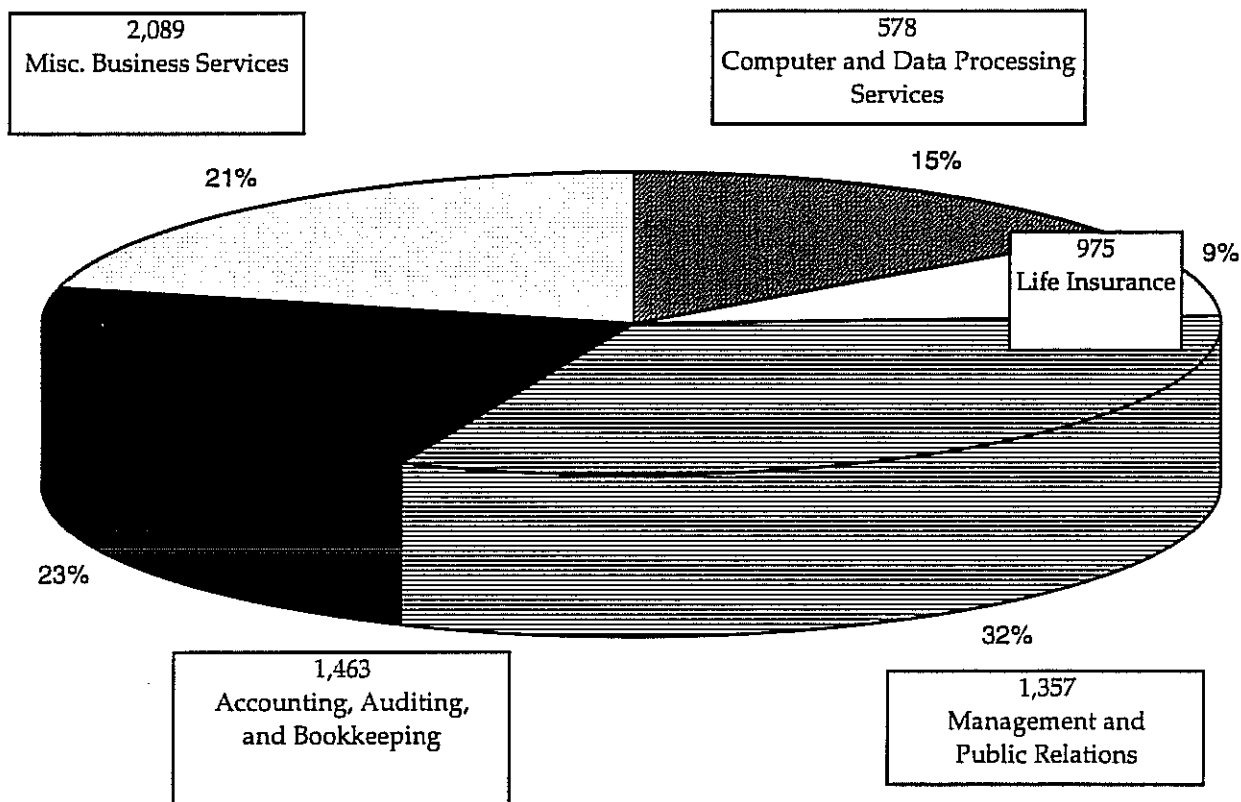
Note: nec = not elsewhere classified

The Concentration Factor measures the extent to which employment is more highly concentrated in Fresno County than in a broader reference region (in this case, California). Industries with a Concentration Factor greater than 1.00 are relatively more concentrated in the county than in the state as a whole.

FIGURE 3-22

COMPONENTS OF THE INFORMATION PROCESSING CLUSTER

1994 Employment



Source: ADE, Inc., from data prepared by MIG, Inc., 1994

Income Generation in the Cluster

As a whole, the 1994 average annual payroll of \$24,352 per employee was well above the Fresno County average for all industries. Within the Information Processing Cluster, the industry with the highest average annual payroll per employee is computer and data processing services at \$40,500 (Table 3-23). The notable exception to the high average earnings in the cluster is miscellaneous business services (\$11,746). Overall, these industries have performed well in the Growth and Prosperity Matrix. None of the cluster components experienced losses of both jobs and income during the period between 1991 and 1994. Accounting was the only information processing industry in a downsizing mode. Miscellaneous business services and public relations grew, but suffered slight reductions in average earnings. What this means is that a relatively high number of low-paying jobs were added, possibly because these are entry-level positions, temporary jobs, or part-time employment. Industries growing in both employment and earnings were life insurance, computer programming services, and data processing (Figure 3-23).

Spatial Distribution of the Cluster

Although Fresno County has a relatively low concentration of information processing employment relative to the state, it has a high proportion of information processing jobs in relation to the rest of the San Joaquin Valley. On average, Fresno County has 29 percent of all the employment in the San Joaquin Valley, but 36 percent of the information processing employment. Fresno County has a disproportionately large share of employment in all information processing industries, except in computer and data processing services where Fresno County accounts for only 17 percent of the San Joaquin Valley employment total. The two information processing industries where Fresno County comprises more than 45 percent of the regional employment are miscellaneous business services and life insurance (Table 3-24).

Evolution of the Cluster

The Information Processing Cluster can encompass a broad range of activities, all of which rely on a secure flow of data and information and a workforce capable of processing these resources. Increased outsourcing of activities, such as billing, customer service, and accounting, have led to the emergence of firms such as FiServe and Medaphis. Over the past couple of decades, data-intensive activities have increasingly consolidated into specialized back-office centers, which perform the routine clerical functions, forms processing, and technical support. The dominant requirements for information processing activities are access to high-capacity telecommunications infrastructure and an adequate labor pool.

Market Trends and Issues

Businesses engaging in information processing activities are typically drawn to less urban areas with affordable commercial real estate, a high quality of life, and areas which meet their labor requirements. The requirements of the labor force are twofold. First, the labor force must have a sufficient number of available employees. This usually implies areas with either high population bases, unemployment, or segments of the population, such as single parents, who desire flexible and/or part-time work hours. Telemarketing has particularly high turnover rates, therefore a high demand for labor. Regions with moderate to low unemployment rates are frequently passed up, since both labor availability and costs cannot meet the industry's needs.

TABLE 3-24
INFORMATION PROCESSING CLUSTER
Spatial Distribution of Employment

	Fresno County		Balance of Region		San Joaquin Valley	
	Employ.	%	Employ.	%	Employ.	%
Life Insurance	975	45.6%	1,162	54.4%	2,137	100.0%
Computer and Data Processing Services	578	16.9%	2,850	83.1%	3,428	100.0%
Misc. Business Services	2,089	46.4%	2,412	53.6%	4,501	100.0%
Accounting, Auditing & Bookkeeping	1,463	36.4%	2,558	63.6%	4,021	100.0%
Management and Public Relations	1,357	34.7%	2,550	65.3%	3,907	100.0%
Cluster Total	6,462	35.9%	11,532	64.1%	17,994	100.0%

Note: ncc = not elsewhere classified

Source: ADE, based on 1994 ES202 data prepared by MIG, Inc.

FIGURE 3-23

INFORMATION PROCESSING CLUSTER
Growth and Prosperity Matrix

	PROSPERITY (-)	PROSPERITY (+)
GROWTH (-)	<i>Job and Avg. Earnings Loss</i>	<i>Downsizing with Avg. Earnings Growth</i> Accounting, Auditing, Bookkeeping
GROWTH (+)	<i>Job Growth, but Declining Avg. Earnings</i> Misc. Business Services Marketing & Public Relations	** Job and Earnings Growth ** Life Insurance Computer Programming Services Data Processing & Preparation

Notes: Industries with 50 or more employees
 Growth measures net employment change.
 Prosperity measures change in average earnings per employee.

A second requirement is adequate training (or the capacity to be trained). Although back-office operations was once seen as low-skilled work, this is less and less accurate. The support technologies continues to evolve at a rapid pace and an educated work force can more readily adapt to these changes. Furthermore, many employees in back-office locations have considerable customer contact. They must be able to represent their companies well and to make on-the-spot decisions regarding various customer requests.

Retail Activity in Fresno County

In 1995, Fresno County's retail sales reached an estimated \$4.5 billion. Figure 3-24 clearly shows two patterns of retail sales growth. Between 1985 and 1990, sales increased exponentially from \$2.9 billion to \$4.0 billion for an average annual growth rate of eight percent. Even with the onset of the recession in the early 1990s, retail sales continued to grow, but at a much slower rate. Between 1990 and 1994, the annual growth rate averaged 1.5 percent. Between 1994 and 1995, retail sales appears to have rebounded with an expected 5.8 percent growth rate.

The single largest retail category in the county is automotive, which accounted for \$1.3 billion in sales or 30 percent of total 1994 retail activity (Table 3-25). The next largest retail category is general merchandise, which rang up \$679 million in sales—a 16 percent share of total sales. Three other large retail categories—grocery and liquor, food and beverage, and consumer durables—each make up 10 percent of total retail sales in Fresno County.

Overall, Fresno County has about 27 percent of the \$16 billion San Joaquin Valley retail market (Table 3-25). However, there are a number of categories where Fresno County captures a larger than average share of retail sales. The retail category with the largest local advantage is fuel and ice, with 40 percent of all Valley expenditures occurring in Fresno County. Other categories where Fresno County is especially competitive include apparel stores, specialty retail, and consumer durables. This relative concentration is not surprising since these types of merchandise elicit comparative shopping behavior and metropolitan areas, with their larger market areas, tend to offer a more abundant selection. However, there are also retail categories in which Fresno County retailers have a disproportionately lower sales than the rest of the San Joaquin Valley. These categories are general merchandise, grocery and liquor, and second-hand merchandise.

As discussed earlier, the focus of this analysis is on export-oriented industries rather than local-serving industries, such as retail trade. Nevertheless, it should be mentioned that retail trade is a significant employer. In 1994, there were approximately 45,600 retail workers, making up 19 percent of Fresno County's employment base. The Fresno economy is actually less dependent on retail activity than most rural areas. By comparison, 21 percent the state's private-sector employment is in retail trade and, in the northern, natural-resource-based regions of California, employment in the retail sector approaches 30 percent of the total. Consistent with the sales figures, retail employment is also growing. Approximately 3,000 net new jobs were added between 1991 and 1994. Average earnings are low, however. At \$14,300 per employee, it amounts to only 72 percent of the countywide average for all industries.

TABLE 3-25

FRESNO VS. SAN JOAQUIN VALLEY RETAIL SALES (\$000), 1994

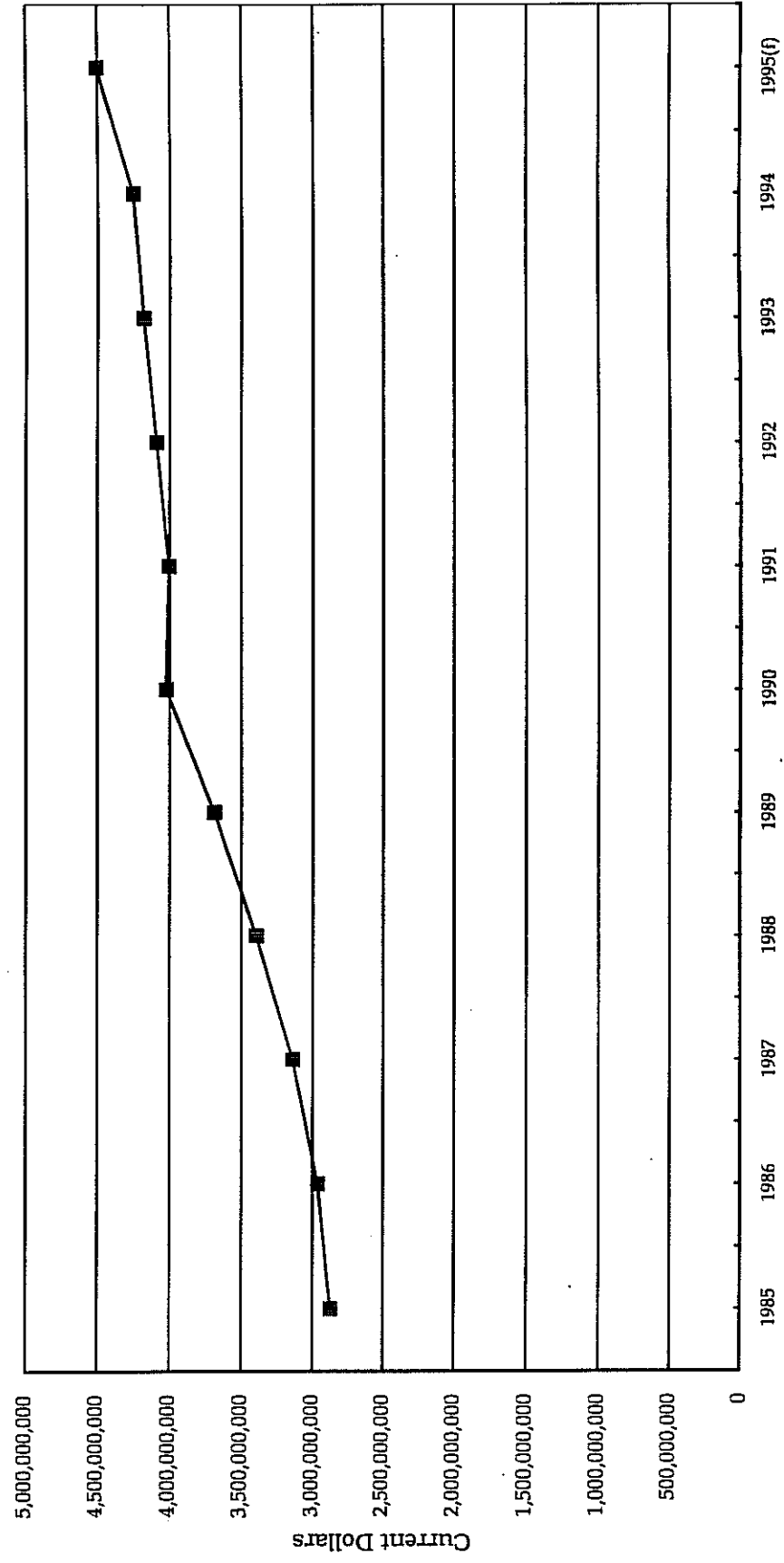
Industry	County Sales, 1994	San Joaquin Valley Sales, 1994	Fresno Sales as a Pct. of San Joaquin Valley	Fresno Share Index*
Apparel Store	166,077	522,459	31.8%	1.19
General Merchandise	679,428	3,050,768	22.3%	0.84
Specialty	454,856	1,415,120	32.1%	1.21
Grocery & Liquor	406,259	1,680,543	24.2%	0.91
Food & Beverage	441,820	1,705,429	25.9%	0.97
Consumer Durables	197,365	636,338	31.0%	1.16
Second-hand Merchandise	8,434	35,761	23.6%	0.89
Farm & Garden	283,649	1,014,703	28.0%	1.05
Fuel & Ice	22,920	57,375	39.9%	1.50
Building Material	331,595	1,144,821	29.0%	1.09
Automotive	1,263,242	4,721,170	26.8%	1.01
Total Retail Sales	4,255,645	15,984,487	26.6%	1.00

* The Share Index measures the extent to which Fresno has a higher or lower share of sales in the particular retail category relative to its overall share of San Joaquin Valley retail sales. Values greater than 1.00 mean that Fresno accounts for a larger than average share of sales.

Source: Eureka Group, 1996 California Retail Survey

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FIGURE 3-24
TOTAL RETAIL SALES, FRESNO COUNTY, 1985-95



Fresno County Tourism

The Visitor Economy

Visitor-related activities in Fresno County contribute a significant amount to the overall regional economy. In 1995, visitors spent approximately \$750 million in Fresno County, while the county's tourism industry provided about 10,000 jobs (Tables 3-26 and 3-27). Conventions and conferences are an important component of the Fresno County visitor economy, with about 150,000 delegates spending approximately \$54 million a year (Table 3-28).

According to a recent study by California State University at Fresno, tourism is growing at a steady pace in Fresno County. In 1995, an estimated 2.1 million tourists visited Fresno County, an increase of 11.4 percent from 1994. Economic impacts of tourism are also steadily increasing, according to a report by Dean Runyan Associates. In 1991, visitor-related spending in all categories amounted to \$687 million, compared to \$750 million in 1995, an increase of 9.2 percent over the four-year period. Especially impressive is the growth in retail sales (20.4 percent) and recreation expenditures (18.5 percent) attributable to tourism between 1991 and 1994.

In terms of employment, Runyan estimates that 10,155 jobs in 1994 could be attributed to tourism, with the most sizeable concentration in eating and drinking establishments, recreation-related businesses, and accommodations. A significant number of jobs in retail establishments and ground transportation businesses can also be attributed to tourism (Table 3-27). Since 1991, the county as a whole saw only a small increase (less than one percent) in visitor-related employment. However, some categories of businesses experienced a much larger increase (such as accommodations), while other types experienced significant job losses (including air and ground transportation and food stores). This trend suggests that while the number of visitors to Fresno County is increasing, the benefits of this growth are being felt primarily in terms of visitor-related spending and not in terms of visitor-related employment.

Government Impacts

Local government experiences benefits from tourism through collection of transient occupancy tax (TOT) revenues, or "bed taxes" on overnight accommodations. In fiscal year 1993-94 (the latest year for which aggregated data is available), local jurisdictions in Fresno County collected \$6.6 million in TOT revenues, with the City of Fresno collecting the bulk of that figure (\$5.9 million). The steady growth of tourism over the past several years is also reflected in TOT revenue. Between fiscal years 1990-91 and 1993-94, local jurisdictions saw TOT revenues rise by 6.7 percent, with Selma and Kingsburg enjoying the largest gains (27.7 and 18.2 percent, respectively). The City of Fresno's TOT revenues increased by a smaller amount, 6.4 percent, over the same time period.

TABLE 3-26

FRESNO COUNTY VISITOR SPENDING BY TYPE OF BUSINESS (\$000), 1991-94

Type of Business	1991	1992	1993	1994	% Change 1991-94
Accommodations	\$68,750	\$69,100	\$70,240	\$72,360	5.3%
Eating, Drinking	\$103,750	\$107,680	\$111,260	\$107,620	3.7%
Food Stores	\$63,670	\$65,660	\$68,910	\$65,370	2.7%
Ground Transportation	\$145,840	\$153,510	\$159,460	\$164,090	12.5%
Recreation	\$68,140	\$71,510	\$74,290	\$80,770	18.5%
Retail Sales	\$167,540	\$175,730	\$183,040	\$201,780	20.4%
Air Transportation	\$67,700	\$62,030	\$56,750	\$56,160	-17.0%
Travel Arrangement	\$2,060	\$2,100	\$2,300	\$2,270	10.2%
County Total	\$687,450	\$707,320	\$726,250	\$750,420	9.2%

Source: Dean Runyan Associates, "California Travel Impacts By County, 1991-1994"

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TABLE 3-27

FRESNO COUNTY EMPLOYMENT GENERATED BY VISITOR SPENDING, 1991-94*

	1991	1992	1993	1994	% Change 1991-94
Accommodations	1,401	1,408	1,415	1,589	13.4%
Eating, Drinking	2,883	3,003	3,109	3,070	6.5%
Food Stores	398	383	378	331	-16.8%
Ground Transportation	1,525	1,549	1,488	1,216	-20.3%
Recreation	1,466	1,463	1,508	1,635	11.5%
Retail Sales	1,351	1,372	1,409	1,471	8.9%
Air Transportation	868	693	618	619	-28.7%
Travel Arrangement	204	202	210	225	10.3%
County Total	10,095	10,074	10,136	10,155	0.6%

Note: Details may not add to totals due to rounding

* Includes full-time and part-time jobs, but excludes working business owners

Source: Dean Runyan Associates, "California Travel Impacts by County, 1991-1994"

TABLE 3-28
ECONOMIC IMPACTS OF FRESNO COUNTY CONVENTIONS
FY 1991-92 to 1995-96

Fiscal Year	1991-92	1992-93	1993-94	1994-95	1995-96	% Change 1991-95
Conventions & Conferences	360	350	340	348	320	-11.11%
Convention Delegates	150,500	151,335	152,175	153,050	149,198	-0.87%
Delegate Spending (\$mil.)*	\$35.3	\$35.5	\$35.7	\$52.3	\$53.7	52.12%

* Calculated using an average delegate stay figure and an average delegate spending figure from the International Association of Convention and Visitor Bureaus

Source: ADE, from Fresno City & County Convention & Visitors Bureau data

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Major Attractions

Major Fresno County attractions include Sequoia and Kings Canyon National Parks in the eastern, forested part of the county (Table 3-29). Sequoia Park's giant redwood trees and recreational opportunities attract close to 850,000 visitors a year, as does Kings Canyon. The Fresno City & County Convention & Visitors Bureau calls Yosemite National Park the county's number one attraction, as many park visitors stop in Fresno on their way to or from California's premier natural treasure, which boasts over 4 million visitors a year. Early spring visitors drive the scenic roads along Fresno County's "Blossom Trail" to enjoy the fruit trees' stunning white and pink blossoms.

Within the city of Fresno, popular attractions include the Chaffee Zoological Gardens (which includes botanical gardens), the Fresno Metropolitan Museum of Art, History and Science, the Fresno Art Museum, and the unique Forestiere Underground Gardens, which features an underground home, grottos, and aquarium. Visitors interested in Fresno County's rich agricultural heritage can tour (in pre-booked groups) the Sun-Maid Growers' raisin processing plant in Kingsburg, the largest in the world.

Existing Employment Projections

The most comprehensive and detailed employment projections currently available are those made for the period 1995 to 2015 by the Fresno Council of Government (COG). The Fresno COG based its employment projections on the California Department of Finance's projections of population growth made in 1993. Those projections have proven to be overly optimistic based on actual growth in the years that have elapsed. The Fresno COG expects to adjust its next set of employment projections based on the Department of Finance new population projections issued in December 1998.

Table 3-30 shows the existing employment projections, recognizing the aforementioned limitations. According to this set of numbers, the Fresno County employment base is expected to expand from 323,202 in 1995 to 592,198 in 2015 for an increase of 83 percent. The projections build in a higher rate of growth in the early period (1995 to 2001) and more moderate growth in the later years (see "LMID" in Glossary).

Total employment is broken down into three categories: retail/services, government/education, and other. The "other" category contains a wide range of economic activities, including agriculture, construction, manufacturing, wholesale trade, and finance, insurance and real estate (FIRE). In 1995, the "other" category was expected to comprise over 46 percent of total employment, the largest of the three categories. However its growth rate is expected to be the slowest of the three, resulting in 254,100 jobs by 2015 or a 43 percent share of total employment.

In contrast, retail/services employment with a 35 percent share of total employment in 1995 is expected to enjoy the highest growth rate, thereby more than doubling in size by 2015. As seen in Figure 3-25, retail/services is expected to reach 231,100 in 2015 or 43 percent of total employment. At this level, it is nearly equal in size to the "other" category. Government/education employment is the smallest of the three employment categories used by the Fresno COG, with a 1995 employment base of 60,800. This figure is expected to increase to 106,100 by 2015.

TABLE 3-29

FRESNO COUNTY VISITOR ATTRACTIONS

Attraction	Location	1995 Visitors	Peak Season
Yosemite National Park	East Central CA	4,102,264	Summer
Sequoia National Park	Eastern Fresno Co.	1,034,493	Summer
Kings Canyon Nat. Park	Eastern Fresno Co.	727,162	Summer
Chaffee Zoological Gardens	City of Fresno	352,000	Spring/Summer
Fresno Metropolitan Museum	City of Fresno	204,226	Varies
Fresno Art Museum	City of Fresno	69,000	Fall-Spring
Blossom Trail	Around Fresno Co.	NA	Early Spring
Forestiére Underground Gardens	City of Fresno	NA	Spring/Summer
Sun-Maid Growers--Group Tours	Kingsburg	6,600	Spring/Summer
Source: National Park Service, Fresno City & County Convention & Visitors Bureau, and individual attractions listed			fresfour.wk4

FIGURE 3-25
FRESNO COUNTY EMPLOYMENT PROJECTIONS, 1995-2015

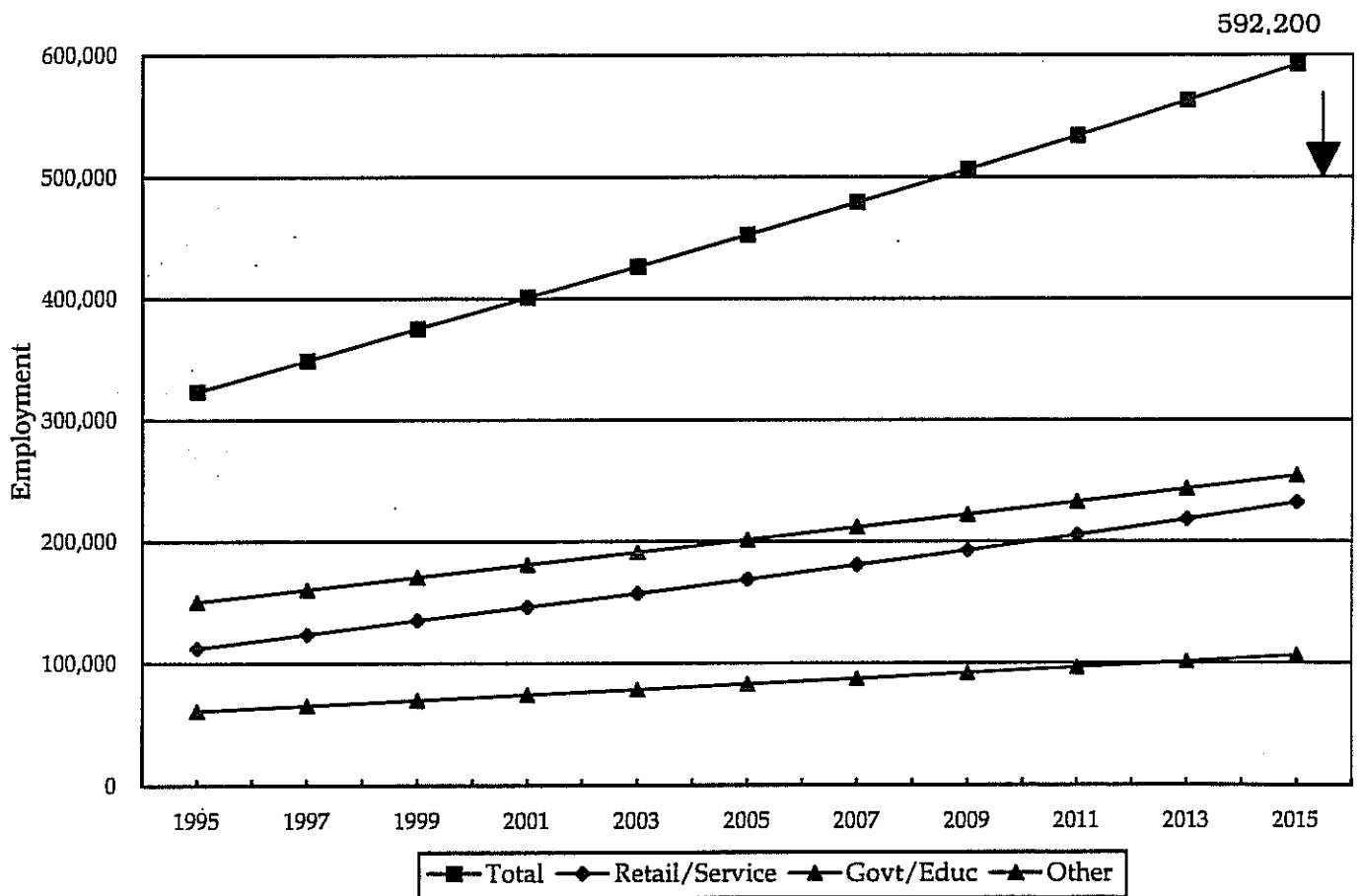


TABLE 3-30
FRESNO COUNTY EMPLOYMENT PROJECTIONS, 1995-2015

Year	Total Employment		Retail/Service		Government/Education		Other*	
	No.	Biennial Increase	No.	Biennial Increase	No.	Biennial Increase	No.	Biennial Increase
1995	323,202	—	112,203	—	60,800	—	150,199	—
1997	348,903	8.0%	123,403	10.0%	65,202	7.2%	160,298	6.7%
1999	375,101	7.5%	134,999	9.4%	69,601	6.7%	170,501	6.4%
2001	400,897	6.9%	146,098	8.2%	74,001	6.3%	180,798	6.0%
2003	426,292	6.3%	157,094	7.5%	78,299	5.8%	190,899	5.6%
2005	452,401	6.1%	168,498	7.3%	82,803	5.8%	201,100	5.3%
2007	479,201	5.9%	180,400	7.1%	87,200	5.3%	211,601	5.2%
2009	506,299	5.7%	192,499	6.7%	91,801	5.3%	221,999	4.9%
2011	533,995	5.5%	205,101	6.5%	96,397	5.0%	232,497	4.7%
2013	562,803	5.4%	218,202	6.4%	101,202	5.0%	243,399	4.7%
2015	592,198	5.2%	231,998	6.3%	106,102	4.8%	254,098	4.4%

* Other includes Agriculture, Manufacturing, Wholesale Trade, and Finance, Insurance and Real Estate (FIRE).

Source: Fresno Council of Governments

Projections based on 1993 CA Dept. of Finance population projections.

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Real Estate Development Trends

Residential Market

Single family residential construction has been steady in recent years, though at a slower rate than in the late 1980s. In the city of Fresno, which accounts for approximately two-thirds of the total county market, single-family permits dropped from 1,718 in 1994 to a low of 1,459 in 1995. The number of permits then rose to 1,600 in 1996. Construction of new apartment units remained low throughout that period: ranging from 150 units in 1993 to 20 units in 1996. Low apartment construction levels reflect difficulties in financing investment properties and local availability of very affordable entry-level single family homes given historically low mortgage interest rates. While median home prices appeared to be holding steady through the middle 1990s, there are also indications that median prices may be falling. The decline is due to a higher proportion of entry-level housing in the sales mix. Geographically, there has been a general increase in housing starts in smaller communities and a drop in housing starts in the Fresno-Clovis Metropolitan Area.

Retail Market

The Fresno retail market consists of approximately 16 million square feet of space in approximately 200 shopping centers larger than 20,000 square feet. New retail space is being added at a rate of approximately 400,000 square feet annually. Vacancy rates in non-regional centers have been holding at approximately 10 percent.

The Fresno area is seeing a change in the method of merchandising. Big-box retailers and power centers are replacing more traditional site arrangements. This is causing some dislocation in existing facilities and increased demand for new construction appropriate to the big-box format. Back office regional operations and specialized retail and entertainment uses have been particularly active in the last few years. Further, the emerging role of the smaller communities is creating a more dispersed market demand into rural areas that will eventually enhance overall retail market activity.

Office Market

Data provided by Colliers Tingey shows that the retail market in the Fresno-Clovis Metropolitan Area now includes 12.6 million square feet of space and has been growing at approximately 400,000 square feet per year. The vacancy rate in 1996 was 10.8 percent. Permit data for the city of Fresno reveal a growing trend in new office construction. Permit value in 1996 reached \$12.7 million, the highest level in the past four years. While this represents a market growth rate of approximately 3.3 percent, average overall lease rates have increased by less than two percent per year. For the metropolitan area as a whole, lease rates were reported at \$1.28 per square foot (full-service equivalent).

Industrial Market

Fresno has made significant strides in developing the industrial real estate market. The market consists of over 36 million square feet of space in more than 1,000 buildings, and represents the largest component of the region's commercial real estate market. Vacancy rates have remained in

the five to six percent range since 1993. New construction has favored build-to-suit projects, such as the 112,000-square-foot Airborne Express building completed in 1994.

Recent interest in industrial development has focused heavily on warehouse and storage facilities, based on the area's central location in the state and convenient access to surface transportation networks. City of Fresno data on new permits issued, for example, shows that of the 167 permits for new construction issued from 1993 to 1996, 27 are for manufacturing uses and 140 are for storage and warehousing uses. Included among these is speculative construction of warehouse and storage facilities.

Several communities, both within and outside of Fresno County, are planning to develop industrial parks to improve their competitive position in the market since the lack of quality space has been identified as a serious deficiency. Smaller communities within the larger region have become particularly active and more competitive in attracting industrial development. In the past, the availability of relatively inexpensive land was offset by constrained labor pools. However, these places are less and less impeded by this obstacle as the urban workforce demonstrates a willingness to travel to their place of employment.

3.3 REVIEW OF FISCAL CONSIDERATIONS

INTRODUCTION

Fresno County's budget reflects the varied types of functions it must perform. Although, the County allocates most of its budget to support state and federal public health and welfare programs, it also provides municipal services (such as police protection, development services, and roads maintenance) to the unincorporated areas of the county. The County also serves as the allocator of property tax and other revenues to municipalities.

Since the early 1980s, the County has developed several policies that are designed to rationalize the allocation of limited funds to residents in unincorporated rural and urbanizing areas and share responsibilities with the majority of the 15 cities in Fresno County. The County has a responsibility to provide both municipal services (i.e., police and planning) to the unincorporated areas and mandated services (i.e., health and welfare) to all County residents. As annexations took place in the early 1980's, the county's tax base has been reduced. At the same time the demand for State mandated services to all residents increased. Therefore, the County had to find a way to reduce municipal services in the unincorporated areas and shift revenue derived from those areas to mandated services.

In response to these trends, the County has negotiated a series of Memorandums of Understanding with the cities in Fresno County. These tax sharing agreements are designed to fairly allocate taxes among the cities and County to cover the costs of providing services they consumed. The basis of these agreements was the calculations of the "net county cost" of providing county-wide services to each city. Net county cost is the difference between the cost of providing county-wide services in each city and the amount of property taxes generated in each city that the County receives.

Of the approximately \$800 in annual revenues, the County receives about only \$41 million in "discretionary" funds. This money is predominantly spent for providing traditional municipal services, such as land use and development and general administrative functions. This limited

money can lead to a general shortage of municipal services. It also leads to increased dependency on special service districts. Discretionary funds are almost completely generated through sales and property taxes. However, the power to levy these taxes has been severely limited by state law. Further, in recent years the County's share of property taxes has been shifted to education. Also, the recently passed Proposition 218 has the potential to severely limit the County's ability to form special districts.

Therefore, similar to most counties, cities and regions in the state, high tax generating activities, such as retail development and upscale residential, are the most desirable types of development since they provide more sales and property taxes that can support municipal services and be used as discretionary revenue. On the other hand, multi-family residential development has a low property tax generation per unit rate and does not attract higher end retail development. Local governments find that this type of development requires more municipal services (police and school) and drains discretionary revenue.

New state and federal initiatives have a great impact on county governments because so much of their money is spent implementing state and federal health and welfare programs. The recent volatility of new health and welfare regulations have had the largest impact on the County budget than any other trend. State regulations in the early 1990's that transferred health care responsibilities to counties have contributed to increasing County expenditures. Decreasing welfare caseloads have somewhat offset these increasing expenditures.

Recent federal welfare legislation may have a serious impact on the County's budget. In 1996, the Congress passed welfare "reform" giving new flexibility to states to design welfare programs. The County may suffer from increased General Assistance welfare payment because the new federal government legislation has allowed the State to pass legislation eliminating food stamps and Social Security Insurance cash grants to immigrants. The future effect of welfare reform is unknown because the State has yet to debate the many welfare reform proposals.

FUNDS OF THE COUNTY BUDGET

Fresno County organizes its budget into 11 funds, not including enterprise funds. The amounts allocated to each fund in the 1996/97 budget are shown below in Table 3-31.

TABLE 3-31 SUMMARY OF FRESNO COUNTY BUDGETARY FUNDS (Not including Enterprise Funds) Fiscal Year 1996-1997		
Fund	Budget	Percent of Total Budget
General	\$776,324,438	82.87%
California Health care For Indigents Programs (CHIP)	\$4,350,443	0.46%
Health and Welfare	\$80,599,320	8.60%
Emergency Medical Services	\$1,115,677	0.12%
Road	\$40,496,019	4.32%
San Joaquin Valley Library System	\$2,110,174	0.23%
Fresno County Free Library	\$5,487,789	0.59%
Fish and Game	\$31,030	0.02%
Off Highway Licence	\$23,407	0.05%
Community Redevelopment	\$68,118	0.01%
Trial Court Operations	\$25,654,753	2.74%
TOTAL	\$936,806,168	100.00%
Source: County of Fresno 1996-97 Adopted Budget		

General Fund

At 83 percent of the total County budget, the General Fund is by far the largest of any County fund. The General Fund finances the legally authorized activities of the County of Fresno not provided for in other specialized funds and accounts for the most discretionary revenue of any County fund.

Figure 3-26 shows that per capita General Fund revenues and expenditures steadily increased between 1986 and 1993. From 1991 to 1993 per capita expenditures sharply increased to a high of \$1,004 per capita and then decreased to \$958 by 1995. This pattern occurred because of increased caseloads in the 1980s and new state health initiatives in the early 1990s. Fresno County social service caseloads then decreased around 1993. These trends are investigated in more detail in the discussions of Health Services and Social Services.

Despite state requirements to have a balanced budget, revenues earmarked for the General Fund total \$766,877,598 in the 1996/97 budget, \$10 million less than total expenditures. A \$10 million balance in reserve from the previous year makes up this shortfall.

General Fund Revenues

The County derives General Fund revenues from property taxes; sales and use taxes; license, permit, and franchise fees; fine, forfeiture, and penalty income; the use of money and income; other governmental units; charges for County services; and other miscellaneous sources.

Figure 3-27, depicts the proportion of General Fund revenue generated from each source. This figure clearly shows that intergovernmental revenues dominate the County budget.

Figures 3-28 and 3-29 show that, as a percentage of total General Fund revenues, three revenue sources fluctuated between 1985 and 1995: the "other revenue" category increased around 1991 (this category consists mostly of transfers from other County departments); "taxes" began to decrease in about 1993; and intergovernmental revenues increased around 1993. The factors behind these trends are covered in the following sections.

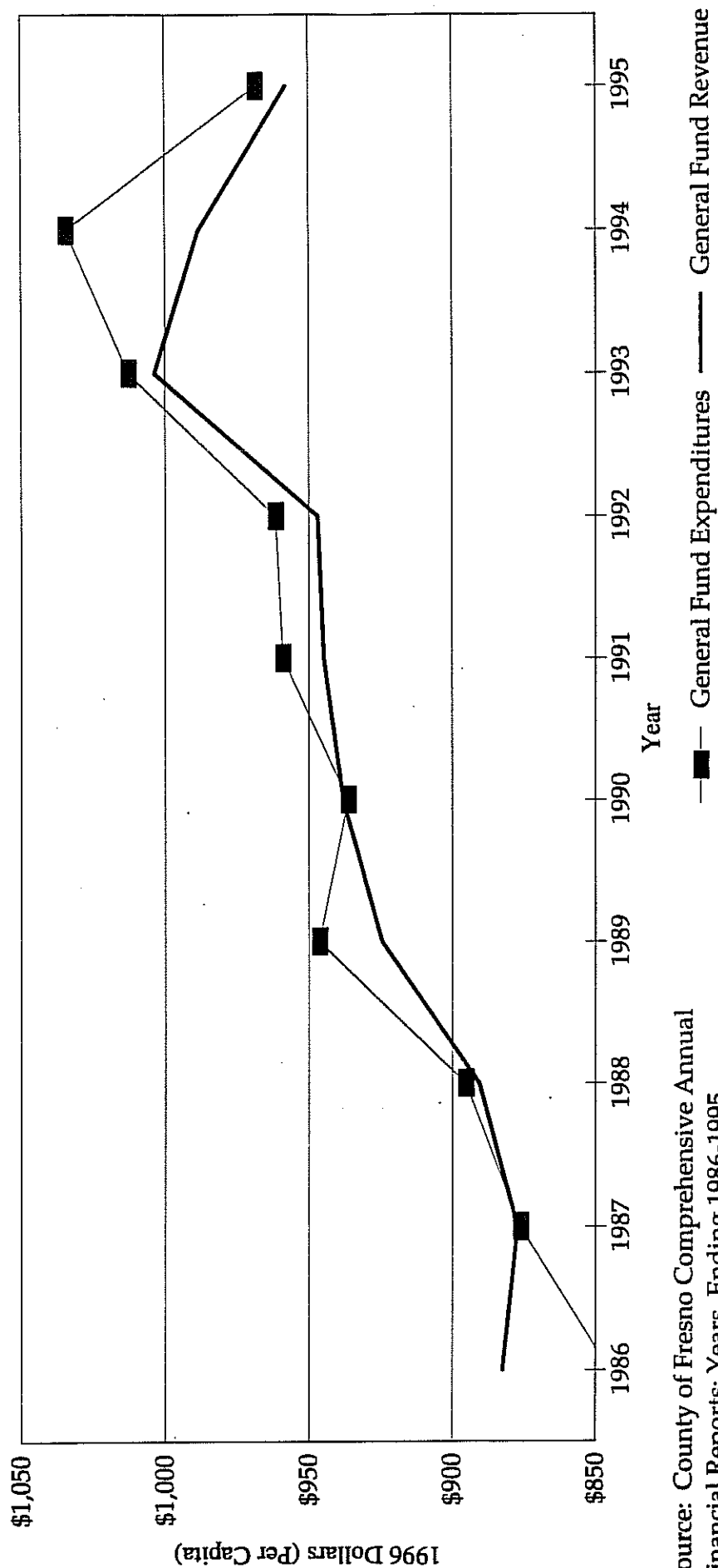
The following sections are a summary of revenue sources organized by size (i.e., largest to smallest) greatest contributions into the General Fund.

Non-Departmental Revenues and Discretionary Funds

Non-departmental revenues are revenues that are not generated through the activities of individual departments. These revenues fund the difference between the total cost of operating departments and the amount of revenue earned from departmental activities (i.e. fees, penalties, etc.). Fresno County's non-departmental revenues are listed in Table 3-32.

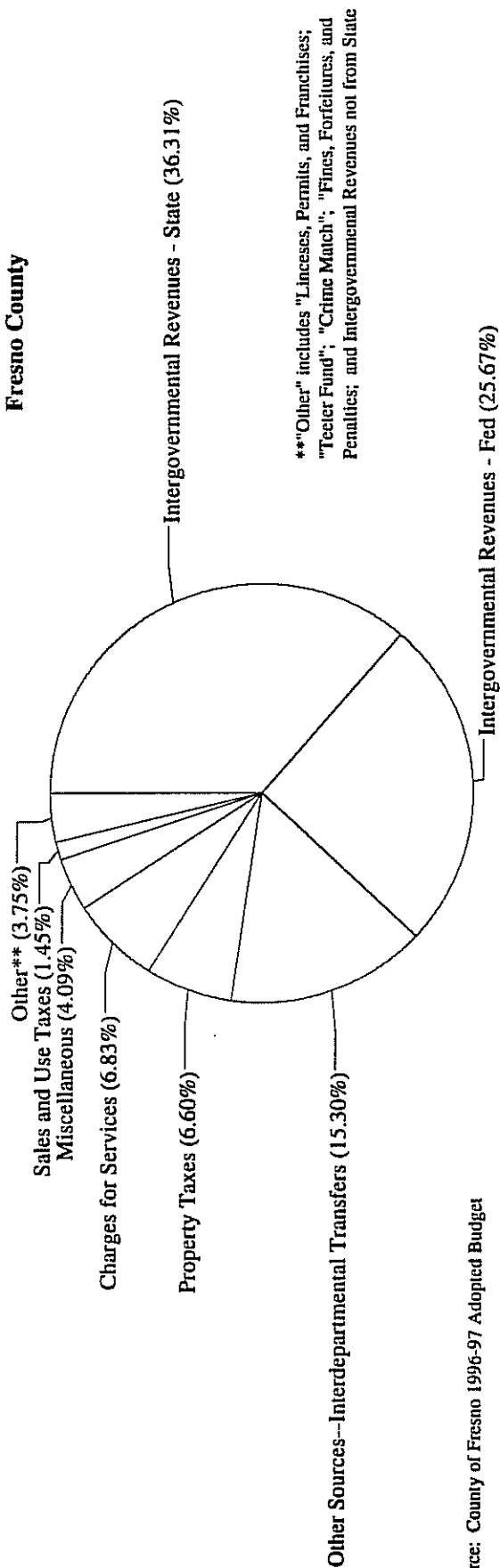
Although these funds are used to cover the cost of operating departments, only a fraction of the money is actually "discretionary." Much of these funds are earmarked for specific functions. For instance, the County provides a matching "maintenance of effort" funding of \$74.9 million for local public safety to receive Proposition 172 sales tax funding in the 1996/97 budget. The County must also spend \$31.4 million in matching funds in order to receive funding for health care. With the \$18.2 million in matching money for Human Services funding, the County only has \$41.8 million of non-departmental funds received in 1996/97 that it is truly allowed to spend as it chooses. out of a total budget of about \$830 million. This is only about five percent of the total County budget. Nearly all this discretionary money is generated from sales and property taxes.

FIGURE 3-26
GENERAL FUND REVENUES AND EXPENDITURES
Fresno County



Source: County of Fresno Comprehensive Annual
 Financial Reports: Years Ending 1986-1995

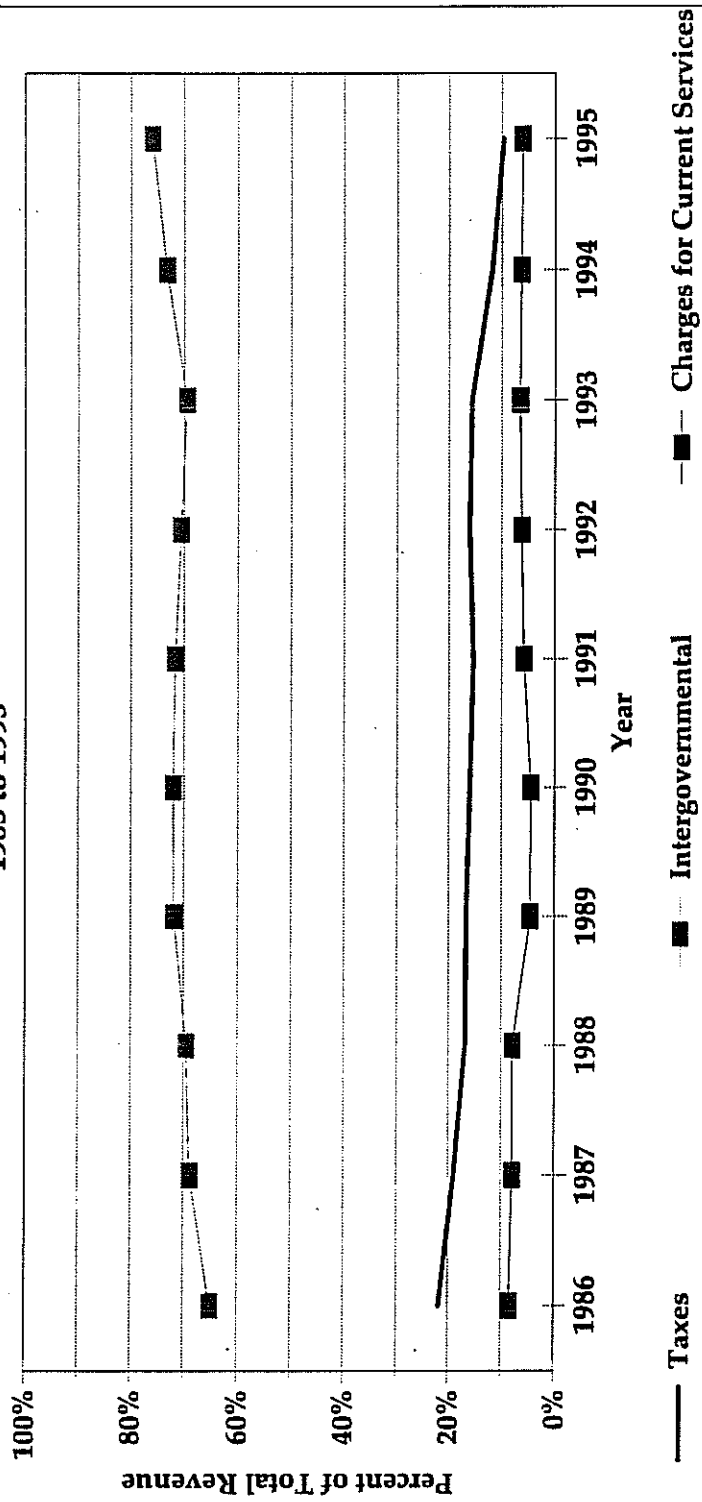
FIGURE 3-27
GENERAL FUND REVENUES BY MAJOR SOURCE
Fresno County



Source: County of Fresno 1996-97 Adopted Budget

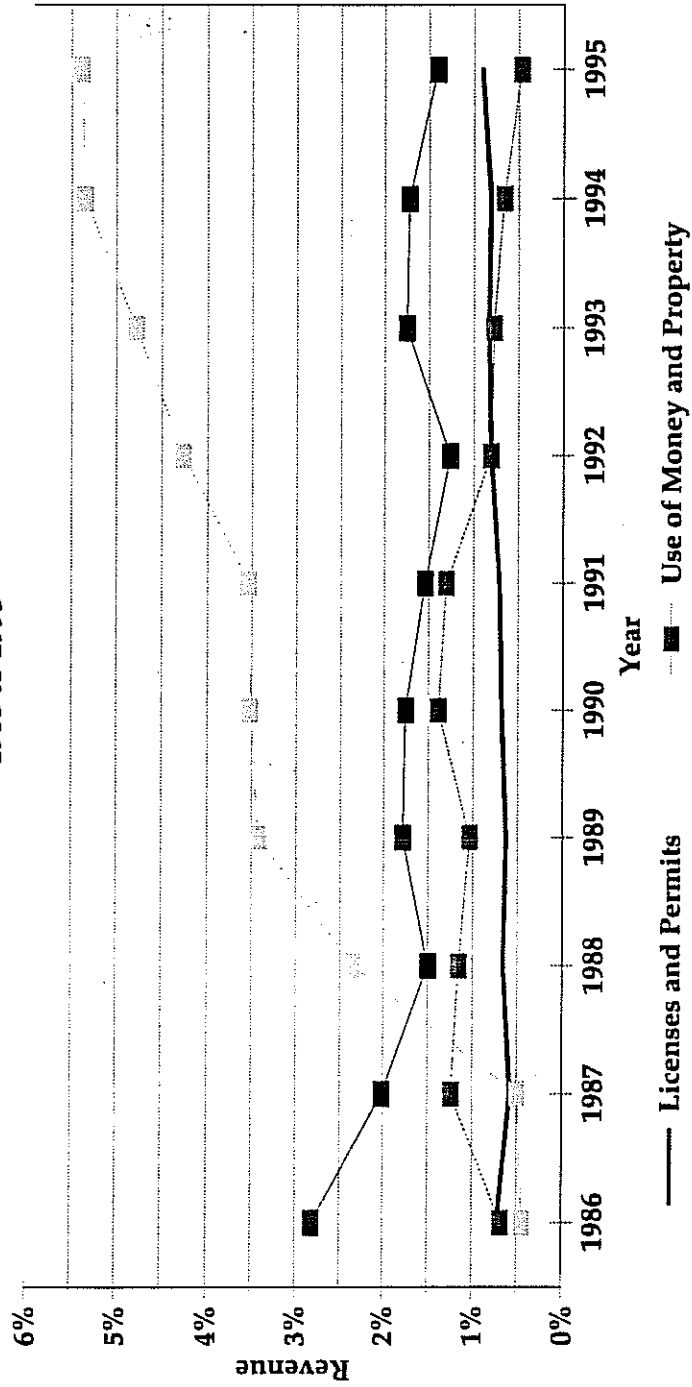
FIGURE 3-28

TOTAL GENERAL FUND REVENUES
Fresno County
1985 to 1995



Source: County of Fresno Comprehensive Annual Financial Reports: Years Ending 1986-1995

FIGURE 3-29
TOTAL GENERAL FUND REVENUES
Fresno County
1985 to 1995



Source: County of Fresno Comprehensive Annual Financial Reports: Years Ending 1986-1995

TABLE 3-32 SUMMARY OF NON-DEPARTMENT REVENUES Fresno County Fiscal Year 1996-1997	
Property Taxes	\$49,490,000
Sales Taxes	\$10,800,000
Other Locally Generated Taxes	\$4,340,000
License Permits and Franchises	\$2,150,000
Use of Money and Property	\$7,300,000
Intergovernmental Revenue State	\$70,150,365
Intergovernmental Revenue Federal	\$160,000
Charges For Services	\$3,196,000
State Health and Welfare Realignment	\$22,817,351
SUB-TOTAL	\$167,309,771
Fund Balance	\$10,000,000
TOTAL	\$177,309,771
Source: County of Fresno 1996-97 Adopted Budget	

As Table 3-33 shows these discretionary funds are distributed among a wide variety of departments. The table also shows that relatively little revenue is available to fund traditionally municipal functions such as land use and development and general administrative functions after non-discretionary funding is removed from the budget.

Tax Sharing, Land Use, and Net County Cost

This trend of limited discretionary funds was compounded as Cities within Fresno County began to accelerate the annexing of unincorporated land. Annexation shifted sales tax revenue from annexed land from the County to the cities. At the same time, the County had to continue to provide countywide services to the residents and businesses absorbed into the cities. County-wide services are those services that the County provides regardless of whether they reside within a city or an unincorporated area. These includes justice, the health, and social services among others. The County no longer had to provide municipal services such as public safety, planning, and zoning to the newly annexed areas. However, these savings did not cover the sales taxes lost during the annexation process. Therefore, people living in unincorporated areas paid taxes that subsidized county-wide services to residents in incorporated areas.

The County was especially hard hit when residents were incorporated into a city. This is because residents demand the full range of county-wide services listed above. Commercial uses, on the other hand, demand primarily municipal services and industrial uses require limited municipal services and even less county-wide services.

Fresno County reacted to this trend in the late 1980's by negotiating memoranda of understanding (MOUs) with various cities. These tax sharing agreements are designed to fairly allocate taxes among the cities and county to cover the costs of providing services. Tax sharing agreements were designed so that residents within cities paid for the county-wide services they consumed. A detailed listing of each Memorandum of Understanding is provided in Appendix 3-B.

The basis for these agreements was calculations of the "net county cost" of providing countywide services to each city. The original analysis was prepared in 1987. The County updated the analysis in 1998, comparing the share of County discretionary revenue used to provide countywide services in each of the fifteen cities and unincorporated area to property and sales tax revenues produced in those areas. Even with the existing tax sharing agreements, the analysis found that the County spends far more providing Countywide services to city residents than it receives in property and sales tax revenues generated within those areas.

TABLE 3-33 DISTRIBUTION OF DEPARTMENTAL REVENUE Fresno County Fiscal Year 1996-1997 (in Millions)			
Department	Matching and Maintenance Of Effort Funding	Discretionary	Total
Justice Services	74.9	19.0	93.9
Land Use & Development	—	2.3	2.3
Admin and Fiscal	—	19.8	19.8
Health Services	31.4	0.4	31.8
Human Services	18.2	2.2	9.1
Source: County of Fresno 1996-97 Adopted Budget			

Intergovernmental Revenues

Revenues received from federal and state sources account for nearly two-thirds of General Fund revenue. Much of this money is spent to fulfill the County's role as an agent for the State and Federal government to carry out health care, social welfare programs, and justice services. With very few exceptions, federal and state agencies earmark the moneys for these specific functions. However, the State provides significant funding to the County through the motor vehicle in-lieu tax, which is not earmarked for a particular purpose.

Table 3-34 shows that funding for welfare and human services is the most prominent source of revenue in this category.

TABLE 3-34

**SUMMARY OF GENERAL FUND REVENUE FROM
STATE AND FEDERAL SOURCES BY FUNCTION**

**Fresno County
Fiscal Year 1996-1997**

STATE SOURCES		
Function	Revenue	Percent
Health	\$10,076,798	3.62%
Welfare and Human Services	\$155,930,141	56.04%
Transportation	\$54,692,948	19.66%
Justice Services	\$38,081,998	13.69%
Agricultural Services	\$7,629,235	2.74%
Other	\$11,851,976	4.26%
TOTAL	\$277,148,893	100.00%
FEDERAL SOURCES		
Function	Revenue	Percent
Health	\$1,570,359	0.01%
Welfare and Human Services	\$165,507,392	84.14%
Other	\$12,575,026	6.39%
CDBG/Housing	\$17,041,779	8.66%
TOTAL	\$196,694,556	100.00%
Source: County of Fresno 1996-97 Adopted Budget		

Per capita state funding increased steadily from 1986 to 1990 before dipping and rising again in 1994 (See Figure 3-30). This is mainly due to the changing social service and health care needs of the county. Trends in Social Services and Health Services are discussed later in this chapter. In real dollars, per capita federal intergovernmental revenues have stayed relatively steady since 1985.

Intergovernmental revenues should increase at the same rate as residential development of the entire county. This is because health care, social welfare programs, transportation and justice services in both unincorporated and incorporated areas, and social service needs increase with population. Of course, federal and state rules could change and thus increase or decrease per capita revenues for these programs. Also, new residents may not have the same need for social services as existing residents. Overall, however, population growth is the most accurate predictor of future intergovernmental revenues.

Other Financing Sources

Transfers from other County funds into the General Fund dominate the "Other Financing Sources" General Fund revenue classification. Most of the transfers originate from the Health and Welfare Trust special revenue fund, which uses monies collected from a one-half cent sales tax and a vehicle license fee (VLF). This funding replaces traditional state revenues earmarked for health and welfare programs eliminated or reduced by "Realignment". Realignment was a program instituted by AB 1288, the 1991 state law that shifted various administrative and financial responsibilities from the State to the counties. The ending of funding from AB 90 hit counties especially hard. This bill funded public health, social services, mental health, indigent health, and juvenile justice programs.

Most of the remaining transfers are funds from the Valley Medical Center Enterprise to reimburse the General Fund local match required to obtain funding from the Disproportionate Share Provider Payment Adjustment Program (SB 855). This 1991 bill provides for supplemental medical payment to hospitals that serve a disproportionate share of Medi-Cal and low income patients. Due to last year's buyout of the Valley Medical Center, the County will eliminate this transfer in the next budgets because the funding will go to CHCC and not the County. The contract with CHCC, however, provides that after five years these funds will be used to reduce the County's direct payment to CHCC. Realignment and SB855 caused "other revenues" to increase from about 3.5 percent of total revenue in 1991 to about 5.5 percent in 1995.

On average, the Vehicle License Fees and sales tax should grow with overall County population growth (for details on the sales tax projection, see below).

Property Taxes

Property Taxes represent about seven percent of General Fund revenues and are the most important discretionary revenues available to the County to fund local programs. In recent years, Fresno County's share of property tax revenues have declined due to a shift in the allocation of funds from counties and local governments to the schools. Proposition 13 (1978) and the Educational Revenue Augmentation Act (1993) are the two state laws that determine the allocation of property tax revenues between the County, local governments, other districts and taxing entities. Proposition 13 requires that:

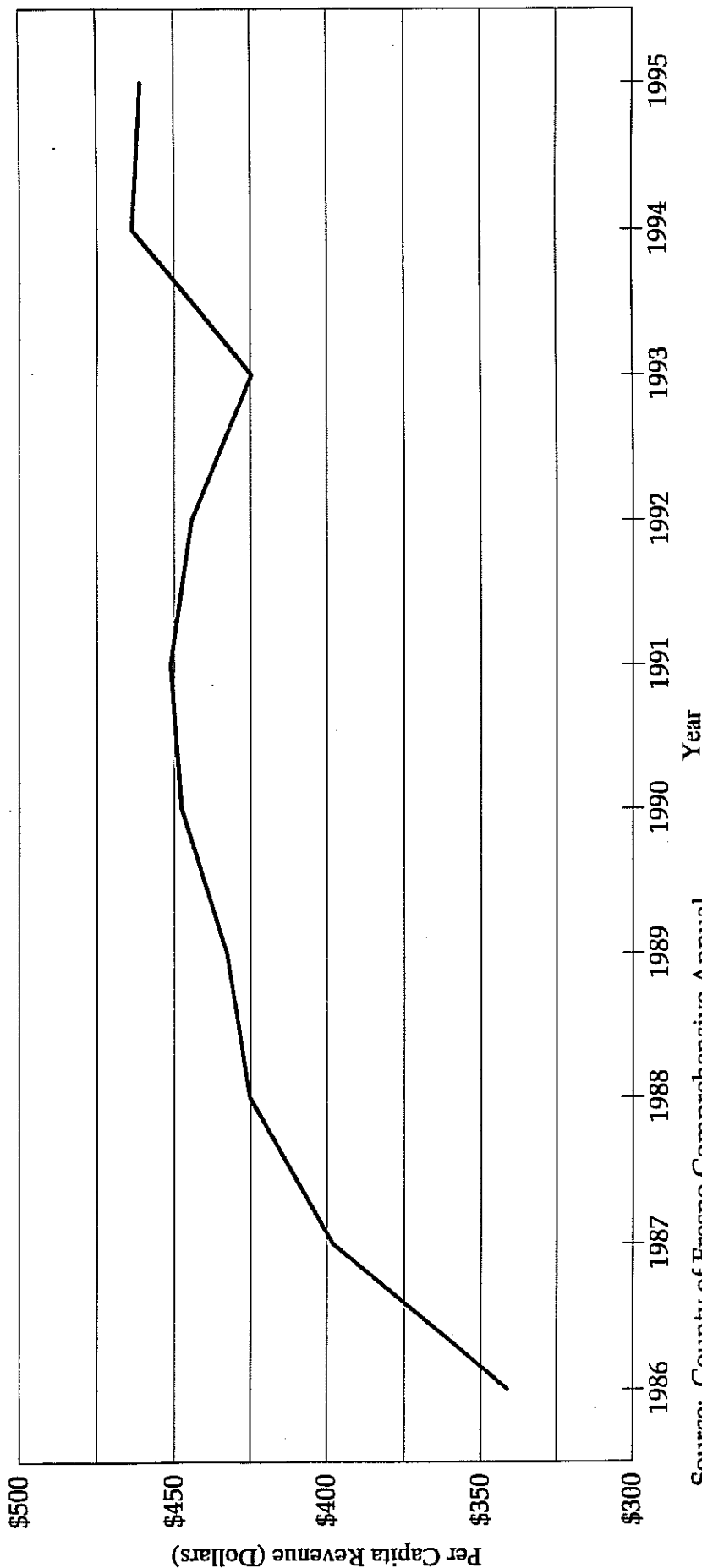
- Property tax is limited to one percent of a property's assessed value.
- Assessed value increases two percent per year, unless a property changes ownership. In that case the county reassesses the property at market rates.
- The county cannot increase property tax rates or incur debt through a General Obligation Bond without a two-thirds vote of approval by the electorate.

The Educational Revenue Augmentation Act shifted property taxes from counties, cities, and special districts into the Educational Revenue Augmentation Fund (ERAF) for school funding. According to the State Department of Equalization, the County received 13 percent of all property tax dollars collected in Fresno County in 1996. This is down from 26 percent in 1993.

Figures 3-31 and 3-32 show that these legislative actions have negatively affected the property tax revenue collected by the County. Between 1986 and 1993, Proposition 13 was in effect but ERAF was not. During this time, property taxes decreased 12 percent, while assessed value of County property increased about four percent. Between 1993 and 1996 when counties shifted money into ERAF and followed the rules of Proposition 13, Fresno's property tax revenue decreased about 42 percent, despite a two percent increase in assessed value.

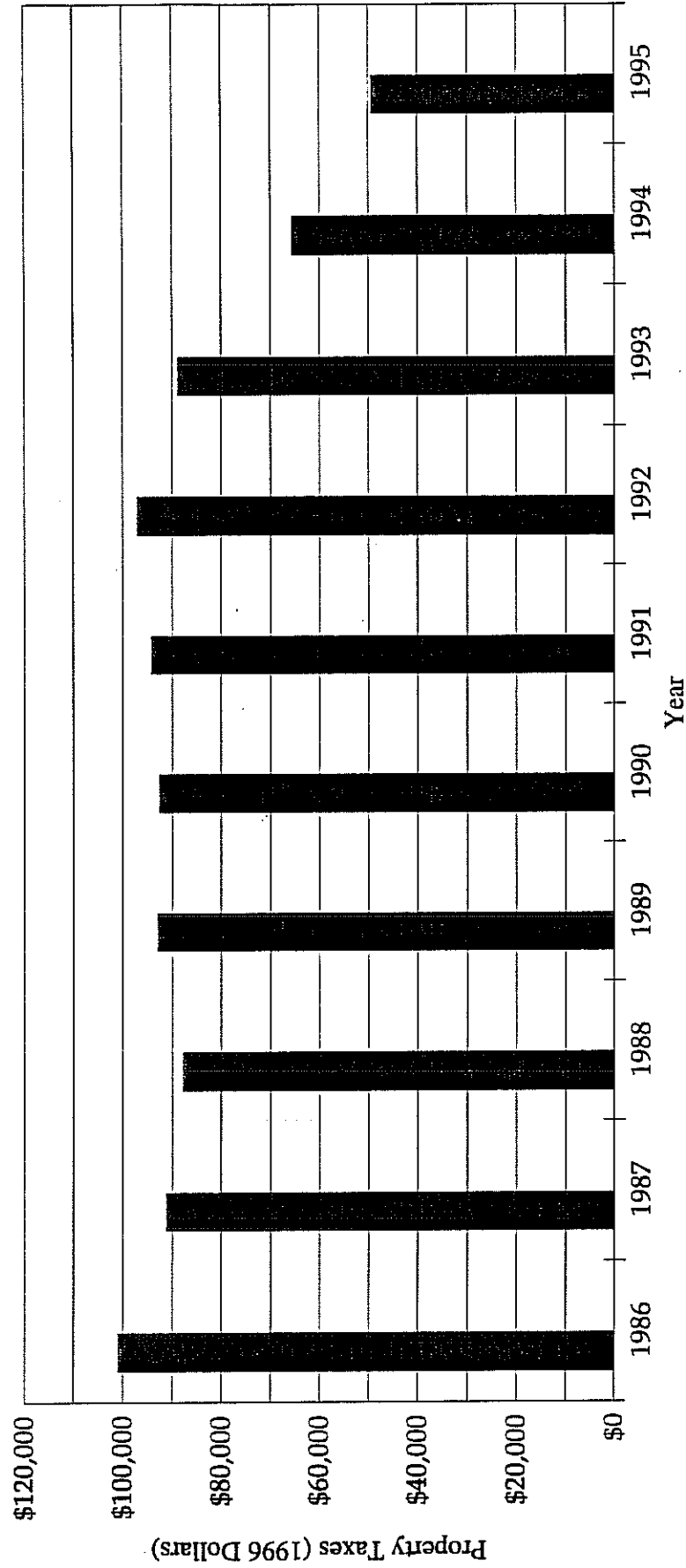
Property tax revenue from redevelopment areas is collected differently. The amount of taxes collected by the County at the initial time of redevelopment are typically "frozen" and the County receives that amount of money on an annual basis. In subsequent years, the redevelopment agency receives the "tax increment". That is, the agency receives the net increase in property taxes due to inflation and improvements to the area.

FIGURE 3-30
REVENUES FROM THE STATE OF CALIFORNIA
Fresno County



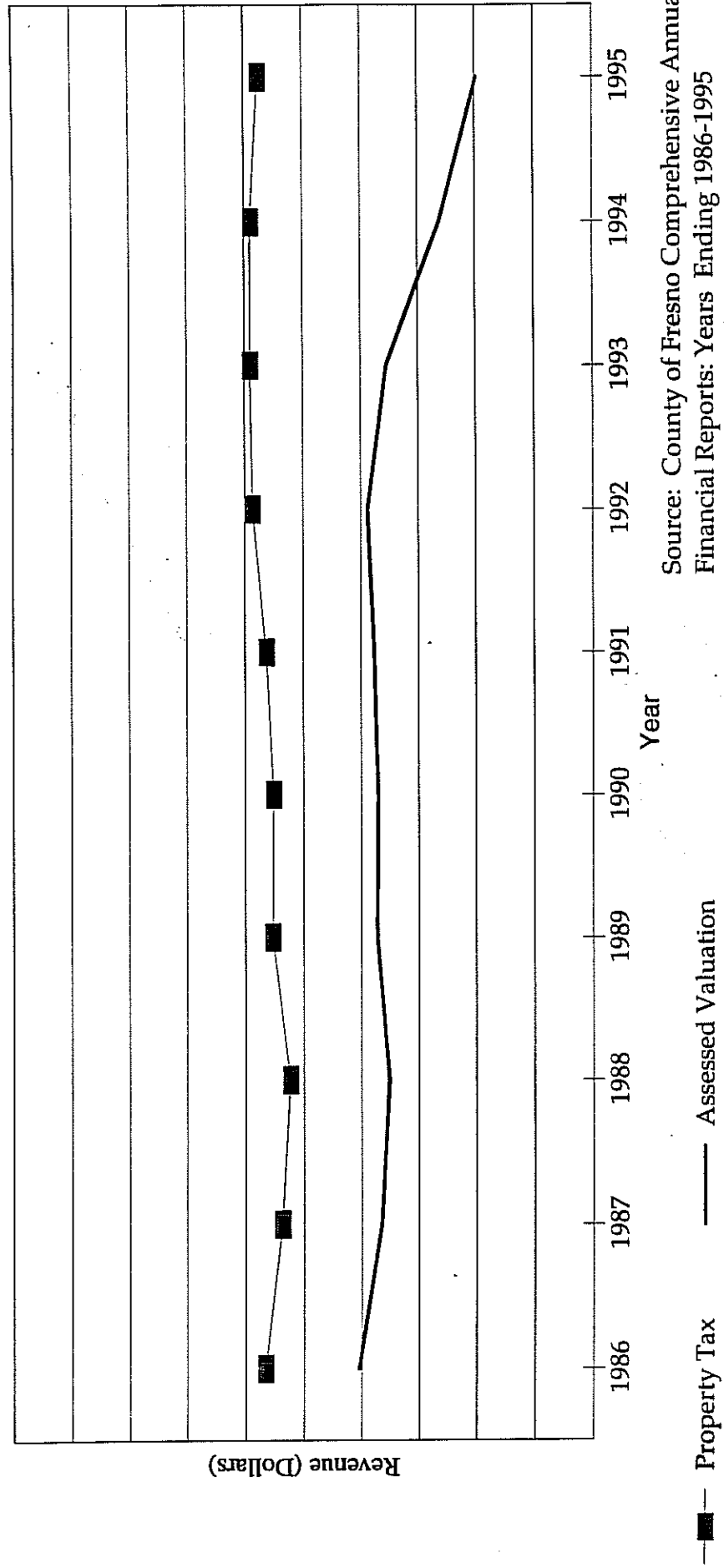
Source: County of Fresno Comprehensive Annual
 Financial Reports: Years Ending 1986-1995

FIGURE 3-31
PROPERTY TAX REVENUE
Fresno County



Source: County of Fresno
 Comprehensive Annual Financial

FIGURE 3-32
ASSESSED VALUE AND PROPERTY TAX TRENDS
Fresno County



Several factors will affect the future level of property tax revenue. Of course, increases in the value of land will increase property taxes. New development and the rate at which people buy and sell properties will have a particularly significant effect on property tax revenues because Proposition 13 allows a market value assessment of newly sold properties.

The extent to which the County directs development into incorporated areas will also affect future property tax revenue. The County has "Memoranda of Understanding" (MOUs) with thirteen of the county's 15 cities. Generally, each city agrees to pay a certain proportion of property tax money to the County, in return for the County directing development activity into the municipal areas, or spheres of influence. These agreements range from 45 percent returned to Mendota, to 33 percent returned to San Joaquin. A more detailed review of the MOUs appears in Appendix 3-B.

Charges for Services

The Charges for Services budgetary classification accounts for about seven percent of General Fund revenue. It covers fees charged to citizens and other governmental units over a wide range of County departments. Table 3-35 shows that three Charges for Services revenue sources, (i.e., justice services, health services, and General Government), dominate this category. More than half of these charges are from justice services through general law enforcement and the Jail and Farm Work Furlough Program. Medi-Cal patient fees comprise the great majority the health care revenues portion of the Charges for Services category. Revenue from the "General Government" category is mostly generated from services to other County funds.

TABLE 3-35 SUMMARY OF GENERAL FUND REVENUE FROM CHARGES FOR SERVICES BUDGET CATEGORY Fresno County Fiscal Year 1996-1997		
Function	Revenue	Percent
General Government	\$9,180,830	17.54%
Health	\$12,106,342	23.13%
Welfare and Human Services	\$425,200	.81%
Justice Services	\$22,073,103	42.18%
Community Development	\$1,495,411	\$2.86%
Parks and Recreation	\$1,266,326	2.42%
Other	\$5,786,631	11.06%
TOTAL	\$49,365,078	100.00%
Source: County of Fresno 1996-97 Adopted Budget		

The Charges for Services budget category averaged \$59 per capita between 1986 and 1996 reaching a high of \$76 in 1988 and a low of \$47 in 1990. The per capita revenue for 1996 was \$55.

Generally, these revenues should increase proportionately with the added population that comes with residential growth throughout the county. However, the revenue generated from public safety and general government charges for services will increase with both residential and commercial development.

Miscellaneous Revenues

The "Miscellaneous Revenues" category accounts for about \$31 million or approximately four percent of the General Fund revenue in the 1996/97 County Budget. This translates into a \$41 per capita revenue source. Welfare repayments, resulting from the recovery of money from welfare fraud, is around \$25 million of the revenue in this category. Another \$2.2 million comes from child support repayments. These sources account for over 80 percent of the revenue in this category.

These revenues should increase proportionately with the added population that comes with new residential development.

Sales and Use Taxes

This category combines all County taxes outside the property tax. These taxes include sales, timber yield, airplane, room (a tax on hotel stays), and racehorse taxes. Revenue from this category totals \$11,140,000 or about 1.5 percent of the County General Fund revenue.

The \$10.8 million collected through sales tax for the General Fund is the primary source of revenue in the Sales and Use Taxes category. Compared with municipalities, sales tax is a small percentage of total general fund revenue. Most of the County sales tax (7.25 cents per dollar) does not go into the County General Fund: five cents of each taxable sale dollar go into the State general fund and some of the money that goes to the County must be shared with the cities. The distribution of sales taxes is listed in Table 3-36.

TABLE 3-36 DISTRIBUTION OF FRESNO COUNTY SALES TAX Fiscal Year 1996-1997		
Recipient	Amount of Sales Tax	County Use Restrictions/Sharing Agreement
State of California	5 cents	NA
Fresno County/Cities	1 cent	Not restricted. Shared per County/City Agreements
Local Transportation Fund	.25 cents	Restricted to transportation uses. 22.89 percent County Road Fund, remaining to COFCG, Fresno County Rural Transit and cities for FY 1996/97.
County—Public Safety	.50 cents	Restricted to Public Safety functions.
County—Transportation Measure C	.50 cents	Restricted to County road projects in unincorporated areas and the cities.
Total	7.75 cents	NA
Source: John Popp, Economic Development Analyst, Public Works and Development Services Department.		
**For specific City/County apportionment for each City refer to Appendix 1.		

Sales Tax is a significant source of discretionary revenue for the County in spite of the fact that much of the revenue is earmarked, shared, or spent in incorporated areas. The State returns one cent of each taxable sale dollar to the jurisdiction where the transaction is made and placed in that General Fund. In other words, if the sale is made in an unincorporated area, the full tax goes to the County General Fund. If the sale is made in a city then that city keeps the money for their general fund. However, as previously discussed, Fresno County does have a "memoranda of understanding" with many cities where the cities agree to return a certain proportion of this money to the County in return for County services and the County directing development into municipal areas. Appendix 3-B has the specific breakdown of the tax sharing agreement for the cities in the County.

TABLE 3-37 PER CAPITA TAXABLE SALES Neighboring Counties 1995			
County	Incorporated	Unincorporated	Entire County
Tulare	\$8,929	\$2,630	\$6,380
Merced	\$7,061	\$2,593	\$5,332
Kern	\$8,995	\$5,098	\$7,239
Fresno	\$8,728	\$4,073	\$7,672
Source: Department of Finance and Board of Equalization			

Table 3-37 shows that per capita sales in Fresno County's unincorporated area is nearly 65 percent higher than that of Tulare or Merced, but about 20 percent lower than Kern. Since per capita

taxable sales of incorporated areas in the four counties are comparable, this is probably an indication that the county capture of retail sales is relatively strong in the unincorporated areas.

Predicting sales tax poses a particular problem because growth in sales can be tied to population (residential development) increases or to the amount of commercial space built in the county. In most jurisdictions, there is a strong correlation between population growth and sales tax over the long term, although there can be pronounced short term variability due to recessions and other factors. For instance, taxable sales increased an average of 2.15 percent between 1986 and 1995, despite a decrease of 3.74 percent during the recession years of 1991 and 1992. Meanwhile, annual county population steadily increased by 2.68 percent between 1986 and 1995. Figure 3-33 shows the trend of per capita taxable sales in Fresno County from 1986 to 1995. Refer to Chapter 1 "Population" and earlier in this chapter for estimates on population growth in Fresno County.

Besides the fact that countywide population is generally a good predictor of sales tax over the long term, there are other reasons for selecting this method. For example, the amount of sales tax generated per square foot of commercial development varies greatly based the type of goods sold. Since specific projections about the mix of commercial development are difficult to ascertain, population is probably the best predictor of sales tax revenues. Population is also a good predictor of the other taxes in this category. The Board of Supervisors has repealed the room tax, a relatively small source of revenue (\$100,000 in the 1996/97 Budget).

If the County wants to reinstate a room tax, the courts have held that taxes such as the room tax must be submitted to a vote prior to implementation. In fact, under Proposition 62, passed in 1986, no general tax (a tax that goes directly into the general fund) may be imposed without a two thirds vote of all members of the Board of Supervisors and a majority vote of the people. Further, any special tax, taxes for a specific purpose, must be voted in by two-thirds of a vote of the people. The 1995 California Supreme Court Case *Santa Clara County Transportation Authority vs. Guardino* held Proposition 62 constitutional. This placed the County's one-half sales tax for transportation funding (Measure C, 1986) in danger of being recinded. However, these sorts of taxes were ruled legal by the courts in a 1997 court case involving a similar tax in Santa Clara County.

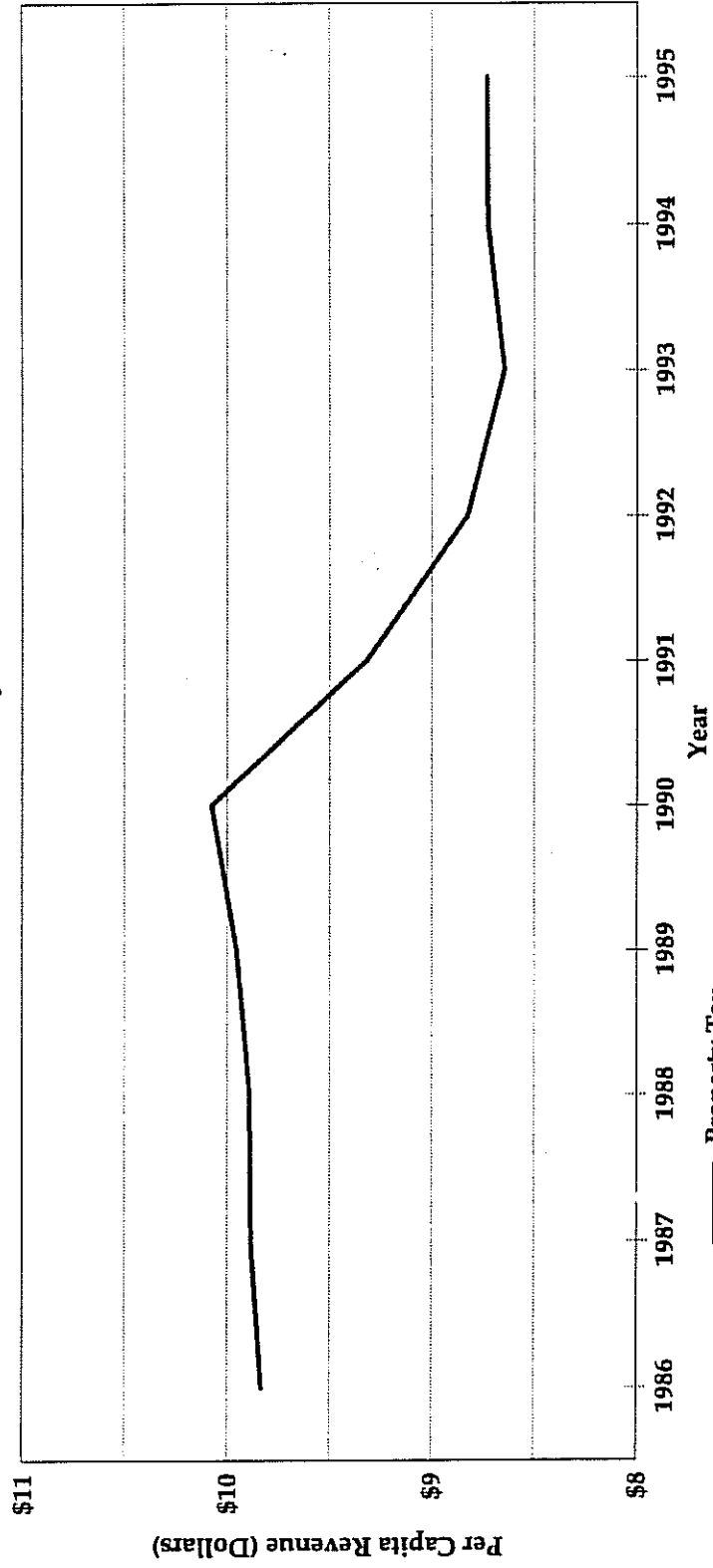
Remaining Categories

The remaining categories, "Use of Money and Property," "Licenses, Permits, and Franchises," "Teeter Fund", "Crime Match," and "Fines, Forfeitures, and Penalties," combine for slightly less than four percent of the General Fund Revenue.

More than 92 percent of the \$8,077,261 revenue placed in the "Use of Money and Property" category is from interest collected from the Treasury Investment Pool and the Employees' Retirement Association, a Pension Trust Fund. This revenue has increased in close correlation with the increase in total General Fund budget.

Franchise fees coupled with revenue generated from development service fees account for about 90 percent of the revenues collected in the "Licenses, Permits, and Franchises" category. Franchise fees from cable television will increase with population, utilities are more likely to grow with development in unincorporated areas.

FIGURE 3-33
PER CAPITA TAXABLE SALES
Fresno County



Source: Board of Equalization

The final two categories are "Crime Match" and "Teeter Fund". The Teeter Fund has been established to collect property tax money generated by jurisdictions in the County. Teeter funds totaling \$294,227 are included in the budget to offset the one time cost of computer equipment required to support departmental computer activity. As a result of Federal Crime Bill legislation, Fresno County has been authorized to receive over \$1.3 million over two years to fund specific programs concerning public safety. This will be placed in the crime match fund.

General Fund Expenditures

The budget classifies expenditures by Health Service, Human Services, Land Use and Development Services, Administration and Fiscal Services, Internal Services, and Justice Services. Figure 3-34 depicts the proportion of General Fund expenditures spent from each budget unit in the 1996/7 Budget.

Development patterns in the county produce varied affects on different government services. The expenditures of some budget units increase regardless of where development occurs in the county. Health services, for instance, is a countywide service, so its expenditures will increase wherever county residential growth occurs. Other expenditures are spent on services for unincorporated areas that are traditionally provided by municipalities. For instance, Sheriff services are nearly exclusive to unincorporated areas; therefore, growth in these areas has a more direct effect on this budget unit than growth in an incorporated city. On the other hand, growth of incorporated areas will have some effect on County law enforcement expenditures because additional city residents will contribute to increased traffic accidents and violations throughout the county and the need for jail services which the sheriff provides for the entire county.

Expenditures for budget units are tied more or less to commercial and residential land use growth, depending on the nature of the service. In general, Human Services, Health Services, Justice Services (with the exception of the Sheriff's Department) will increase in proportion to the residential population. On the other hand, expenditures for the Sheriff's patrol, Land Use and Development Services, Administration and Fiscal Services, and Internal Services increase with both commercial and residential land use. Details and exceptions are reviewed in the following sections.

Figure 3-33 shows total expenditures from 1986 to 1995. Expenditures increased sharply around 1992 and then declined until 1995. This was due to increased health care expenses around 1992 and a decrease in welfare caseloads in 1993 to 1995. The following section explains these trends in more depth and is a summary of major expenditure categories from the General Fund in order from largest to smallest.

Human Services

Table 3-38 shows the proportion of expenditures spent on various Human Services functions.

TABLE 3-38		
SUMMARY OF FRESNO COUNTY HUMAN SERVICES EXPENDITURES		
Fiscal Year 1996-1997		
Budget Unit	Expenditures	Percent of Department Budget
Librarian	\$160,063	0.04%
Social Services		
Administration	\$77,831,287	20.63%
Grants	\$1,070,002	0.28%
AFDC	\$285,288,142	75.62%
Adoptions	\$1,879,955	0.50%
In Home Supportive Services	\$8,378,464	2.22%
Aid to Refugees	\$97,500	0.03%
General Relief	\$2,408,700	0.64%
Veteran's Services	\$170,884	0.05%
TOTAL	\$377,284,997	100.00%
Source: County of Fresno 1996-97 Adopted Budget		

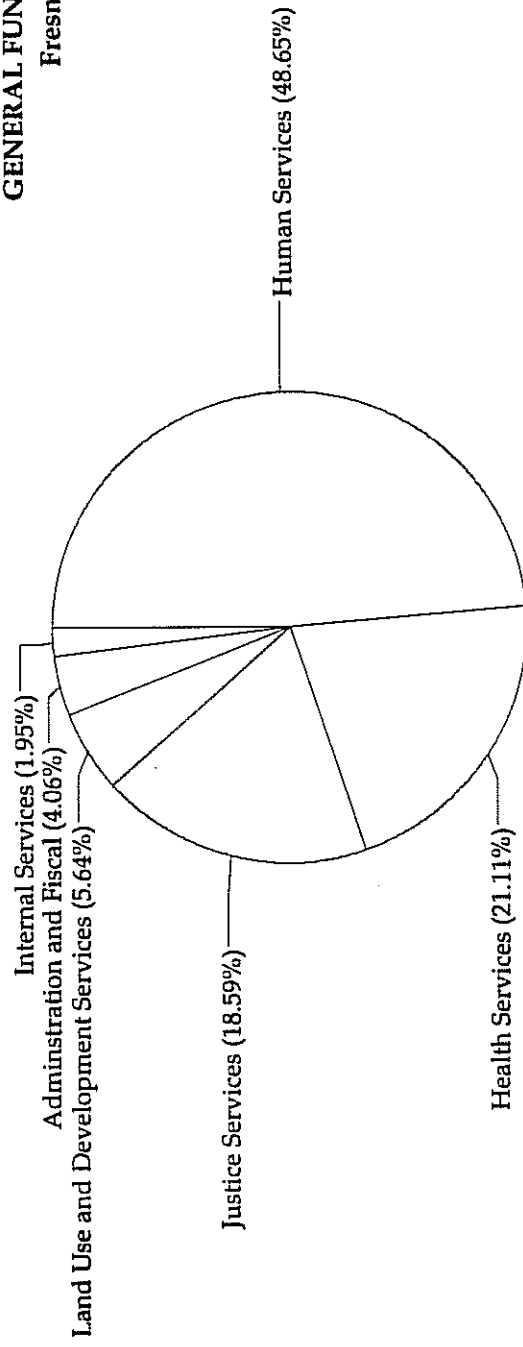
Human Services account for nearly half of all County expenditures in the 1996/97 Budget. Further, Aid to Families with Dependent Children (AFDC) payments accounted for more than 75 percent of all human services expenditures. AFDC payments are split into three groups. The Family Group, the Unemployed Parent Group, and the Foster Care program. The Family Group and the Unemployed Parent group provide mandated public assistance cash grants for families composed of eligible children, their caretakers, and other essential persons in the household. Eligibility for the Family Group is predicated upon continued parental absence from the home due to death or incapacity of one or both parents. The Family Group accounts for about two-thirds of all AFDC expenditures. The eligibility for the Unemployed Parent program is predicated upon low income due to unemployment of a parent. The third group is the Foster Care program. It provides funds to foster families to finance food, housing, and other basic needs of foster children.

When corrected for inflation, County General Fund expenditures on human services have increased 43 percent from 1986 to 1996, despite only a 29 percent increase in County population. During the past five years, however, Fresno County has seen a 1.2 percent total decrease in Human Service expenditures despite a 10 percent population increase. Figure 3-35 shows that reduced per capita caseloads around 1993 in the AFDC programs resulted in lower expenditures. This was despite an increase in the average county unemployment rate from 11.1 percent to 14.5 percent between 1991 and 1995.

Federal and proposed state legislation could have profound effects on the AFDC program. Counties must spend their revenues according to state regulations which, in turn, are based on federal regulations. In 1996 the Federal Government passed the "Personal Responsibility and Work Opportunity Reconciliation Act of 1996" (HR3734), which changes the name of the AFDC program to Temporary Assistance for Needy Families (TANF). This program provides states with broad flexibility to design replacements for the three programs described above. However, it does mandate that states meet a strict work component requirement, set a time limit of five years for recipients to receive money, and force unmarried minor teen mothers receiving funds to live at home or to live in some other adult supervised setting.

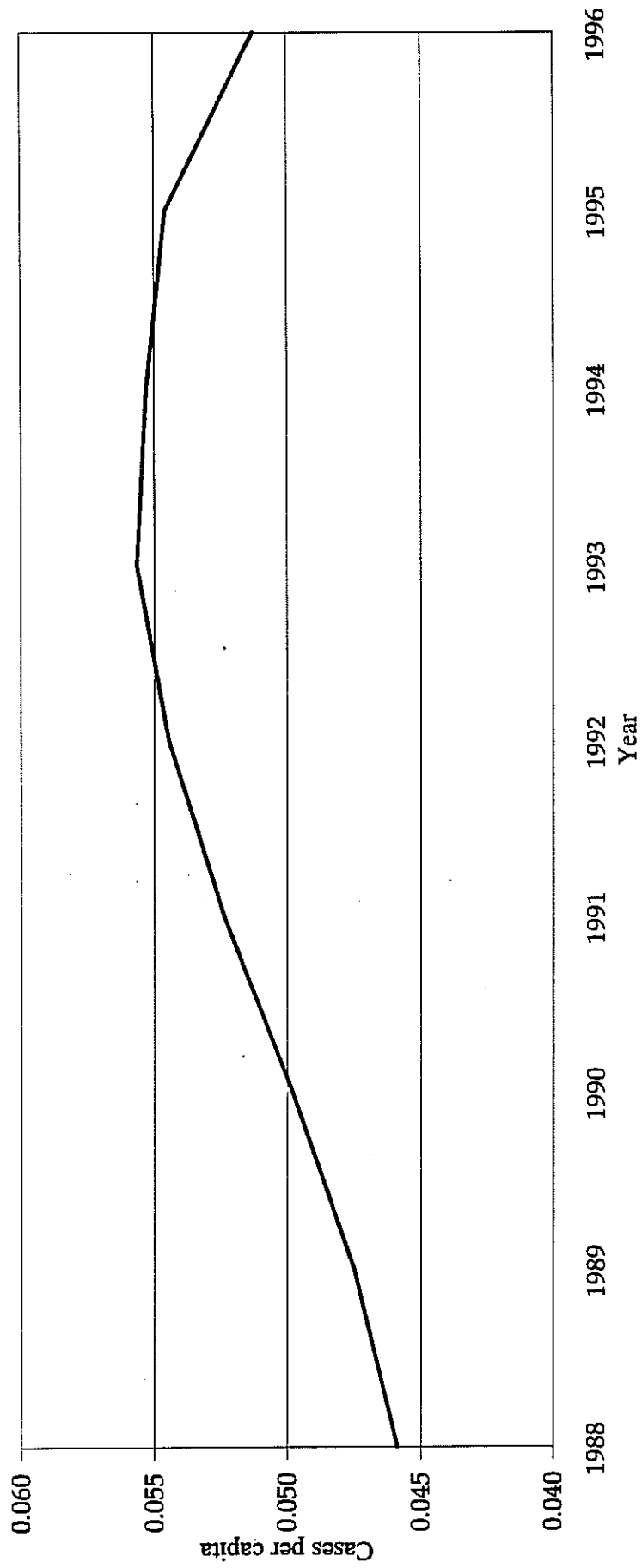
FIGURE 3-34

**GENERAL FUND EXPENDITURES
Fresno County**



Source: County of Fresno 1996-97 Adopted Budget

FIGURE 3-35
AFDC CASES
Fresno County



Source: County of Fresno Comprehensive Annual
Financial Reports: Years Ending 1986-1995

In response to TANF, the State has passed programs that limit benefits to non-citizens. The State now prohibits food stamps and Social Security Insurance (SSI) for immigrants. SSI provides cash assistance to disabled people unable to work and provides In Home Supportive Services (IHSS) to people who need care in the home. Fresno County has approximately 7,000 people receiving food stamps, 11,000, and 1200 people receiving IHSS services.

The California Temporary Assistance Program (CalTAP), proposed by the Governor could have several fiscal effects on the County. First, the proposed program reduces grants to able bodied recipients by 15 percent after six months. There are also new work and child support requirements as well as a prohibition on illegal immigrants receiving cash assistance. Proposed time limits, however, could have even more profound affects on the County budget. As of the program's effective date, applicant families would have a 12 month cumulative time limit during a 36 consecutive month period. After 12 months off aid the family can apply for aid again for up to a maximum of five years of cumulative aid.

Three other groups have proposed programs: the State Legislative Analyst, the California State Association of Counties, and a coalition of children's advocates. Of these, the Governor's proposal would have the greatest impact on California counties. This is because each program but CalTAP provides state funds to counties to pay for the General Relief caseload brought on by welfare reform. Many immigrants previously receiving SSI, food stamp recipients, and people removed from AFDC rolls due to welfare reform will probably apply for General Relief. This could have a large impact on the budget because General Relief is completely funded by the County.

Health Services

The Health Services Agency General Fund expenditure category is separated into six budget units. Table 3-39 shows that the Mental Health, Public Health, and County Medical Services budget units are the primary components of General Fund Health Services accounting for about 96 percent of expenditures.

TABLE 3-39		
SUMMARY OF FRESNO COUNTY HEALTH EXPENDITURES		
Fiscal Year 1996-1997		
Budget Unit	Expenditures	Percent of Budget Category
Administration	\$1,060,889	0.65%
Environmental Health	\$4,195,018	2.55%
Mental Health	\$46,981,826	28.70%
Public Health	\$20,440,089	12.49%
County Medical Services	\$90,601,661	55.35%
Animal Control	\$408,224	0.26%
TOTAL	\$163,687,707	100.00%
Source: County of Fresno 1996-97 Adopted Budget		

The Mental Health unit provides mental health and substance abuse services for the residents of Fresno County. The Public Health budget provides funding for a wide variety of clinical services.

This budget also funds the California Children Services program and the adult and juvenile detention facility medical services.

County Medical Services appropriates the matching funds required by Realignment (AB 1288, 1991) and the Disproportionate Share Provider Payment Adjustment program. AB1288 shifted many administrative and financial health care responsibilities from the State to the counties and allowed counties to raise health care funds through a half-cent sales tax and, to a lesser extent, a vehicle license fee. County health expenditures reacted to this State action by jumping from \$56,833,000 in 1991 to \$95,055,000 in 1992. Figure 3-36 shows that General Fund per capita spending on health care went from \$93 in 1991 to \$178 in 1994. Current expenditures are \$197 per capita.

Realignment funding will now be used to pay the contract with the Community Hospitals of Central California to take over the health care of the county's indigent and inmate population. The base of the contract is \$17.5 million per year. This amount will be adjusted each fiscal year, based on the consumer price index (CPI). The potential danger that the County faces in this arrangement is the possibility that taxable sales will not keep up with the CPI. If this happens, the funding from the half cent sales tax will not keep up with the fees due to the CHCC and the money will have to be found elsewhere in the County Budget.

The Disproportionate Share Provider Program (SB855) provides funds to hospitals that serve more than 40 percent Medi-cal recipients. In past budgets, SB855 revenues accounted for significant appropriations from the County Medical Services budget. The buyout of the VMC greatly reduces these budget items because CHCC, not the County, will be providing indigent care. However, the contract with the CHCC stipulates that after five years funds received by CHCC from The Disproportionate Share Provider Program (SB855) will be used to reduce the County's direct payment to CHCC by specified amounts.

Change in total county population is the best predictor of future expenditures of these budget units because the County provides health service to the entire county, not just unincorporated areas. Future changes in state and federal regulations could have a significant impact on future health care expenditures. However, changes in population is the most reliable predictor of future expenditures because the nature of future regulation is unknown.

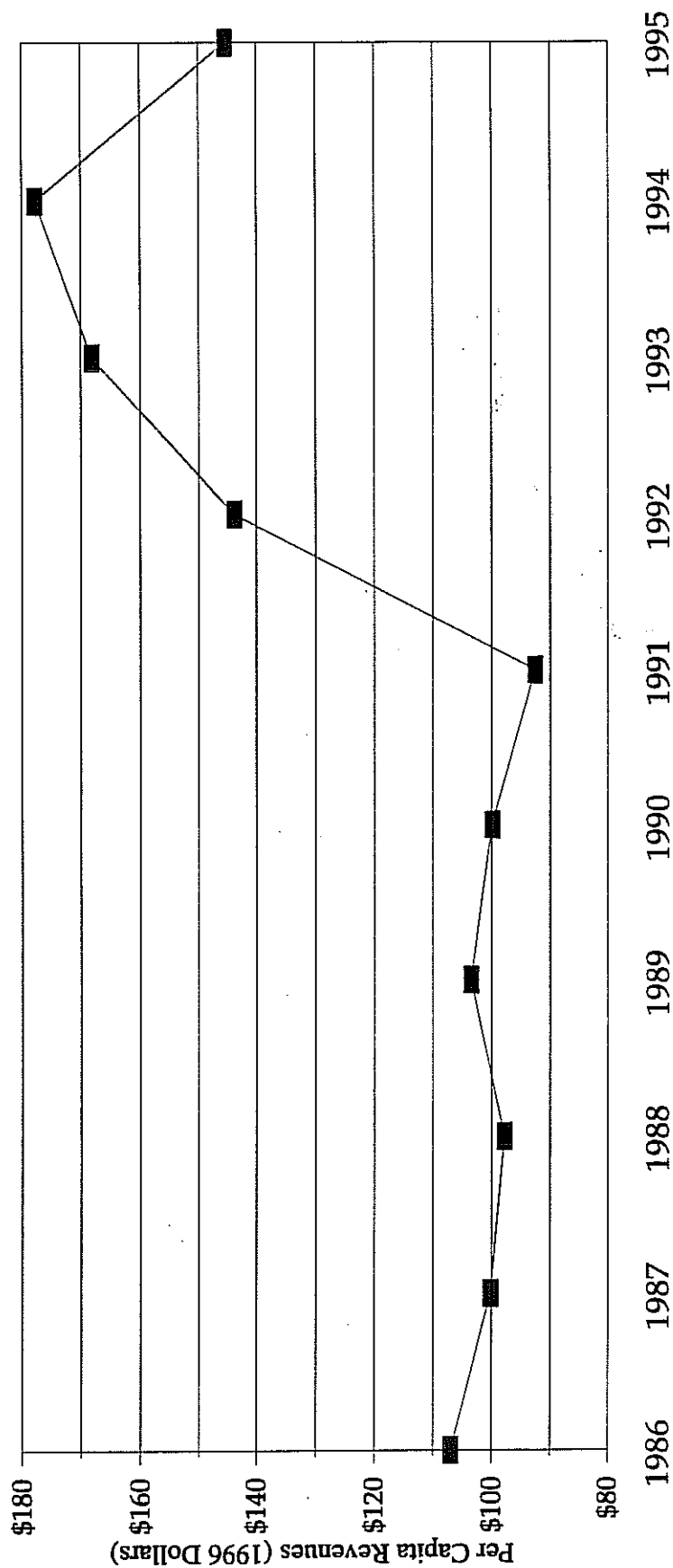
Justice Services

Justice Services account for just under 19 percent of all General Fund Expenditures. This category of expenditures includes a wide range of budget units including: County Clerk--Elections, Court Services, the District Attorney, the Grand Jury, Indigent Defense, Probation, the Coroner, and the Sheriff. As mentioned above, the expenditures for these budget units, except the Sheriff's Department, will increase as residential population increases. The expenditures of the Sheriff's Department, on the other hand, increases with both residential and commercial growth in the unincorporated area.

In real terms, per capita spending on Justice Services has increased from \$196 in 1986 to only \$198 in 1995. The 1995/96 fiscal year marked the first time that County General Fund expenditures on health services (\$197 per capita) were larger than that on justice services (\$182 per capita).

FIGURE 3-36

GENERAL FUND HEALTH CARE EXPENDITURES
Fresno County



Source: County of Fresno Comprehensive Annual Financial Reports:
 Years Ending 1986-1995

Land Use and Development Services

The Land Use and Development Services expenditure category accounts for only 5.6 percent of the General Fund and \$58 per capita spending. The Development Services and the Community Development Block Grant Program (CDBG) account for about 70 percent of the expenditures within this Department.

Expenditures for the CDBG are spent to administer the U.S. Department of Housing and Urban Development CDBG programs for the County. It encompasses many programs that focus on neighborhood upgrade, economic development, and low income housing. Appropriations for these programs are based on revenue from the federal government which, in general, are based on need and population. Expenditures, therefore, should increase with the population of unincorporated areas, because cities typically have their own CDBG programs.

CDBG funds, however, tend to vary depending on the political priorities and the fiscal situation of the federal government. For example, the federal government decreased CDBG revenues to Fresno County 57 percent between 1981 and 1988 and five percent between 1989 and 1991. From 1992 to 1996, however, federal CDBG funds to Fresno County increased five percent.

TABLE 3-40

**SUMMARY OF FRESNO COUNTY LAND USE AND
DEVELOPMENT SERVICES EXPENDITURES
Fiscal Year 1996-1997**

Budget Unit	Expenditures	Percent of Total Budget Unit
Advertising County Resources	\$26,675	0.06%
Agriculture	\$4,542,737	10.38%
Cooperative Extension	\$413,860	0.95%
Local Agency Formation Commission	\$165,506	0.38%
Public Works and Development Services		
Public Works and Development Services	\$15,585,365	35.61%
Public Works — Transit Services	\$1,441,440	3.29%
Public Works — Grants	\$5,559,695	12.79%
Community Development Block Grant	\$15,991,490	36.54%
TOTAL	\$43,764,728	100.00%

Source: County of Fresno 1996-97 Adopted Budget

Budget unit 1930, Advertising County Resources, supports the promotion of trade and commerce throughout Fresno County. Expenditure of these funds provides potential benefit to residents throughout the County. Budget unit 4010, Agriculture, supports a variety of countywide functions. In addition to inspection and regulation of agricultural commodities and practices, the department also enforces State laws regarding the accuracy of weight and measuring devices, prepackaged merchandise, and vapor recovery pursuant to air pollution regulations. These varied services span the County, both in the cities and unincorporated areas.

The Local Agency Formation Commission (LAFCO) is supported under budget unit 4370. LAFCO oversees proposed governmental service reorganizations and expansion of cities' political boundaries. Budget unit 7205 tracks financial activity relating to Community Development Block

Grant (CDBG) funding received from the federal government. Virtually all revenue for this program is federal aid money and is spent countywide. However, the cities of Fowler, Fresno, Huron, Mendota, and San Joaquin do not participate in the County CDBG program.

Budget unit 7610 supports the County Cooperative Extension office, which provides education and research programs in agriculture, nutrition, family and consumer sciences through cooperative efforts with the University of California. The County's share of such costs includes clerical, field assistance, printing, operating supplies, transportation, and facilities.

It should be noted that most of the General Fund cost of these services is funded through a variety of offsetting revenues. For example, federal grant money funds the CDBG programs, and permit fees and service charges offset the cost of development application processing. Thus, the net county cost - discretionary revenue used to fund the department - is about \$2.3 million, or about five percent of the total budget.

Public Works and Development Services expenditures pay for planning, environmental and land use analysis, air quality analysis, economic development, redevelopment, building permits and inspection, and several other related activities. Expenditures for these funds increase as residential and non-residential development increase in unincorporated and, to a much lesser extent, in incorporated areas. Development in unincorporated areas increase the budget because County development services perform traditional municipal functions; the more that development occurs the more these services will be required. Growth in incorporated areas only slightly affect County planning functions. Many developments within cities have a countywide effect on transit, auto congestion, air quality, public services, the environment and other concerns. As cities develop, therefore, counties must provide some analysis and negotiate with municipalities over development concerns and related issues. These costs, however, are insignificant compared to the effects of development in unincorporated areas.

Public Works-Grants includes funding for program planning and implementation of three housing programs and the California Integrated Waste Management Board Used Oil Program.

Administration and Fiscal Services

At \$31,466,113, Administration and Fiscal Services account for less than four percent of the General Fund budget. Administrative and Fiscal Services expenditures include the Board of Supervisors, administration offices, County Counsel, a contingency fund, Interest and Miscellaneous Expenditures, Auditor-Controller/Treasurer-Tax Collector, and the Assessor-Recorder. Expenditures in each of these budget units increase with residential and commercial development.

Most of these expenditures are for countywide needs. However, a small percentage of these services are unique to the County's expanded role in the unincorporated area. At about \$9.1 and \$8.2 million, respectively, the expenditures of the Auditor-Controller/Treasurer-Tax Collector and the Assessor-Recorder make up the bulk of Administration and Fiscal Services budget. This is due to the staffing and computer equipment required to collect and manage the data necessary for these offices to fulfill their functions.

Internal Services

The expenditures for this department total about \$15.1 million and account for just less than two percent of the budget. Expenditures are split into two categories: General Services and Capital Improvements.

General Services accounts for about \$12.4 million. This unit provides the majority of facility related services for the County such as building and grounds maintenance, security, and real estate services. It also provides personnel management, purchasing, and parks services (there are no recreation programs). With the exception of parks, these functions increase at the same rate as Administrative and Fiscal Services.

Parks expenditures, however, increase with population. The parks budget maintains and operates the approximately 800 developed acres of Regional County parks, campgrounds, and recreation areas in unincorporated areas. The County has no parks within incorporated areas. There are no neighborhood parks in the unincorporated area. Clearly, budgetary costs will increase as population in the unincorporated area increases. To a lesser extent, the budget is also affected by residential development inside of cities, because these residents travel to the regional parks in the unincorporated areas.

Enterprise Funds

Enterprise Funds are used for operations that are financed and operated in a manner similar to private businesses. The expenditures of providing goods or services are financed primarily through user charges. There are three sets of enterprise funds: the Valley Medical Center, Solid Waste, and County Services Area, Other. This section provides a brief overview of each fund's function, expenditures, revenues, and relation to land use.

Valley Medical Center

There are four budgets within the Valley Medical Center Enterprise Fund: the Valley Medical Center, the County's acute inpatient and teaching hospital facility for medical care to indigents; VMC Equipment; the Valley Medical Center Transition budget (to account for all the costs to complete the billing and accounting functions of VMC and the ambulatory Care Department subsequent to the implementation of the contract with CHCC); ambulatory care (ambulatory care is health care that is located at various sites throughout the county); and ambulatory care equipment.

The CHCC contract reduces expenditures and revenues for each of these budgets. CHCC took over VMC operations in October 1996 with 73 percent of the fiscal year still remaining. The VMC budget reflects a 51 percent decrease from what the revenues and expenditures would have been had the VMC not been bought. When the local match revenue used to repay the General Fund for the Disproportionate Share Provider Payment Adjustment Program (SB855) is removed from the budget, a 73 percent decrease occurs from what the budget would have been had the VMC not been purchased. Similarly, the Ambulatory Care Department expenditures and revenues decreased 73 percent due to the buy out. The revenues and expenditures of both the equipment budgets are also reduced in the current budget due to the CHCC contract.

In the future, expenditures and revenues for these units will be zero because the County will no longer operate the VMC.

Solid Waste Enterprise

Fresno County participates in the operation of one transfer station and three disposal sites located in various areas of the county: Shaver Lake Transfer Station; Southeast Regional Disposal Site; American Avenue Disposal Site; and the Coalinga Disposal Site. Also included in the enterprise is the Fresno-Clovis Metropolitan Solid Waste Commission. This commission provides oversight responsibilities. Enterprise Fund expenditures and revenues found in the 1996/97 Proposed Budget include:

- Revenues: \$19,333,207
- Expenditures: \$11,279,932
- Net: \$ 8,053,275

Figure 3-37 shows that both revenues and expenditures rose sharply after 1993 since two private landfills run by Browning Ferris Industries were closed and American Avenue Landfill, the regional landfill for the Fresno area, began to take on the extra tonnage of refuse no longer being handled by the private landfills. The tonnage of refuse received at the American Avenue Landfill increased at an annual average of 137 percent between 1993 and 1996, compared to a 20 percent increase in the previous six years.

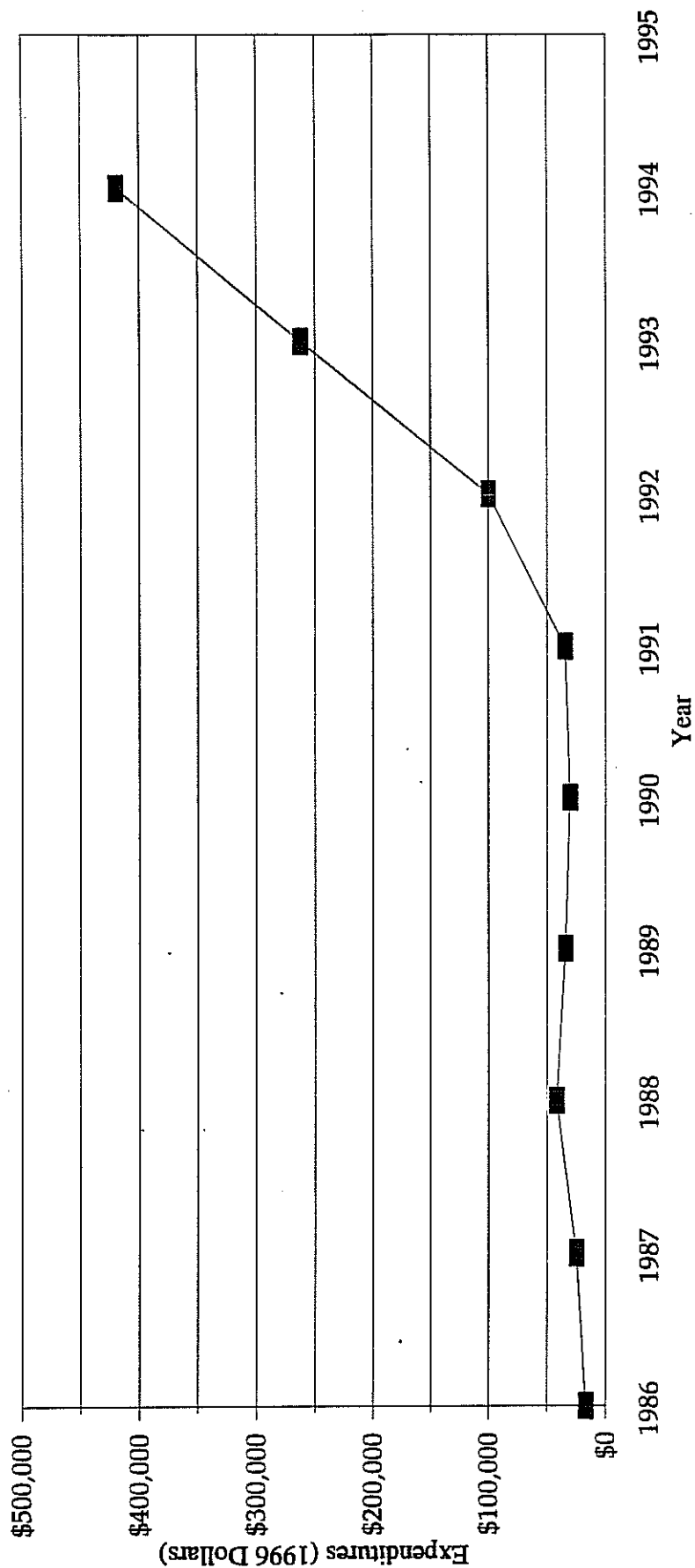
The 1996/97 budget indicates that funds will be accumulated in the budget year for anticipated costs of future construction, bond debt, equipment purchases, and related site improvements at the American Avenue Disposal Site.

County Service Areas, Other

Districts are formed based on requests from the developers or county residents. The current Special Districts administered by the Fresno County Board of Supervisors include districts formed in 1963. However, since 1963, various entities besides the County, including the city of Fresno, have managed them. The special districts, started in 1993 and governed by the Fresno County Board of Supervisors, include County Service Areas, Waterworks Districts, Highway Lighting Districts, Sanitation Districts, and Maintenance Districts. They were established to provide services within specific areas of the County. Table 3-39 shows that County Service Areas account for over 72 percent of the budget for the County Service Area, Other Enterprise. These districts provide a broad spectrum of services including one or more of the following: community water; community sewer, street lighting; snow removal; storm drainage; fire protection; garbage collection; recreation; and road, park, or landscape maintenance.

User assessments are the principal source of revenue for this enterprise fund. Therefore, the recently past Proposition 218 could have an impact on these districts. This initiative revises the process for levying special-benefit assessments so they are subject to approval by property owners. The more a property a voter owns, the more weight that vote carries in the initiative. It also limits

FIGURE 3-37
DISPOSAL SITE EXPENDITURES
Fresno County



Source: County of Fresno Comprehensive Annual Financial Reports: Years Ending 1986-1995

assessment districts to activities that directly benefit the affected property owners and permits voters to repeal taxes via initiative.

It is difficult to predict the affects of this proposition because its meaning is under debate. Also, the initiative will probably be in litigation for some time to come. The public may repeal assessment district assessments through the initiative process if an issue becomes too contentious. The repeal by initiative issue could seriously hamper the County's ability to issue bonds because of the danger that voters could vote down assessments, making counties unable to pay off the bonds. Also, assessment districts will be more difficult to use to finance infrastructure for future development if the proposition passes its legal challenges.

However, the County does predict consequences to many of their existing assessment districts. The Proposition will likely impact about 15 recreation, maintenance, and street lighting districts. These will very likely be subject to approval by the property owners assessed by the districts. The remaining districts are exempt from the proposition because of procedural reasons or they are funded through fees and not through the Proposition's definition of an assessment. These districts include 52 road zones and the approximately 15 sewer, water, and refuse districts.

The repeal by initiative issue could seriously hamper the County's ability to issue bonds because of the danger that voters could vote down assessments, making counties unable to pay off the bonds. Also, assessment districts will be more difficult to be used to finance infrastructure for future development if the proposition passes its legal challenges.

TABLE 3-41		
COUNTY SERVICE AREAS, OTHER Fresno County		
District	Budget	Percent of Total Enterprise Budget
Highway Lighting District	\$27,695	0.46%
County Sanitation District	\$35,938	0.60%
County Service Areas	\$4,328,739	72.10%
Waterworks Districts	\$1,405,859	23.42%
Maintenance Districts	\$205,167	3.42%
TOTAL	\$4,679,245	100.00%
Source: County of Fresno 1996-97 Adopted Budget		

SPECIAL REVENUE FUNDS

Like Enterprise Funds, the County established Special Revenue Funds to finance particular governmental activities. Special Revenue Funds, however, are financed by specific taxes or other earmarked revenues and are authorized by statutory or charter provisions. There are ten such funds, but three, (i.e., the Health and Welfare Trust Fund, the Road Fund, and the new Trial Court Operation Fund) account for over 91 percent of all the Special Revenue Budgets (See Table 3-42).

TABLE 3-42		
SUMMARY OF FRESNO COUNTY SPECIAL REVENUE FUNDS		
Fiscal Year 1996-1997		
Budget Unit	Budget*	Percent of all Special Revenue Funds
Health and Welfare Trust Fund	\$80,599,320	43.97%
Road Fund	\$40,496,019	22.82%
Trial Court Operation Fund	\$25,634,753	15.97%
Fresno County Free Library	\$5,487,789	3.40%
California Healthcare for Indigents Program	\$4,350,443	2.71%
San Joaquin Valley Library Fund	\$2,110,174	1.05%
Emergency Medical Services	\$1,115,677	0.70%
Fish and Game	\$188,530	0.05%
Off Highway Licence	\$430,907	0.02%
TOTAL	\$145,574,191	100.00%
Source: County of Fresno 1996-97 Adopted Budget		
*Note: Expenditures match revenues for each of these funds.		

This section groups special revenue funds into health-related funds, the Road Fund, the Trial Operations Fund, library related-funds, and recreation-related funds. With the exception of the Road Fund, each of these funds should increase with population growth and should grow along with the population of the entire County, not just the unincorporated parts of the County.

Health Related Special Revenue Funds

There are three health related special revenue funds: the Health and Welfare Trust Fund, the California Healthcare for Indigents (CHIP) Fund, and the Emergency Medical Services Fund. The Health and Welfare Trust Fund, by far the largest of the three funds, accounts for the one-half cent sales tax and Vehicle License Fee the County earns as a result of Realignment. In the past, this money was allocated to the budgets for Public Health, VMC, and Ambulatory Care. Now that the VMC has been sold the money will go to the County Medical Services Budget to pay for the contract payment to CHCC.

A Tobacco Surtax Fund, established by Proposition 99 (1988), finances the CHIP Fund. The CHIP funds are directed to counties for use in paying private and county providers for uncompensated health care to people who cannot afford to pay for those services. This program was scheduled to end at the end of the 1995/96 fiscal year. The Governor, however, extended the program through at least through the 1996/97 fiscal year.

The County established the Emergency Medical Fund to receive deposits associated with Proposition 99 and two Senate Bills 12 (1987) and 612 (1988). The funding is provided to address uncompensated care costs of hospitals and physicians. Of the \$1.1 million in the fund, \$750,000 comes from penalty assessments on traffic fines allowed under SB 12 and SB612. Most of the remaining money is raised through Proposition 99 Tobacco Surtax monies.

Road Fund

Fresno County has the largest county road system in California. The road fund provides money for maintaining, rehabilitating, and reconstructing the county's 3,600 miles of roads and 555 bridges in unincorporated areas.

More than 90 percent (\$34.6 million) of the \$38.3 million revenue comes from the following sources. The State Highway Users Tax, an 18 cent gas tax collected by the State and disbursed to the Counties, provides over \$14 million in revenue for fiscal year 1996/97. The contribution from the Fresno County General Fund is about \$1.02 million to the road fund. Another \$10.2 million is direct state and federal aid for highway construction. An additional \$5.4 million is produced from two sales tax sources: the one-half cent sales tax allocated by Local Measure "C" and the one-quarter cent local transportation sales tax. Another \$3.9 million is earned from the Motor Vehicle Licence Fee (VLF). The VLF is levied annually at a two percent of market value of motor vehicles registered in the county and is imposed by the state "in lieu" of local property taxes. Approximately \$100,000 is earned from the "blanket transportation permit" program. These permits, updated annually, allow trucks to use a systems of County roadways. For more information about this program, read *Chapter 4: Transportation and Circulation*.

With the exception of the General Fund contribution, each of these revenue sources will increase with population. The General Fund contribution may go up or down depending on the needs of the county's unincorporated areas. In other words, any funding for road transportation needs not produced by the other revenue sources must be contributed from the County's General Fund. Therefore, the budget of the Road Fund will increase with the needs of both residential and non-residential development. Figure 3-38 shows that (in 1996 dollars) per capita Road Fund expenditures and revenues fell from about \$60 in 1986 to \$42 in 1987. Per capita Road Fund expenditures and revenues have been steady at about \$40 per capita since 1987.

Trial Operations Fund

In 1995-96, passage of Assembly Bill 2544 required counties to establish a local Trial Court Operations Fund to account for expenditures and revenues related to the operation of trial courts. Therefore, Fresno County established this fund to account for the appropriations required for the operation of the trial courts. This fund consists of three budget units: Fresno County Courts, Central Valley Municipal Courts, and Trial Court Miscellaneous Expenditures. These budget units are summarized in Table 3-43.

TABLE 3-43		
TRIAL COURT OPERATIONS FUND		
Fiscal Year 1996-1997		
Budget Unit	Budget*	Percent of Special Revenue Fund
Fresno County Court	\$20,874,760	81.43%
Central Valley Municipal Court	\$4,474,729	17.46%
Trial Court Miscellaneous Expenditures	\$285,264	1.11%
Total	\$25,634,753	100.00%
Source: County of Fresno 1996-97 Adopted Budget		
*Note: Expenditures match revenues for this fund.		

There are three significant revenue categories that pay for the services provided by the fund: transfers from the General Fund, the State Trial Court Block Grant, and the State Trial Court Trust Fund. The State funding and General Fund transfers should rise with the increase of population in the entire county.

Library Related Funds

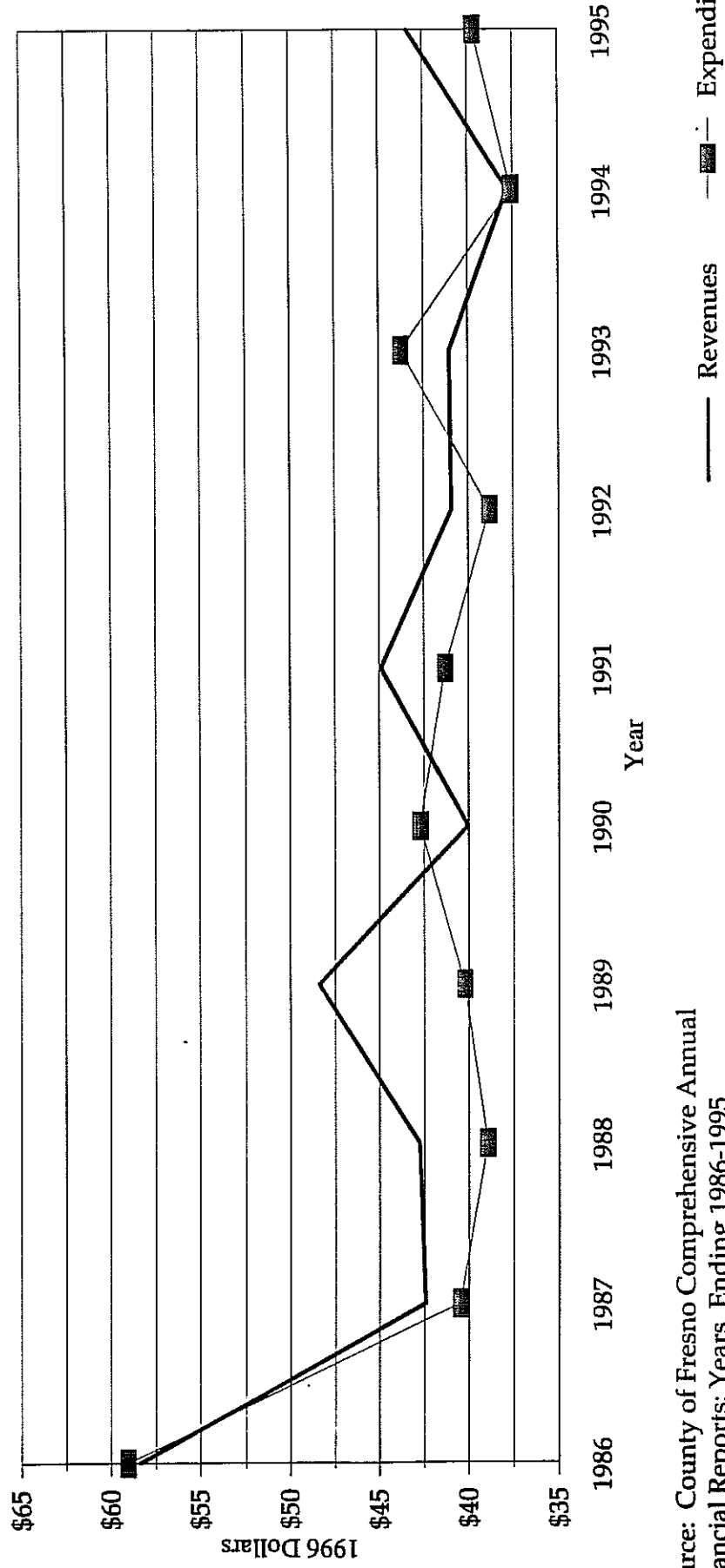
The two library related special revenue funds include:

- County Library Fund: \$5,341,337
- San Joaquin Valley Library: \$2,110,174
- Total: \$7,451,511

The Fresno County Free Library is a special district that provides informational, cultural and recreational services through 36 library outlets. The library system is in particular financial difficulty. In fact, the budget predicts that the library system may be forced to have rolling closures of branches at the end of the fiscal year. They have been hit especially hard by Proposition 13 and the diversion of money to ERAF because the County Free Library system is 90 percent dependant on property taxes. The library is especially dependant on property because it has not benefitted from many of the ERAF and Proposition 13 mitigation efforts from the General Fund and the state that other County budget units have enjoyed. Since 1978, the year before the enactment of Proposition 13, the per capita revenues to the County Free Library budget has decreased 66 percent, corrected for inflation. Figure 3-39 shows this downward trend and shows that revenues took a sharp decrease in 1991, the year ERAF was instituted.

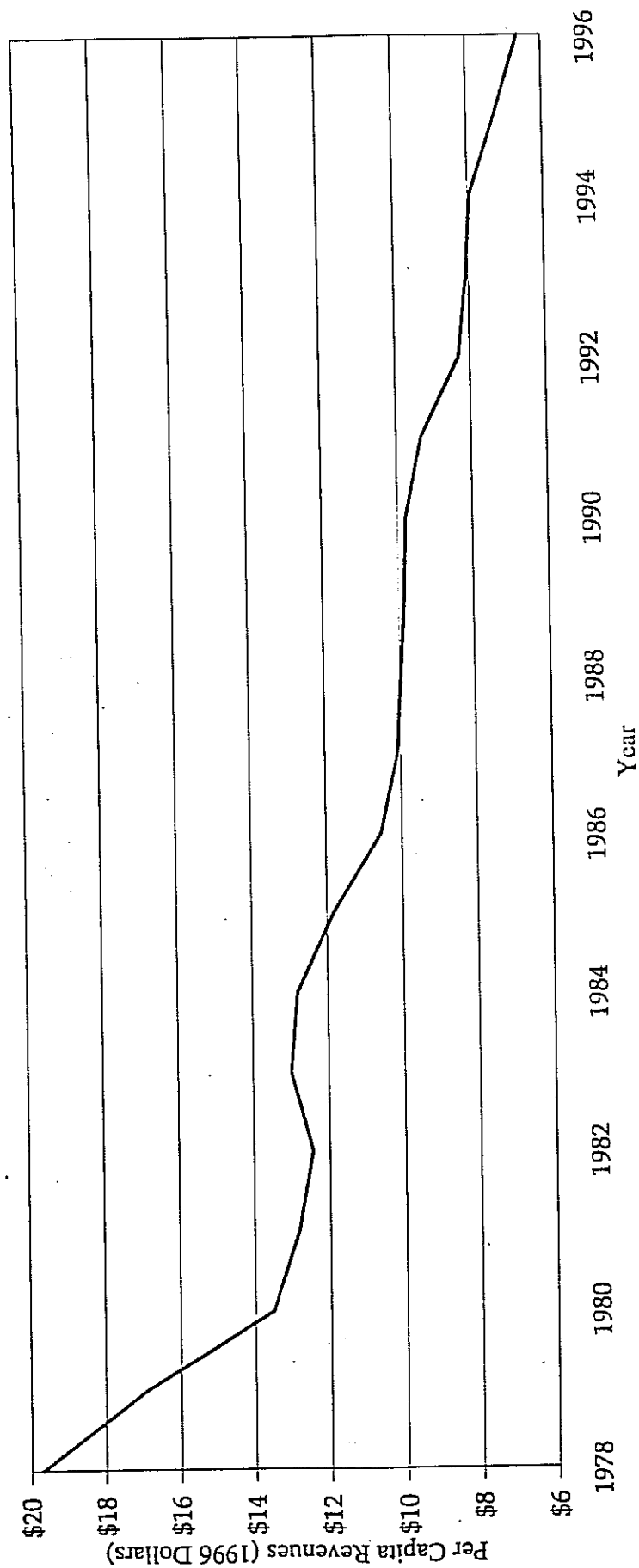
The San Joaquin Valley Library System performs a variety of library services for its members using a combination of local, state, and federal funds and promote resource sharing and cost savings programs. There are nine member libraries in the Fresno, Madera, Kings, Tulare, Kern, and Mariposa County Areas. Charges for Services represents the largest contribution to this fund. This figure represents member libraries' contributions for basic services. Contributions into the fund increase with the population of the region.

FIGURE 3-38
ROAD FUND BUDGET
Fresno County



Source: County of Fresno Comprehensive Annual
 Financial Reports: Years Ending 1986-1995

FIGURE 3-39
FRESNO COUNTY FREE LIBRARY REVENUES



Source: Office of Fresno County Free Library

Recreation Related Funds

There are two recreation related funds: Off Highway License and Fish and Game. Together, they accounted for less than \$619,437, \$.81 per capita, in the 1996/97 Adopted Budget. The Fish and Game fund is used to finance projects and activities related to the conservation and propagation of wildlife. The Fish and Game Code requires that 50 percent of all funds collected for violations accrue to this fund. The Off Highway License Fund is where the County places fees collected from the selling of identification certificates allowing the use of trail bikes, dune buggies, and similar vehicles for off-highway use.

3.4 FINDINGS

- Growth in the labor force for Fresno County has consistently exceeded the growth in employment opportunities and is a major contributor to the continuing high rates of unemployment found in Fresno County and the larger regional economy. In 1995, the average annual unemployment rate was 14.1 percent.
- Employment projections for both Fresno County and San Joaquin Valley indicate that a continuation of past trends will continue to maintain the current gap between growth in the labor force and growth in employment.
- During the period 1991-94, total employment in California declined by 2.6 percent, while employment in Fresno County increased by 4.3 percent. Yet despite job growth in the county, overall earnings have not increased proportionally which indicates a lack of growth in higher paying employment categories and/or excessive growth in lower income categories.
- A number of local and regional business sectors are showing both growth in employment and earnings, which suggests that emphasizing employment growth in these sectors could mitigate the imbalance between lower and higher paying jobs in Fresno and the Valley.
- Employment in the Fresno economy is concentrated in relatively few industries. At the 3-digit SIC level, 50 percent of all workers in the private sector are employed in just 18 industries.
- The economic base of Fresno County—that part of the economy that brings in new dollars and investments—is driven by a cluster of agricultural industries. These industries form an agricultural infrastructure, as well as production processes that are centered around several commodity groups.
- Many of the county's growing businesses are directly related to the Agricultural Cluster. This cluster contained more than 73,520 export-oriented jobs in 1994 and accounted for 30 percent of Fresno's total private-sector employment base.
- Cluster industries are not only major employers themselves, but also generate employment elsewhere in the economy through backward and forward linkages. In the cluster industries, one new job is expected to create at least two additional jobs among suppliers and providers of local services. In the case of cotton production and meat and dairy products, the multiplier effects are as high as 5; i.e., five indirect and induced jobs for each additional direct job.
- Primary agricultural production in Fresno County accounted for over \$3 billion in 1995—making it the most productive agricultural county in California. Over the most recent period for which data are available (1994-95), Fresno County's agricultural production grew modestly, with a net increase of \$90 million or three percent. The largest gains were experienced in fruit, nuts, and vegetables.
- Fresno County accounted for slightly more than 20 percent of commodity values in the San Joaquin Valley. In other words, one out of every five dollars in Valley-wide commodity production comes from Fresno County. The county's ten top crops, in order of value, are:

cotton, grapes, poultry, tomatoes, milk, head lettuce, almonds, cattle and calves, nectarines, and oranges.

- The competitiveness of Fresno County's agriculture clusters depends on the depth of its agricultural infrastructure. This infrastructure refers to a host of specialized suppliers and service providers. The major components of the infrastructure include seasonal contract laborers; crop production services; suppliers of various materials (such as seeds and chemicals), farm machinery and tools, pumping equipment and irrigation systems, and packaging materials; storage and distribution services; and agriculture-related financial services. In addition to private businesses, non-profit organizations and government agencies are also integral to the overall functioning of the cluster.
- Fresno County contains a disproportionately large share of the agricultural infrastructure within the San Joaquin Valley. The county has 29 percent of the Valley's total employment, but more than 32 percent of the employment in the agricultural infrastructure. The concentration is particularly high in storage and trucking and in crop production services.
- The Fruit, Nut, and Vegetable Cluster is the largest of the commodity-specific clusters. The cluster as a whole employed approximately 28,430 persons in 1994, which is about 12 percent of all private-sector jobs in the county. In relation to the other counties in the San Joaquin Valley, Fresno County has a proportionally high percentage of jobs in fruit, nut, and vegetable crop production. However, the county has a proportionally low percentage of jobs in value-added processing industries.
- The Livestock, Poultry, and Dairy Cluster is the second largest commodity cluster. In 1994, this cluster employed approximately 7,520 persons. In contrast to fruits and vegetables, the processing component of the Livestock Cluster is relatively large in Fresno County. Several of the industries in this cluster are high performers, experiencing both job and payroll growth.
- Cotton from the San Joaquin Valley is renown for its high quality. Most of the employment in the Cotton Cluster is associated with cotton production; only a limited amount of value-added products are produced locally.
- The agricultural diversity of Fresno County includes several crops that do not fall in the three main commodity clusters. Other crops with \$10 million or more in production are beans, corn, and sugar beets. In addition, there are more than 1,740 workers engaged in a variety of food processing industries that are outside the scope of the other commodity clusters.
- The Metalworking and Machinery Cluster and Information Processing Cluster comprise a relatively small percentage of total employment, but both clusters experienced net growth during the recession years (1991-94) and offer average earnings exceeding the countywide average for all industries.
- In 1995, Fresno County's retail sales reached an estimated \$4.5 billion. During the early 1990s, the growth rate slowed to an annual average rate of 1.5 percent. More recently, between 1994 and 1995, retail sales appears to have rebounded with an expected 5.8 percent growth rate.

- Overall, Fresno County has about 27 percent of the \$16 billion San Joaquin Valley retail market. Fresno County captures larger than average retail sales in several categories: fuel and ice, apparel stores, specialty retail, and consumer durables.
- Visitor-related activities contribute a significant amount to the county's economy. In 1995, visitors spent approximately \$750 million in Fresno County, while the tourism industry provided an estimated 10,000 jobs.
- In real estate development, single family residential construction has been relatively stable. There is some evidence that median home prices may be falling, an indication that a higher proportion of entry-level housing is in the sales mix. Retail and office construction are also experiencing steady growth. Expansion in both of these submarkets is approximately 400,000 square feet annually. Vacancy rates are in the 10 percent range.
- At present, industrial buildings represent the largest component of the region's commercial real estate market. Recent interest has focused on warehouse and storage facilities. Of 167 permits for new industrial construction issued by the City of Fresno between 1993 and 1996, 140 were for storage and warehousing uses.
- In all of the real estate submarkets, there has been a general increase in construction activity in smaller communities relative to the Fresno-Clovis urbanized area.
- The County has negotiated a series of Memorandums of Understanding with the cities in Fresno County. The tax sharing agreements are designed to fairly allocate taxes among the cities and County to cover the costs of providing services. Tax sharing agreements were designed so that residents within cities paid for the county-wide services they consumed. The basis of these agreements was the calculations of the "net county cost" of providing county-wide services to each city. Net county cost is the difference between the cost of providing county-wide services in each city and the amount of property taxes generated in each city that the County receives.
- General Fund revenues and expenditures steadily increased between 1986 and 1993. This pattern occurred because of increased Welfare caseloads in the 1980s and new state health initiatives in the early 1990s. Increasing expenditures in Fresno County were partially offset by social service caseload around 1993.
- Of the approximately \$800 million annual revenues, only about \$176 million is "discretionary" revenue; that is, money that can be expended on any service seemed appropriate by the Board. Much of this revenue is used to supplement the cost of services not fully funded from fees, charges, or intergovernmental revenues. Such revenues are also the primary source of funding municipal services such as police or recreation in the unincorporated parts of the County. Competition for these scarce revenues diminishes the ability of the County to fully fund municipal services, and increases dependency on special service districts.
- State health care funding will now be used to pay the contract with the Community Hospitals of Central California to take over the health care of the County's indigent and inmate population. The base of the contract is \$17.5 million per year. This amount will be adjusted each fiscal year, based on the consumer price index (CPI). The potential danger that the

County faces in this arrangement is the possibility that taxable sales will not keep up with the CPI. If this happens, the funding from the half cent sales tax will not keep up with the fees due to the CHCC and the money will have to be found elsewhere in the County Budget.

- Revenues received from Federal and State sources account for nearly two-thirds of General Fund revenue. Much of this money is spent to fulfill the County's role as an agent for the State and Federal governments to carry out health care, social welfare programs, and justice services. With very few exceptions, Federal and State agencies earmark the moneys for these specific functions. Intergovernmental revenues should increase at the same rate as residential development of the entire county. This is because health care, social welfare programs, transportation and justice services in both unincorporated and incorporated areas, and social service needs increase with population growth.
- Several factors will affect the future level of property tax revenue. Of course, increases in the value of land will increase property taxes. New development and the rate at which people buy and sell properties will have a particularly significant effect on property tax revenues because Proposition 13 allows a market value assessment of newly sold properties.
- Property Taxes represent about seven percent of General Fund revenues and are the most important discretionary revenues available to the County to fund local programs. Two State legislative actions greatly limited the amount of property tax the County can collect.
- Compared with municipalities, sales tax is a small percentage of total general fund revenue. Sales Tax is, however, a significant source of discretionary revenue for the County. The State returns one cent of each taxable sale dollar to the jurisdiction where the transaction is made and placed in that General Fund.
- In most jurisdictions, there is a strong correlation between population growth and sales tax over the long term, although there can be pronounced short term variability due to recessions and other factors. For instance, taxable sales increased an average of 2.15 percent between 1986 and 1995, despite a decrease of 3.74 percent during the recession years of 1991 and 1992. Meanwhile, annual County population steadily increased by 2.68 percent between 1986 and 1995.
- Under Proposition 62, passed in 1986, no general tax (a tax that goes directly into the general fund) may be imposed without a two thirds vote of all members of the Board of Supervisors and a majority vote of the people. Further, any special tax (taxes for a specific purpose) must be voted in by two-thirds of a vote of the people. The 1995 California Supreme Court Case *Santa Clara County Transportation Authority vs. Guardino* held Proposition 62 constitutional. This ruling clearly calls for careful review by the County to evaluate whether any of their taxes fall within the restrictions of Proposition 62.
- Development patterns in the County produce varied affects on different government services. The expenditures of some budget units increase regardless of where development in the County occurs. Other expenditures are spent on services for unincorporated areas that are traditionally provided by municipalities. For instance, Sheriff services are nearly exclusive to unincorporated areas; therefore, growth in these areas has a more direct effect on this budget unit than growth in an incorporated city.

- Expenditures for budget units are tied to commercial and residential land use growth, depending on the nature of the service. In general, Human Services; Health Services; and Justice Services (with the exception of the Sheriff's Department) will increase in proportion to the residential population. On the other hand, expenditures for the Sheriff's patrol; Land Use and Development Services; Administration and Fiscal Services; and Internal Services increase with both commercial and residential land use.
- Human Services account for nearly half of all County expenditures in the 1996/97 Budget. Further, Aid to Families with Dependent Children (AFDC) payments accounted for more than 75 percent of all human services expenditures.
- Federal welfare "reform" and proposed State legislation could have profound effects on the AFDC program. In 1996, the federal government passed the "Personal Responsibility and Work Opportunity Reconciliation Act of 1996" (HR3734) which provides states with broad flexibility to design replacements for the three programs described above.

Four State groups have proposed programs: the Governor, the State legislative analyst, the California State Association of Counties, and a coalition of Children's advocates. Of these, the Governor's proposal would have the greatest impact on California counties. This is because each program but CalTAP provides State funds to counties to pay for the General Relief caseload brought on by welfare reform. Many immigrants previously receiving SSI, food stamp recipients, and people removed from AFDC rolls due to welfare reform will probably apply for General Relief. This could have a large impact on the budget because General Relief is completely funded by the County.

- The per capita costs of police protection, including detectives, administrative costs, and patrol in unincorporated areas, is higher in Fresno than in surrounding counties. The per capita cost in Tulare is \$124 and \$76 in Merced Counties while the cost in Fresno is \$178 per capita. This is probably due to the higher crime rate in Fresno County and the extensive road system that the Fresno Sheriff's Department must cover.
- The expenditures of the Solid Waste Enterprise Fund rose sharply after 1993. This is because around this time two private landfills run by Browning Ferris Industries were closed and American Avenue Landfill, the regional landfill for the Fresno area, began to take on the extra tonnage of refuse no longer being handled by the private landfills. In addition, funds are being accumulated for anticipated costs of future construction, bond debt, equipment purchases, and related site improvements at the American Avenue Disposal Site.
- The County has several districts that provide services through user assessments. The recently passed Proposition 218 may have a distinct affect on the viability of these assessment districts. It is difficult to predict the affects of this proposition because its meaning is under debate. Also, the initiative will probably be in litigation for some time to come. Especially contentious legal issues are the constitutionality of the initiative's provision that the public can repeal assessment districts and the weighted vote method of initiative.
- Proposition 218 will likely impact about 15 recreation, maintenance, and street lighting districts. These will very likely be subject to approval by the property owners assessed by the

districts. The remaining districts are exempt from the proposition because of procedural reasons or they are funded through fees and not through the Proposition's definition of an assessment. These districts include 52 road zones and the approximately 15 sewer, water, and refuse districts.

- The repeal assessments by initiative aspect of the proposition could seriously hamper the County's ability to issue bonds. Also, assessment districts will be more difficult to be used to finance infrastructure for future development if the proposition passes its legal challenges.

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3.7 GLOSSARY

ECONOMIC CONDITIONS

Backward Linkage - Transaction between an industry and its supplier.

BEA - Bureau of Economic Analysis.

Chain of Production - The chain of production refers to the steps involved in producing a good from raw material to finished product. This concept can also be applied to services.

Concentration Factor - See Location Quotient.

ES202 Series on Industrial Employment and Payroll - The primary database used in the economic base study is ES202 which is collected by the California Labor Market Information Division under an arrangement with the U.S. Department of Labor. The data are more complete, current, and accurate than any other source because all employers covered by unemployment insurance laws are compelled to report quarterly. Data on employment, payroll, and establishments is available at the 4-digit SIC level. Employers' confidentiality is protected by law because data cannot be published for a particular category of business if there are three or fewer employers in that category, or if one firm employs 80 percent or more of the workers in that category. Unless otherwise noted, the ES202 data used in this study were supplied by a private vendor, MIG, Inc., which estimates employment and payroll values where disclosure would violate the confidentiality rules. MIG's ES202 database does not contain information on establishments. At the time this study was initiated, the most consistent time series for which disaggregated data were available covered the period 1991 to 1994.

Export - Any good or service sold to an entity outside of established boundaries. Exports can be divided into foreign and domestic exports. Foreign exports are goods and services sold outside of the U.S. while domestic exports are those goods and services sold outside of the region but within the U.S.

Final Product - Finished goods or services that are purchased or sold to the ultimate consumer, including households, governments, and other businesses and organizations.

Forward Linkage - Transaction between an industry producing a good or service and the consumers of that product.

Growth Potential Index - The Growth Potential Index is a composite measure based on the Index U.S. Bureau of Labor Statistics's projected employment and output growth (1995-2005); recent employment growth in the region; and a comparison of the region's employment growth relative to a reference region (the state economy).

Import - Any good or service purchased from outside of the established area. Imports can also be divided into foreign and domestic imports. Foreign imports are goods and services purchased from entities outside of the U.S. Domestic imports are goods and services purchased from entities outside of the region, but within the U.S.

Industry - A term for the collective activities of a group of firms that produce the same kind of commodity or service, or are engaged in the same kind of operations. The auto industry and the industry are examples of industries within the manufacturing sector.

Industry Cluster - The cluster is a geographically proximate group of firms and industries that are interdependent, complementary, and/or competitive. At the core are industries and firms which have a high demand for inputs of materials and services, and their purchase of various inputs then drives the growth and development of supplier industries. Generally, there is a regionally based economic infrastructure that provides the foundation required by the cluster. This could be a specialized work force, higher education system, etc. The synergies or relations among cluster firms help to spur new innovations and to attract other firms to service or be a part of the core cluster.

Input - Materials, land, and labor that are used to make final or intermediate goods and services.

Input/Output Analysis - An analysis, usually shown in matrix form, that shows how industries interact with one another in terms of production and consumption of goods and services. On a very detailed level, the analysis shows monetary flows as each industry's output is sold to intermediate and final users, and each industry purchases the materials and services required for its own production functions. It makes certain assumptions which are not realistic, e.g., constant quantities of certain inputs are needed to produce given outputs, and that consumer demand is constant. Despite these drawbacks, it is an estimating technique that provides useful information about the interactions within an economy.

Intermediate Product - A material object purchased as an input for further processing into a final good that is ultimately bought by the consumer. An example is a glass windshield that would be an intermediate product input into the final production of an automobile.

Labor Force - The universe for measuring the labor force begins with all persons aged 16 and over. In this report, the labor force includes civilians only (i.e., members of the armed services are excluded). The labor force is further divided into two persons currently employed and persons looking for work (unemployed). The unemployment rate is calculated as a proportion of the civilian labor force that is currently unemployed. Persons not employed and not looking for work are also excluded from the labor force count; they are not counted as unemployed. In this report, labor force is a residence-based measure, while employment is measured at the place of work.

LMID - The California Labor Market Information Division (LMID) also provides county-level employment projections, although for a shorter time frame. In 1999, LMID projects that total employment in Fresno County will be 308,600. In comparison, the 1999 employment projections derived from the Department of Finance's population figures is 375,100, exceeding LMID by 66,500.

Location Quotient - The Location Quotient (LQ) shows whether an industry has a higher or lower concentration of employees in the region versus a reference economy, in this case the state as a whole. An LQ value above 1.0 signifies a high local concentration of a particular industry relative to the nation, while a value below 1.0 indicates a relatively low industry concentration.

Multipliers - A set of predictive outcomes based on input-output analysis; e.g., estimated changes in employment or output based on changes in final demand. Employment multipliers are typically divided into three types: direct effects that measure employment change in the subject industry; indirect effects that measure employment change in supplier industries; and induced effects that measure employment change in other local-serving industries.

Output - Goods and/or services produced.

Payroll Index - A ratio which compares average earnings in a particular industry or cluster with a benchmark, such as average earnings for the regional economy as a whole.

Prosperity Index - A ratio which compares payroll growth against employment growth. Values greater than 1.0 indicate that payroll is increasing faster than employment, thus raising average earnings. On the other hand, values lower than 1.0 indicate that payroll growth is lagging behind employment growth, thereby lowering average earnings.

Recent Litigation - Recent litigation challenging the constitutionality of marketing orders and generic advertising (now before the U.S. Supreme Court) threatens some of the cohesion that has characterized crop-specific organizations. The suit was brought by Fresno County fruit growers against the California Tree Fruit Agreement, the marketing order that mandates assessments on peach, plum, and nectarine production to fund generic advertising programs. The plaintiffs allege that they are being forced to "render financial support for others' speech," a violation of their First Amendment Right to free speech, and that they are being forced to associate with their competitors. This case is being closely watched by all of the state's generic promotional programs (some of which also face legal challenges), despite the apparent support received from agricultural producers who vote in annual referenda.

Regional Advantage - When used as an indicator, "Regional Advantage" is synonymous with the differential shift component of shift-share analysis. (See Shift-Share Analysis)

Shift-Share Analysis - Shift-share analysis helps determine the components of growth in a regional economy. This study focuses on the differential shift component of shift-share analysis which evaluates the performance of a local industrial sector in relation to the performance of that sector in a reference economy, in this case the state. The differential shift measures the difference between regional industrial growth and national industrial growth. Therefore, this study uses the term "Regional Advantage" instead of less intuitive "differential shift." A positive value indicates that the industry grew faster at the regional level than at the national level. Whereas a negative value indicates that the regional industry did not keep pace with the same industry at the national level.

Standard Industrial Classification (SIC) - The standardized numerical system established by the Federal Government for defining industries and classifying individual firms.

System - establishments. Industries are defined by the type of activity in which they are engaged, and are stratified into 2-, 3-, and 4-digit codes. The system is hierarchical, with the most detailed activities given 4-digit codes, more aggregated activities are assigned 3-digit codes, and broader categories have 2 digits. An example is SIC 37, Transportation Equipment. Under it is SIC 371, Motor Vehicles and Equipment, as well as several other transportation-related

activities. Under SIC 371 are several 4-digit codes, including SIC 3711, Motor Vehicles and Car Bodies; SIC 3713, Truck and Bus Bodies; and so on.

Value Added - Value of output (shipments) minus the cost of materials. Typically the main components of value added are payments to workers (wages and salary), owners (profits), and interest.

FISCAL CONSIDERATIONS

AFDC - Aid to Families with Dependant Children. Aid provided to low income families with single mothers and foster children.

CalTAP - California Temporary Assistance Program. Welfare "reform" proposal from Governor Wilson.

CDBG - California Development Block Grant. Grant to counties and cities to administer U.S. Department of Housing and Urban Development programs.

CHCC - Community Hospital of Central California. The organization with which the County has contracted to provide indigent and inmate medical services.

CHIP - California Health Care for Indigents Program.

CPI - Consumer Price Index. Price index that measures inflation.

Disproportionate Share Provider Payment Adjustment Program - Program instituted by SB855. This bill provides for supplemental medical payment to hospitals that service a disproportionate share of Medi-Cal and low income patients.

Enterprise Funds - County funds that are used to account for operations that are financed and operated in a manner similar to private businesses.

ERAF - The Education Revenue Augmentation Fund. A fund each county instituted in 1993 after passage of the Educational Revenue Augmentation Act. This act implemented a tax shift from California counties, cities, and special districts into the ERAF for school funding.

Medi-Cal - State health insurance program for low income and disabled citizens.

Motor Vehicle In-Lieu Tax - Also called the Motor Vehicle License Fee (VLF). This fee is levied annually at 2% of the market value of motor vehicles and is imposed by the state "in lieu" of local property taxes.

MOU - Memorandum of Understanding. Agreement between two government entities.

Net County Costs - The difference between the cost of providing county-wide services in each city and the amount of property taxes generated in each city that the County receives.

Personal Responsibility and Work Opportunity Reconciliation Act of 1996 - Welfare "reform"
bill passed by congress in 1996.

Proposition 13 - Article of the California Constitution that limits the maximum annual increase of any ad valorem tax on real property.

Realignment - Realignment was a program instituted by AB1288, the 1991 State law that shifted various administrative and financial responsibilities from the State to the Counties.

Special Revenue Funds - County funds established to finance particular governmental activities.

TANF - Temporary Assistance for Needy Families. Program initiated under the Personal responsibility and Work Opportunity Reconciliation Act of 1996. This program provides states with flexibility to those formerly receiving AFDC payments.

Tax Increment - New property tax generated by development.

Unincorporated Area - That area of the county that is not part of a municipal government.

Incorporated Area - That area of the county that is part of a municipal government.

VLF - Motor Vehicle License Fee. Also called the Motor Vehicle In-Lieu Tax. This fee is levied annually at 2% of the market value of motor vehicles and is imposed by the state "in lieu" of local property taxes.

VMC - Valley Medical Center. The hospital that ceased operation on October 7, 1996, when CHCC began providing indigent and inmate medical services.

APPENDIX 3A

INPUT-OUTPUT ANALYSIS OF CLUSTER COMPONENTS

The tables in Appendix 3A identify the types of outputs (intermediate goods and services) required by the cluster industries and estimate the amount of inputs needed. The lists have been truncated to show only key supplies, but collectively they account for most of the inputs. By revealing the constituent elements of a production chain, these lists help to determine the components of the clusters.

TABLE A-1

AGRICULTURAL INFRASTRUCTURE
Agricultural Services

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*		930.202
Total Inputs		563.757
Agricultural Production Materials	46.2%	260.709
Livestock and Dairy Production	16.4%	92.494
Wholesale Trade	7.3%	41.165
Maintenance and Repair, Other Facilities	3.3%	18.846
Air Transportation	3.1%	17.210
Colleges, Universities, Schools	2.0%	11.255
Packaging Materials	1.7%	9.641
Information Processing and Accounting	1.5%	8.492
Warehousing and Trucking	1.4%	8.095
Legal Services	1.3%	7.375
Laundry, Cleaning and Shoe Repair	1.2%	7.036
Textile Goods, N.E.C	1.2%	6.606
Automobile Repair and Services	1.0%	5.843
Textile Bags	1.0%	5.603
Livestock and Dairy Processing	0.7%	3.968
Insurance Carriers	0.7%	3.871
Electric Services	0.6%	3.583
Railroads and Related Services	0.5%	2.779
Automobile Rental and Leasing	0.5%	2.756
Banking	0.5%	2.632
Noncomparable Imports	0.5%	2.589
Photofinishing, Commercial Photography	0.5%	2.541
Internal Combustion Engines, N.E.C.	0.4%	2.336
U.S. Postal Service	0.4%	2.234
Personnel Supply Services	0.4%	2.205
Forestry Products	0.4%	2.032
Other Commodities	5.3%	29.862
<p>* 1992 Dollars Source: Report based on IMPLAN Model.</p>		

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TABLE A-2

AGRICULTURE INFRASTRUCTURE
Agricultural Production Materials

Commodity Inputs	Share of Total Inputs	Value of Inputs (\$Mil.)*
Total Industry Output*		258.340
Total Inputs		161.626
PRODUCTION MATERIALS (Intra-industry)	18.7%	30.290
Wholesale Trade	7.8%	12.622
Cyclic Crudes, Organic Chemicals	4.7%	7.657
Insurance Carriers	3.9%	6.296
Internal Combustion Engines, N.E.C.	3.9%	6.242
Warehousing & Trucking	3.7%	6.051
Gas Production and Distribution	3.4%	5.513
Packaging Equipment	3.0%	4.895
Mechanical Equipment	3.0%	4.861
Blast Furnaces and Steel Mills	2.9%	4.676
Advertising	2.8%	4.516
Natural Gas & Crude Petroleum	2.8%	4.476
Motor Vehicle Parts and Accessories	2.4%	3.937
Iron and Steel Foundries	2.3%	3.769
Electric Services	2.1%	3.449
Maintenance and Repair, Other Facilities	2.1%	3.442
Information Processing and Accounting	2.0%	3.300
Motors and Generators	1.8%	2.904
Inorganic Chemicals, N.E.C.	1.8%	2.843
Fabricated Metal Products	1.6%	2.579
Mechanical Measuring Devices	1.2%	1.896
Petroleum Refining	1.0%	1.585
Potash, Soda, and Borate Minerals	1.0%	1.560
Air Transportation	0.9%	1.439
Railroads and Related Services	0.9%	1.401
Chemical, Fertilizer Mineral Mining, N.E.C.	0.9%	1.389
Banking	0.8%	1.262
Metal Stampings, N.E.C.	0.8%	1.216
Phosphate Rock	0.7%	1.209
Other Commodities	15.1%	24.349

* 1992 Dollars

Source: Report based on IMPLAN Model.

fcaginp4.wk4

TABLE A-3

AGRICULTURE INFRASTRUCTURE
Packaging Materials

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		337.098
Total Inputs		226.593
Paper Mills, Except Building Paper	14.6%	33.130
Plastics Materials and Resins	14.0%	31.665
PACKAGING MATERIALS (Intra-industry)	7.9%	17.881
Wholesale Trade	7.4%	16.801
Paperboard Mills	6.6%	15.055
Warehousing and Trucking	4.9%	11.034
Electric Services	3.6%	8.263
Cyclic Crudes, Organic Chem.	2.6%	5.996
Aluminum Rolling and Drawing	2.6%	5.929
Blast Furnaces and Steel Mills	2.4%	5.519
Plate Making	2.3%	5.148
Printing	2.2%	5.026
Information Processing and Accounting	1.4%	3.140
Maintenance and Repair, Other Facilities	1.4%	3.132
Real Estate	1.3%	2.944
Railroads and Related Services	1.1%	2.593
Advertising	1.1%	2.448
Inorganic Chemicals Nec.	1.0%	2.226
Legal Services	0.9%	2.076
Gas Production and Distribution	0.9%	2.015
Fabricated Metal Products	0.9%	1.960
Mechanical Equipment	0.8%	1.917
Synthetic Rubber	0.7%	1.513
Special Industry Machinery N.E.C.	0.7%	1.491
Air Transportation	0.6%	1.430
Adhesives and Sealants	0.6%	1.417
Insurance Carriers	0.6%	1.377
Typesetting	0.6%	1.368
Sawmills and Planing Mills, General	0.6%	1.342
Other Commodities	13.6%	30.758

* 1992 Dollars

Source: Report based on IMPLAN Model.

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TABLE A-4

AGRICULTURE INFRASTRUCTURE
Food Processing Equipment

Commodity Inputs	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		45.206
Total Inputs		25.922
Mechanical Equipment	14.5%	3.770
Wholesale Trade	10.1%	2.621
Blast Furnaces and Steel Mills	8.0%	2.071
Fabricated Metal Products	6.1%	1.584
FOOD PROCESSING EQUIP (Intra-industry)	5.6%	1.454
Advertising	4.6%	1.202
Maintenance and Repair, Other Facilities	3.4%	0.889
Metal Stampings, N.E.C.	2.8%	0.727
Motors and Generators	2.7%	0.695
Packaging Materials	2.7%	0.692
Switchgear and Switchboard Apparatus	2.6%	0.662
Electric Services	2.2%	0.564
Iron and Steel Foundries	2.1%	0.541
Relays and Industrial Controls	1.8%	0.464
Nonferrous Wire Drawing and Insulating	1.7%	0.429
Information Processing and Accounting	1.7%	0.429
Warehousing and Trucking	1.5%	0.388
Real Estate	1.4%	0.367
Transformers	1.4%	0.359
Air Transportation	1.3%	0.344
Primary Copper	1.2%	0.315
Legal Services	1.2%	0.303
Aluminum Rolling and Drawing	1.2%	0.302
Noncomparable Imports	1.1%	0.281
Gaskets, Packing and Sealing Devices	1.0%	0.257
Rubber and Plastics Hose and Belting	0.8%	0.218
Screw Machine Products and Bolts, Etc.	0.7%	0.191
Personnel Supply Services	0.7%	0.189
Insurance Carriers	0.7%	0.188
Banking	0.7%	0.185
Nonwoven Fabrics	0.7%	0.179
Hardware, N.E.C.	0.7%	0.175
Gas Production and Distribution	0.7%	0.169
Other Commodities	10.5%	2.719

* 1992 Dollars

Source: Report based on IMPLAN Model.

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TABLE A-5

AGRICULTURE INFRASTRUCTURE
Warehousing and Trucking

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*		461.974
Total Inputs		221.693
WAREHOUSE & TRUCK (Intra-indus	47.8%	105.872
Petroleum Refining	7.9%	17.450
Real Estate	4.7%	10.443
Automobile Repair and Services	4.0%	8.916
Insurance Carriers	3.4%	7.605
Wholesale Trade	2.9%	6.388
Information Processing and Accountin	2.9%	6.386
Electric Services	2.1%	4.618
Tires and Inner Tubes	1.8%	4.016
Communications, Except Radio and TV	1.7%	3.829
Maintenance and Repair, Other Facilit	1.6%	3.561
Air Transportation	1.5%	3.403
Legal Services	1.3%	2.780
Automobile Rental and Leasing	1.2%	2.600
Miscellaneous Retail	1.2%	2.590
Food Stores	1.1%	2.384
Banking	0.9%	2.104
Personnel Supply Services	0.9%	2.021
General Merchandise Stores	0.7%	1.502
Motor Vehicle Parts and Accessories	0.7%	1.454
Packaging Materials	0.6%	1.393
Advertising	0.6%	1.373
Automotive Dealers & Service Stations	0.6%	1.328
Hotels and Lodging Places	0.4%	0.986
U.S. Postal Service	0.4%	0.939
Apparel & Accessory Stores	0.4%	0.922
Furniture & Home Furnishings Stores	0.4%	0.862
Research, Development & Testing Serv	0.4%	0.857
Fabricated Metal Products	0.4%	0.798
Equipment Rental and Leasing	0.3%	0.770
Other Commodities	5.2%	11.543

* 1992 Dollars

Source: Report based on IMPLAN Model.

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TABLE A-6

FRUIT, NUTS, & VEGETABLE CLUSTER
Fruit and Vegetable Production

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		1,299.112
Total Inputs		205.050
Agricultural Services	53.8%	110.222
Agricultural Production Materials	16.0%	32.847
Packaging Materials	5.9%	12.035
Real Estate	5.1%	10.378
Wholesale Trade	4.7%	9.629
Insurance Carriers	2.3%	4.794
Warehousing and Trucking	1.8%	3.783
Petroleum Refining	1.2%	2.473
Maintenance and Repair, Other Facilities	1.2%	2.365
FRUIT & VEG PROD. (Intra-industry)	0.7%	1.434
Electric Services	0.6%	1.289
Miscellaneous Repair Shops	0.6%	1.162
Banking	0.5%	0.989
Bags, Plastic	0.5%	0.985
Canvas Products	0.5%	0.966
Air Transportation	0.3%	0.663
Mechanical Equipment	0.3%	0.621
Paper Coated & Laminated N.E.C.	0.3%	0.617
Minerals, Ground Or Treated	0.3%	0.553
Gas Production and Distribution	0.2%	0.496
Bags, Paper	0.2%	0.470
Lubricating Oils and Greases	0.2%	0.436
Tires and Inner Tubes	0.2%	0.435
Communications, Except Radio and TV	0.2%	0.428
Storage Batteries	0.2%	0.403
Motor Vehicle Parts and Accessories	0.2%	0.375
Textile Bags	0.2%	0.338
Railroads and Related Services	0.2%	0.323
Other Commodities	1.7%	3.540

* 1992 Dollars

Source: Report based on IMPLAN Model.

fcvegpd4.wk4

TABLE A-7

FRUIT, NUT, & VEGETABLE CLUSTER
Fruit and Vegetable Processing

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		588.811
Total Inputs		360.021
Packaging Materials	21.3%	76.554
Fruit and Vegetable Crop Production	12.0%	43.363
Wholesale Trade	10.2%	36.827
FRUIT & VEG PROCESSING (Intra-industry)	8.3%	29.710
Livestock and Dairy Processing	7.6%	27.248
Misc. Food Processing	7.5%	27.156
Advertising	4.9%	17.520
Warehousing and Trucking	4.5%	16.315
Noncomparable Imports	2.3%	8.374
Grain and Other Agricultural Crops	2.2%	7.874
Electric Services	1.8%	6.441
Fabricated Metal Products	1.7%	6.095
Agricultural Production Materials	1.6%	5.739
Livestock and Dairy Production	1.3%	4.501
Cyclic Crudes, Organic Chem.	1.0%	3.434
Maintenance and Repair, Other Facilities	0.9%	3.089
Gas Production and Distribution	0.8%	3.030
Paper Coated & Laminated N.E.C.	0.8%	2.956
Information Processing and Accounting	0.7%	2.699
Real Estate	0.6%	2.105
Forestry Products	0.6%	1.984
Bags, Plastic	0.5%	1.732
Railroads and Related Services	0.5%	1.711
Other Commodities	6.5%	23.562

* 1992 Dollars

Source: Report based on IMPLAN Model.

fcvegpc4.wk4

TABLE A-8

LIVESTOCK CLUSTER
Livestock, Poultry, and Dairy Production

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		569.875
Total Inputs		436.256
Feed and Pasture	45.3%	197.707
Agricultural Services	14.4%	62.720
LIVESTOCK PRODUCTION (Intra-industry)	12.7%	55.229
Wholesale Trade	4.9%	21.272
Real Estate	4.5%	19.849
Warehousing and Distribution	3.2%	13.862
Other Medical and Health Services	2.1%	8.994
Misc. Food Processing	1.8%	7.853
Electric Services	1.6%	6.843
Maintenance and Repair, Other Facilities	1.3%	5.507
Agricultural Production Materials	1.1%	4.731
Insurance Carriers	1.0%	4.428
Railroads and Related Services	1.0%	4.408
Banking	0.7%	2.850
Drugs	0.5%	2.163
Livestock and Dairy Processing	0.4%	1.695
Miscellaneous Repair Shops	0.4%	1.585
Petroleum Refining	0.3%	1.125
Mechanical Equipment	0.2%	1.071
Water Supply and Sewerage Systems	0.2%	0.995
Grain and Other Crops	0.2%	0.981
Other Commodities	2.4%	10.387
<p>* 1992 Dollars</p> <p>Source: Report based on IMPLAN Model.</p> <p>fclive4.wk4</p>		

TABLE A-9
LIVESTOCK CLUSTER
Meat, Poultry, and Dairy Processing

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		875.918
Total Inputs		700.904
Livestock and Dairy Production	52.2%	365.590
MEAT, POULTRY, DAIRY (Intra-industry)	24.3%	170.427
Wholesale Trade	5.5%	38.694
Packaging Materials	4.6%	32.001
Advertising	2.4%	16.976
Misc. Food Processing	1.7%	12.047
Warehousing and Trucking	1.3%	8.806
Electric Services	1.2%	8.497
Fruit and Vegetable Processing	1.0%	7.305
Maintenance and Repair, Other Facilities	0.5%	3.235
Gas Production and Distribution	0.5%	3.200
Bags, Plastic	0.4%	2.983
Paper Coated & Laminated N.E.C.	0.4%	2.869
Real Estate	0.3%	2.115
Paper Coated & Laminated Packaging	0.2%	1.455
Bags, Paper	0.2%	1.424
Air Transportation	0.2%	1.344
Information Processing and Accounting	0.2%	1.314
Noncomparable Imports	0.2%	1.165
Legal Services	0.2%	1.105
Feed and Pasture	0.2%	1.102
Other Commodities	2.5%	17.251
<p>* 1992 Dollars</p> <p>Source: Report based on IMPLAN Model.</p> <p style="text-align: right;">fdlvp4.wk4</p>		

TABLE A-10

COTTON CLUSTER
Cotton Production

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)
Total Industry Output*.....		325.338
Total Inputs		170.038
Agricultural Services	72.7%	123.629
Agricultural Production Materials	9.8%	16.735
Real Estate	5.9%	9.998
Wholesale Trade	2.4%	4.062
Insurance Carriers	1.9%	3.196
Maintenance and Repair, Other Facilities	1.1%	1.899
Warehousing and Trucking	0.9%	1.557
COTTON (Intra-industry)	0.8%	1.433
Electric Services	0.7%	1.184
Banking	0.5%	0.828
Livestock and Dairy Production	0.4%	0.707
Petroleum Refining	0.4%	0.639
Miscellaneous Repair Shops	0.3%	0.550
Gas Production and Distribution	0.3%	0.457
Mechanical Equipment	0.2%	0.304
Other Commodities	1.7%	2.862
<p>* 1992 Dollars</p> <p>Source: Report based on IMPLAN Model.</p> <p>fccoton4.wk4</p>		

TABLE A-11

METALS & MACHINERY CLUSTER
Fabricated Metal Products

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		155.307
Total Inputs		87.601
Blast Furnaces and Steel Mills	23.7%	20.782
Wholesale Trade	9.8%	8.556
FABRICATED METAL (Intra-industry)	9.3%	8.138
Aluminum Rolling and Drawing	6.6%	5.816
Maintenance and Repair, Other Facilities	3.7%	3.257
Warehousing and Trucking	3.6%	3.154
Packaging Materials	3.4%	2.944
Electric Services	2.9%	2.533
Mechanical Equipment	2.8%	2.451
Advertising	2.4%	2.125
Iron and Steel Foundries	2.2%	1.917
Metal Stampings, N.E.C.	1.8%	1.569
Information Processing and Accounting	1.5%	1.288
Screw Machine Products and Bolts, Etc.	1.5%	1.287
Paints and Allied Products	1.4%	1.194
Real Estate	1.2%	1.075
Air Transportation	1.0%	0.914
Copper Rolling and Drawing	1.0%	0.901
Gas Production and Distribution	1.0%	0.889
Chemical Preparations, N.E.C	0.9%	0.829
Primary Copper	0.9%	0.786
Hotels and Lodging Places	0.9%	0.772
Cyclic Crudes, Organic Chem.	0.9%	0.755
Glass and Glass Products, Exc Containers	0.8%	0.737
Primary Aluminum	0.8%	0.684
Legal Services	0.8%	0.671
Brass, Bronze, and Copper Foundries	0.7%	0.618
Banking	0.7%	0.606
Insurance Carriers	0.7%	0.571
Other Commodities	11.2%	9.782

* 1992 Dollars

Source: Report based on IMPLAN Model.

fcmetal4.wk4

TABLE A-12
METALS & MACHINERY CLUSTER
Mechanical Equipment

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		66.979
Total Inputs		38.297
MECHANICAL EQUIP (Intra-industry)	22.3%	8.546
Blast Furnaces and Steel Mills	8.3%	3.163
Wholesale Trade	7.9%	3.039
Iron and Steel Foundries	4.6%	1.779
Fabricated Metal Products	3.9%	1.496
Electric Services	3.6%	1.376
Maintenance and Repair, Other Facilities	3.5%	1.332
Advertising	3.1%	1.197
Information Processing and Accounting	2.7%	1.039
Real Estate	2.1%	0.800
Packaging Materials	2.1%	0.789
Relays & Industrial Controls	1.9%	0.737
Aluminum Rolling and Drawing	1.8%	0.671
Warehousing and Trucking	1.7%	0.652
Motors and Generators	1.7%	0.632
Legal Services	1.5%	0.573
Brass, Bronze, and Copper Foundries	1.4%	0.519
Air Transportation	1.3%	0.515
Screw Machine Products and Bolts, Etc.	1.3%	0.507
Abrasive Products	1.1%	0.419
Primary Copper	1.0%	0.384
Iron and Steel Forgings	1.0%	0.366
Noncomparable Imports	0.9%	0.332
Aluminum Foundries	0.9%	0.330
Banking	0.8%	0.311
Nonferrous Wire Drawing and Insulating	0.8%	0.304
Gas Production and Distribution	0.7%	0.258
Insurance Carriers	0.7%	0.255
Equipment Rental and Leasing	0.6%	0.230
Copper Rolling and Drawing	0.6%	0.229
Transformers	0.6%	0.225
Communications, Except Radio and TV	0.6%	0.219
Primary Metal Products, N.E.C	0.6%	0.212
Other Commodities	12.7%	4.862

* 1992 Dollars

Source: Report based on IMPLAN Model.

fcmech4.wk4

TABLE A-13
INFORMATION PROCESSING CLUSTER

Commodity Demand	Share of Total Inputs	Value of Inputs (\$ Mil.)*
Total Industry Output*.....		422.808
Total Inputs		147.769
INFO PROCESSING (Intra-industry)	33.9%	50.125
Real Estate	6.9%	10.131
Packaging Materials	5.8%	8.614
Semiconductors and Related Devices	5.4%	8.050
Air Transportation	4.4%	6.467
Personnel Supply Services	3.6%	5.284
Legal Services	3.4%	5.044
Communications, Except Radio and TV	2.3%	3.325
Wholesale Trade	2.2%	3.299
Colleges, Universities, Schools	1.7%	2.526
Advertising	1.5%	2.191
Electronic Components, N.E.C.	1.4%	2.027
Printing	1.4%	2.005
Maintenance and Repair, Other Facilities	1.4%	2.002
U.S. Postal Service	1.3%	1.971
Computer Storage Devices	1.2%	1.785
Hotels and Lodging Places	1.2%	1.737
Electric Services	1.1%	1.668
Miscellaneous Repair Shops	1.1%	1.644
Banking	1.1%	1.584
Computer Peripheral Equipment,	1.0%	1.492
Business Associations	0.8%	1.121
Photographic Equipment and Supplies	0.8%	1.113
Magnetic & Optical Recording Media	0.7%	1.092
Warehousing and Trucking	0.7%	0.975
Noncomparable Imports	0.7%	0.963
Equipment Rental and Leasing	0.6%	0.920
Services To Buildings	0.5%	0.793
Automobile Rental and Leasing	0.5%	0.729
Typesetting	0.5%	0.722
Engineering, Architectural Services	0.5%	0.671
Other Commodities	10.6%	15.697

* 1992 Dollars

Source: Report based on IMPLAN Model.

frinfo4.wk4

APPENDIX 3B

MEMORANDA OF
UNDERSTANDING AND TAX SHARING INFORMATION

The following is a general description of the provisions of memorandums of understanding (MOUs) between Fresno County and the cities within Fresno County. Each MOU is separated into sales tax provisions, property tax provisions, land use provisions, and redevelopment provisions. The below tables, therefore, are separated into these categories.

TABLE 3B-1
SALES TAX PROVISIONS

CITY	DATE AGREEMENT EXECUTED	SALES TAX PROVISIONS
Coalinga	February 13, 1990	<ul style="list-style-type: none"> • ½ of 1% First Year Beginning July 1, 1990 • 1 ½ of 1% Second Year • Maximum of 5% by Year 9
Parlier	Sept. 17, 1991	<ul style="list-style-type: none"> • Maximum of 5% by Year 9 from the time the City became eligible to reallocate sales taxes.
Mendota	March 27, 1990	<ul style="list-style-type: none"> • ½ of 1% First Year Beginning July 1, 1990 • Second Year Amount Delay Because Sales Tax Has Not Grown • Ultimately 5%
San Joaquin	August 13, 1991	<ul style="list-style-type: none"> • Maximum of 5% by Year 9 from the time the City became eligible to reallocate sales taxes.
Selma	April 17, 1990	<ul style="list-style-type: none"> • ½ of 1% First Year Beginning July 1, 1990 • 1 ½ of 1% Second Year • Maximum of 5% By Year 9
Clovis	August 21, 1990	<ul style="list-style-type: none"> • ½ of 1% First Year Beginning Oct. 1, 1990 • 1 ½ of 1% Second Year Beginning July 1, 1990 • Maximum of 5% By Year 9
Sanger	February 9, 1993	<ul style="list-style-type: none"> • ½ of 1% First Year Beginning Oct. 1, 1990 • 1 ½ of 1% Second Year Beginning July 1, 1990 • Maximum of 5% By Year 9
Kingsburg	October 16, 1990	<ul style="list-style-type: none"> • 2% First Year Beginning April, 1993 • Maximum of 5% By Year 9
Fresno	February 26, 1991	<ul style="list-style-type: none"> • ½ of 1% First Year Beginning April 1, 1991 • 1 ½ of 1% Second Year Beginning July 1, 1991 • Maximum of 5% By Year 5
Reedley	April 9, 1991	<ul style="list-style-type: none"> • 1 ½ of 1% First Year Beginning July 1, 1991 • Maximum of 5% by Year 9
Fowler	June 9, 1992	<ul style="list-style-type: none"> • 5% by the ninth year of the agreement • Percentage would phase in over 9 years beginning with 1.5% on July 1, 1992.
Kerman	April 21, 1992	<ul style="list-style-type: none"> • 5% by the ninth year of the agreement • Percentage would phase in over 9 years beginning with 1.5% on July 1, 1992.

Firebaugh	June, 14, 1994	<ul style="list-style-type: none">• 5% by the ninth year of the agreement• Percentage would phase in over 9 years beginning with 2% on July 1, 1992.
Orange Cove	October 8, 1996	N/A
Huron	September 15, 1998	<ul style="list-style-type: none">• ½ of 1% First Year Beginning July 1, 1998/99• 1 ½ of 1% Second Year• Maximum of 5% By Year 8

**TABLE 3B-2
PROPERTY TAX PROVISIONS**

CITY	PROPERTY TAX PROVISIONS
Coalinga	<ul style="list-style-type: none"> • County Share 56% • City Share 44% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Parlier	<ul style="list-style-type: none"> • County Share 60% • City Share 40% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Mendota	<ul style="list-style-type: none"> • County Share 55% • City Share 45% • County will retain its share of property tax base for undeveloped property, • County will share base on developed property
San Joaquin	<ul style="list-style-type: none"> • County Share 67% • City Share 33% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Selma	<ul style="list-style-type: none"> • County Share 62% • City Share 38% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Clovis	<ul style="list-style-type: none"> • County Share 63% • City Share 37% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Sanger	<ul style="list-style-type: none"> • County Share 53% • City Share 47% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Kingsburg	<ul style="list-style-type: none"> • County Share 67% • City Share 33% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Fresno	<ul style="list-style-type: none"> • County Share 62% • City Share 38% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Reedley	<ul style="list-style-type: none"> • County Share 66% • City Share 34% • County will retain its share of property tax base for undeveloped property • County will share base on developed property

Fowler	<ul style="list-style-type: none"> • County Share 65% • City Share 35% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Kerman	<ul style="list-style-type: none"> • County Share 66% • City Share 34% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Firebaugh	<ul style="list-style-type: none"> • County Share 60% • City Share 40% • County will retain its share of property tax base for undeveloped property • County will share base on developed property
Orange Cove	<ul style="list-style-type: none"> • County Share 90% • City Share 10% • For Parcels 1 and 2, the JPA between the County and Redevelopment Agency shall determine the distribution of the property tax revenue. • For Parcel 3, County will retain all of its base property tax revenue upon annexation.
Huron	<ul style="list-style-type: none"> • County Share 58% • City Share 42% • County will retain its share of property tax base for undeveloped property • County will share base on developed property

**TABLE 3B-3
LAND USE PROVISIONS**

City	Land Use Provisions
Coalinga	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's sphere of influence (s.o.i.) • Notification area based upon map in memorandum of understanding between City and County.
Parlier	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's sphere of influence (s.o.i.) • Notification area two miles beyond city's s.o.i. and for the Manning Ave Corridor four hundred feet both north and south of the centerline of the road.
Mendota	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area two miles beyond city's s.o.i.
San Joaquin	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area two miles beyond city's s.o.i.
Selma	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area two miles beyond city's and sanitation district's s.o.i.
Clovis	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area based upon map attached in memorandum of understanding with the County.
Sanger	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area two miles beyond city's s.o.i.
Kingsburg	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area two miles beyond city's and sanitation district's s.o.i.
Fresno	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within ½ miles in of city's boundaries in city's s.o.i. • Notification area based upon maps attached in City's memorandum of Understanding with the County
Reedley	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area based upon map attached Exhibit #2 of City's memorandum of understanding with the County and two miles beyond city's s.o.i.
Fowler	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area is two miles beyond city's s.o.i.
Kerman	<ul style="list-style-type: none"> • Annexations based upon standards in attached Exhibit 1. • County referral policy within city's s.o.i. • Notification area is two miles beyond city's s.o.i.

Firebaugh	<ul style="list-style-type: none">• Annexations based upon standards in attached Exhibit 1.• County referral policy within city's s.o.i.• Notification area is two miles beyond city's s.o.i.
Huron	<ul style="list-style-type: none">• Annexations based upon standards in attached Exhibit 1.• County referral policy within city's s.o.i.• Notification area is two miles beyond city's s.o.i.
Orange Cove	<ul style="list-style-type: none">• "Annexation Area" shall be contingent upon the approval by the State of California to a site privately owned and operated re-entry facility on the "Annexation Area."

TABLE 3B-4
REDEVELOPMENT PROVISIONS

City	Redevelopment Provisions
Coalinga	<ul style="list-style-type: none"> 100% pass through of County's & library districts share of property tax increment. Can negotiate a separate special agreement.
Parlier	<ul style="list-style-type: none"> 100% pass through of County's & library districts share of property tax increment. Can negotiate a separate special agreement.
Mendota	<ul style="list-style-type: none"> 100% pass through of county's & library districts share of property tax increment. Can negotiate a separate special agreement.
San Joaquin	<ul style="list-style-type: none"> 100% pass through of county's & library districts share of property tax increment. Can negotiate a separate special agreement.
Selma	<ul style="list-style-type: none"> 100% pass through of county's & library districts share of property tax increment Can negotiate a separate special agreement. Exception for five residential areas which need public improvements; the agency will retain 100% of county's tax increment share for fifteen years.
Clovis	<ul style="list-style-type: none"> 100% pass through of county's & library districts share of property tax increment. Can negotiate a separate special agreement. A separate agreement was negotiated for a new redevelopment project; county shared part of its tax increment with agency.
Sanger	<ul style="list-style-type: none"> 100 % pass through or negotiate alternative agreement.
Kingsburg	<ul style="list-style-type: none"> 100% pass through of county's & library's districts share of property tax increment. can negotiate a separate special agreement.
Fresno	<ul style="list-style-type: none"> Detailed process and agreement for alternative to 100% pass through of county's and library district's share of property tax increment. If city decides to select the alternative method, there is a limit of 20 years to retain a portion or all of the county's increment. City obligated to hire outside consultant if staffs do not agree on use of county's increment. Even with use of County's increment city still agrees to minimize such use in the redevelopment projects.
Reedley	<ul style="list-style-type: none"> 100% pass through of county's & library districts share of property tax increment. Can negotiate a separate special agreement.
Fowler	<ul style="list-style-type: none"> 100 % pass through or negotiate alternative agreement.
Kerman	<ul style="list-style-type: none"> 100% pass through or negotiate alternative agreement. If a designated area to the east of the city is annexed and included in a propose redevelopment project area, the redevelopment agency may retain 100% of the County's share of the property tax increment within that area for up to 15 years as long as it is used only to address significant health, safety, and housing issues in that area.
Firebaugh	<ul style="list-style-type: none"> 100% pass through or negotiate alternative agreement.
Huron	N/A

Orange Cove	<ul style="list-style-type: none"> Existing redevelopment agreements with the Orange Cove Redevelopment Agency will continue to be in effect for the allocation of tax increment from existing project areas.
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The following table contains the required changes to City Sales and Use Tax Ordinances, as directed under the memorandums of understandings for the fiscal year beginning July 9th, 1997.

TABLE 3B-5
CHANGES TO CITY SALES AND USE TAX ORDINANCES

City's With MOU's	Sales Tax Rate July 1,1996	Change	Sales Tax Rate July 1,1997
Clovis	.9600	-.005	.9550
Coalinga	.9750	-.005	.9700
Firebaugh	.9750	-.005	.9700
Fowler	.9750	-.005	.9700
Kerman	.9700	No Change	.9700
Kingsburg	.9700	-.005	.9650
Mendota	.9950	-.010	.9850
Parlier	1.000	No Change	1.000
Reedley	.9800	-.005	.9750
San Joaquin	.9750	No Change	.9750
Sanger	.9700	-.005	.9600
Selma	.9650	-.005	.9600
Fresno	.9458	No Change	.9458

EXHIBIT 3B-1 STANDARDS FOR ANNEXATION

The proposal must be consistent with the adopted sphere of influence of the city and not conflict with the goals and policies of the Cortese-Knorr Act.

The proposal must be consistent with city general and specific plans, including adopted goals and policies.

Pursuant to CEQA, the proposal must mitigate any significant adverse effect on continuing agricultural operations on adjacent properties, to the extent reasonable and consistent with the applicable general and specific plan.

A proposal for annexation is acceptable if one of the following conditions exists:

1. There is existing substantial development provided the City confines its area requested to that area needed to include the substantial development and create logical boundaries.
2. Development exists that requires urban services which can be provided by the City.
3. If no development exists, at least 50% of the area proposed for annexation has:
 - (i) Approved tentative subdivision map(s) (S.F. residential)
 - (ii) Approved site plan (for other uses)

The proposal would not create islands. Boundaries must ultimately minimize creation of peninsulas and corridors, or other distortion of boundaries.

For any of the following circumstances a proposal for annexation is presumed to comply with all standards for annexation:

The request for annexation is by a city for annexation of its own publicly-owned property for public use.

The request for annexation is by a city in order to facilitate construction of public improvements or public facilities which otherwise could not be constructed.

The request for annexation is to remove an unincorporated island or substantially surrounded area.

The request for annexation is for an industrial or regional commercial project for which a development application has been made and no significant adverse environmental impact will result that cannot be mitigated or overridden by a necessary public purpose. Condition(s) assuring the financing or completion of necessary development infrastructure before completion of annexation shall be made a part of the proposal.

The annexation is intended to mitigate or otherwise comply with standards/conditions required by another agency with respect to another development/annexation.

CHAPTER 4: TRANSPORTATION AND CIRCULATION



4.1 INTRODUCTION

This chapter describes existing transportation services and facilities, including highway, transit, bikeway, rail, and aviation facilities and related programs.

4.2 STREET AND ROADWAY SYSTEM

EXISTING ROADWAYS

Fresno County's circulation system consists of a roadway network that is primarily rural in character, with the exception of the urbanized area surrounding the cities of Fresno and Clovis and various smaller communities in the southern and western parts of the county. The most important inter-regional roadways within the county are the state highways, particularly State Route (SR) 99, Interstate 5 (I-5), and State Route (SR) 41, which traverse the county from north to south.

I-5 is the primary north-south route for interregional and interstate business, freight, tourist, and recreation travel, linking Southern California to Northern California and the Pacific Northwest. SR 99 performs a similar function on a regional level, connecting most of the cities in the San Joaquin Valley to Sacramento and southern California. SR 41 links Fresno County to Yosemite National Park and the Sierra communities to the north, as well as to Kings County and the central coast to the south. In addition to I-5, SR 99, and SR 41, Fresno County is served by State Routes 33, 43, 63, 145, 168, 180, 198, and 269.

The county is also served by other major roadways that serve local and regional traffic, connect the cities and communities of Fresno County, and provide farm-to-market routes. These roadways provide the critical freight and commercial linkages between production/manufacturing and the larger inter-regional distribution system. These roadways appear on the Fresno County General Plan Circulation System map as expressways, super arterials, arterials, and collectors.

FUNCTIONAL CLASSIFICATION

The *Fresno County General Plan* classifies roadways according to the following hierarchy: freeways, expressways, super arterials, arterials, collectors, and local roads.

Freeways

Freeways are high-speed (65 mph) facilities with a high degree of access control. The main function of freeways is to provide a link between the county transportation system to the surrounding regions and beyond. Freeway access is typically provided by interchanges or, occasionally, at-grade ramp connections, linking the freeway to surface roadways. In Fresno County, I-5, SR 99, and SR 41 (between SR 99 and Friant Avenue) are designated freeway facilities.

Work is in progress (1997) that will create additional freeway segments on SR 41 between the city of Fresno and the Madera County line; SR 168 from SR 180 to Temperance; and SR 180 between SR 99 and the city of Clovis.

Expressways

Expressways are typically high-speed (55 mph), four-lane divided highways with a high degree of access control. They are designed to connect cities and communities in Fresno County with each other, with the freeway system, other expressways, or communities in surrounding counties. Access is provided by at-grade intersections, which are typically spaced no closer than one-half mile from each other. Most expressway facilities in the county, such as SR 33 and Manning Avenue, are located in rural or transitional areas. Many of the roadways that are designated on the County's Circulation Diagram as expressways are currently two-lane roadways that do not yet meet expressway design and access control standards. Restructuring of pre-existing access would not usually occur until these roadways are improved to multi-lane expressway standards.

Super Arterials

Super arterials are typically four-lane divided roadways with a moderate to high degree of access control. They are designed to provide mobility within Fresno County and between individual cities by enabling traffic to move on continuous routes that join major traffic generators, freeways, expressways, and other arterials. Access control is managed by license and must conform to specific pre-determined access and design criteria maintained by the public works department. Otherwise, access and function are as an arterial. Fresno County's Circulation System map classifies SR 145 north of Kerman, Golden State Boulevard south of the city of Fresno, and Manning Avenue between Academy and Zediker as super arterials.

Arterials

The purpose of the arterial street network is to provide connections between major traffic generators to the freeway, expressway and arterial street system. Arterials are classified as either urban or rural. Urban arterials, such as Shaw Avenue and Cedar Avenue, are typically four-lane, divided roadways with moderate to high access control. Rural arterials, such as American Avenue (west of SR 41) and Academy Avenue, are typically two-lane roadways or four-lane divided roadways with low to moderate access control. Expressways have the same geometric design standards as arterials; the only differences are related to stricter access limitations on expressways.

Collectors

The purpose of the collector street system is to link the local road network to the arterial street system. Urban collectors are two- or four- lane undivided roadways with little access control and low to moderate speeds (35-45 mph). Rural collectors are generally two-lane roadways with little access control.

Local Roads

Local roads provide direct connections between abutting properties and the collector street system. These facilities are, typically, two-lane undivided roadways with little or no access control.

Figure 4-1 illustrates Fresno County's transportation system. For the sake of clarity this figure does not show local roads.

EXISTING TRAFFIC VOLUMES AND LEVELS OF SERVICE

The evaluation of traffic volumes on the roadway network provides an understanding of the general nature of travel conditions in Fresno County. However, traffic volumes do not indicate the quality of service provided by the roadway facilities nor the ability of the roadway network to carry additional traffic. To accomplish this, the concept of "level of service" has been developed. All recent traffic volume data on the county's roadway system has been collected and organized in a database for the General Plan Update effort.

Level of Service

Level of service is a qualitative assessment of operational or service characteristics that measures the effect of a number of transportation related factors, including volume, speed and travel time, interruptions, freedom to maneuver, driving comfort, and convenience. Level of service cover the entire range of traffic operations that are designated from "A" (best conditions) to "F" (worst conditions). Level of service "E" describes conditions approaching or at maximum capacity.

This analysis of the Fresno County's roadway system employs a level of service methodology developed by the Transportation Research Board's 1994 *Highway Capacity Manual*. The specific version used was developed by the Florida Department of Transportation (FDOT), called the "Florida Tables". FDOT's methodology provides level of service and volume thresholds for freeway, arterial, and highway facilities using speed, saturation flow, signalization, and a number of other variables.

Facilities are grouped by the development characteristics in either urbanized, transitioning urbanized, or rural undeveloped areas.

Urbanized Areas

Urbanized areas, such as the cities of Fresno and Clovis, are generally defined as places with a population of approximately 500,000 (based on the 1990 U.S. Census) and commonly within the urbanized area boundaries developed by the Federal Highway Administration (FHWA).

Transitioning Urbanized Areas

Transitioning urbanized areas are defined as areas outside urbanized areas that are planned to be included within the urbanized area within the next 20 years based on a population density of 1,000 persons per square mile. This analysis expands the grouping to include communities with populations of at least 5,000 that are not within the urbanized area. The communities of Coalinga, Firebaugh, Kerman, Mendota, Reedley, Fowler, San Joaquin, Orange Cove, Kingsburg, Selma, and Sanger, as well as unincorporated areas of the county near the cities of Clovis and Fresno were grouped into this category.

Rural Undeveloped Areas

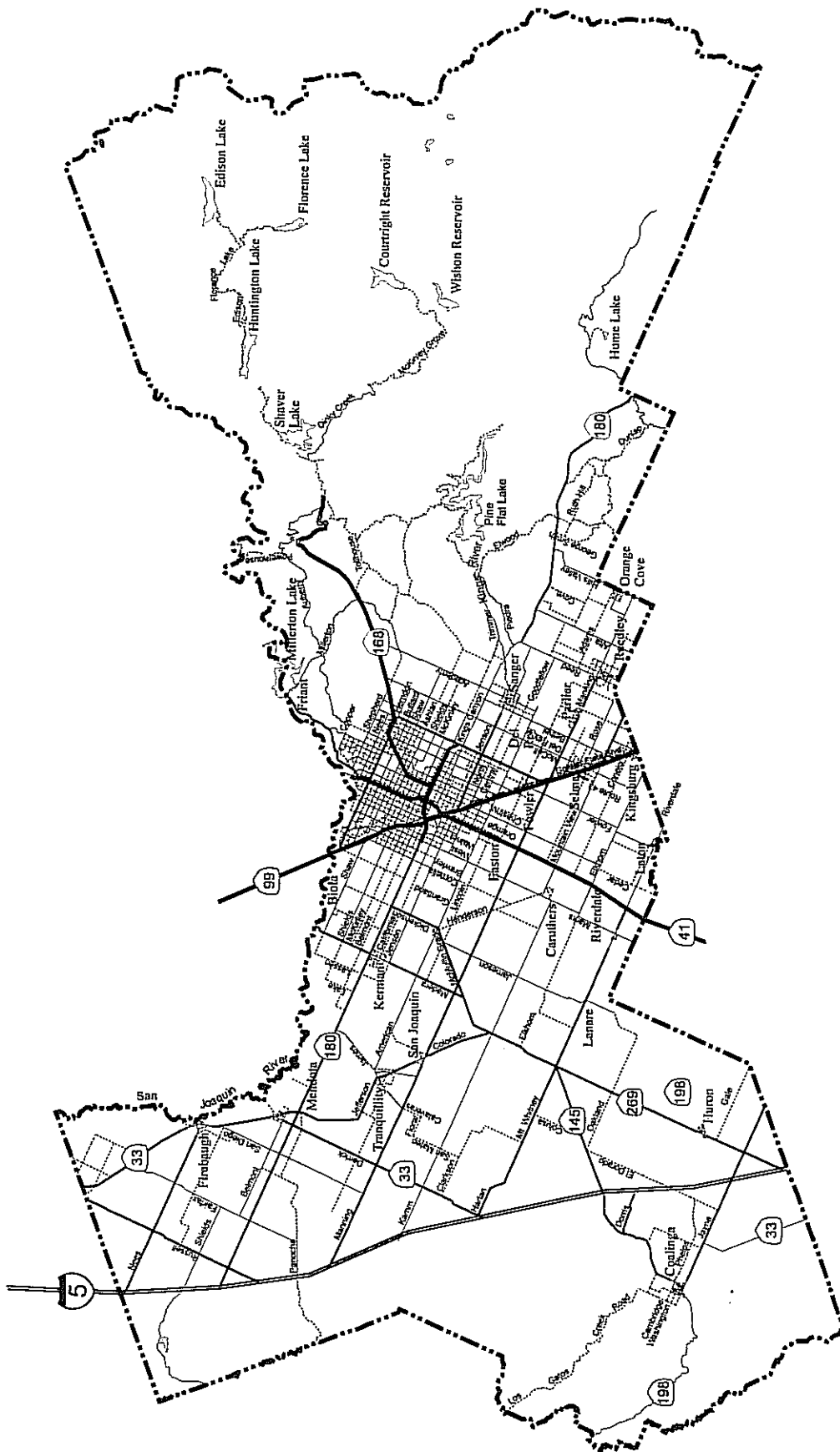
Rural undeveloped areas are generally all portions of the county that fall outside the urbanized or transitioning urbanized areas. Most of the county west of SR 41 and east of Academy Avenue were grouped into this category, with the exception of the areas listed above.

Table 4-1 describes the facility types that are found in the Florida Tables, including a correlation between these facility types and the functional classification system employed by Fresno County.

TABLE 4-1			
FDOT FACILITY TYPES			
Area Type	Facility Type	Description	Fresno County Facility
Urbanized	Freeway		
	Group 1	within urbanized area over 500,000 population or near CBD ¹	Freeway
	Group 2	within urbanized area but not in Group 1	Freeway
	Arterials		
	Type A	fewer than 0.50 signals/mile	Expressway / Arterial
	Type B	0.50 to 2.49 signals/mile	Expressway / Arterial
	Type C	2.50 to 4.50 signals/mile	Arterial
	Type D	more than 4.50 signals/mile and not within CBD.	Arterial
	Type E	more than 4.50 signals/mile and within CBD.	Arterial
Transitioning Urbanized	Freeway	within Transitioning Urbanized Area	Freeway
	Arterials		
	Type A	fewer than 0.50 signals/mile	Expressway / Arterial
	Type B	0.50 to 2.49 signals/mile	Expressway / Arterial
	Type C	2.50 to 4.50 signals/mile	Arterial
	Type D	more than 4.50 signals/mile	Arterial
Rural Undeveloped	Freeway	within Rural Undeveloped Area	Freeway
	Highway	more than 1 lane per direction	Expressway / Arterial
	2-lane Highway	no more than 1 lane per direction	Expressway / Arterial / Collector
1. CBD=Central Business District			

Tables 4-2 through 4-5 summarize the level of service definitions for each of the functional classification categories. A review of these tables indicate that traffic operations start to deteriorate (i.e., level of service "D") at a volume-to-capacity ratio of 0.72 and 0.80 for freeways and arterial roadways, respectively. On two-lane rural highways, however, level of service "D" begins at a much lower volume-to-capacity ratio (0.36). This level of service distinction recognizes that two-lane rural highways are used for long-distance travel and that drivers must frequently pass slower vehicles in order to maintain high travel speeds. Driver frustration grows since frequent passing on two-lane highways becomes increasingly difficult at relatively low volume-to-capacity ratios.

To determine roadway level of service, relationships have been developed between daily traffic volumes and level of service based on facility type, number of lanes, temporal distribution of traffic, regional setting, and volume-to-capacity ratio. Table 4-6 summarizes approximate



Fresno County General Plan

Fresno County Transportation System

Figure 4-1

Existing

Freeway

Expressway

Super Arterial

Arterial

Collector



NORTH

0 10
1" = 10 miles

maximum daily traffic volumes for each facility/level of service combination. Note that level of service represents peak hour conditions although it is based on daily traffic and capacity estimates.

TABLE 4-2

FREEWAY LEVEL OF SERVICE DESCRIPTIONS
Rural, Transitional, or Urban

LOS	V/C Ratio	Description
A	0.00-0.30	Free Flow: Vehicles completely unimpeded to maneuver in traffic stream. Average speeds near 60 mph.
B	0.31-0.48	Free Flow: Ability to maneuver in traffic stream only slightly restricted. Average speeds over 57 mph.
C	0.49-0.71	Stable Flow: Freedom to maneuver in traffic stream noticeably restricted. Average speeds over 54 mph.
D	0.72-0.87	Approaching Unstable Flow: Freedom to maneuver in traffic stream is severely limited. Average speeds over 46 mph.
E	0.88-1.00	Unstable Flow: Volumes at or near capacity. Maneuvering is extremely limited. Average speeds over 30 mph.
F	>1.00	Forced Flow: Queues form behind breakdown points. Average speeds less than 30 mph.

Source: *Highway Capacity Manual*, Transportation Research Board, 1994.

TABLE 4-3

ARTERIAL LEVEL OF SERVICE DESCRIPTIONS
Urbanized Areas

LOS	V/C Ratio By Arterial Type ¹					Description
	A	B	C	D	E	
A	0.00 to 0.33	n/a	n/a	n/a	n/a	Free Flow/Insignificant Delays: No approach phase at a signalized intersection is fully utilized by traffic and no vehicle waits longer than one red signal indication.
B	0.34 to 0.55	0.00 to 0.70	n/a	n/a	n/a	Stable Operation/Minimal Delays: An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles.
C	0.56 to 0.75	0.71 to 0.89	0.00 to 0.36	n/a	n/a	Stable Operation/Acceptable Delays: Major approach phases fully utilized. Most drivers feel somewhat restricted.
D	0.76 to 0.89	0.90 to 0.97	0.37 to 0.82	0.00 to 0.61	0.00 to 0.76	Approach Unstable/Tolerable Delays: Drivers may have to wait through more than one red signal indication. Queues may develop but dissipate rapidly, without excessive delays.
E	0.90 to 1.00	0.98 to 1.00	0.83 to 0.93	0.62 to 0.87	0.77 to 0.87	Unstable Operation/Significant Delays: Volumes at or near capacity. Vehicles may wait through several signal cycles. Long queues form upstream from intersection.
F	more than 1.00	more than 1.00	more than 0.93	more than 0.88	more than 0.88	Forced Flow/Excessive Delays: Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

Source: *Highway Capacity Manual*, Transportation Research Board, 1994.

¹Level of service is not achievable where "n/a" is shown

TABLE 4-4

ARTERIAL LEVEL OF SERVICE DESCRIPTIONS
Transitioning Urbanized Areas

LOS	V/C Ratio by Arterial Type ¹					Description
	A	B	C	D	E	
A	0.00 to 0.30	n/a	n/a	n/a	n/a	Free Flow/Insignificant Delays: No approach phase at a signalized intersection is fully utilized by traffic and no vehicle waits longer than one red signal indication.
B	0.31 to 0.50	0.00 to 0.73	n/a	n/a	n/a	Stable Operation/Minimal Delays: An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles.
C	0.51 to 0.70	0.74 to 0.91	0.00 to 0.36	n/a	n/a	Stable Operation/Acceptable Delays: Major approach phases fully utilized. Most drivers feel somewhat restricted.
D	0.71 to 0.84	0.92 to 0.98	0.37 to 0.84	0.00 to 0.63	n/a	Approach Unstable/Tolerable Delays: Drivers may have to wait through more than one red signal indication. Queues may develop but dissipate rapidly, without excessive delays.
E	0.85 to 1.00	0.98 to 1.00	0.85 to 0.93	0.64 to 0.89	n/a	Unstable Operation/Significant Delays: Volumes at or near capacity. Vehicles may wait through several signal cycles. Long queues form upstream from intersection.
F	more than 1.00	more than 1.00	more than 0.93	more than 0.89	n/a	Forced Flow/Excessive Delays: Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

Source: *Highway Capacity Manual*, Transportation Research Board, 1994.

¹Level of service is not achievable where "n/a" is shown

TABLE 4-5

2-LANE HIGHWAY LEVEL OF SERVICE DESCRIPTIONS
Rural, Undeveloped Areas

LOS	V/C Ratio	Description
A	0.00-0.11	Free Flow: Almost no platoons of three or more cars. Drivers delayed no more than 30% by slow moving vehicles.
B	0.12-0.24	Free Flow: Some platoons form. Drivers delayed no more than 45% by slow moving vehicles.
C	0.25-0.39	Stable Flow: Noticeable increase in platoon formation and size. Drivers delayed no more than 60% by slow moving vehicles.
D	0.40-0.62	Approaching Unstable Flow: Heavy platooning. Passing becomes difficult. Drivers delayed no more than 75% by slow moving vehicles.
E	0.63-1.00	Unstable Flow: Intense platooning. Passing is virtually impossible. Drivers delayed more than 75% by slow moving vehicles.
F	>1.00	Forced Flow: Queues form behind breakdown points.

Source: *Highway Capacity Manual*, Transportation Research Board, 1994.

Note: Assumed conditions include 60/40 directional split, 5% heavy vehicles, and 20%, 40%, and 60% no passing zones for level, rolling, and mountainous terrain, respectively.

TABLE 4-6

EVALUATION CRITERIA FOR LEVEL OF SERVICE

No.	Description	Approximate Maximum Daily Traffic Volume Per Lane by LOS Category				
		A	B	C	D	E
1	Rural Freeway	4,500	7,250	10,650	13,050	14,900
2	Rural Multi-Lane Highway	4,200	7,050	9,800	11,700	13,550
3	Rural 2-Lane Highway	1,300	2,650	4,300	6,800	11,000
4	Urban Freeway, Group 1	5,600	9,000	13,250	16,200	18,525
5	Urban Arterial, Type B	n/a	6,375	7,900	8,475	8,550

Source: DKS Associates, 1996.

Fresno County has not adopted a comprehensive level of service standard. However, it is a well established County practice to maintain level of service "C" as a goal for development mitigation, and as a threshold for County capacity-enhancing roadway projects. For this analysis, Table 4-7 summarizes those roadway sections that currently operate at level of service "D" or worse and the daily traffic volume, capacity, facility type, and number of lanes on each roadway segment. Figures 4-2 and 4-3 show the roadways operating at level of service "D" or worse in the rural and urban areas of the county, respectively.

TABLE 4-7

EXISTING LEVEL OF SERVICE DEFICIENCIES
Unincorporated Fresno County
1995

Roadway	Segment	Lanes	Type ¹	Capacity	ADT	LOS
State Rt. 41	south of Mtn. View	2	3	22,000	8,700	D
	north of Mtn. View	2	3	22,000	9,535	D
	south of American	2	5	17,100	17,500	F
	north of American	2	5	17,100	16,800	D
State Rt. 43	south of Elkhorn	2	3	22,000	10,405	D
	north of Elkhorn	2	3	22,000	8,718	D
State Rt. 99	Mtn. View to 2 nd	4	1	59,600	43,000	D
	2 nd to SR 43	4	1	59,600	44,000	D
	Adams to Clovis	6	1	89,400	66,000	D
Ashlan Av	west of Palm	2	5	17,100	18,900	F
	east of Palm	2	5	17,100	19,200	F
Shaw Avenue	east of Palm	6	5	51,300	49,700	D
	west of Blackstone	6	5	51,300	50,100	D

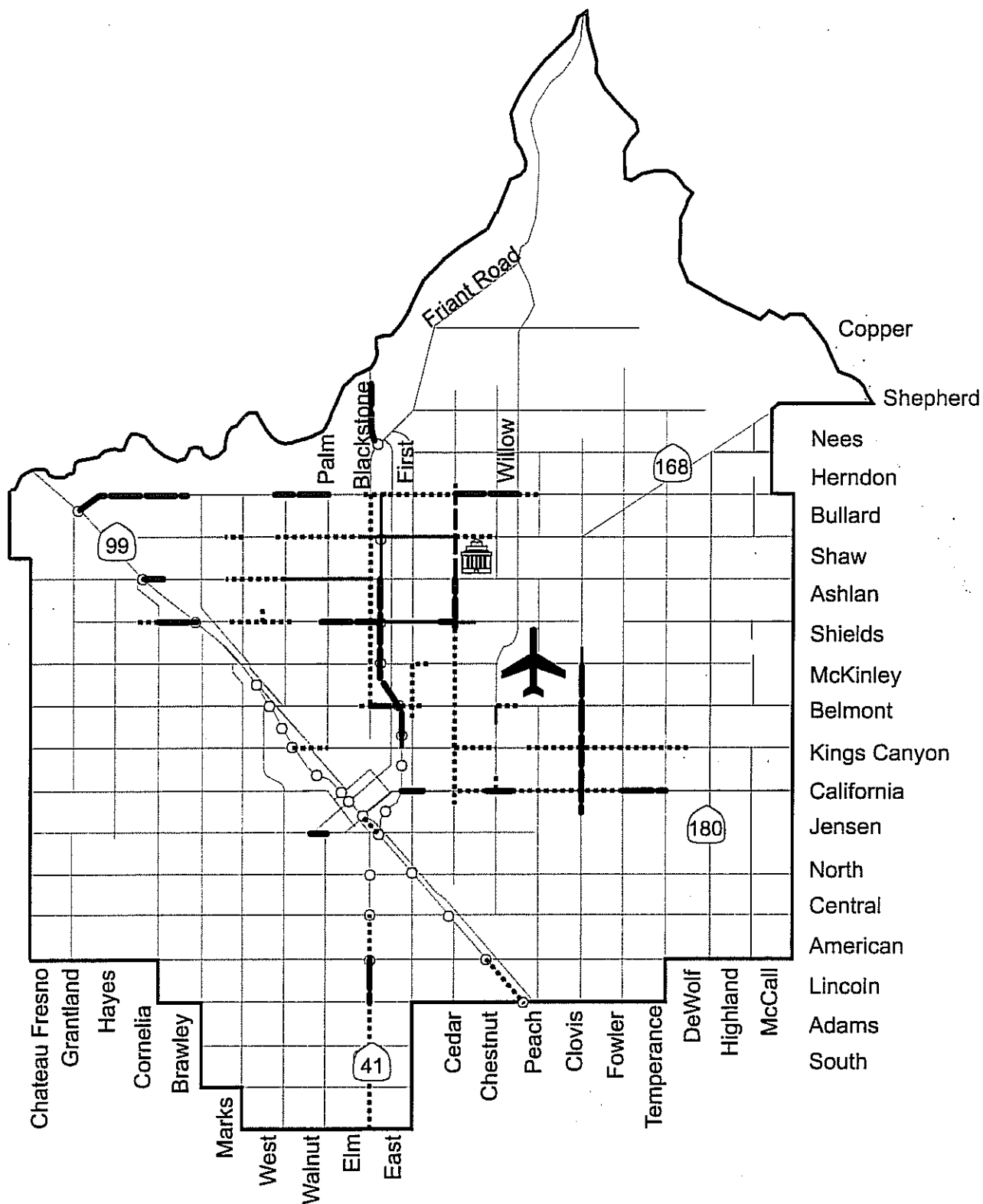
¹Class refers to functional classification; refer to Table 4-7, column 1 for description.

4.3 TRUCK/FREIGHT MOVEMENTS

As found in the California State Vehicle Code, trucks are defined as heavy freight vehicles which meet the Service Transportation Assistance Act of 1982 (STAA). Truck transportation, followed by rail, air, and pipeline, provides the majority of goods movement in Fresno County. Fresno County has considerable long-distance trucking activity due to the presence of I-5 and SR 99 and

carries relatively high truck percentages on the rural local (non-State) highway system to serve the local agricultural economy and dispersed field production/distribution patterns. According to the Caltrans publication 1995 "Average Annual" Daily Truck Traffic on the California State Highway System, SR 99 carries the greatest volume of truck traffic in Fresno County (between 7,800 and 22,100 vehicles per day), where it comprises up to 24 percent of the total vehicle traffic. I-5 also experiences large volumes of truck traffic (between 5,500 and 6,500 vehicles per day), which represents up to 33 percent of the total vehicle volume. Table 4-8 lists several state highway segments that carry large volumes of truck traffic.

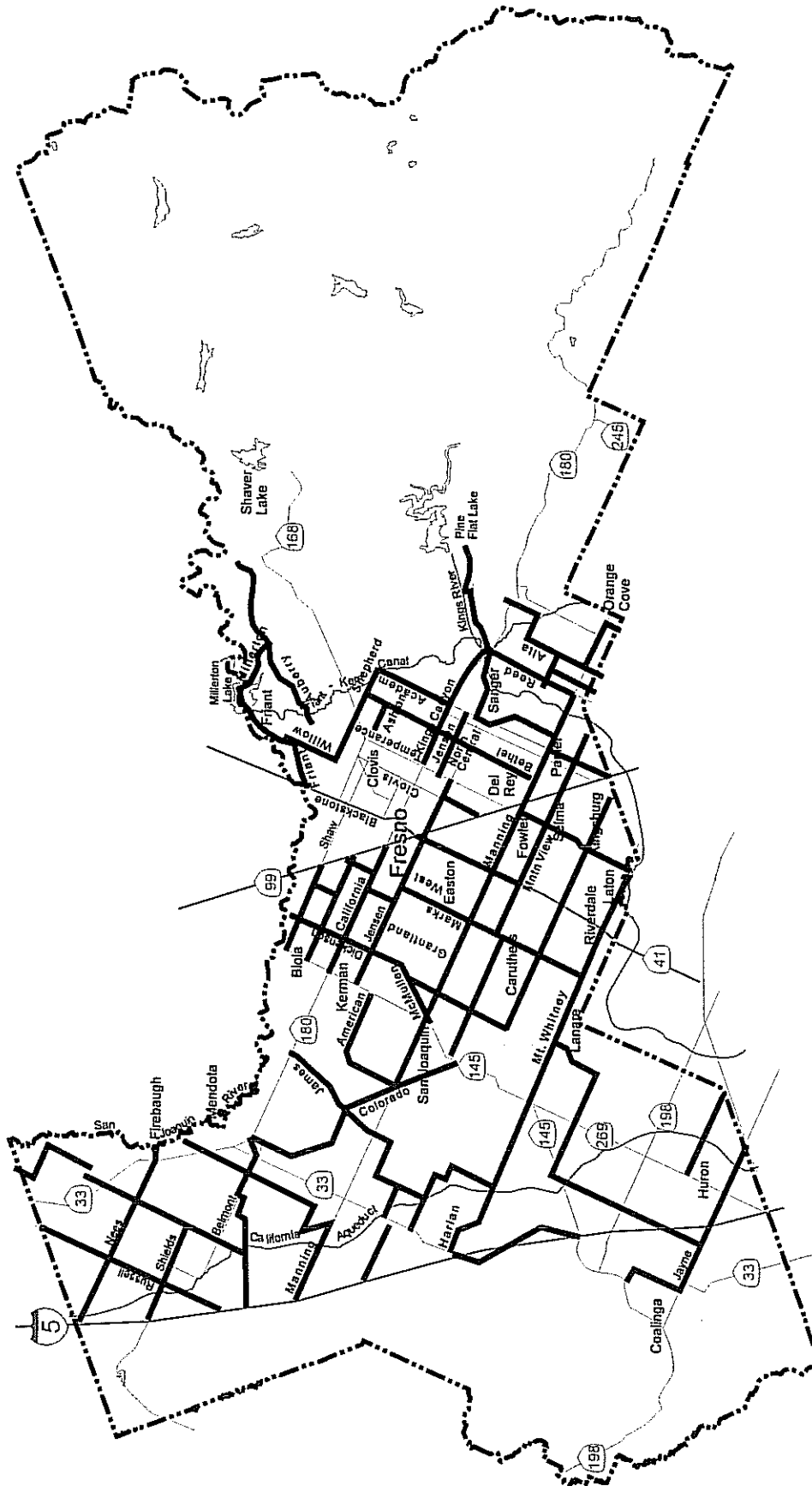
All vehicles that exceed the legal height, width, length or weight limits established in the vehicle code require special permits in order to operate on Fresno County roads. Vehicles that exceed the legal limits but do not exceed height and weight limits established by the County may obtain an annual blanket transportation permit that allows the truck to use the system of county roadways, defined as the Blanket Transportation Permit Route System shown in Figure 4-4. Individual trip permits are required to move extra legal loads on other county roads and for loads exceeding the blanket permit maximums to be moved on the Blanket Transportation Permit Route System.



Fresno County General Plan

**Level of Service-
(Urban)**

Figure 4-3



Blanket Transportation
Permit Routes



NORTH

0 5 10
1" = 10 miles

TABLE 4-8
ROADWAYS WITH DAILY TRUCK VOLUMES GREATER THAN 2,000
Unincorporated Fresno County
1995

Roadway	Segment	Total ADT	Truck ADT	% Trucks
I-5	Jct. SR 198	19,500	6,435	33%
I-5	Jct. SR 198	20,300	5,887	29%
I-5	Jct. SR 33/145	20,300	5,887	29%
I-5	Jct. SR 33/145	21,400	5,564	26%
SR-99	Jct. SR 201E	40,500	9,720	24%
SR-99	Jct. SR 43S	44,000	10,560	24%
SR-99	Jct. SR 43S	56,000	13,440	24%
SR-99	Merced	61,000	14,701	24%
SR-99	Chestnut	49,000	11,760	24%
SR-99	Jct. SR 41N	92,000	22,080	24%
SR-99	Jct. SR 41N	52,000	10,920	21%
SR-99	Jct. SR 180S	52,000	10,920	21%
SR-99	Jct. SR 180S	64,000	12,800	20%
SR-99	Jct. SR 180N	61,000	12,200	20%
SR-99	Jct. SR 180N	63,000	12,600	20%
SR-99	Clinton	61,000	12,200	20%
SR-99	Clinton	56,000	11,200	20%
SR-99	Herndon	39,000	7,800	20%
SR-99	Madera Co.	49,000	9,310	19%
Golden State Bl.	American to Jefferson	4,600	2,385	52%
Jensen Ave.	Walnut to Fruit	7,160	2,370	33%
Jensen Ave.	Valentine to Brawley	5,230	2,119	41%
Jensen Ave.	West to Marks	7,030	2,380	34%

Sources: Caltrans, 1995 Average Annual Daily Truck Traffic on the California State Highway System; and Fresno County Department of Public Works

4.4 TRANSIT SERVICES AND FACILITIES

Public agencies and privately-owned service providers deliver transit services to Fresno County's communities and residents. Within the Fresno-Clovis Metropolitan Area (FCMA), fixed-route transit service is provided by Fresno Area Express (FAX) and the city of Clovis Transit. Handy Ride and Clovis Round-Up provide demand-responsive service primarily for elderly and disabled persons. Outside the FCMA, the Fresno County Rural Transit Agency (FCRTA), a joint-powers agency formed in 1979, represents and includes transit services in each of Fresno County's incorporated cities that provide fixed-route, intra-city service and linkage to the FCMA. All routes are accessible to both elderly and disabled persons. Intercity ground transportation within the county and beyond are provided by Amtrak, and some privately-owned carriers, such as Greyhound.

URBAN TRANSIT SERVICE

Transit service within the Fresno-Clovis Metropolitan Area (FCMA) is provided by Fresno Area Express (FAX), Clovis Stageline, Clovis Round-up and Handy Ride. Figure 4-5 depicts the fixed-route transit service boundaries within the urban area of the county.

Fresno Area Express (FAX)

FAX provides fixed-route service to the city of Fresno with 11 routes, some extending to the communities of Clovis, Pinedale, Highway City, Calwa, and Malaga. FAX also provides access to Amtrak and California State University, Fresno. Three of the 11 routes are also bicycle accessible. Ridership on FAX in 1998 totaled 10,399,087 passengers.

Clovis Stageline

Clovis Stageline provides fixed-route service within the city of Clovis, with connections to FAX routes 9, 28, and 38. Clovis buses operate on 30-minute headways.

Handy Ride

Handy Ride provides demand-responsive service to elderly and disabled persons within the FCMA. Handy Rides service area is bounded by Cornelia Avenue on the west, the Fresno/Madera county line and Shepherd Avenue on the north, Temperance Avenue on the east and Central Avenue on the south. Handy Ride vehicles meet ADA requirements pertaining to wheelchair access.

Clovis Round-Up

Similar to Handy Ride, Clovis Round-Up provides demand responsive service to elderly and disabled persons within the city of Clovis.

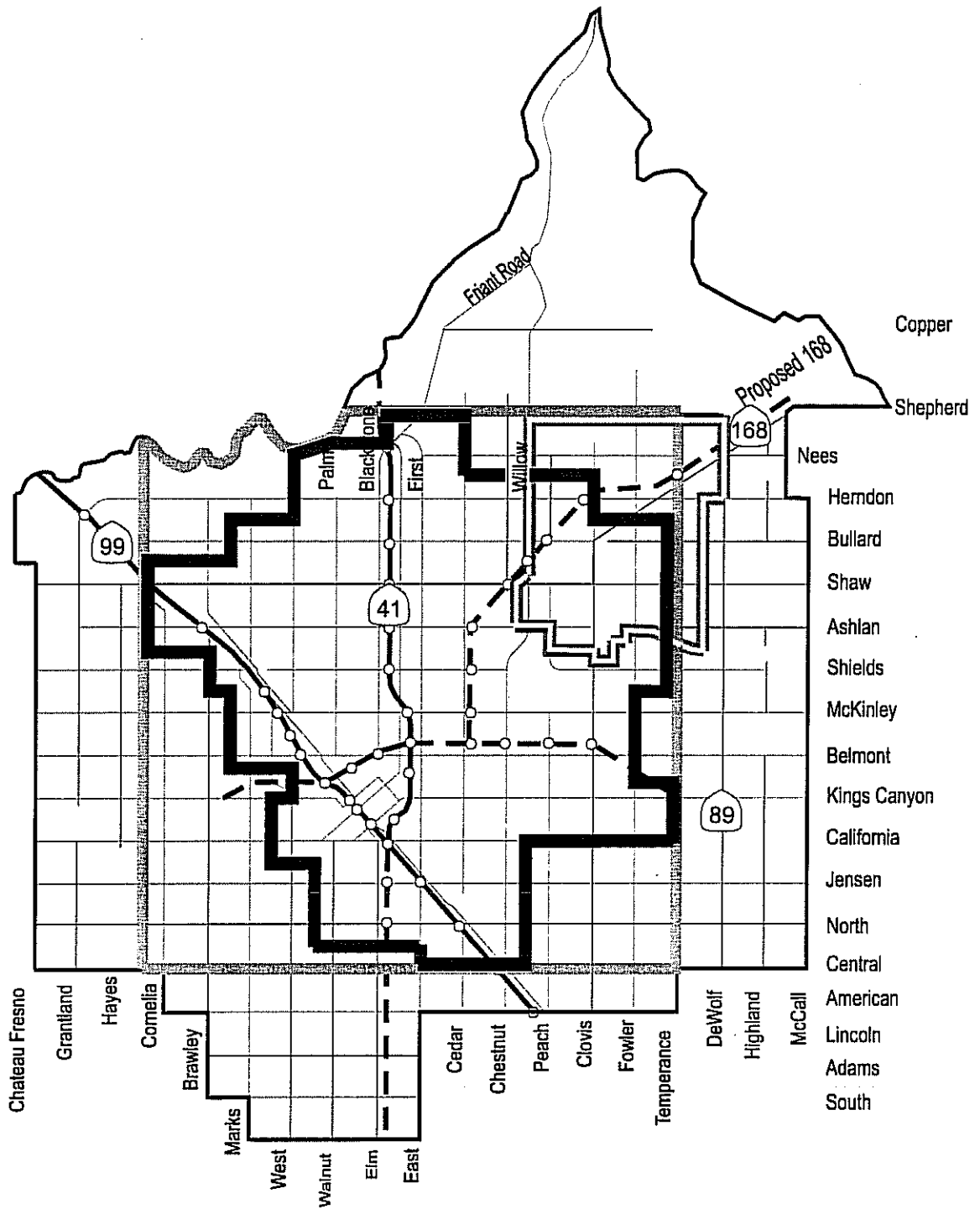
RURAL TRANSIT SERVICE

The Fresno County Rural Transit Agency (FCRTA) is responsible for transit service to the incorporated cities and unincorporated portions of Fresno County that lie outside the FCMA.

FCRTA provides intercity transit service along four primary corridors:




- Firebaugh - Mendota - Kerman Corridor
- Kingsburg - Selma - Fowler Corridor
- Orange Cove - Reedley - Parlier - Sanger Corridor
- Coalinga - Huron - O'Neills - Five Points - Lanare - Riverdale - Caruthers - Raisin City - Easton Corridor

The following FCRTA subsystems provide demand-responsive, intra-city transit service: Coalinga, Firebaugh, Fowler, Huron, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, Sanger, San Joaquin, and Selma. With the exception of Kingsburg and Selma, this service is limited to weekdays, typically between 8:00 a.m. and 5:00 p.m., with some services ending earlier in the day.



NORTH

No Scale

-  FAX Service Area
-  Clovis Transit Service Area
-  Handy Ride Service Area

Fresno County General Plan

Urban Transit Services

Figure 4-5

Source: DKS Associates

Kingsburg and Selma also offer Saturday services. Figure 4-6 depicts the rural transit providers in Fresno County.

INTERCITY TRANSIT SERVICE

Amtrak

Amtrak provides intercity rail service to Fresno County via a station located in downtown Fresno. The San Joaquin route provides north-south service between Oakland and Bakersfield with several stops in both directions. Fresno County residents can also board the San Joaquin in Madera and Hanford.

The San Joaquin rail service is augmented by feeder buses that connect the Amtrak stations at Bakersfield and Stockton to other major urban areas.

Greyhound

Greyhound Bus Lines provides intercity bus transportation in Fresno County. Service is provided to major urban centers throughout the state and the rest of the nation. From Fresno, Greyhound provides direct service to the Bay Area, Sacramento, San Jose, Stockton, Visalia, Bakersfield, and Los Angeles. Service is also available to Yosemite National Park via routes connecting in Merced and to San Diego via routes connecting in Los Angeles.

Transportes Intercalifornias

Transportes Intercalifornias provides service between the cities of Fresno and Los Angeles twice daily. Connecting service in Los Angeles extends to Santa Ana, San Ysidro, and Tijuana, Mexico.

Orange Belt Stage Lines

Orange Belt Stage Lines provides daily service linking the city of Fresno with Visalia, Paso Robles and San Luis Obispo, via the communities of Parlier and Fowler. Connections to Greyhound and Amtrak provide access to intercity and interstate service.

In May 1997, the Rural CTSA began providing a fixed-route, accessible commuter service. The Southeast Corridor Service will link the communities of Fowler, Kingsburg, and Selma to the Fresno/Clovis Metropolitan Area. The Westside Corridor Service will provide similar service to Firebaugh, Kerman, Mendota, San Joaquin, and Tranquility.

Table 4-9 summarizes the FCRTA subsystems that provide scheduled, fixed-route intercity transit service, including the areas that connect with each system.

TABLE 4-9

RURAL INTER-CITY TRANSIT SERVICE
Fresno County Plan Area
1996

Subsystem	Days/Times of Operation	Connections
Auberry	M-F; 8:00am-5:00pm	New Auberry, Big Sandy Indian Reservation, Burrough Valley, Marshall, Prather, Sycamore, Tollhouse
Coalinga	M-S; 8:00am-6:15pm	Huron, O'Neills, Five Points, Lanare, Riverdale, Caruthers, Raisin City, Easton, Fresno
Firebaugh ¹	Scheduled	Mendota, Kerman, Fresno
Friant	Scheduled (shuttle)	Fresno
Fowler ^{1,2}	Scheduled	Kingsburg, Selma
Huron	M-S; 8:00am-6:15pm	Coalinga, Riverdale, Lanare, Caruthers, Easton, Fresno
Kerman ¹	Scheduled	Fresno, Mendota, Firebaugh
Kingsburg ¹	Scheduled	Fowler, Selma, Fresno
Laton ³	Scheduled	Grangeville, Hanford, Hardwick
Mendota ¹	Scheduled	Firebaugh, Kerman
Orange Cove	M-F; 8:00am-5:00pm	Reedley, Parlier, Sanger, Fresno
Parlier ²	Scheduled	Reedley, Selma, Fowler, Fresno
Reedley ²	Scheduled	Parlier, Selma, Fowler, Fresno
Sanger	M-F; 8:00am-5:00pm	Fresno, Parlier, Reedley, Orange Cove
San Joaquin	M-F; 8:00am-5:00pm	Firebaugh, Cantua Creek, El Porvenir, Kerman, Mendota, Tranquility, Three Rocks
Selma ^{1,2}	Scheduled	Fowler, Fresno, Parlier, Reedley

Source: Draft 1996 Regional Transportation Plan, Council of Fresno County Governments.

¹Inter-city service via Greyhound Bus Lines.

²Inter-city service via Orange Belt Stage Lines.

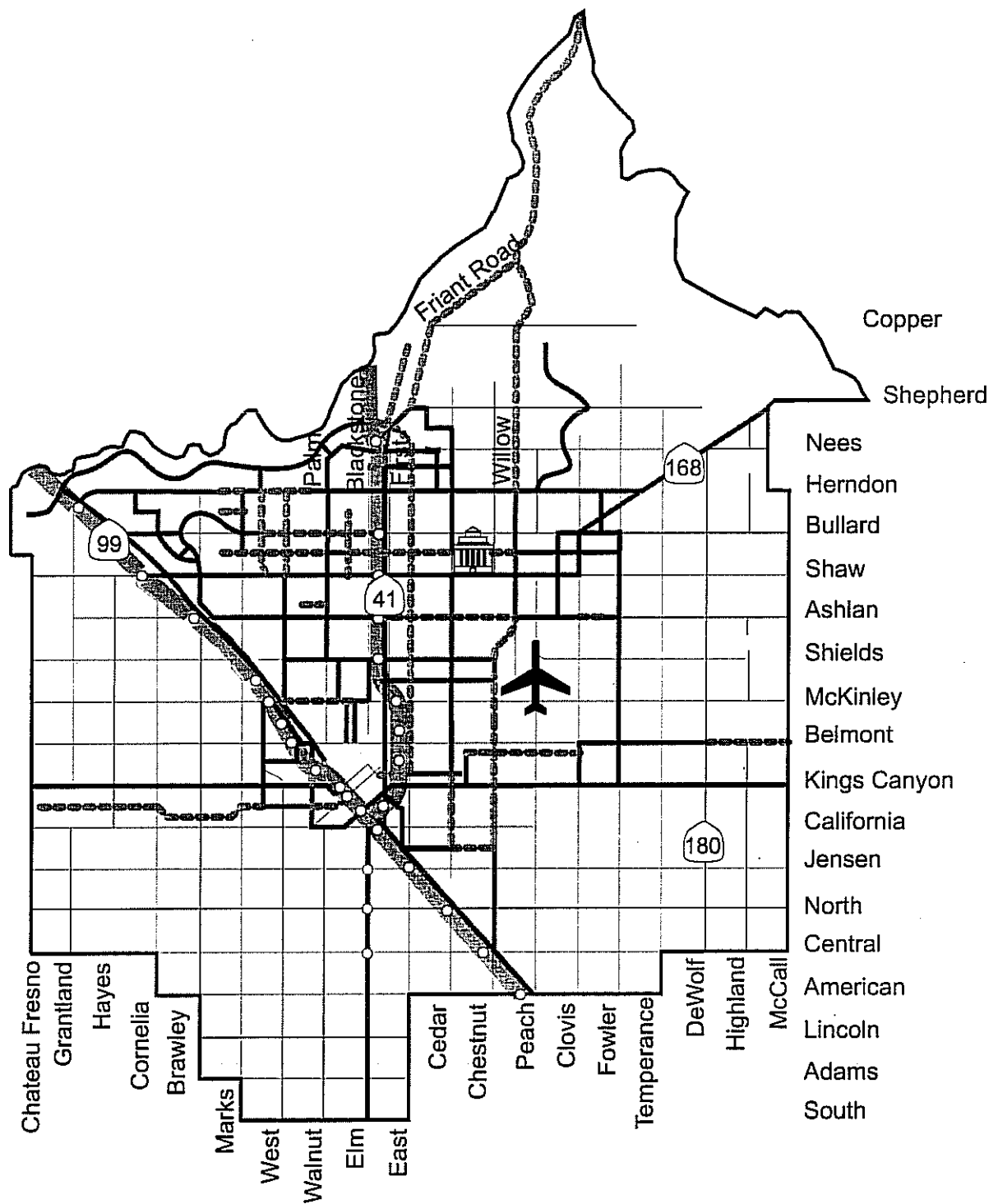
³Inter-city service via Kings Rural Area Transit.

4.5 BICYCLE, PEDESTRIAN AND RECREATIONAL FACILITIES

Bikeways in Fresno County are planned to provide both regional and local service to most cities. Pedestrian and recreational (including equestrian and hiking) facilities are more localized and do not form a contiguous, regional system and therefore are not discussed in any detail in this document.

BICYCLE FACILITIES

Bikeway plans have been developed by a number of community plan areas. COFCG is in the process of compiling these plans and developing an updated Bikeway Master Plan, which is expected to be completed sometime in 2000. The plan will include an inventory of existing bicycle facilities as well as all bicycle facilities planned throughout the county (Figures 4-7 and 4-8). There are three classes of bikeways:



NORTH

No Scale



Urban Highway System



Existing Bikeways



Planned Bikeways



Fresno Air Terminal

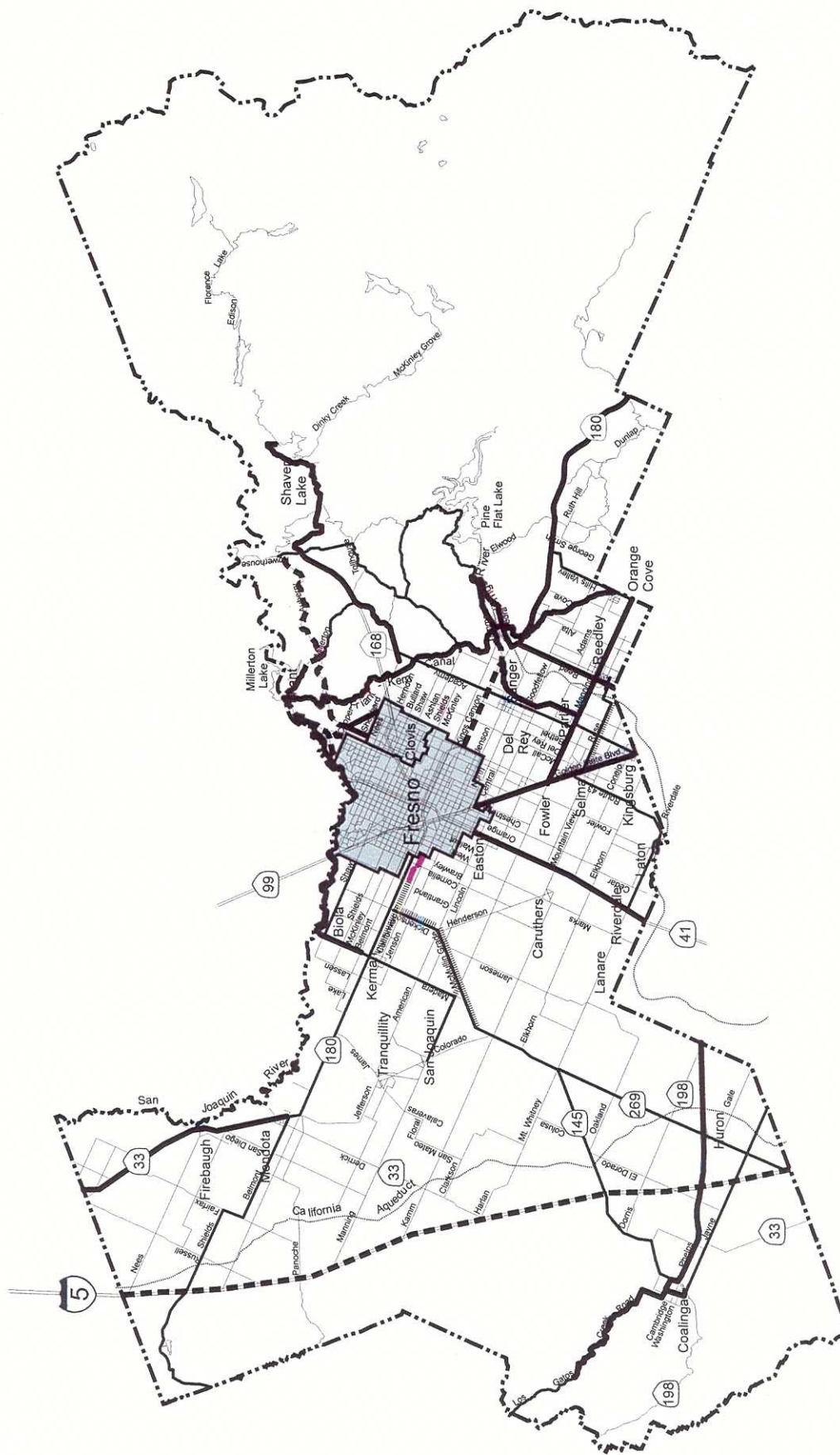


CSU Fresno

Fresno County General Plan

**FCMA Bikeway
System**

Figure 4-7



- Implemented Bike Lanes Class II
- Implemented Bike Lanes Class I
- New Plan Proposals
- Current Bike Plan Planned Bikeway
- Current Bike Plan (recommended for removal from plan)

Source: Fresno County Rural Bikeways System Map, 1999; DKS, 1999

Class I Bikeway

A Class I Bikeway (Bicycle Path) is a paved route separated from a street or roadway and expressly reserved for non-motorized traffic, with cross traffic minimized.

Class II Bikeway

A Class II Bikeway (Bike Lane) is a paved striped lane for one-way bicycle travel on a street or roadway.

Class III Bikeway

A Class III Bikeway (Bike Route) is a shared-use street or roadway, identified by bicycle route signs.

RECREATIONAL TRAVEL

The county's roadways are experiencing large volumes of recreational travel due to its proximity to the three national parks (Yosemite, Kings Canyon, and Sequoia), Sierra National Forest, and several wilderness and recreational areas. In 1993, according to the California Office of Tourism, 275 million recreational person trips were made to or through the county. SR 41 is annually the highest volume entrance into Yosemite National Park. SR 33 and 99 also carry large volumes of recreational travelers. The Fresno Air Terminal and Amtrak also provide opportunities for recreational travel.

4.6 RAIL SERVICES, FACILITIES AND LEVELS OF OPERATION

There are two mainline railroad lines that run north-south through Fresno County. The first owned by the Burlington Northern and Santa Fe Company, connects the county to Sacramento and the Bay Area to the north and to Bakersfield in the south via the town of Laton. The second, owned by Union Pacific Railways parallels the SR99 corridor and connects the county northward to Sacramento and the San Francisco Bay Area and southward to Bakersfield via the town of Kingsburg. Both lines include service to the city of Fresno.

Active branch lines connect the city of Fresno to Sanger and Reedley in the east and Kerman, Mendota and Firebaugh in the west. Another branch line extends west from the mainline in the city of Hanford (in Kings County) to provide service to Huron in the southwestern part of the county. Figure 4-9 depicts the major rail facilities that traverse Fresno County.

Additionally, the San Joaquin Valley Railroad (SJVR) operates about two freight trains per day at low speeds along a Union-Pacific-owned rail line that travels eastward from the city of Fresno through Sanger, then southeastward through Reedley. SJVR also operates about two freight trains per day along a Union-Pacific-owned line that extends westward from Hanford in Kings County to Huron. Port Railroads Inc., part of SJVR, operates about one to two freight trains per day on track that leads westward from the city of Fresno to a junction north of Tranquility, with one branch continuing northwestward through Firebaugh and the other branch passing southeastward through Tranquility, San Joaquin, Burrell, and Riverdale. The maximum speeds along these rail lines are 10 to 25 mph.

4.7 AIRPORT FACILITIES AND SERVICES

FRESNO AIR TERMINAL

The primary passenger aviation facility in the county is the Fresno Air Terminal (FAT). This 2,300 acre facility has two runways and is base for approximately 300 general aviation aircraft. FAT has 12 airlines that offer passenger service and four fixed base operators (FBOs) offering services that include:

- Charter Service and Air Taxi
- Fueling
- Maintenance and Repair
- Storage
- Flight and Maintenance Instruction
- Advertising
- Surveying
- Patrols
- Rentals and Sales

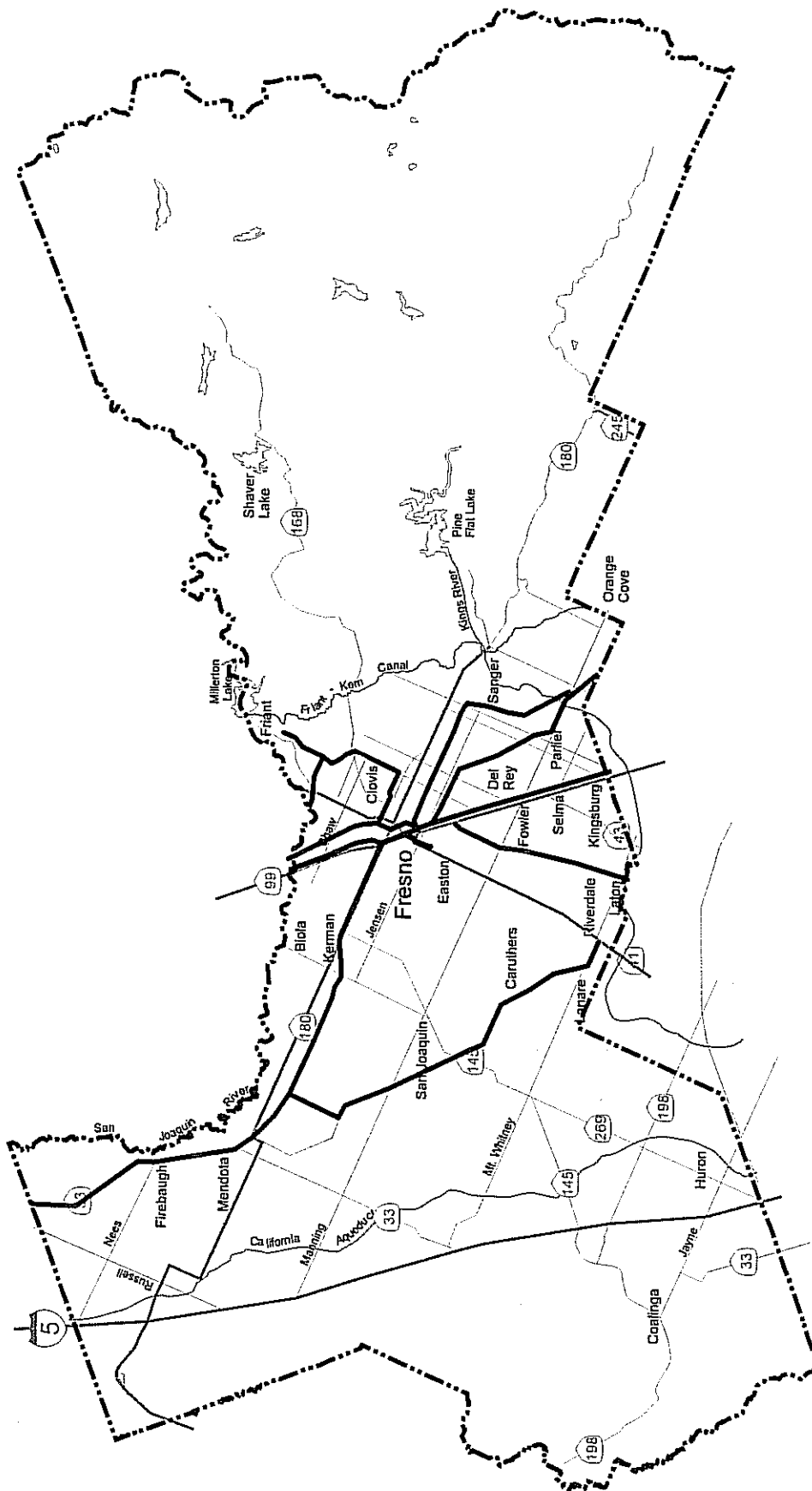
FAT handles approximately 200,000 operations per year, but has experienced an 18 percent increase in total passenger activity between December 1995 and May 1996, compared to the same time period one year earlier.

FRESNO CHANDLER DOWNTOWN AIRPORT

The Fresno Chandler Downtown Airport is a federally designated "reliever" airport. This 200-acre facility has two runways, five FBOs and is base for 161 aircraft. Chandler handles approximately 75,000 operations per year.

OTHER AIRPORTS

There are also seven "basic utility" airports that are either publicly or privately-owned, public use facilities located throughout the county, summarized in Table 4-10. The privately owned Sierra Sky Park is being evaluated to determine its status and viability as a Basic Utility Airport.



— Rail Facility



NORTH

0 10 miles
1" = 10 miles

Source: DKS Associates

TABLE 4-10

**AVIATION FACILITIES
Fresno County Planning Area
1996**

Facility	Runways	FBOs	Aircraft	Operations/Year
Fresno Air Terminal	2	4	300	200,000
Fresno Chandler Downtown Airport	2	5	161	75,000
Coalinga Municipal Airport	2	0	14	15,000
Firebaugh Airport	1	0	20	18,900
Mendota Airport	1	1	3	13,000
Reedley Municipal Airport	1	1	60	25,000
Selma Aerodome	1	4	70	35,800
Sierra Sky Park	1	0	n/a	n/a
Harris Ranch Airport	1	0	3	10,000
Countywide Total:	12	n/a	650	400,000
Source: Draft 1996 Regional Transportation Plan, Council of Fresno County Governments				

LEMOORE NAVAL AIR STATION

The Lemoore Naval Air Station straddles the Fresno/Kings County line. This is a military installation and does not provide general aviation services. Figure 4-10 shows the location of public aviation facilities in Fresno County.

4.8 COMMUTER PARKING

PARK-AND-RIDE LOTS

There are three park-and-ride facilities in Fresno County. Caltrans maintains a 30-space lot on Lodge Road, along the south side of the intersection of Lodge Road and SR 168 north of Clovis.

Caltrans also maintains a 15-space lot on Auberry Road, in the northeast corner of the intersection of Auberry Road and State Route 168 in the town of Auberry. The third park-and-ride facility is a 45-space lot owned by and located within the city of Coalinga.

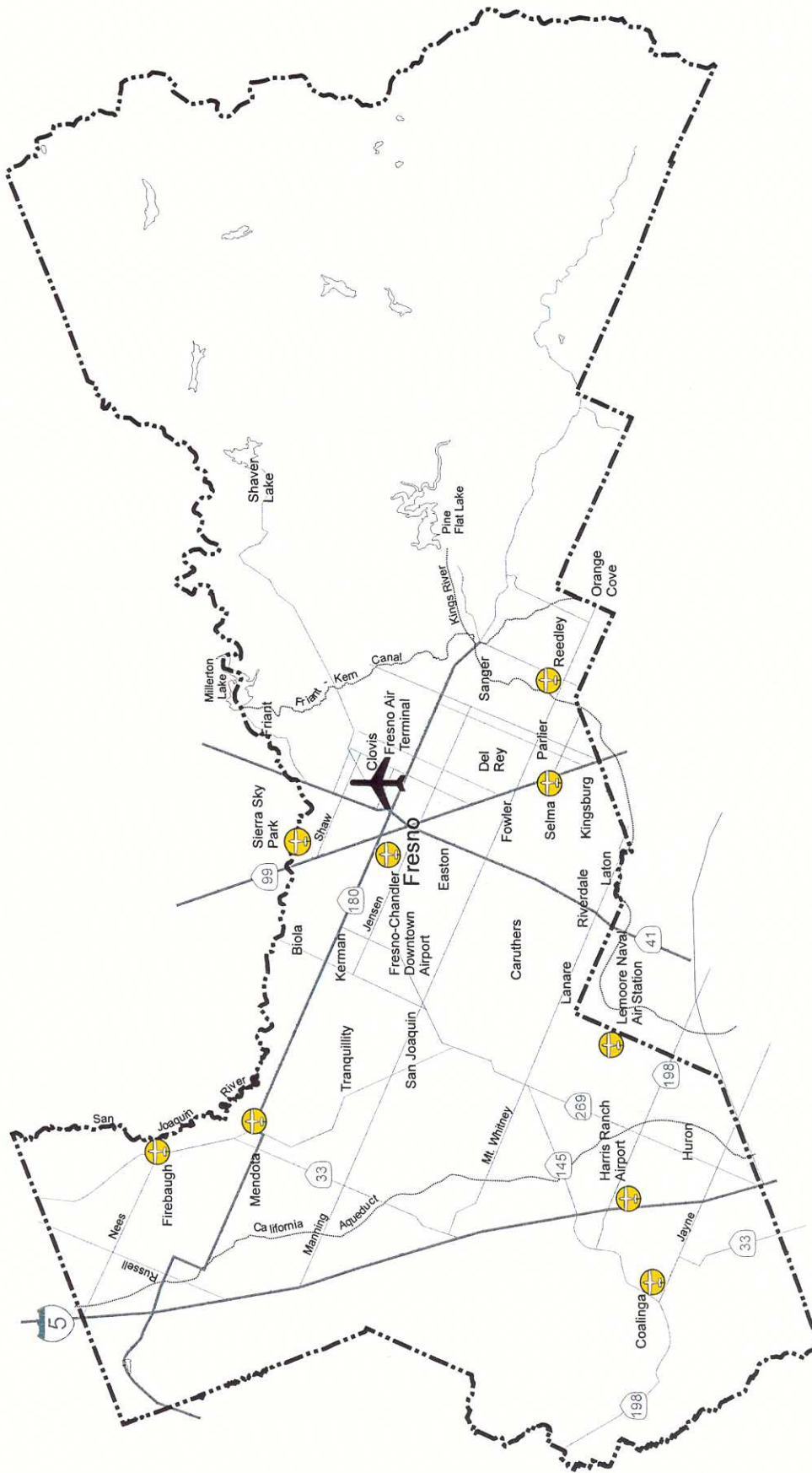
4.9 PLANNED TRANSPORTATION SYSTEM

THE COFCG'S 1998 REGIONAL TRANSPORTATION PLAN (RTP)

As federal regulation requires the RTP to be "financially constrained," the RTP also includes a financial plan to demonstrate how the capacity improvements can be implemented while the existing transportation system is being maintained. A major component of this financing plan came from Measure "C", the half-cent sales tax for funding transportation improvements that was passed by Fresno County voters in 1986. Tables 4-11 and 4-12 outline the short-term and long-term transportation improvement programs contained in the 1998 RTP.

TABLE 4-11
SHORT-TERM TRANSPORTATION IMPROVEMENT PROGRAM
FRESNO COUNTY
(FY 1998/99 through FY 2003/04)

Rte	Limits/Postmiles	Description	Funding Source	Year Construction	Est. Cost ¹ (\$1,000)
168	Fut. 180 to 0.1 mi. N. of Shields	Const. 6-ln Frwy	Local/State/Federal	96/97	\$71,480
168	From 0.1 mi. N. of Shields to Gettysburg	Const. 6-ln Frwy	Local/State/Federal	96/97	\$42,940
180E	Rt. 41-Chestnut	Const. 6-ln Frwy	State/Federal	96/97	\$86,410
41	Jensen Ave. to Adams	Const. 4-ln Frwy/Expwy	Local/State	96/97	\$33,100
41	Aud. OC-Madera Co. Line	Convert 2-ln Hwy —4-ln Frwy	State/Federal	96/97	\$23,370
41	Floral Ave. to Adams	Const. 2-ln. Expwy	Local/State	96/97	\$12,590
41	Floral Ave. to Elkhorn	Const. 2-ln. Expwy	Local/State	96/97	\$21,500
201	Rt. 99 to Tulare Cnty Ln.	Partial 2-ln to 4-ln from 99/Marion/L. Turn Marion to Tulare Co. line	Local/State	97/98	\$5,660
180W	Vineland to Grantland	Widen, AC Overlay	SHOPP	98/99	\$20,400
168	From Gettysburg to Bullard Ave. (0.2 mi. E. of Villa)	Const. 6-ln Frwy/Purchase ROW	Local/State/Federal	98/99	\$53,880
180W	Grantland Ave.-Brawley Ave.	Widen/Reconst.	Local/State	98/99	\$4,490
168	Bullard Avenue to Temperance Ave.	Const. 4-ln Frwy	Local/State	98/99	\$76,210
168	(Bullard Ave. to Flower Ave.) ²	Const. 4-ln Frwy	Local/State	98/99	(\$43,170)
168	(Fowler Ave. to Temperance Ave.) ²	Const. 4-ln Frwy	Local/State	98/99	(\$33,040)
168	Temperance Ave. to Shepherd Ave.	Const. 4-ln Expwy	Local/State	98/99	\$21,880
180W	Hughes/West Diagonal	Const. 2/4-ln Arterial	Local/State	98/99	\$3,410
180W	Whitesbridge to 4 mi. Slgh	Widen, AC Overlay	SHOPP	99/00	\$10,400
180W	Yuba Ave. to First St.	Widen, AC Overlay	SHOPP	99/00	\$11,270
180	Belmont to Marks	Passing Lanes	Local/State	99/00	\$2,270
Academy/Bethel	Rt. 180 to Rt. 168	Const. 4-ln Hwy	Local/State	99/00	\$9,980
33	Los Gatos Crk. to Palmer	Widen, AC Overlay, Realignment	Local/State/Federal	99/00	\$6,550
33	Bass Ave. to Helm Canal Rd.	Widen, AC Overlay, Realignment	Local/State/Federal	99/00	\$8,720
180E	Chestnut Ave. to Clovis Ave.	Const. 4-ln Frwy	Local/State	00/01	\$74,080
180W	4 mi. Slgh to Yuba Ave.	Widen, AC Overlay	SHOPP	01/02	\$8,090
180E	Clovis Ave. to Temperance Ave.	Const. 4-ln Expwy	Local/State	03/04	\$32,120



Fresno County General Plan	
Public Aviation Facilities in Fresno County	
 	
 Airport (Basic Utility)	 Fresno (Air Carrier)

Figure 4-10

TABLE 4-11

**SHORT-TERM TRANSPORTATION IMPROVEMENT PROGRAM
FRESNO COUNTY
(FY 1998/99 through FY 2003/04)**

Rte	Limits/Postmiles	Description	Funding Source	Year Construction	Est. Cost¹ (\$1,000)
180E	Temperance Ave. to Academy Ave.	Const. 4 ln Frwy	Local/State	03/04	\$37,140

Source: Council of Fresno County Governments, 1998.

¹In thousands of dollars.

²Bullard Ave. to Fowler Ave. (\$43,170) and Fowler Ave. to Temperance Ave. (\$33,040) represent segments of the overall Bullard Ave. to Temperance Ave. project which totals \$76,210.

TABLE 4-12

**LONG-TERM TRANSPORTATION IMPROVEMENT PROGRAM
FRESNO COUNTY
(FY 2004/05 through FY 2007/08)**

Rte	Limits/Postmiles	Description	Funding Source	Year Construction	Est. Cost¹ (\$1,000)
180E	Academy Ave. to Trim. Spring	Const. 4-ln Expwy	Local /State	04/05	\$20,870
180E	Trimmer Spring to Frankwood	Const. 2-ln Expwy	Local /State	05/06	\$16,470
180W	Huges/West to Rt. 99	Const. 2-ln Expwy	Local /State	05/06	\$35,370
180W	Brawley Ave to Hughes/West	Const. 6-ln Expwy/4-ln Expwy	Local /State	06/07	\$37,310
Academy /Bethel	Rt. 99 to Rt. 180	Const. 2-ln Hwy/4-ln Hwy	Local /State	06/07	\$22,460

Source: Council of Fresno County Governments

¹In thousands of dollars.

4.10 FINDINGS

The key findings concerning the Fresno County General Plan Transportation and Circulation Element are the following:

- Fresno County does not have an adopted, comprehensive level of service standard. However, the County does use a LOS C as its minimum LOS. Most roadways in Fresno County currently operate at level of service "C" or better.
- In 1996, the major roadways that operated at level of service "D" or worse included: SR 99, between Bethel and SR 43, between Merced and Clovis, and between Herndon and the Madera County line; Ashlan Avenue at Palm; and certain arterials located in the cities of Fresno and Clovis.
- In 1986, voters approved a measure to implement a local sales tax (Measure C) that provides funding for improvements to the regional and local transportation network over a 20-year period.
- While goods are transported through a variety of modes (including rail, air and pipeline), most are moved by trucks over the county's freeway and arterial roadway system. Freight movement is increasing rapidly, especially in heavy (five or more axle) trucks. High volumes of heavy trucks affect pavement life, traffic congestion and traffic safety.
- While the County has planned for substantial system of bikeways, implementation has been limited to a few high-demand routes.

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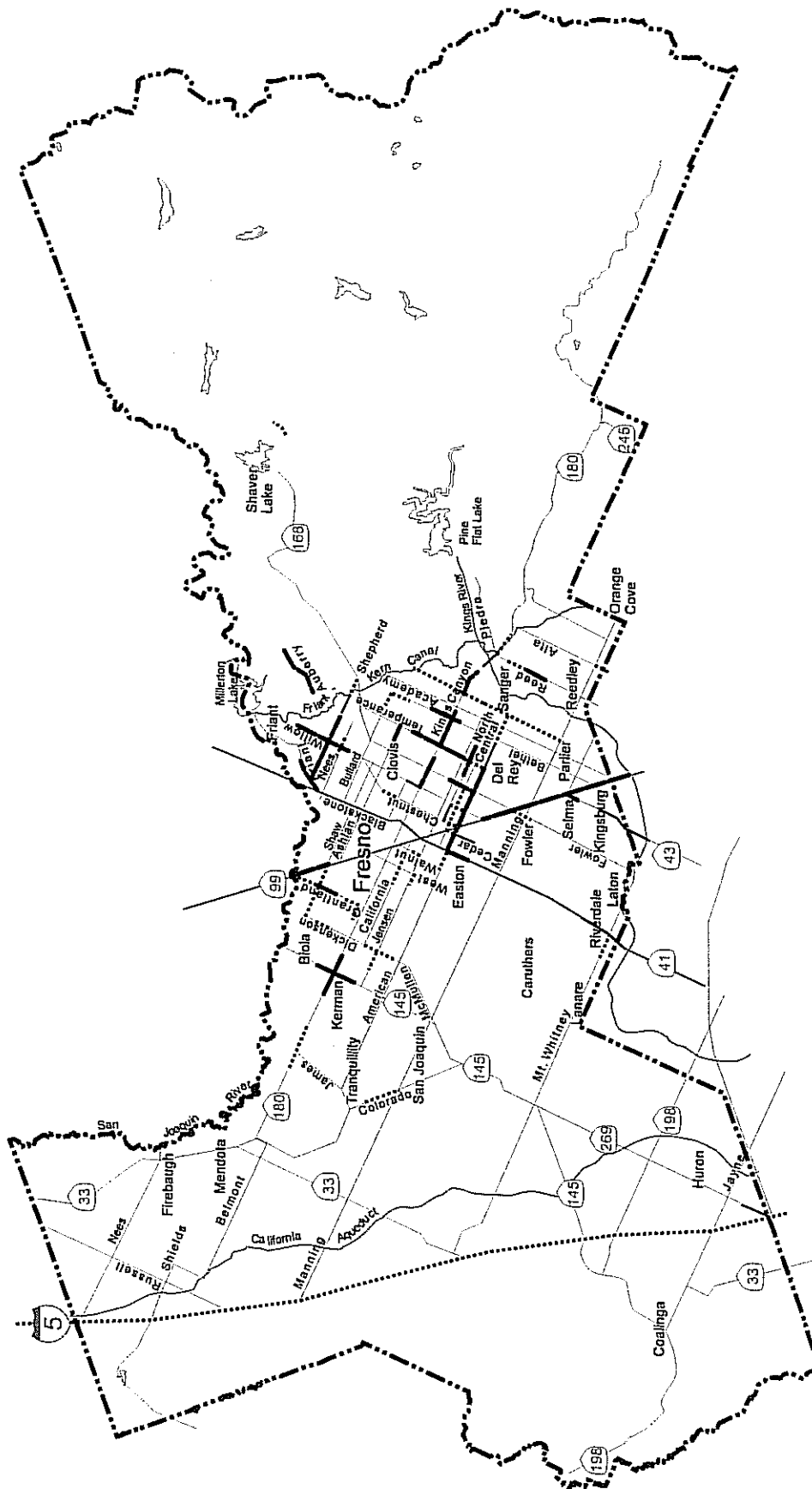
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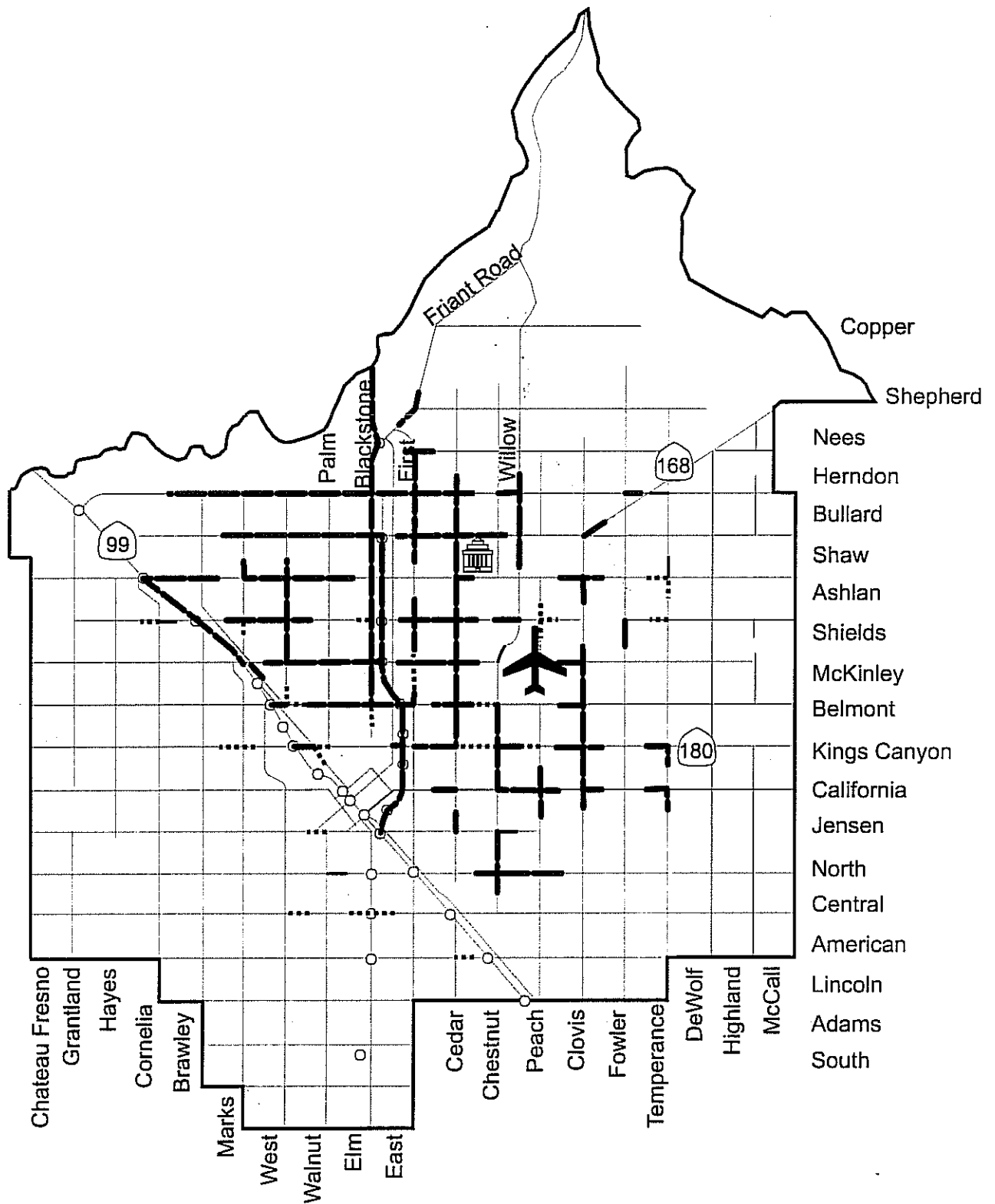


..... LOS D ——— LOS E ——— LOS F



NORTH

0 10
1" = 10 miles



N O R T H

No Scale

..... LOS D
 ——— LOS E
 ——— LOS F



Fresno Air Terminal

CSU Fresno

Fresno County General Plan

**Year 2020 Urban
Level of Service**

Figure 4-12

4.12 PERSONS CONSULTED

Davis, N. Ruth, Planning Coordinator II, Council of Fresno County Governments

Parker, Lisa, Division Secretary, Fresno County Public Works and Development Services Department

Gorman, Lynn, Senior Engineer, Fresno County Public Works and Development Services Department

Gray, Mike, Associate Transportation Engineer, California Department of Transportation, Division of Traffic Operations

4.13 GLOSSARY

Arterial - Provides for mobility within the county and its cities, carrying through traffic on continuous routes and joining major traffic generators, freeways, expressways, super arterials, and other arterials. Access to abutting private property and intersecting local streets will generally be restricted. Urban arterials in Fresno County will typically be developed as four or six-lane divided roadways. Rural arterials may be developed as two- or four-lane undivided or four-lane divided roadways.

Average Daily Traffic (ADT) - The average total vehicular volume passing a point or segment of a roadway facility, in both directions for two-way streets, for a 24-hour period.

Bicycle Lane (Class II Bikeway) - A travel lane on a roadway facility expressly reserved for bicycles and adjacent to lanes used by motorized vehicles.

Bicycle Path (Class I Bikeway) - A paved route expressly reserved for bicycles that is independent of any roadway facilities and traverses an otherwise unpaved area. Bicycle paths may parallel roads but are typically separated from them by landscaping.

Bicycle Route (Class III Bikeway) - A facility shared by motorized vehicles and bicycles that is identified as a bicycle facility using signs but no pavement markings or lane stripes.

Bikeway - A term that is used to denote any facility used by bicycle traffic.

Caltrans - California Department of Transportation.

Capacity - The maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions; usually expressed as vehicles per hour or persons per hour.

Capital Improvements Program (CIP) - A program administered by a city or county government and reviewed by a planning commission which schedules permanent improvements, usually for a minimum of five years in the future, to fit the projected fiscal capability of the local jurisdiction. The program generally is reviewed regularly for conformance to and consistency with the general plan.

Collector - Provides for internal traffic movement within communities, and connect local roads to arterials, super arterials, and expressways. Direct access to abutting private property will generally be permitted. Urban collectors in Fresno County may be developed as two-lane or as four-lane undivided roadways. Urban collectors which serve industrial uses will typically be developed as four-lane undivided roadways. Rural collectors will typically be developed as two-lane undivided roadways.

Congestion Management Plan - A mechanism employing growth management techniques, including traffic level of service requirements, standards for public transit, trip reduction programs involving transportation systems management and jobs/housing balance strategies,

and capital improvement programming, for the purpose of controlling and/or reducing the cumulative regional traffic impacts of development.

Demand-responsive (transit service) - Service provided by on-call transit providers. In urban areas, this type of service is typically provided to disabled and elderly persons. In rural areas, demand responsive service may be provided where fixed-route service is not available.

Expressway - Provides for rapid through-traffic movement on continuous routes which connect the cities and communities within the county with each other, with freeways and other expressways, and with communities in adjoining counties. Expressways provide a high degree of access control. Urban expressways in Fresno County will typically be developed as four- or six-lane divided roadways. Rural expressways will typically be developed as two-lane undivided or four-lane divided roadways.

Fixed-route (transit service) - Scheduled transit service that is provided along a pre-determined route, operating on fixed headways.

Freeway - A multi-lane divided highway having a minimum of two lanes for exclusive use of traffic in each direction and full control of access and egress.

Headway - The average time increment between consecutive stops along a fixed transit route at a given location.

Level of Service - A scale that measures the amount of traffic a roadway may be capable of handling either on a given segment of roadway or at the intersection of two or more roadways. Levels range from "A" to "F", with "A" representing the highest level of service, and "F" representing conditions at or near capacity. See Tables 4-3 for level of service definitions.

Local Road - Low speed (15-25 mph), low volume (less than 5,000) roadways that provide connectivity between individual dwelling units or business parks to collector roadways.

Platoon - A group of vehicles or pedestrians traveling together as a group, either voluntarily or involuntarily due to signal control, geometrics or other factors.

Right-of-Way - A strip of land occupied or intended to be occupied by certain transportation and public use facilities, such as roadways, railroads and utility lines.

Super Arterial - Provides for mobility within the county and its cities, carrying through traffic on continuous routes and joining major traffic generators, freeways, expressways, and other arterials. Access to abutting private property and intersecting local streets is restricted. It is a special designation originally developed in Fresno County to manage access on Golden State Boulevard (old State Highway 99), where all access rights were conveyed to the County following relinquishment by the State. Access to a super arterial is permitted by license, and must conform to specific access and design criteria maintained by the Public Works Department. Super arterials in Fresno County will typically be developed as four-lane divided roadways.

Transit - The conveyance of persons or goods from one place to another by means of a local, public transportation system.

Transit Dependent - Refers to persons unable to operate automobiles or other motorized vehicle, or those who do not own motorized vehicles. Transit-dependent citizens must rely on transit, para-transit, or owners of private vehicles for transportation. Transit-dependent citizens include the young, the handicapped, the elderly, the poor, and those with prior violations in motor vehicle laws resulting in the suspension of driving privileges.

Trip - A one-way journey that proceeds from an origin to a destination via a single mode of transportation; the smallest unit of movement considered in transportation studies. Each trip has one "production end," (or origin – often from home, but not always), and one "attraction end," (destination).

Truck Route - A circulation path required for all vehicles exceeding set weight or axle limits, a truck route follows major arterials through commercial or industrial areas and avoids sensitive areas.

Volume - The number of persons or vehicles passing a point on a lane, roadway, or other trafficway during some time interval, often taken to be one hour, expressed in vehicles.

Volume-to-Capacity (V/C) Ratio - The ratio of demand flow rate to capacity for a traffic facility.

CHAPTER 5: PUBLIC FACILITIES AND SERVICES



5.1 INTRODUCTION

Development is dependent on a complicated network of public facilities and services. Each type of service has a unique set of constraints and must adapt to growth and change differently. This chapter discusses public facilities, including water, sewage collection and treatment, drainage, and solid waste. This chapter also describes public services in the county, including general government, law enforcement, fire protection, public utilities (gas and electricity, and telephone), schools, and libraries. The various systems and their capacities are described, and their implications for the general plan are discussed.

5.2 MEMORANDA OF UNDERSTANDING

The County has entered into Memoranda of Understanding (MOU) with all 15 cities in Fresno County to provide or share public facilities and services. Chapters 1 and 3 describe the scope and the services between the County and each city. Table 1-15 in Chapter 1 also lists each MOU and describes each entity's shared land use responsibilities within each sphere of influence.

5.3 STORM DRAINAGE AND FLOOD CONTROL

During winter and spring months, river systems in Fresno County swell with heavy rainfall and snow melt runoff. To prevent flooding, a wide variety of storm drainage and flood control measures are utilized throughout the county. In rural areas, the management of reservoir releases, canals, and levee systems reduces the likelihood of flooding and reroutes stormwater around urban areas. In developed areas, storm drainage systems composed of street gutters, inlets, underground storm drains, ponds, pumping stations, and open channels are used to collect and control stormwater runoff. The following discussion characterizes the storm drainage and flood control systems for unincorporated and incorporated areas within Fresno County.

UNINCORPORATED AREAS

The following description of storm drainage and flood control systems in unincorporated areas of Fresno County is divided into three geographic regions:

- Western Fresno County
- Central Fresno County
- Eastern Fresno County

Western Fresno County extends eastward from the Coast Range to Fresno Slough; central Fresno County extends eastward from Fresno Slough to of the Sierra Nevada foothills; and eastern Fresno County extends from the Sierra Nevada foothills to the Great Western Divide, marking the eastern border of the county.

Western Fresno County

Western Fresno County, is largely unpopulated. The major land uses in the area are agriculture and grazing. Interstate 5 and the California Aqueduct pass in a north-south direction through western Fresno County. Large watersheds in the Coast Range drain stormwater eastward into the valley and the Fresno Slough.

Geography, Rainfall, and Soils

Western Fresno County consists of the Coast Range within which lies the county's western boundary with San Benito and Monterey Counties, and the San Joaquin Valley area between the Range and the Fresno Slough. A complex system of streams drain the eastern slope of the Coast Range into the Valley. Annual precipitation ranges from only 6 to 8 inches, however, during storm events, the Valley is subject to flooding from high stream flows due to their large drainage basins. The Coast Range soils are also subject to erosion since stormwater runoff typically carries large volumes of sediment and naturally occurring minerals, such as selenium, arsenic and asbestos, which may be undesirable to downstream users.

Rivers, Streams, and Existing Flood Control Facilities

Western Fresno County contains five major stream systems that flow from the Coast Range: Little Panoche Creek, Panoche Creek, Tumey Gulch Arroyo Ciervo, Cantua Creek, and Arroyo Pasajero. The location, capacity, and managing agency for each stream system and associated flood control facility is summarized in Table 5-1. The data available for mapping storm drainage and flood control systems within unincorporated areas in Fresno County is shown in Table 5-2. The following is a description of each stream system and flood control facility.

Little Panoche Creek

Little Panoche Creek is located in the northwestern corner of Fresno County. It is managed for flood control purposes by the California Department of Water Resources (DWR). DWR operates and maintains a detention dam and reservoir (Little Panoche Reservoir) on the creek approximately 3 miles west of I-5. The facility was constructed by the Bureau of Reclamation to provide flood protection for the California Aqueduct. It was designed for a 100-year storm and has a storage capacity of 820 acre-feet. When storage levels in the reservoir exceed 820 acre-feet the dam's uncontrolled spillway releases water. Little Panoche Creek then flows under I-5 and the California Aqueduct. The creek ends at a retention basin located on the eastside of the aqueduct. When the retention basin fills with stormwater during high flows, stormwater is pumped into the aqueduct.

Panoche Creek

Panoche Creek is located south of Little Panoche Creek in northwestern Fresno County. It flows under I-5 and across the California Aqueduct which is siphoned in large pipes under the creekbed. The estimated 100-year peak flow for Panoche Creek is 22,000 cubic feet per second (cfs). On the east side of the aqueduct, the water is not channelized and flows overland. During high creek flows, stormwater may flood agricultural land and portions of the city of Mendota.

Tumey Gulch and Arroyo Ciervo

Two streams — Tumey Gulch and Arroyo Ciervo — are located in central-western Fresno County and flow easterly from Ciervo Mountain. The estimated 100-year peak flow for Tumey Gulch is 3,600 cfs and for Arroyo Ciervo, 900 cfs. No flood control facilities exist on the streams; however the California Aqueduct obstructs their eastward flow. During periods of high stream flow, sediment laden flood water may form ponds on the westside of the aqueduct. These ponds may spill stormwater and sediment into the aqueduct during storm events.

Cantua Creek System

The Cantua Creek system includes Arroyo Hondo, Cantua Creek, Salt Creek, Martinez Creek, and Domegine Creek in central-western Fresno County. These creeks drain the eastside of Joaquin Ridge, crossing I-5 between Kamm Road and Fresno-Coalinga Road. The estimated 100-year peak flow from the Cantua Creek system is 8,300 cfs. As with Tumey Gulch and Arroyo Ciervo, stormwater from the Cantua Creek system may form ponds on the westside of the California Aqueduct during periods of high flow.

Arroyo Pasajero Stream System

The Arroyo Pasajero stream system encompasses the largest drainage area in western San Joaquin Valley. The major creeks in the system are Los Gatos, Warthan, Jacalitos, and Zapato-Chino Creeks. They drain through the city of Coalinga and under I-5 between El Dorado and Jayne Avenues. Water from these streams is collected in a ponding basin on the west side of the California Aqueduct. Sediment containing asbestos washes downstream and is deposited in the ponding basin. During flood events, there is potential for the Arroyo Pasajero Stream System to cause physical damage to the Aqueduct and I-5. There is also a potential for floodwaters to wash asbestos fibers into the aqueduct.

TABLE 5-1
MAJOR FLOOD CONTROL FACILITIES IN WESTERN FRESNO COUNTY
Fresno County Planning Area
1997

Facility/Waterbody	Location	Capacity ¹	Managing Agency
Little Panoche Reservoir	3 miles west of I- 5 in the northwest corner of the county.	820 acre-ft	Department of Water Resources
Little Panoche Creek	Flows easterly from the north side of Panoche Mt. in the northwest corner of the county.	N/A	Department of Water Resources
Panoche Creek	Flows eastward just north of Panoche Rd. crossing I- 5 approx. 1 mi. north of the Panoche Rd. interchange.	N/A	Department of Water Resources
Tumey Gulch & Arroyo Ciervo	Flow eastward from Ciervo Mt. crossing I-5 between Panoche Rd. and Harlan Ave.	N/A	Department of Water Resources
Cantua Creek	Flows easterly between Ciervo Hills and Three Sisters crossing I-5 just south of Coalinga-Mendota Rd. interchange.	2,200 cfs ² (bankfull at approx. 10-year event)	Department of Water Resources
Arroyo Pasajero (including Los Gatos, Warthan, acalitos, and Zapato-Chino Creeks)	This stream system drains the largest drainage basin in the western San Joaquin Valley, flowing from the hills of the Coastal Range west of Coalinga and Pleasant Valley, through Coalinga and westerly across I-5 and terminating in a constructed ponding basin west of the aqueduct.	2500 cfs (typ. flow) ² 36,000 cfs 100-yr peak flow ²	Department of Water Resources, U.S. Army Corps of Engineers, Bureau of Reclamation
¹ Source of data, Department of Water Resources ² River channel capacity is difficult to define due to significant changes in the river conditions over time, variance in channel conditions and geometry along a given river reach, and assumptions made in developing hydraulic models. The numbers provided in this table are design capacity and actual river capacity may vary significantly.			

TABLE 5-2

**DATA AVAILABILITY FOR STORM DRAINAGE AND FLOOD CONTROL SYSTEMS
FOR UNINCORPORATED AREAS
Fresno County Planning Area
1997**

Data Source	Geographic Coverage	Scale	Data Type	Format	Date
FEMA	Entire county on 96 individual maps	1:1,000	Flood Insurance Rate Maps (FIRM) showing floodrate zones	hardcopy	1996 (City of Fresno) and 1982 (other areas)
USGS	Entire county on 134 individual maps	1:24,000	.5 minute topographic maps	hardcopy	variable

Flood Issues in Western Fresno County

Flood issues in western Fresno County are varied in scope and unique in nature. Many creeks prone to high flows and significant erosion are found in the area, but most of the region is unpopulated, so flooding in many areas poses little threat to life or personal property. Major facilities that are subject to flooding include I-5 and the California Aqueduct. Downstream urban areas that are subject to flooding include the communities of Coalinga, Huron, and Mendota. Important wetland habitat in the Mendota Wildlife Management Area is also subject to flooding and may be impacted by sediments carried by flood flows from these creeks.

In 1995, I-5 was flooded by the Arroyo Pasajero and Cantua Creek storm runoff. High stream flows in the Arroyo Pasajero washed out a bridge, while high flows in Cantua Creek inundated the Cantua Creek culvert and flooded the highway. Since that time, the Arroyo Pasajero bridge has been replaced with a structure to accommodate high stream flows. Cantua Creek remains unchanged.

During large storm events, the California Aqueduct is flooded by high flows from Arroyo Pasajero. Consequently, the U.S. Bureau of Reclamation (USBR), U.S. Army Corps of Engineers (Corps), and the California Department of Water Resources (DWR) are coordinating efforts to relieve the threat of flooding from this stream system. The preferred alternative under consideration is construction of a 143,000 acre-foot reservoir with 42,000 acre-feet of sediment storage. Other options include expansion of existing detention basins in the area. Other stream systems obstructed by the aqueduct may pose a flooding hazard during periods of high flow when ponds form on the west side of the aqueduct. The streams carry large amounts of sediment. When ponds fill with sediment, water and sediment spill into the aqueduct. The USBR, Corps, and DWR are studying the situation.

Various stream systems also flood developed areas in western Fresno County storm events. Creeks that feed into Arroyo Pasajero flow through the city of Coalinga creating flood hazards and prevent development in impacted areas. Downstream, Arroyo Pasajero is prone to flooding the road into the city of Huron. After crossing the California Aqueduct, Panoche Creek flows overland and floods both agricultural land and portions of the city of Mendota.

The Mendota Wildlife Management Area receives water from Panoche Creek which drains into Mendota Pool. During storm events, the sediments carried in Panoche Creek contain high levels of selenium and arsenic, which may degrade the water quality within the Mendota Wildlife Management Area.

Eastern Fresno County

Eastern Fresno County is located primarily in the Sierra Nevada. Precipitation falls mainly as snow and the region is characterized by smaller local watersheds and draining to the reservoirs upstream of Millerton and Pine Flat Lakes. Because most of the region is located on federal land, storm drainage and flood control issues in eastern Fresno County are not included in the study area. However, it is acknowledged that the flows originating in the mountains and foothills contribute to the drainage and flooding problems on the valley floor.

Central Fresno County

Central Fresno County includes the area between the valley floor around Fresno Slough and eastward to the Sierra Nevada foothills, including Millerton Lake to Pine Flat Lake. As this area is the county's population center, storm drainage and flood control systems are largely designed to protect urban development. Streams in central Fresno County generally flow from out of Sierra Nevada to the east and westward to the valley bottom.

Geography, Rainfall, and Soils

The western slope of the Sierra Nevada drains into central Fresno County via the San Joaquin and Kings Rivers, and small creeks and stream systems. The geographic area of central Fresno County runs along the Sierra Nevada foothills at elevations around 500 feet on the west and slopes down to the Fresno Slough on the valley floor and drains gently to the north. Average annual precipitation in the central Fresno County area varies from six inches near Mendota to about 70 inches upstream. While the flooding potential in the fall and winter is generally from rain, spring flooding is a result of rapid snow melt in the mountains. Soils in the foothills are typically medium to coarse-textured, and gravelly or rocky. Soils in the floodplains are generally level, very deep, and well drained. Soils in the valley floor are fine and poorly drained.

Rivers, Streams, and Existing Flood Control Facilities

The San Joaquin and the Kings Rivers, flow westerly from the Sierra Nevada into central Fresno County. The Fresno Slough, also known as the North Fork of the Kings River is connected to the San Joaquin River by the James Bypass, a manmade canal. They direct floodwater from the Kings River to the San Joaquin River. Three dams have been constructed to control flows on the rivers. These dams are Friant and Mendota Dams on the San Joaquin River and Pine Flat Dam on the Kings River. Pine Flat Dam is operated primarily for flood control purposes. Friant Dam was constructed and is managed by the U.S. Bureau of Reclamation (USBR) as part of the Central Valley Project (CVP). Although Friant Dam does serve to reduce release volumes in the main San Joaquin River channel, it was not sited, designed or engineered for the purpose of flood control. Any flood control capability of the Friant Unit is incidental to its function as a diversion facility. Mendota Dam is operated primarily for irrigation.

In addition to the flood control facilities on the San Joaquin and Kings Rivers, a number of reservoirs and detention basins have been constructed on streams east of the Fresno-Clovis area to prevent urban flooding. These facilities include Redbank Dam and the Redbank-Fancher Creeks Flood Control Project. The Redbank-Fancher Creeks Flood Control Project consists of two dams (Big Dry Creek Dam and Fancher Creek Dam), three detention basins (Redbank Creek, Pup Creek, and Alluvial Drain Detention Basins), and canals to convey discharges around developed areas. The Friant-Kern Canal draws water from Millerton Lake at Friant Dam and flows south along the foothills toward Bakersfield.

A description of drainage systems and flood control facilities are described in detail below. Table 5-3 also summarizes the location, capacity, and managing agency for each stream system and flood control facility in central Fresno County.

San Joaquin River

The San Joaquin River forms the boundary between Madera and Fresno Counties. It flows from the Great Western Divide in the Sierra Nevada southwest along the northern border of Fresno County where it is joined by flows from the North Fork of the Kings River. From there the river flows northwest up the San Joaquin Valley toward the Delta.

San Joaquin River flows are regulated by Friant Dam, which is the most significant of a number of dams along the river. Located in the north-central part of the county, it was completed in 1942 by the U.S. Bureau of Reclamation (USBR) as part of the Central Valley Project (CVP). The reservoir, Millerton Lake, has a storage capacity of about 520,500 acre-feet. The CVP Friant Unit consists of Friant Dam and Millerton Lake, the Friant-Kern Canal, which runs south to Kern County, and the Madera Canal which runs northwesterly to Madera County. Releases from Friant Dam to the San Joaquin River and the Friant-Kern Canal provide service to water users within Fresno County.

The storage capacity of Millerton Lake is inadequate for full flood protection during wet years and emergency releases may result in flooding problems downstream. The storage to runoff ratio for Millerton Lake is 60 percent which provides limited flexibility in the operation of Friant Dam. The Corps has evaluated the operational plans for all the dams in the San Joaquin River system to determine the possibility of coordinated releases to reduce the likelihood of coincident peak flows downstream with some success. Nevertheless, in 1997, emergency releases from Friant Dam combined with large storm events and several levee breaks downstream contributed to flooding along the San Joaquin River. In this context, it is important to emphasize that although Friant Dam does serve to reduce release volumes in the main San Joaquin River channel, it was not sited, designed or engineered for the purpose of flood control. Any flood control capability of the Friant Unit is incidental to its function as a diversion facility. The amount of capacity in Millerton Lake that USBR keeps available for runoff varies throughout the year, according to defined operating criteria that have been developed, and agreed to by Federal agencies (USBR, U.S. Army Corps of Engineers) and state agencies, most notably the Department of Water Resources (DWR). The Madera Canal also serves to release runoff volumes from the San Joaquin River.

The Friant-Kern Canal carries irrigation water from Millerton Reservoir southeast to Kern County. The average annual delivery from the canal is about one million acre-feet with a design capacity of 5,000 cfs. There is a spillway into the Kings River just upstream of a double barrel 24½-foot

diameter (i.e., two 24½-foot pipes) siphon under the river. Although the canal was constructed by the USBR and is normally managed by the Friant-Kern Water Users Authority, floodwater in the canal is managed by the Corps. During times of flooding, water from the Friant-Kern Canal may not be releasable to the Kings River since the Corps may not want additional flows on the river.

Mendota Pool is a 5,000 acre-foot reservoir created by Mendota Dam located just outside the city of Mendota on the San Joaquin River. The primary function of the dam is storage of irrigation water for agriculture, although the water level in the pool also functions to maintain water levels in the Mendota Wildlife Management Area. Mendota Pool provides little or no flood protection. Mendota Dam contains flows from the San Joaquin River as well as discharge and releases from the Kings River via the North Fork (Fresno Slough and James Bypass). The Delta-Mendota Canal conveys Delta water to Mendota Pool from the north and several irrigation channels divert flows from it. The USBR, in coordination with the Central California Irrigation District, manages this system which is part of the Central Valley Project. The USBR has proposed replacing the existing structure with a new Mendota Dam which may raise the water level in the pool.

Southern California Edison (SCE) and Pacific Gas and Electric (PG&E) own and operate a number of dams and reservoirs on the San Joaquin River and its tributaries upstream of Friant Dam. The most notable of these are Edison Lake and Florence Lake. These upstream storage facilities are operated for the production of electric energy and have a combined capacity of about 609,530 acre-feet. Their operation does affect the flow of water into Millerton Lake and subsequently the timing and availability of releases to Friant Unit Contractors. None of these storage facilities is designed or operated for flood control, and the Corps currently has no jurisdiction over releases from these structures. Cumulative flood releases from the upper San Joaquin River dams could overwhelm Friant Dam.

From Friant to Gravelly Ford, the San Joaquin River is part of the Designated Floodway Program administered by the State Reclamation Board. Land use restrictions and river management practices allow the river to meander, flood the overbanks, and remain in a relatively natural state. Downstream of Gravelly Ford, the river is confined by levees. The design capacity of the San Joaquin River from Friant Dam to Chowchilla Bypass is in excess of 8,000 cfs while the channel capacity downstream is reduced. The major San Joaquin River "choke point" in Fresno County is the reach near Mendota and Firebaugh, which has a channel capacity of 8,000 cfs. Beyond that point, San Joaquin River channel capacity continues to decrease for some distance due to lack of annual flooding and natural channel clearing since Friant Dam was constructed. Further downstream, the river channel has been deepened and widened by historic flows of the Merced River, Tuolumne River and other tributaries.

In addition to release from Friant Dam, two uncontrolled streams, Cottonwood Creek and Little Dry Creek, add significantly to the river flows below Friant during heavy precipitation. Historically, prior to the development of flood control system, large areas within the San Joaquin Valley were within the river's floodplain. As development has encroached into the floodplain, the river has been confined to a relatively narrow channel constrained by levees, which reduced the carrying capacity of the river. Most of the flow (as much as 5,500 cfs) from Friant Dam is diverted northward to the Chowchilla Bypass about 11 river miles upstream from Mendota Dam. Downstream of Chowchilla Bypass, the river is not confined by levees (within Fresno County) and generally carries no more than 2,500 cfs.

Kings River

The Kings River flows from the Sierra Nevada southwest through the central part of Fresno County and into Tulare County at Reedley. North of Hanford the river branches with the South Fork flowing southward to the Tulare Lakebed. The North Fork joins Fresno Slough which conveys flows north to the San Joaquin River at Mendota Pool. Several sloughs and canals branch off of the river, and are used for water storage and to convey irrigation water.

The Kings River flows are regulated by Pine Flat Dam, which was completed in 1954 with the primary purpose of flood protection. Pine Flat Reservoir, located 16 miles northeast of Sanger in the east central part of the county, has a storage capacity of approximately one million acre-feet. The flood control functions of the facility are managed by the Corps while the releases for irrigation diversion are managed by the Kings River Water Association (KRWa).

Pine Flat Dam is similar to Friant Dam in that its operating parameters for allocating reserve capacity change throughout the precipitation year. Management of the reservoir space is based on forecasts, expected runoff patterns, snow measurements, and expected fill date. The objective is to exactly fill the reservoir without spilling. With a large volume available for snow melt and a sufficient storage to runoff ratio, Pine Flat Dam operations normally avoid emergency spillage.

Downstream of Pine Flat Dam, the Kings River is managed for flood control by the Kings River Conservation District in cooperation with Corps, DWR, and local irrigation districts. Releases from Pine Flat Dam and flows from two uncontrolled streams, Holland Creek and Mill Creek, provide the majority of the river's flow. Numerous sloughs and irrigation canals branch off the Kings River; the capacity of the river is more than 13,000 cfs. The Kings River flood control facilities include many miles of levees in central Fresno County. There are three weirs on the river, Army Weir, Crescent Weir, and Stinson Weir. The natural river branches to the north fork (also known as Fresno Slough) which flows to join the San Joaquin River at Mendota Pool and the south fork which flows to Tulare Lakebed. Army Weir is located at this branch just upstream from SR 41. Crescent Weir is located at the Crescent Bypass southwest of 22nd and Excelsior Avenues. The Crescent Bypass flows to Fresno Slough. Stinson Weir is located near the confluence of Murphy Slough and Fresno Slough at Elkhorn Avenue. Normal flows are held by these weirs in the main channel. During storm events, as much as 4,750 cfs is diverted to the North Fork and the San Joaquin River. As much as 2,500 cfs of additional flow is diverted to the South Fork and Tulare Lakebed. As much as 3,200 cfs can then be diverted to the Crescent Bypass. Any flow above approximately 10,000 cfs is divided equally between the north and south forks.

In practice, flow management on the Kings River is carefully coordinated between anticipated weather, upstream flows and ability of downstream users to receive the water. Significant adjustment may be necessary, and a variety of operations options are considered including storing or routing water through alternate sloughs or requesting users to accept additional water. Fresno Slough and the James Bypass are normally dry except for groundwater seepage and irrigation returns. Flow is diverted to the South Fork only in very wet years.

Redbank Reservoir

Redbank Reservoir, formed by Redbank Dam, is located on Redbank Creek north of Shaw Avenue. The reservoir has a gross pool capacity of 1,030 acre feet, and receives water from the Redbank

Creek watershed. The reservoir is operated for flood control by the Fresno Metropolitan Flood Control District.

Redbank-Fancher Creeks Flood Control Project

The Project comprises a system of 2 dams, 3 detention basins, and canals to protect developed areas in and around the city of Fresno from a 200-year storm. The project was built by the Corps and is managed and operated by the Fresno Metropolitan Flood Control District (FMFCD). Fancher Creek Reservoir has a capacity of 9,712 acre-feet and retains water from Fancher and Hog Creeks, and some flows from Redbank Creek. Fancher Dam diverts flows via canals around Fresno. Redbank Creek Detention Basin (940 acre-feet) contains local flows from Redbank Creek downstream from Redbank Dam. Alluvial Drain Detention Basin and Pup Creek Detention Basin have capacities of 305 and 559 acre-feet, respectively, and can each regulate discharges into Dry Creek at 25 cfs.

Big Dry Creek Reservoir

Big Dry Creek Reservoir, with a capacity of 30,200 acre-feet, retains flows from Big Dry Creek and Dog Creek and diverts flows via Little Dry Creek to the San Joaquin River at a rate of up to 700 cfs. During a flood event, no water is typically released from Big Dry Creek Dam. However, during a severe flood event, it may be necessary to release water from the reservoir.

TABLE 5-3
MAJOR FLOOD CONTROL FACILITIES IN EASTERN AND CENTRAL
FRESNO COUNTY
Fresno County Planning Area
1997

Facility/Waterbody	Location	Capacity	Managing Agency
Millerton Reservoir*	17 miles northeast of SR 99 on the San Joaquin River in the north central part of the county	520,500 acre-ft ¹	U.S. Bureau of Reclamation
Pine Flat Reservoir	16 miles northeast of Sanger on the Kings River in the east central part of the county	1,000,000 acre-ft ¹	U.S. Army Corps of Engineers
Mendota Pool	On the San Joaquin River at Mendota where the river turns north and Fresno Slough joins the river in the northwestern part of the county	5,000 acre-ft ²	U.S. Bureau of Reclamation
Big Dry Creek Reservoir	West of Friant-Kern Canal and north of Tollhouse Road on Big Dry Creek	30,200 acre-ft ¹	Fresno Metropolitan Flood Control District
Redbank Reservoir	7 miles east of Clovis, 3 miles southwest of the Friant-Kern Canal between Dog Creek and Fancher Creek in the central part of the county	1,030 acre-ft	Fresno Metropolitan Flood Control District
Fancher Creek Reservoir	East of the Friant-Kern Canal at the confluence of Fancher and Hog creeks	9,712 acre-ft ¹	Fresno Metropolitan Flood Control District
Redbank Creek Detention Basin	On Redbank Creek north of McKinley Avenue and west of DeWolf Avenue	940 acre-ft ¹	Fresno Metropolitan Flood Control District
Pup Creek Detention Basin	On Pup Creek south of Herndon Avenue and east of Temperance Avenue	559 acre-ft ¹	Fresno Metropolitan Flood Control District
Alluvial Drain Detention Basin	On Alluvial Drain west of Temperance Avenue and north of Nees Avenue	305 acre-ft ¹	Fresno Metropolitan Flood Control District
San Joaquin River	Flows from the Sierra Nevada southwest along the northern border of the county to Mendota where it turns to flow to the northwest. Forms the border between Fresno and Madera counties	8,000 cfs ^{1,4} (Friant Dam to Chowchilla) 2,500 cfs ^{1,4} (to Mendota) 4,500 cfs ^{1,4} (Mendota Dam to Sand Slough)	U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, and Local Irrigation Districts
Kings River	Flows from the Sierra Nevada to Sanger and Reedley and into Kings County then southwest near the Fresno-King County boundary to Army Weir above Hwy 41 where the normal flow is diverted to the North Fork. Excess flows are diverted to Tulare Lakebed	13,000 cfs ^{3,4}	Kings River Conservation District
Fresno Slough & James Bypass	A seasonal waterway system which connects the Kings River near Laton and Lemoore NAS to the San Joaquin River at Mendota Pool during flood events	4,750 cfs ¹	U.S. Army Corps of Engineers

TABLE 5-3

**MAJOR FLOOD CONTROL FACILITIES IN EASTERN AND CENTRAL
FRESNO COUNTY
Fresno County Planning Area
1997**

Facility/Waterbody	Location	Capacity	Managing Agency
Friant-Kern Canal	Flows southeasterly from Millerton Lake through Orange Cove continuing on to Bakersfield. Crosses 5 feet below Kings River via a 24.25 ft diameter 3,000 ft siphon	5,000 cfs ¹	Friant-Kern Water Users' Authority, U.S. Bureau of Reclamation, U.S. Army Corps of Engineers
<p>*Friant Dam/Millerton Reservoir is not sited, designed, or operated to function as a flood control facility, and any such capability is incidental to its function as a diversion facility.</p> <p>¹Source, U.S. Army Corps of Engineers</p> <p>²Source, Central California Irrigation District</p> <p>³Source, Kings River Conservation District</p> <p>⁴River channel capacity is difficult to define due to significant changes in the river conditions over time, variance in channel conditions and geometry along a given river reach, and assumptions made in developing hydraulic models. The numbers provided in this table are design capacity and actual river capacity may vary significantly.</p>			

Flood Issues in Central Fresno County

Flood issues in central Fresno County are associated with the San Joaquin River, Kings River, and several other stream systems. The San Joaquin River from Gravelly Ford to the Chowchilla Bypass outside Fresno County is confined by a levee system. The design capacities of the river are shown in Table 5-3. These capacities are considered safe carrying capacities with 3 feet of allowable freeboard. Over time, encroachment of vegetation, substantial sedimentation and land subsidence has considerably reduced channel capacity. Erosion, seepage, and prolonged high water compromise levee integrity. Levee maintenance is generally under the jurisdiction of local reclamation or irrigation districts. The reach between Friant Dam and Gravelly Ford is part of the Designated Floodway Program administered by the State Reclamation Board. Uncontrolled flooding from the San Joaquin River between the Chowchilla Bypass and Dos Palos tends to flow into Madera County north of Mendota.

The USBR is studying improvements to Mendota Pool. The area has shown evidence of significant subsidence, possibly affecting levee height, river invert (i.e., bottom of low-flow channel), as well as the pool depth. It has been suggested that Mendota Dam may be useful in retaining sediments from being transported downstream and further reducing channel capacity of the San Joaquin River, but this may adversely affect management of the Mendota Wildlife Area. Construction of a new dam at Mendota may improve flood control capabilities of lower reaches of the San Joaquin. At present (1997), Mendota Dam is of limited usefulness for flood control purposes. The flooding hazards in the region are from Panoche Creek to the west and flooding into Madera county downstream from Mendota Pool.

The flooding potential from creeks and streams between the San Joaquin and Kings Rivers in the east has been substantially eliminated within the last few years by the completion of the Redbank-Fancher Creeks Flood Control Project. The Federal Emergency Management Agency (FEMA) flood insurance rate maps for the Fresno-Clovis Metropolitan Area were recently revised, with the

assistance of the Fresno Metropolitan Flood Control District (FMFCD). The revised maps show a decrease in the areas designated 100-year floodplain pursuant to completion of flood control facilities on the Fresno Stream Group. However, as 100-year storm event flows have been increased from 18,000 cfs to 24,500 cfs in the San Joaquin River over past decades (due to increasing intensity of storms and statistical analysis of the meteorologic/hydrologic database for the San Joaquin River), no FEMA map revisions have been made to note the widening extent of the 100-year and 100- to 500-year floodplains in the San Joaquin River channel.

Uncontrolled creeks within the Kings River system, notably Mill Creek, continue to challenge management of Pine Flat Dam and Kings River flood control during consecutive large storm events. In 1997, water was not released from Pine Flat due to large flows in Mill Creek, pushing the limits of the system. If another large event occurred before Pine Flat Reservoir releases could provide adequate storage space and the Mill Creek watershed was still saturated, rapid runoff in Mill Creek and an emergency spill at Pine Flat would have overwhelmed the system. In the event of a major release from Pine Flat Dam, downstream flooding would occur over agricultural lands near the riverbanks and possibly within the cities of Reedley and Kingsburg.

INCORPORATED AREAS

Fresno County contains fifteen incorporated areas: Coalinga, Clovis, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, Sanger, San Joaquin, and Selma. For the most part, each city operates its own storm drainage and flood control system. Exceptions are the cities of Fresno and Clovis which are managed by the Fresno Metropolitan Flood Control District. Many cities also rely on levee maintenance by the U.S. Army Corps of Engineers and irrigation districts to provide flood protection from certain creeks and rivers. The following is a description of the storm drainage and flood control systems for the fifteen incorporated cities within Fresno County.

<p align="center">TABLE 5-4</p> <p align="center">CHARACTERISTICS OF STORM DRAINAGE AND FLOOD CONTROL SYSTEMS IN INCORPORATED AREAS</p> <p align="center">Fresno County Planning Area</p> <p align="center">1997</p>						
Storm Drainage and Flood Control Characteristics						
City	Storm Drain Inlets	Storm Drains	Open Ditches/ Canals	Pump Stations	Ponding Basins	Levees
Coalinga	X	X	X		X	X
Clovis	X	X	X	X	X	
Firebaugh	X	X	X	X	X	X
Fowler	X	X			X	
Fresno	X	X	X	X	X	X
Huron	X	X	X		X	X
Kerman	X	X		X	X	
Kingsburg	X	X	X	X	X	
Mendota	X	X	X		X	
Orange Cove	X	X	X		X	
Parlier	X	X			X	
Reedley	X	X	X	X	X	
Sanger	X	X	X	X	X	
San Joaquin	X	X	X	X	X	
Selma	X	X	X	X	X	

Coalinga

Coalinga is located in western Fresno County on SR 33 near Warthan and Los Gatos creeks. The storm drainage and flood control system for the city of Coalinga is composed of storm drain inlets, underground storm drains, open ditches, ponding basins, and levees (Table 5-4). In general, stormwater in the city of Coalinga flows into storm drain inlets and enters storm drains and a ditch which convey water to two local ponding basins and creeks. One ponding basin collects stormwater from a subdivision on the east side of town, the other basin collects water from a subdivision on the west side of town. The basins are designed to fill with water via gravity. Stormwater collects in these basins until it percolates through the soil or evaporates into the air. Stormwater that is not conveyed to these basins flows into Los Gatos and Warthan creeks. Los Gatos Creek is located in the northwestern part of the city while Warthan Creek is located in the southwestern part of the city. Levees are located along these creeks to help prevent localized flooding during high creek flows. A map of the storm drainage system for Coalinga is available from the city (Table 5-5).

TABLE 5-5
DATA AVAILABILITY FOR STORM DRAINAGE AND FLOOD CONTROL SYSTEMS IN
INCORPORATED AREAS
Fresno County Planning Area
1997

Data Source	Geographic Coverage	Scale	Data Type	Format	Date
City of Coalinga	Coalinga	1:700; 1:300	ponding basins, storm drains, inlets, flow direction	hardcopy	1993/1994
Fresno Metropolitan Flood Control District	Clovis	1:200	drainage zones, ponding basins, inlets, storm drains, canals, pump stations	hardcopy	variable (1980s-1990s)
Fred Rabe Engineering	Firebaugh	1:700	drainage zones, ponding basins, inlets, storm drains, canals, river, pump stations	hardcopy	1991
N/A	Fowler	N/A	N/A	N/A	N/A
Fresno Metropolitan Flood Control District	Fresno	1:200	drainage zones, ponding basins, inlets, storm drains, canals, pump stations	hardcopy	variable (1980's-1990's)
N/A	Huron	N/A	N/A	N/A	N/A
Blair, Church, and Flynn Consulting Engineers	Kerman	1:400	ponding basins, storm drains, inlets, pump stations	hardcopy	1981
City of Kingsburg	Kingsburg	1:300	ponding basins, storm drains, inlets, drainage zones, pump stations, canals	electronic (AutoCAD)	1994
RM Associates	Mendota	1:200	ponding basins, storm drains, canals, inlets	hardcopy; electronic	1995
N/A	Orange Cove	N/A	N/A	N/A	N/A
Giersch & Olson, Inc.	Parlier	1:800	ponding basins, pump stations, inlets, canals	hardcopy	1991
City of Reedley	Reedley	1:200	ponding basins, pump stations, inlets, canals/ditches, drainage zones, storm drains	hardcopy	1983
Yamabe & Horn Engineering, Inc.	Sanger	unknown	ponding basins, pump stations, inlets, canals, drainage zones	hardcopy, electronic (AutoCAD)	1990's
Yamabe & Horn Engineering, Inc.	San Joaquin	1:400; 1:100	ponding basins, pump stations, inlets, canals	hardcopy, electronic (AutoCAD)	1995
City of Selma	Selma	1:800	ponding basins, inlets, ditches, pump stations, storm drains	hardcopy	1981/1982

Clovis

The storm drainage system for the city of Clovis is part of an elaborate network of pipelines, canals, pumping stations, and ponding basins managed by the Fresno Metropolitan Flood Control District (District). The District's storm drainage system is composed of 135 stormwater ponding basins, 350 miles of storm drain pipelines, 44 pumping plants, 3 flood control dams, and 3 flood detention

basins. The storm drainage and flood control system for the city of Clovis is composed of drainage zones, storm drain inlets, underground storm drains, ponding basins, irrigation canals, and pump stations (Table 5-4). In general, stormwater in Clovis flows from northeast to southwest. Stormwater in the city of Clovis flows directly into street gutters and is channeled into storm drain inlets. These storm drain inlets convey water into underground storm drains which carry water to central collection pipes. Stormwater is conveyed to a series of ponding basins and open channels. Some basins use pumps to transport water to irrigation canals while others are percolation-evaporation basins. A map of the storm drainage system for Clovis is available from the Fresno Metropolitan Flood Control District (Table 5-5).

Firebaugh

Firebaugh is located in northwestern Fresno County, west of the San Joaquin River. The storm drainage and flood control system for the city of Firebaugh is composed of 32 drainage zones, a ponding basin, storm drain inlets, underground storm drains, an irrigation canal, three pump stations, and levees (Table 5-4). In general, stormwater in the city of Firebaugh flows into streets and enters underground storm drains via inlets. Stormwater is pumped from these storm drains into the main canal of the Central California Irrigation District on the west side of the city. In addition to this main storm drainage system, a ponding basin for a subdivision is located along Fannin Drive. Water collects in this basin until it percolates through the soil or evaporates into the air. Levees, managed by the Lower San Joaquin Levee District, are located along the San Joaquin River to the east of the city. A map of the storm drainage system for Firebaugh is available from Fred Rabe Engineering (Table 5-5).

Fowler

Fowler is located in central Fresno County along SR 99. The storm drainage and flood control system for the city of Fowler is comprised of storm drain inlets, underground storm drains, and ten ponding basins (Table 5-4). In general, stormwater in Fowler drains from east to west. Recently, storm drain inlets and storm drains were constructed along Merced Street. Stormwater flows into these storm drains and is conveyed to a ponding basin on 7th Street. Stormwater from the northern and southern sections of the city drains to two ponding basins on the westside of the city. The ponding basins are designed to collect stormwater by gravity. Stormwater collects in the basins until it percolates through the soil or evaporates into the air. No open canals/ditches or pumps are used to convey stormwater in the city. No map of the storm drainage system for Fowler is available (Table 5-5).

Fresno

The storm drainage system for the city of Fresno is part of an elaborate network of pipelines, canals, pumping stations, and ponding basins managed by the Fresno Metropolitan Flood Control District (District). The District's storm drainage system is composed of 135 stormwater ponding basins, 350 miles of storm drain pipelines, 44 pumping plants, three control dams, and three flood detention basins. The storm drainage and flood control system for the city of Fresno is composed of drainage zones, storm drain inlets, underground storm drains, ponding basins, irrigation canals, pump stations, and levees (Table 5-4). In general, stormwater in Fresno flows from northeast to southwest. Stormwater flows into streets and enters underground storm drains through inlets. The network of curbs and gutters is an important element of the city's urban runoff management

system since it obviates the need for additional underground storm sewers, which are more expensive to construct and maintain. Stormwater is carried by storm drains to ponding basins and irrigation canals. Ponding basins are designed to fill with water by gravity. Some basins use pumps to transport water to irrigation canals while others are percolation-evaporation basins. Levees and the Red Bank-Fancher Creek Reservoir protect Fresno from high stream flows. A map of the storm drainage system for Fresno is available from the Fresno Metropolitan Flood Control District (Table 5-5).

Huron

The city of Huron is located in western Fresno County, west of the California Aqueduct and east of Interstate 5. The storm drainage and flood control system for the City of Huron is composed of a ponding basin, underground storm drains, storm drain inlets, a drainage ditch, and levees (Table 5-4). Stormwater in the city of Huron flows into streets and enters underground storm drains via inlets. Storm drains convey water to a drainage ditch which transports water to a ponding basin on the westside of the California Aqueduct. This storm drainage system services about half of the city. The other half of the city has no formal storm drainage system. In these areas, city streets convey stormwater from west to east. No map of the storm drainage system for Huron is available (Table 5-5).

Kerman

Kerman is located in central Fresno County on SR 145. The storm drainage system for the city of Kerman is composed of nine drainage zones, seven ponding basins, underground storm drains, storm drain inlets, and a pump station (Table 5-4). Stormwater flows into streets and enters inlets where it is conveyed to storm drains and ponding basins. Stormwater collects in ponding basins until it percolates through the soil or evaporates into the air. No canals or levees are used as part of the storm drainage and flood control system for Kerman. A map of the storm drainage system for Kerman is available from Blair, Church, and Flynn Consulting Engineers (Table 5-5).

Kingsburg

The City of Kingsburg is located in southern Fresno County near the border with Tulare County, just north of the Kings River. Much of the area surrounding the city is agricultural farmland. The City of Kingsburg operates the storm drainage system in the city. The storm drainage system consists of storm drain inlets, storm drains, two canals, two pump stations, and approximately eleven ponding basins (Table 5-4). Stormwater flows into streets and enters underground storm drains via inlets. Storm drains convey water to canals on Greenwood and Bethel Avenues and one of approximately eleven ponding basins throughout the city. Although the City of Kingsburg is located near the Kings River, flooding from the river has not historically been a threat. A map of the storm drainage system for the City of Kingsburg is available from the city (Table 5-5).

Mendota

The city of Mendota is located in northwestern Fresno County, north of the Mendota Wildlife Refuge along SR 33. The storm drainage and flood control system for Mendota is composed of two ponding basins, underground storm drains, and storm drain inlets (Table 5-4). Stormwater flows into streets and enters storm drains via inlets. Storm drains transport water in the southeastern

and southwestern part of the city to Fresno Slough and the Mendota Wildlife Refuge. Stormwater in the northeastern part of the city is drained through a vacant field toward the airport. A map of the storm drainage system for Mendota is available from RM Associates (Table 5-5).

Orange Cove

The city of Orange Cove is located on the southern border of Fresno county along the Tulare County border. The stormwater drainage system for Orange Cove is composed of underground storm drains, open ditches and collection basins (Table 5-4). Stormwater flows into streets and enters inlets where it is conveyed to drains, open ditches, and one of three basins. Each basin is designed for a specific stormwater need. One basin is designed to serve a subdivision of 300 lots. The other two basins are designed to serve a 200 unit apartment complex and a 54 unit apartment complex. No map of the storm drainage system for Orange Cove is available (Table 5-5).

Parlier

The city of Parlier is located in southern Fresno county, just east of SR 99 near the Kings River. The storm drainage system for Parlier is composed of twenty drainage zones, nine ponding basins, underground storm drains, and storm drain inlets (Table 5-4). The ponding basins range in size from approximately 1 to 2 acres. Stormwater is conveyed directly to basins by city streets. The basins are designed to fill with water by gravity. Stormwater collects in these basins until it percolates through the soil or evaporates into the air. The city's storm drainage system employs no canals or pumping facilities. A map of the storm drainage system for Parlier is available from Giersch and Olson (Table 5-5).

Reedley

The city of Reedley is located in southern Fresno County along the Kings River. The storm drainage and flood control system for the city of Reedley is composed of twelve drainage zones, three ponding basins, underground storm drains, storm drain inlets, a drainage ditch, and a pump station (Table 5-4). Stormwater flows into city streets and enters storm drain inlets where it is conveyed to underground storm drains and the Buttonwillow Ditch on the eastside of the city. Storm drains carry water to one of the city's three ponding basins. The Camanche Park Ponding Basin is located at the northeast corner of North Avenue and Columbia Avenue. Another ponding basin is located at the end of Hemlock Avenue and Curtis Avenue. Both of these ponding basins are designed to fill with water by gravity. Stormwater collects in these basins until it percolates through the soil or evaporates into the air. A third ponding basin is located at the intersection of Washington Avenue and Caroline Avenue. Stormwater from this ponding basin is pumped to an irrigation canal. A map of the storm drainage system for Reedley is available from the city (Table 5-5).

Sanger

The city of Sanger is located in central Fresno County. The storm drainage system for Sanger is composed of nine drainage zones, storm drain inlets, underground storm drains, three canals, six pump stations, seven ponding basins, and levees (Table 5-4). Stormwater in Sanger flows into streets and enters storm drains through inlets along the street. Storm drains convey water to the Fowler Switch Canal, Lonetree Canal, and Centerville-Kingsburg Canal. Levees located along the

Kings River Overflow Channel protect the city from high river flows. A map of the storm drainage system for Sanger is available from Yamabe and Horn Engineering (Table 5-5).

San Joaquin

The city of San Joaquin is located in western Fresno county, between SR 99 and Interstate 5. The storm drainage system for San Joaquin is composed of seven drainage zones, storm drain inlets, underground storm drains, pump stations, irrigation canals, and one ponding basin (Table 5-4). Stormwater in San Joaquin flows into streets and enters storm drains through inlets located along Colorado, California, and Manning avenues. The storm drain located along California Avenue conveys water directly to a ponding basin in the northern portion of the city by gravity. The storm drain located along Colorado Avenue conveys water to the northeastern portion of the city where it is pumped into an irrigation canal adjacent to Sutter Avenue. The storm drain located along Manning Avenue conveys water to the western portion of the city where it is pumped to an irrigation canal adjacent to Olive Road. Additional ponding basins and storm drains are planned in the future for San Joaquin. A map of the storm drainage system for San Joaquin is available from Yamabe and Horn Engineering (Table 5-5).

Selma

The city of Selma is located in southern Fresno County adjacent to SR 99. The storm drainage and flood control system for Selma is composed of storm drain inlets, underground storm drains, four ponding basins, and pump stations (Table 5-4). Stormwater in Selma flows into streets and enters storm drains through inlets located along streets. Storm drains convey water to ponding basins. A map of the storm drainage system for Selma is available from the city (Table 5-5).

5.4 WATER SUPPLY AND DISTRIBUTION FACILITIES

Fresno County's groundwater and surface water management is accomplished through various combinations of public and private water agencies and districts, including the Bureau of Reclamation, utility companies, and local irrigation districts, all eventually governed by state and federal regulations.

Water management policy in Fresno County is dominated by four issues: a limited water supply; the cost of subsurface drainage, disposal, and treatment; potential reduction of imported surface water sources; and maintaining the productivity and quality of its aquifer. Water is a critical element in planning for future development. Land use decisions are made by the various city councils and the Fresno County Board of Supervisors while decisions related to water are made by the numerous independent water boards. Additionally, beyond local decisions, state and federal agencies may influence the delivery of vital surface water in the future. For example, the Central Valley Project (CVP) deliveries to Fresno County may be reduced by the Central Valley Project (CVP), as it complies with the Central Valley Project Improvement Act (CVPIA) and resolves issues related to the protection of endangered species and aquatic species in the Delta. The Environmental Impact Statement (EIS) for the CVPIA is not yet finalized (as of September 1999), and it has not been formally determined that additional releases from Friant Dam to the San Joaquin River (for restoring habitat along the San Joaquin River) will have a net negative impact on Fresno County's groundwater. It is

possible that groundwater conditions will improve through greater recharge from the river channel.

LOCAL SURFACE WATER SUPPLY

Most of Fresno County's water originates from surface supplies controlled by the Bureau of Reclamation, the Kings River Water Association (KRWA), the U.S. Army Corps of Engineers, Pacific Gas and Electric, or Southern California Edison. The San Joaquin River and the Kings River are the largest sources of surface water to county residents, industries, and agriculture. Water from both rivers is controlled upstream by a system of storage and flood control reservoirs, owned and operated by different agencies, before it flows onto the valley floor. Beyond securing additional water storage and flow regulation, reservoirs are used to provide flow regulation for hydro generation of electricity. Both the San Joaquin and Kings Rivers are subject to extreme variation in annual runoff resulting from annual changes in mountain precipitation. Storage has helped to regulate and make more efficient use of available water during dry years. However, storage capacity is generally inadequate to accommodate runoff during wet years and substantial flows are lost due to flood releases. Both the Kings River and the San Joaquin River have been determined to be "fully allocated" by the State Water Resources Control Board (SWRCB).

Minor potential sources of surface water may be created by water impounded by flood control detention facilities built on the Fresno Stream Group as well as on Mill Creek or the Arroyo Pasajero Stream Group. Water rights applications have been filed for potential impounded water on the Fresno Stream Group, and water rights applications may be filed for detention facilities on Mill Creek or the Arroyo Pasajero Stream Group.

Kings River

Kings River Water Association

The history of water management on the Kings River is marked by numerous disputes over water rights. These disputes eventually led to the formation of the Kings River Water Association (KRWA) as a way to solve disputes and coordinate water management along the river. Under a series of complex agreements and water schedules, the KRWA, managed by a water master, ensures that water rights are apportioned, reservoir storage is administered, and diversions are scheduled for the Association's 28 member agencies. KRWA members have contracts for 1,006,500 acre-feet of storage in Pine Flat Reservoir. The water master manages Pine Flat Dam water releases and deliveries to points of diversion, while the Corps of Engineers is responsible for managing flood releases.

The KRWA's members pay for irrigation storage benefits on the Pine Flat Dam. The Dam, authorized by Congress as part of the 1944 Flood Control Act and completed in 1954, was designed for flood protection. However, 37 percent of the project also provides an irrigation storage benefit. Pine Flat reservoir has a storage capacity of about 1.0 million acre-feet. Annual Kings River runoff averages about 1,692,000 acre-feet. The lowest minimum runoff of record was 391,700 acre-feet in 1923/24 (23.1 percent of average) and the highest recorded runoff was 4,476,400 in 1982/83 (264.5 percent of average).

Irrigation/water districts and companies in Fresno County with water rights to Kings River flows include:

- Alta Irrigation District
- Consolidated Irrigation District
- Fresno Irrigation District
- James Irrigation District
- Kings River Water District
- Laguna Irrigation District
- Liberty Mill Race Company
- Murphy Slough Association
- Reed Ditch Company
- Riverdale Irrigation District
- Tranquility Irrigation District

Pacific Gas and Electric

PG&E owns and operates storage facilities on the Kings River and its tributaries upstream of the Pine Flat Dam. These upstream storage facilities (Courtright Lake and Wishon Dam) have a combined capacity of about 251,700 acre-feet. These facilities are operated for the production of electric energy and their operation does affect the flow of water into Pine Flat Reservoir and subsequently the timing and availability of releases.

Other storage reservoirs and power projects have been proposed on the Kings River, most notably at Rodgers Crossing and on Dinkey Creek. Neither of these projects advanced because of controversy over environmental issues.

Kings River Conservation District

The Kings River Conservation District (KRCD) was formed in 1951 as a public agency that could act for the entire Kings River service area on a variety of water rights and project related issues. The KRCD was formed for purposes of assisting with contract negotiations, water rights, power development, and conservation improvements.

Kings River water is primarily used and diverted for agricultural irrigation. However, several incorporated and unincorporated communities rely on the conjunctive use of groundwater from recharge by the Kings River to meet municipal and industrial demands. The City of Fresno has expanded its boundaries into lands that were once used for farming and irrigated with water from the Fresno Irrigation District. The City of Fresno has an arrangement with the Fresno Irrigation District whereby the City acquires surface water from former irrigated land when that land is urbanized. Some of the water that was once used for irrigation is now delivered to percolation basins (Leaky Acres) for groundwater recharge. Other incorporated cities in Fresno County (Clovis, Sanger, Reedley, Parlier, Kingsburg, Selma, Fowler, Kerman and San Joaquin) also rely on groundwater recharged by the Kings River.

San Joaquin River

San Joaquin River flows are regulated by Friant Dam, which was constructed in 1942 and is operated by the U.S. Bureau of Reclamation (USBR) as part of the Central Valley Project (CVP). The CVP Friant Unit consists of Friant Dam and Millerton Lake, the Friant-Kern Canal and the Madera Canal. Releases from Friant Dam to the San Joaquin River and the Friant-Kern Canal provide service to water users within Fresno County. The reservoir, Millerton Lake, has a storage capacity of about 520,500 acre-feet.

SCE and PG&E own/operate storage facilities on the San Joaquin River and its tributaries upstream of Friant Dam. These upstream storage facilities are operated for the production of electric energy and have a combined capacity of about 609,530 acre-feet. Their operation does affect the flow of water into Millerton Lake and subsequently the timing and availability of releases to Friant Unit Contractors. Friant Unit Contractors in Fresno County include:

- City of Fresno
- Fresno County WWD 18
- Fresno Irrigation District
- Garfield Water District
- International Water District
- Orange Cove Irrigation District
- City of Orange Cove

All service contracts are for Class 1 water, except for Fresno Irrigation District, which has a service contract for Class 2 water (see 'Friant Users Authority' below for an explanation of Class 1 and Class 2 service contracts). The County of Fresno, Hills Valley Water District, and Tri-Valley Water District receive water deliveries from Friant Unit facilities under an exchange agreement involving the Cross Valley Canal. This arrangement is discussed in greater detail below under 'Friant Water Users Authority.'

Annual San Joaquin River runoff averages approximately 1,861,000 acre-feet. The lowest minimum runoff of record was about 360,000 acre-feet in 1977/78 (19.3 percent of average) and the highest recorded runoff was 4,640,000 in 1982/83 (249.3 percent of average).

U.S. Bureau of Reclamation

The majority of San Joaquin River water rights were acquired by the U.S. Bureau of Reclamation during the development/construction of the Central Valley Project's Friant Unit facilities. These water rights were obtained through purchase and exchange agreements with the individuals and entities that held those water rights at the time the Friant Unit facilities were developed. Historically, San Joaquin River water was diverted by these downstream users. River water is now delivered to the east side of San Joaquin Valley through the Friant-Kern and Madera Canals to supplement groundwater pumping and help mitigate overdraft problems. The USBR continues to make releases from Friant Dam and exchanges imported water from the Delta to satisfy contractors who previously had owned San Joaquin River water rights.

The USBR has obligations to deliver project water downstream of Friant Dam through water rights settlement contracts. When the USBR constructed Friant Dam, they acquired the riparian water rights of the small downstream diverters between the dam and Gravelly Ford. These riparian water users generally consisted of small parcels along the river below the flood plain escarpment. The settlement contracts negotiated with each land owner provide for a continuous flow of 5.0 cubic feet per second (cfs) at the control point of each parcel, that point being farthest downstream from Friant Dam. Based on the provisions of these settlement contracts, the USBR is required to provide a continuous flow of 5.0 cfs at the control point of the parcel farthest downstream from Friant Dam, which is at Gravelly Ford. The settlement contracts generally specify that the water would be used for agricultural and incidental domestic purposes.

The USBR also provides an exchange supply for larger riparian water right holders farther downstream of Gravelly Ford. These water users, comprising Central California Irrigation District, Firebaugh Canal Company, San Luis Canal Company and Columbia Canal Company, obtain their water supply from the Delta via the Delta-Mendota Canal and Mendota Pool. Should the USBR not be able to meet their contractual obligations for water deliveries from the Delta, the exchange contract provides for releases from Friant Dam and delivery using the San Joaquin River.

Friant Water Users Authority

Although, the USBR operates and maintains Friant Dam, the Friant Kern Canal is operated and maintained by the Friant Water Users Authority. The Friant Kern Canal has a capacity of about 5,300 cfs at Friant Dam and this capacity gradually decreases to 2,500 cfs at its terminus as total demand decreases from north to south. The Friant Water Users Authority has a provision in their agreement with the USBR that allows for draining the Friant Kern Canal during the wintertime for maintenance. The canal can be dewatered as necessary during the period from December 1 through January 31. The Friant-Kern Canal is generally unavailable for San Joaquin River flood release relief during periods when canal maintenance activity is underway.

CVP water service contracts in the Friant Unit generally employ a two class system and contractual water entitlements are designated as Class 1 and Class 2 supplies. Class 1 water is based on the firm/dependable supply that would normally be available for delivery each year. Class 1 water is typically contracted to districts that serve areas that have limited or no access to groundwater of acceptable quality. Class 2 water is that supply in excess of Class 1 that is periodically available for delivery. Because of uncertainty regarding availability and time of occurrence, Class 2 water is undependable in character and can be furnished only if, as, and when it can be made available as determined by USBR's Contracting Officer. Class 2 water is typically under contract to districts that have access to good groundwater supplies or other surface water sources. These districts can accept recurring CVP deficiencies and rely primarily on their other sources of supply. Fresno Irrigation District is the only CVP contractor in Fresno County that has a Class 2 contract entitlement. The City of Fresno has a Class 1 contract, which is unusual for a large urban center. This represents a secure source of supply which is very important to the Fresno-Clovis Metropolitan Area.

As mentioned above, some of the CVP contractors in Fresno County receive their surface water through Friant Unit facilities under the provisions of an exchange contract involving the Cross

Valley Canal. The exchange agreement is between the respective federal water contractors and the Arvin-Edison Water Storage District (AEWSD) located in Kern County near the terminus of the Friant-Kern Canal. A total of 128,300 acre-feet of CVP Delta water supply contracted to the federal Cross Valley Canal water users is delivered to AEWSD. This water is exchanged for 40,000 acre-feet of AEWSD's Class 1 and 134,000 acre-feet of its Friant Unit Class 2 contractual entitlement, which is delivered to the various Cross Valley Canal contractors in accordance with their contract. Approximately 10,000 acre-feet of Cross Valley Canal water is contracted to agencies within Fresno County.

The Central Valley Project Improvement Act (CVPIA) of 1992 has made significant changes to the management of the CVP and created a complex set of new programs and requirements. The CVPIA is described subsequently under 'Institutional Issues,' along with its potential effects upon Bureau contractors.

IMPORTED WATER SUPPLY

Surface water supplies for water users located adjacent to and west of the Fresno Slough area are imported from the Sacramento-San Joaquin River Delta (Delta). The delivery of Delta water is controlled under the terms and provisions of water service contracts and water rights exchange agreements between the water users and the USBR. Water service contracts provide a supplemental supply of surface water to augment groundwater pumping. Water rights exchange agreements provide a substitute water supply to replace water rights disrupted by the construction and operation of CVP facilities. Surface waters are delivered through the USBR's CVP facilities and/or facilities jointly owned and operated by the USBR and the State Water Project (SWP). CVP facilities are organized into divisions and units. CVP/joint use facilities are used to serve contractors in Fresno County including the San Luis Unit and Delta Division.

Federal and State of California Responsibilities

The USBR and SWP use the Delta as a common conveyance facility and reservoir releases and Delta exports must be coordinated to enable both parties to fulfill their contractual obligations. The USBR and SWP operate under a Coordinated Operating Agreement (COA), which became effective November 1986. The COA defines the rights and responsibilities of the CVP and SWP, and provides a mechanism to measure and account for these various responsibilities.

The USBR and State of California jointly operate the San Luis Unit. The management of the San Luis Unit must consider the simultaneous operation of the north and south of the Delta CVP and SWP facilities. Operation of the south of Delta CVP facilities to provide water deliveries to contractors considers three conditions:

- determination of water demands for CVP water service contractors and exchange contractors; development of a plan to fill and draw down San Luis Reservoir; and
- coordination of Delta pumping and San Luis Reservoir operation.

Water is pumped south of the Delta by the USBR's Tracy Pumping Plant (Delta Mendota Canal) and the State's Banks Pumping Plant (San Luis Canal). The water is conveyed 67 miles south to O'Neill Forebay where it is either pumped into San Luis Reservoir for storage or continues

flowing south. During spring and summer, water pumped at Banks and Tracy Pumping Plants cannot supply all state and federal water project needs. This is largely due to pumping cutbacks mandated to protect Delta fisheries and provide water quality control. At these times, additional supply is provided from releases from the San Luis Reservoir which flow south in the California Aqueduct to meet CVP and SWP needs. Because the ability to export water from the Delta is constrained by water availability, Delta constraints, environmental regulations, and pumping capacity, the operation of the San Luis Reservoir is an extremely important element of providing water to Fresno County CVP contractors.

The San Luis and Delta-Mendota Water Authority operates and maintains the Delta-Mendota Canal and Mendota Pool. CVP contractors and exchange contractors divert their entitlements directly out of the Delta Mendota Canal and/or Mendota Pool. There is an intertie and pumping plant that allows Delta Mendota Canal flows to be pumped into San Luis Reservoir for storage.

James and Tranquility Irrigation Districts formally served their water users with Kings River water. In 1963 these two districts leased their average Kings River water entitlement to other lower Kings River districts at a price equivalent to the cost for purchasing a like amount of CVP water from the Mendota Pool. Up to 26,600 acre-feet of the annual James/Tranquility entitlement is credited to the lower Kings River districts. James and Tranquility Irrigation District benefit by avoiding significant channel losses in exchange for an improved water delivery from the Mendota Pool.

The exchange contractors in Fresno County (Central California Irrigation District, Columbia Canal Company and Firebaugh Canal Company) hold on behalf of their landowners significant water rights to San Joaquin River waters that were historically diverted for irrigation. Only parts of these districts are within Fresno County. To make the construction of Friant Dam and the subsequent storage and diversion of San Joaquin River water to other users both inside and outside the basin feasible, the USBR agreed to provide "substitute water" from the Delta which would be delivered via the Delta-Mendota Canal and Mendota Pool to satisfy the water rights held by these districts. The exchange contractors now receive surface water deliveries under the terms and conditions of a "Contract For Exchange Of Waters" (Exchange Contract) negotiated with the USBR. The Exchange Contract provides for the total annual delivery of 840,000 acre-feet under noncritical year hydrologic conditions. Under critical year hydrologic conditions the delivery would be reduced to 630,000 acre-feet, a maximum reduction of 25 percent. The exchange contractors have the right to divert their riparian rights from water released from Friant Dam into the San Joaquin River when water from the Delta is not available in sufficient quantities to meet contractual quantity requirements. By contractual agreement with the Friant Unit Contractors and by the decision of the District Court in *Westlands Water District, San Benito Water District, vs. United States of America*, No. CV-F-94-5217-OWW, the Exchange Contractors have a first priority to flows from the Delta exported by USBR. The Exchange Contract does not provide a full water supply for irrigation of agricultural crops within the exchange contractor's boundaries. Even under noncritical hydrologic conditions, groundwater pumping is needed to supplement surface water deliveries.

Contract Provisions

CVP water service contracts contain provisions which stipulate the conditions under which water will be delivered and to produce revenue to cover the appropriate share of the costs construction, operation and maintenance. Contract provisions that could affect water users in Fresno County include:

Definition of Type of Water Delivered: water service contracts provide for delivery of irrigation and/or municipal and industrial (M&I) water. Irrigation water is used for the production of agricultural crops including incidental domestic use and livestock watering.

Water Shortage Provisions: each contract provides that the USBR is obligated to deliver a specified amount of water to the extent that water is available. The USBR also is required to use all reasonable means to guard against shortage in the amount of water made available to the contractor. The USBR is contractually committed to deliver the amount of water specified absent drought or other unavoidable causes.

Acreage Limitation: each contractor is obligated to comply with the Reclamation Reform Act of 1982, as amended.

Water Conservation: each contractor is required to formulate and institute a water conservation program. The water conservation plan would be prepared in accordance with the "Criteria for Evaluating Water Conservation Plans" (April 30, 1993) developed by USBR pursuant to the Central Valley Project Improvement Act (CVPIA).

Water Transfers: water transfers are allowed in accordance with the provisions of Title 34 of the CVPIA.

San Luis Unit

The CVP San Luis Unit encompasses the contractors within Fresno County that receive CVP water from that unit. The San Luis Unit facilities include:

- San Luis Canal (also named the California State Aqueduct in the SWP system by the CVP)
- B. F. Sisk San Luis Dam and Reservoir;
- Coalinga Canal;
- Dos Amigos Pumping Plant;
- Los Banos and Little Panoche Detention Dams and Reservoirs;
- O'Neill Dam and Forebay;
- O'Neill Pumping-Generating Plant;
- Pleasant Valley Pumping Plant; and
- William R. Gianelli Pumping-Generating Plant.

Water contractors that receive deliveries from San Luis Unit facilities include:

- Avenal
- City of Coalinga

- City of Huron
- Pacheco Water District
- Panoche Water District
- San Luis Water District
- Westlands Water District

The CVP Delta Division includes the Delta-Mendota Canal and Mendota Pool service areas which encompasses the contractors within Fresno County that receive CVP water from that division. The CVP Delta Division includes:

- Contra Costa Canal;
- Contra Loma Reservoir;
- Delta Cross Channel;
- Delta-Mendota Canal; and
- Tracy Pumping Plant.

Water contractors that receive deliveries from Delta Division facilities include:

- Broadview Water District
- Central California Irrigation District
- Columbia Canal Company
- Eagle Field Water District
- Firebaugh Canal Company
- Fresno Slough Water District
- James Irrigation District
- Laguna Water District
- Melvin Hughes - James ID
- Mercy Springs Water District
- Oro Loma Water District
- Pacheco Water District
- Panoche Water District
- Reclamation District 1606
- Tranction Ranch
- San Luis Water District
- Tranquility Irrigation District
- Westlands Water District
- Widren Water District

GROUNDWATER

The long-term availability of groundwater to provide for various beneficial uses in Fresno County is difficult to define. Information defining specific aquifer boundaries, estimating safe yield potential, and characterizing groundwater quality is limited. Groundwater conditions vary considerably from eastern to western Fresno County. Aquifers east of the valley trough are generally semi-confined to unconfined and water quality is good with the exception of some areas that have been contaminated by various petroleum products, industrial solvents, pesticides and nitrates. Overdraft and recharge conditions vary considerably. Groundwater overdraft is occurring in the vicinity of the major cities (most notably Clovis and Fresno) and the

irrigation/water districts that rely exclusively on groundwater (such as Raisin City Water District and Mid-Valley Irrigation District). The aquifer serving the Fresno-Clovis area, the Kings Groundwater Basin (EPA-designated 'Fresno Sole Source Aquifer') is designated as 'critically overdrafted' by DWR. This aquifer is rechargeable, and is being intensively managed for sustained production and improved water quality by the cities of Fresno and Clovis. A significant groundwater mound has developed in the vicinity of the Fresno-Clovis Regional Wastewater Treatment and Reclamation Facility located southwest of Fresno.

Aquifers west of the valley trough are generally semi-confined to confined and water quality is often affected by naturally occurring concentrations of minerals such as sodium, chloride and boron and trace elements such as selenium. Most pumping occurs below a naturally occurring subterranean clay layer known as the Corcoran Clay, although considerable pumping occurs above the layer based on location and water quality issues. This layer is several hundred feet below the ground surface and pumping costs can be high because of the lifts involved. Groundwater overdraft is a problem in western Fresno County, especially in Westlands Water District and in the Pleasant Valley near Coalinga, because of limited groundwater recharge, periodic droughts and inadequate surface water supplies. Long-term recharge is inadequate to maintain water table elevations.

The California Department of Water Resources (DWR) has studied long-term water supply conditions for California. DWR estimated groundwater overdraft at 650,000 acre-feet for 1990 in the Tulare Lake Region, which generally includes Fresno County. Groundwater overdraft conditions vary annually based on demand, surface water availability and climate. Long-term projects would indicate a continuing annual overdraft of the basin underlying most of Fresno County.

In the foothill and mountain areas of eastern Fresno County, the availability of groundwater is limited to water contained in rock fractures and voids. Finding water can be difficult and yields and transmissivity are limited. This aquifer's potential for recharge, its potential for sustained production management, and its amenability to groundwater cleanup efforts are generally very limited.

Subsidence

In some areas along the valley trough and in parts of western Fresno County, groundwater pumping has caused subsidence of the land surface. This usually occurs in areas where the groundwater basin is over drafted and long-term recharge is inadequate to maintain the water table elevation. Subsidence can impact conjunctive use programs by reducing storage capacity and changing transmissivity. Irrigation facilities and structures also can be damaged. In general, subsidence in Fresno County has stabilized, except during droughts. Areas in Fresno County where subsidence has been a problem generally include Westlands Water District and the Pleasant Valley Water District.

Subsurface Drainage

Agricultural lands in western Fresno County are becoming increasingly impacted by rising saline shallow groundwater that occurs as a result of irrigation with imported surface water primarily from the CVP. This problem is caused by a combination of: geologic and soil

conditions that restrict downward movement of water below the crop root zone; native soil salinity; inefficient irrigation water management; and the lack of adequate drainage.

The San Luis Unit Authorization Act (PL 86-488) includes facilities required to dispose subsurface drainage flows. The USBR started construction of the San Luis Drain in 1968. Eighty-five miles of the drain and the first phase of the Kesterson Reservoir were completed before the project was halted in 1975 for funding problems and environmental concerns over drainage water discharge impacts to the Delta. Following disclosure of bird mortalities in the Kesterson Reservoir caused by selenium from the introduced drainage waters and concern for public health, the Department of the Interior in a March 1985 agreement with Westlands Water District called for the cessation of drainage flows to Kesterson Reservoir by June 30, 1986.

The USBR has estimated that approximately 380,000 acres of agricultural land will require drainage by the year 2020.

Groundwater Management

In 1992, the State Legislature adopted new water code sections authorizing any local agency that provides water service to adopt a groundwater management plan, if the groundwater is not subject to management under other provisions of law or a court decree. Several agencies in Fresno County have recently prepared and adopted water management plans under AB 3030 including: Fresno Irrigation District; Alta Irrigation District; Consolidated Irrigation District; the County of Fresno; and Kings River Conservation District.

WATER QUALITY

The quality of local and imported surface water supplies from the Kings River, the San Joaquin River, and the Delta are excellent for both irrigation and M & I uses. The concentration of total dissolved solids (TDS) and other mineral constituents is typically low and harmful levels of trace elements are not present. The Friant Kern and San Luis Canals are also used by some communities to provide for M & I demands. Because of the excellent quality water from these sources, conventional water treatment processes can be used. Conventional water treatment typically includes: flocculation; sedimentation; clarification; filtration; and disinfection.

The TDS of water in the Delta Mendota Canal tends to be higher than the other surface water sources because the USBR allows nonproject water from groundwater pumping to be discharged into the Delta-Mendota Canal and Mendota Pool. The Exchange Contract contains provisions that set forth requirements that the USBR must meet regarding the quality (salinity) of water delivered through the Delta-Mendota Canal and Mendota Pool. These contractual water quality requirements are:

- *Daily:* quality of water shall not exceed 800 ppm TDS;
- *Monthly:* quality of water shall not exceed a monthly weighted mean value of 600 ppm TDS;
- *Annually:* quality of water shall not exceed a weighted mean annual (calendar year) value of 450 ppm TDS; and

- **5-Year:** quality of water shall not exceed a weighted mean value of 400 ppm TDS for any 5 consecutive years.

The San Luis and Delta-Mendota Water Authority operates the Delta-Mendota Canal and Mendota Pool to comply with these contractual water quality requirements. However, the discharges of nonproject water into the Delta-Mendota Canal and Mendota Pool have degraded the quality of the water that would have otherwise been received. The Delta Mendota Canal and Mendota Pool are not used to provide water for M & I uses in Fresno County.

Most poor quality groundwater is located along the western side of Fresno County. Concentrations of TDS, sodium, sulfate, boron, chloride and carbonate/bicarbonate, and trace elements (such as selenium) limit the beneficial use of groundwater in this area. Contaminants such as pesticides, petroleum products and industrial solvents also occur in groundwater in localized areas in Fresno County. Dibromochloropropane (DBCP), a pesticide, is present in large areas in eastern Fresno County. DBCP has exceeded the maximum contaminant level (MCL) of groundwater in many locations.

Communities like Fresno and Clovis have begun to construct well head treatment facilities to reduce DBCP levels to acceptable concentrations. DBCP is gradually diminishing as a groundwater problem for the Fresno-Clovis area, as well as for the cities of Sanger, Reedley, Parlier, and Selma, and for untreated private water wells in the county. The problem is decreasing because DBCP was banned in 1977, and has been diluted and extracted from the well-level portions of the Fresno Sole Source Aquifer since then. However, as discussed below under 'Surface Water Treatment,' the MCL for DBCP has been reduced under Assembly Bill 21, which will result in the need for enhanced wellhead treatment for the affected areas. Newly discovered areas of herbicide (e.g., Simazine™) contamination represent an emerging groundwater quality issue in this area.

Nitrate levels in rural groundwater wells have been increasing from fertilizers used in agriculture and feedlot operations. Many of these wells have nitrate concentrations that exceed the MCL for nitrate in drinking water.

Naturally-occurring groundwater contaminants are prevalent in the eastern and central portions of the county. These include radon gas and gross alpha radiation from dissolved uranium in the Sierra fractured rock aquifer and in the Kings Groundwater Basin areas in central Fresno County. This type of contamination is expensive to monitor and very difficult to remediate.

For additional discussion, see 'Water Quality' in Chapter 7 - Natural Resources.

INSTITUTIONAL ISSUES

Statewide, water resource management is changing to reflect the evolving state/federal/local agency policies, environmental concerns and realities of a limited water supply. The evolving nature of water resource management and the institutional response to these changes will potentially have both short and long term consequences for the allocation of water resources in Fresno County. Several institutional factors could impact water resource management in Fresno County are summarized below.

Federal Government

Central Valley Project Improvement Act (CVPIA)

The CVPIA has made significant changes to the management of the CVP and created a complex set of new programs and requirements. The USBR is presently (1997) completing a programmatic level environmental document under the National Environmental Policy Act (NEPA) to evaluate the environmental consequences of various alternatives for implementation. Interim guidelines and procedures have already been promulgated to implement the CVPIA's provisions.

The CVPIA addresses five principal areas:

1. limitations on new and renewed CVP contracts;
2. water conservation and other water management actions;
3. water transfers;
4. fish and wildlife restoration actions; and
5. establishment of an environmental restoration fund.

Renewals of existing water service contracts are limited to a 25 year term with contracts only renewed on an interim basis until completion of the programmatic environmental documentation. Long-term contract renewal also will require additional environmental documentation. The CVPIA requires that 800,000 acre-feet of the CVP project yield be dedicated to general fish and wildlife habitat purposes. It also sets a goal for doubling the anadromous fish population of Central Valley rivers and streams.

The CVPIA sets a goal for restoring the fishery and riparian habitat in the San Joaquin River. This may require additional water in certain reaches of the San Joaquin River and future studies will evaluate the alternatives for acquiring that water. Study of the alternatives is required by the CVPIA, but the study has not moved forward because of funding cuts by Congress.

The CVPIA also provides for the enhancement of refuge water supplies, requiring dedication of CVP yield to deliver firm Level 2 water supplies to 14 federal, state and private wetland habitat areas, and five additional habitat areas located in the San Joaquin Basin Action Plan lands.

An important provision of the CVPIA provides individual growers with the right to transfer their water entitlements or rights to others. Since urban buyers are willing to pay far more than agricultural users can afford for water, this provides a substantial incentive for transfers of water out of agricultural areas. Conversely, the liberalized transfer rules would enable urban centers of the county, such as the cities of Fresno and Clovis, to purchase water entitlements outside the county to augment local supplies. It is important to note that existing CVP contractors have the right of first refusal to purchase CVP water proposed for transfer.

The CVPIA could also reduce contract water allocations to the county under its mandate that a certain portion of CVP water be allocated to habitat restoration and other environmental purposes. It is anticipated that the U.S. Fish and Wildlife Service will request increases in instream flows in the San Joaquin River under CVPIA provisions for fish and wildlife habitat restoration and enhancement. These increases could be implemented by terminating some

junior water rights, such as the Fresno Irrigation District's (FID) Class 2 water from the San Joaquin (FID has the county's only contract allocation for Class 2 water, in the amount of 75,000 acre-feet, which is typically available only in wet years). These requirements could also reduce imported CVP surface water deliveries from the Delta. No formula or mechanism for allocating water for environmental purposes as been established to date. Current proposals include a tiered pricing structure whereby higher rates would be charged for higher rates of water use.

Also of significance to the cities is the CVPIA water conservation provisions, which require water metering. Since the City of Fresno's charter contains a provision forbidding water metering, this conflict places Fresno's CVP contract water allocation of 60,000 acre-feet per year in severe jeopardy. Fresno's CVP contract is due for renewal in 2006, and local officials are working to reach a solution to this problem, including the possibility of placing the metering issue on the ballot.

CVPIA - Restoration Fund and Friant Surcharge

As required by Congress, the CVPIA provides appropriating funds to partially finance the costs to carry out "programs, projects, plans, and wildlife restoration, improvement, and acquisition provisions" of the CVPIA. Reclamation must:

- determine, assess, and collect additional annual mitigation and restoration payments (Restoration Payments) on CVP irrigation water and municipal and industrial (M&I) water, additional CVP water, CVP water pursuant to a water rights settlement contract, flood water used for M&I purposes, and Section 215 water, if any, sold and delivered to the water contractors; and
- determine a power restoration payment obligation to be assigned to power. The Restoration Fund payment was \$12.00 per acre-foot in 1992 and it is adjusted annually for inflation using the Consumer Price Index.

The CVPIA also provides for Friant Surcharges in addition to the Restoration Fund payment as follows: \$4.00 per acre-foot of delivered CVP water on or before September 30, 1997; \$5.00 per acre-foot of delivered CVP water after September 30, 1997 and through September 30, 1999; and \$7.00 per acre-foot of delivered CVP water after September 30, 1999.

USBR is currently (1997) negotiating with CVP water contractors for early water service contract renewal. If a CVP contractor does not enter into a contract early, the CVP may charge a 150 percent penalty on top of the annual Restoration Fund payment. This penalty would begin January 1 of the year following completion of the Final Programmatic EIS for the CVPIA or October 1, 1997, whichever occurs sooner.

Reclamation Reform Act (RRA)

Agricultural lands served by federal project water or non-project waters delivered through CVP facilities under a Warren Act Contract are subject to the provisions of the Reclamation Reform Act (RRA) of 1982. The RRA applies to all lands receiving water supplies developed by the USBR or from facilities financed by the USBR throughout the 17 western states, including the Central Valley Project. The RRA contains several anti-monopoly and anti-speculation clauses

which restrict the acreage of land under one ownership that can be irrigated with federally subsidized water or facilities. The RRA does not limit the amount of land that can be owned by an individual landowner, but limits the acreage that an individual land owner can own and irrigate with Reclamation project water. There are different categories of ownership, but generally the amount of land that can be owned and irrigated with reclamation water is 960 acres. The landowner receives reclamation water at less than full cost for the landholding up to 960 acres. There is no limit to the amount of leased land that can be irrigated with reclamation water, but the full cost of water must be paid to irrigate lands in excess of 960 acres. CVP districts must certify annually to Reclamation that lands irrigated within the district are in compliance with the RRA. This certification would consist of an annual accounting/reporting of irrigated lands, ownerships and leases within the district.

Endangered Species Act (ESA)

The federal Endangered Species Act (ESA) is designed to preserve endangered and threatened species by protecting individuals of the species and their habitat and by implementing measures that promote their recovery. Once a species is listed, Section 7 of the ESA requires that federal agencies, in consultation with the Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS), ensure that their actions do not jeopardize the continued existence of the species or habitat critical for survival of that species. State agencies and private parties are subject to the ESA and Section 9 prohibits the taking of endangered/threatened species for which protective regulations have been adopted or are being prepared. The ESA has been interpreted to apply to new construction/projects and major rehabilitation for project operation and maintenance. For example, federal, state and local pumping operations in the Delta have been affected under biological opinions to protect the winter-run salmon and Delta smelt. The California ESA is similar to the federal ESA and must be complied with in addition to the federal ESA.

Various federal and state decisions have allocated waters to environmental uses to protect species that have been listed under the federal and state ESA's. Additional waters will be allocated for environmental purposes such as:

- natural community conservation planning;
- protection/enhancement of water quality;
- water releases for fish;
- protection of riparian habitat, fisheries and wildlife; and
- protection of migratory birds.

San Joaquin Valley Drainage

In 1984, the San Joaquin Valley Drainage Program (SJVDP) was established as a joint federal state effort to investigate drainage and drainage related problems. The SJVDP published its recommended plan for managing the west side drainage problem in 1990. A Memorandum of Understanding was signed in 1991 which allowed federal and state agencies to coordinate their activities for implementing the plan and work has been ongoing. Westlands Water District prevailed in a court action against the USBR for failing to provide drainage in accordance with the provisions of their water service contract. The USBR and SWRCB will be conducting

studies, which should commence during 1997, to evaluate the alternatives and environmental consequences of drain water disposal.

Land Retirement

Land retirement has been suggested as an alternative for reducing the drainage problem. Land retirement refers to the permanent removal of land from agricultural production. The USBR and Westlands Water District are currently (1997) commencing with independent studies to evaluate the environmental consequences, economic impacts and management requirements of land retirement alternatives. Lands that will be evaluated for retirement are largely located in irrigated areas in western Fresno County.

Water Transfers

Water transfers are allowed under the *California Water Code* and CVPIA. Long-term transfers under the *California Water Code* Section 1735 are subject to the requirements of the California Environmental Quality Act (CEQA) and approval by the SWRCB. Long-term water transfers can not injure vested water rights or cause any unreasonable impact to fish and wildlife. The CVPIA also contains provisions that allow for long-term transfers of CVP project water. These long-term transfers under the CVPIA are subject to environmental documentation under the National Environmental Policy Act (NEPA) and approval by the USBR. The USBR has interim guidelines for long-term water transfers.

San Joaquin River Exchange Contractors

The exchange contractors have the ability through a contract provision within their Exchange Contract with the USBR to revert to their water rights on the San Joaquin River. This could happen if the USBR was unable to deliver a Delta supply of acceptable quality and quantity. Under that condition the USBR would deliver water rights of water stored in Millerton Lake to the exchange contractors at the expense of the Friant Unit water contractors.

Safe Drinking Water Act

Under the Safe Drinking Water Act, the U.S. Environmental Protection Agency (EPA) has the authority to set standards for contaminants in drinking water supplies. The Act is administered and enforced by the California Department of Health Service (DHS). The National Primary Drinking Water Standards establish maximum contaminant levels (MCLs) which set the maximum permissible levels of contaminants that are legally allowed in public water distribution systems. The National Secondary Drinking Water Standards, or secondary MCLs, apply at the point of delivery to the customer and generally involve protecting aesthetic aspects of drinking water such as taste, odor, and appearance. Additional water quality standards are included in the Trihalomethane Regulations and the Lead and Copper Rule.

Radon Rule

The EPA has proposed a new drinking water requirement called the Radon Rule. This rule would require that radon levels in drinking water not exceed 300 picocuries, which is well below the existing radon levels in groundwater being pumped by municipal users such as the

cities of Fresno and Clovis. Available mitigation includes installation of costly aerators at each well. The alternative is to close wells exceeding the radon MCL (Maximum Contaminant Level) and convert to treated surface water supply, which would also be very expensive. The new MCL is expected to be promulgated in 2000, and the cities will have a three-year phase-in period for compliance. The City of Fresno is actively evaluating alternatives for bringing their system into compliance with the proposed MCL.

Surface Water Treatment Rule

The federal Surface Water Treatment Rule (SWTR) was promulgated by the EPA to protect against disease-causing organisms *Giardia lamblia*, *Legionella*, and viruses in surface drinking water sources and in groundwater sources influenced by surface water. The SWTR requires all utilities with surface water supply, or groundwater supply influenced by surface water, to provide adequate disinfection and, under most conditions, filtration. The Enhanced Surface Water Treatment Rule (ESWTR) provides additional protection against organisms including *Cryptosporidium parvum*. Other amendments to the SWTR have included the Disinfectants/Disinfection By-Products Rule and the Total Coliform Rule.

State of California

San Joaquin River

The *San Joaquin River Management Plan* (SJTMP) was created to address the needs of the San Joaquin River system. Assembly Bill 3603 (September 1990) requires the SJTMP to: provide a forum where information can be developed and exchanged to provide for the orderly development and management of the resources of the San Joaquin River system; identify actions which can be taken to benefit legitimate uses of the San Joaquin River system; and develop compatible solutions to water supply, water quality, flood protection, fisheries, wildlife habitat, and recreation needs.

Assembly Bill 3030 (AB 3030)

AB 3030, passed in 1993, authorized local agencies which provide water service to adopt a groundwater management plan if the groundwater is not subject to management under other provisions of law or a court decree. Several local agencies within Fresno County have developed and adopted AB 3030 plans. These plans provide a vehicle for future groundwater management actions. The County of Fresno has a groundwater management plan that was adopted by the Board of Supervisors on March 11, 1997. The boundaries of the other agencies in Fresno County have AB 3030 plans that overlap with the Fresno County plan as well as groundwater management plans of other agencies. To avoid potential conflicts, the County plan contains language (at page 19) that explicitly states that the overlapping areas will be subject to the primary responsibility of the other agency, unless it chooses otherwise.

Endangered Species Act (ESA)

The California ESA is similar to the federal ESA and must be complied with in addition to the federal ESA. All state lead agencies are required to consult with the Department of Fish and Game (DFG) about projects that impact state listed species. The DFG renders an opinion

regarding whether the proposed project jeopardizes a listed species and provides alternatives to avoid jeopardy. Many California species are both federally and state listed. The California ESA directs the DFG to coordinate with the FWS and NMFS in the consultation process so that consistent/compatible opinions and findings can be adopted by both federal and state agencies.

Surface Water Treatment

As demand for M&I water increases in Fresno County, surface water treatment facilities will be constructed to meet demand. Surface water treatment must conform to the requirements of California's Surface Water Treatment Rule (SWTR). California's SWTR is intended to comply with the EPA's SWTR that was adopted June 29, 1989. It established treatment and performance requirements in place of maximum contaminant levels for turbidity, *Giardia*, viruses, *Legionella* and heterotrophic plate count (HPC) bacteria and satisfies the 1986 Safe Drinking Water Act (SDWA) amendment to the criteria for filtration and disinfection of public water supplies.

Other initiatives to ensure adequate water quality of water supplies include: 1) programs to manage entire watersheds' land use and agricultural practices to provide high quality runoff for surface water treatment uses; and 2) proposed water treatment regulations for controlling the treatment-resistant coccidia parasite.

An additional issue of local concern is the difficulty of ensuring a constant year-round supply to surface water treatment facilities in the county when the water impoundment structures on the San Joaquin and Kings Rivers were not designed for year-round storage and delivery.

Assembly Bill 21

AB 21 was adopted to reduce MCLs for various groundwater contaminants to the point where there are no known adverse health effects. Of greatest local concern is the new MCL for Dibromochloropropane (DBCP), a pesticide that was used extensively in the eastern area of the county until 1977, when it taken off the market. DBCP exceeded the previous MCL of 0.2 parts per billion (ppb) of groundwater in many locations. This has resulted in the closure of some municipal wells in Fresno and Clovis which are down-gradient from the contamination. The new MCL is 0.02 ppb, which is one order of magnitude lower than the old MCL. Although the MCL has not yet been implemented by DHS, once implemented it will likely affect many more of Fresno's and Clovis' production wells. Mitigation would consist of adding Granulated Active Charcoal filters (GACs) to all wells for wellhead treatment.

State Water Resources Control Board

Water Rights and Regulatory Issues

The State Water Resources Control Board (SWRCB) is responsible for regulating flows and water quality in the Delta, which has been the subject of numerous past actions and orders by the SWRCB. The SWP and CVP are subject to existing SWRCB Delta decisions which are implemented through Water Right Decision 1485 (adopted in 1978) and Water Right Order 95-6 (adopted in 1995). In May, 1994, the SWRCB adopted the Bay/Delta Plan. The SWP and CVP currently operate their facilities in an effort to meet many objectives of the Plan. On December

15, 1994, representatives of the State and Federal governments along with other various interested parties signed the Principles for Agreement on Bay/Delta Standards between the State of California and the federal government.

The SWRCB has authority over all water rights in California under the common law public trust doctrine to protect the public trust uses. The SWRCB is authorized under *Water Code* Section 1394 to include a reservation of jurisdiction in a permit when issues related to the protection of vested rights, protection of the public interest, and coordination with other projects cannot be resolved when the application is approved. Most of the SWP and CVP permits include reservations of jurisdiction. The SWRCB has reserved jurisdiction over water right permits within the Delta watershed/tributaries since 1965 through the use of Standard Water Right Permit Term 80.

The SWRCB is commencing water right proceedings to implement the Plan and to establish terms and conditions in appropriate water right permits. As a first step in this process, the SWRCB will be obtaining input from interested parties in a scoping phase to determine how to organize the water right process and comply with the SWRCB's CEQA responsibilities. The SWRCB anticipates preparation of an Environmental Impact Report.

Area of Origin

"County-of-origin" statutes provide for the reservation of water supplies for counties in which the water originates when, in the judgment of the SWRCB, an application for the assignment or release from priority of state water right filings will deprive the area of origin of water necessary for its present and future development. Watershed protection statutes are provisions which require that the construction and operation of elements of the CVP and SWP not deprive the watershed, or area where water originates, or immediately adjacent areas which can be conveniently supplied with water, of the prior right to water reasonably required to supply the present or future beneficial needs of the watershed area or any of its inhabitants or property owners. In 1984, additional area-of-origin protections were enacted which included the San Joaquin River.

Central Valley Regional Water Quality Control Board (Regional Board)

Wastewater Treatment Facilities and Wastewater Reclamation

The Regional Board issues waste discharge requirements (WDR) for the various wastewater treatment plants in Fresno County. The provisions of these WDR's set forth the conditions for disposing of the treated wastewater effluent from the wastewater treatment plants. As demand for water resources increases in Fresno County, wastewater reclamation and reuse will become an important element of the overall water supply. The WDR's will regulate the reuse of this water.

Agricultural Drainage

The Regional Board is responsible for regulating point sources of pollution. Subsurface agricultural drainage waters that are collected, conveyed and disposed would be subject to regulation by the Board.

Kings River Issues

The cities of Fresno and Clovis, along with other communities in eastern Fresno County, will continue to expand into irrigation districts with substantial Kings River water rights. As this expansion continues, pressure will grow to transfer these waters for M & I uses.

James and Tranquility Irrigation Districts have an existing exchange agreement that provides for the substitution of CVP water for their Kings River water right. These districts have the right to revert to their Kings River supply should the USBR be unable to provide a CVP supply.

City of Fresno

Renewal of CVP Water Service Contract

The City of Fresno's CVP water service contract is due for renewal during 2006. The City of Fresno is constrained from negotiating for early contract renewal, as provided for in the CVPIA. The CVPIA set forth certain requirements for contract renewal. One of those requirements is to measure water deliveries to customers at each delivery connection and to charge for water based on usage. In 1992, voters approved a City ordinance that prohibits metering domestic connections or reading meters where they have been installed. This ordinance makes it difficult for the city of Fresno to comply with the measurement provisions of the CVPIA. The inability to negotiate for early contract renewal may trigger the imposition of the Restoration Fund penalty later in 1997, which will increase the cost of water. This situation also may jeopardize the long-term renewal of the CVP contract in 2006.

INCORPORATED COMMUNITIES

The incorporated communities within Fresno County use both treated surface water and groundwater to provide for M & I water demands. However, groundwater provides most of the water used for M & I purposed in the County. The source of water for the 15 incorporated communities is summarized in Table 5-6.

TABLE 5-6 SOURCE OF WATER FOR INCORPORATED AREAS Fresno County 1997		
Incorporated Area	Surface Water Source	Groundwater No. of Wells
City of Clovis	Kings River	35
City of Coalinga	San Luis Canal via the Coalinga Canal	None
City of Firebaugh	None	6
City of Fowler	None	6
City of Fresno	Friant Kern Canal and Kings River	247
City of Huron	San Luis Canal	None
City of Kerman	None	3
City of Kingsburg	None	7
City of Mendota	None	5
City of Orange Cove	Friant Kern Canal	6
City of Parlier	None	6
City of Reedley	None	12
City of Sanger	None	11
City of San Joaquin	None	3
City of Selma	None	15
Source: State Department of Health Services, 1995, Annual Reports to the Drinking Water Program; Montgomery Watson, 1999.		

Actual 1995 water use for the incorporated communities, based on records from the State Department of Health Services, is summarized in Table 5-7. Surface water deliveries to the City of Fresno and the City of Clovis are used for groundwater recharge. These waters in 1995 consisted of 60,000 acre-feet from Fresno's CVP water service contract and 85,000 acre-feet from the Kings River delivered by the Fresno Irrigation District (FID). The latter deliveries are made pursuant to the City of Fresno's contracts with FID for: 1) Kings River groundwater delivery in lieu of irrigation of annexed land; and 2) to exchange treated, reclaimed wastewater for Kings River water.

The City of Orange Cove treats surface water obtained from their CVP water service contract. Orange Cove also has six wells that are used to supplement surface water deliveries during drought years or during periods when the Friant Kern Canal is out of service for maintenance.

TABLE 5-7

**1995 SURFACE AND GROUNDWATER
BY INCORPORATED AREAS
Fresno County
1997**

Incorporated Area	1995 Water Use (acre-feet)		
	Surface Water	Groundwater	Total
City of Clovis ¹	17,700	17,114	34,814
City of Coalinga	3,579	0	3,579
City of Firebaugh	0	2,092	2,092
City of Fowler	0	1,117	1,117
City of Fresno ²	145,000	130,389	130,389
City of Huron	881	0	881
City of Kerman	0	2,004	2,004
City of Kingsburg	0	2,583	2,583
City of Mendota ³	0	1,597	1,597
City of Orange Cove ⁴	1,224	0	1,224
City of Parlier ⁵	0	1,599	1,599
City of Reedley	0	4,792	4,792
City of Sanger	0	4,461	4,461
City of San Joaquin	0	568	568
City of Selma	0	5,252	5,252

Source: State Department of Health Services, 1995 Annual Reports to the Drinking Water Program.

Notes:

¹Some surface water is used for groundwater storage.

²Surface water is used for groundwater recharge only. Total shown is the amount actually delivered to customers through system.

³1994 data, report was not filed for 1995.

⁴Six groundwater wells are used to supplement surface water supplies during years when surface water flows are inadequate.

⁵1993 data, reports were not filed for 1994 and 1995.

Historic annual water use by the incorporated communities during the period 1991 through 1995 is summarized in Table 5-8. Total annual water deliveries can vary based on climatic conditions and other factors that influence demand; however, total annual water demand within the incorporated areas in Fresno County has generally increased over the five year period.

TABLE 5-8 HISTORIC WATER USE BY INCORPORATED AREAS Fresno County 1991-1995					
	Total Annual Water Use (acre-feet)				
Incorporated Area	1991	1992	1993	1994	1995
City of Clovis	13,387	14,195	15,314	16,353	16,153
City of Coalinga	3,352	3,148	2,780	2,693	3,579
City of Firebaugh	1,747	1,741	1,953	2,262	2,092
City of Fowler	No Data	819	1,347	1,347	1,117
City of Fresno ¹	117,555	118,295	119,512	129,847	130,389
City of Huron	768	874	875	795	881
City of Kerman	1,693	1,936	1,829	1,954	2,004
City of Kingsburg	1,995	2,206	2,398	2,465	2,583
City of Mendota	999	No Data	No Data	1,597	No Data
City of Orange Cove	951	1,055	1,137	No Data	1,224
City of Parlier	3,015	1,572	1,599	No Data	No Data
City of Reedley	4,018	4,296	4,297	4,602	4,792
City of Sanger	4,296	4,530	4,609	4,416	4,461
City of San Joaquin	442	899	565	No Data	568
City of Selma	4,307	4,826	4,973	5,175	5,252
Source: State Department of Health Services, Annual Reports to the Drinking Water Program; Montgomery Watson, 1999. Notes: ¹ Actual deliveries to water users not including groundwater recharge.					

Pressurized water is delivered to water users in buried pipeline facilities. Deliveries are typically metered and customers are billed for the amount of water delivered. The City of Fresno is the only incorporated community in Fresno County that does not generally meter deliveries to its residential customers — it meters water deliveries to those single-family homes that request it, and to all multi-family uses. The general characteristics of the water systems are summarized in Table 5-9.

TABLE 5-9
CHARACTERISTICS OF WATER SYSTEMS IN INCORPORATED AREAS
Fresno County
1997

Incorporated Area	Total Connections			Population Served	
	Metered	Flat Rate	Total	Permanent	Seasonal
City of Clovis	17,010	1,202	18,212	69,455	69,455
City of Coalinga	3,262	176	3,438	9,875	10,375
City of Firebaugh	348	782	1,130	5,185	7,185
City of Fowler	1,020	18	1,038	3,829	3,829
City of Fresno	15,700	86,018	101,718	475,000	475,000
City of Huron	640	0	640	5,669	10,000
City of Kerman	21	1,598	1,619	6,700	6,700
City of Kingsburg	201	2,185	2,386	8,505	8,505
City of Mendota	No Data			No Data	
City of Orange Cove	70	1,598	1,668	6,435	7,500
City of Parlier	No Data			No Data	
City of Reedley	220	4,015	4,235	19,200	21,500
City of Sanger	4,391	10	4,391	18,591	18,591
City of San Joaquin	15	745	760	2,787	3,500
City of Selma	1,851	2,882	4,733	16,250	16,250

Source: State Department of Health Services, 1995 Annual Reports to Drinking Water Program.

UNINCORPORATED COMMUNITIES

Fresno County has approximately 370 entities providing water for various M & I uses. These water systems can be separated into two groups:

1. Those with 200 connections or more (about 20 entities); and
2. Those with fewer than 200 connections (about 350 entities).

Water systems with 200 or more service connections are regulated by the State Department of Health Services, Division of Drinking Water. In accordance with state regulations, each of these systems is inspected annually and monitored for possible contamination and to determine the need for system improvements. Water systems with fewer than 200 service connections are regulated by the Fresno County Health Services Agency.

TABLE 5-10

SUMMARY OF UNINCORPORATED COMMUNITIES WITH MORE THAN 200 WATER SERVICE CONNECTIONS**Fresno County
1997**

Bakeman Water Company
 Biola Community Services District
 California State University, Fresno
 Caruthers
 Del Rey Community Services District
 Fresno County Water Works District #18
 Fresno County Water Works District #41
 Hume Lake Christian Camps, Inc.

Laton Community Services District
 Malaga County Water District
 Parkland Agriculture
 Pinedale County Water District
 Riverdale Public Utilities District
 Shaver Lake Heights MWC
 Sierra Cedars Community Service District

Source: State Department of Health Services

IRRIGATION/WATER DISTRICTS

Irrigation/Water Districts within Fresno County use a variety of water sources, including groundwater, local surface water and imported surface water. Even though significant volumes of surface waters are used annually within the county, these annual supplies are not adequate to meet long term demand. Therefore, groundwater is pumped by the water users in these districts to provide for a full supply. The Fresno County area irrigation/water districts are divided into two groups: districts that have some type of CVP contract for a surface water supply (water supply contract, exchange contract or settlement contract); and districts that have a right to local surface waters (typically on the Kings River) or that rely exclusively on groundwater pumping.

CVP Water Users/Districts

Water users and districts in Fresno County that receive a CVP water supply are summarized in Table 5-11. CVP contracts for water contractors within Fresno County typically provide for a Class 1 entitlement, except for Fresno Irrigation District which has a Class 2 entitlement.

TABLE 5-11			
CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT AGENCIES			
Fresno County			
1997			
Irrigation/Water Agencies	Contract Entitlement (ac-ft)		
	Agricultural	M & I	Total
San Luis Canal			
City of Coalinga	0	10,000	10,000
City of Huron	0	3,000	3,000
Pacheco Water District	10,000	80	10,080
Panoche Water District	66,937	63	67,000
San Luis Water District	59,560	440	60,000
Westlands Water District	1,100,000	0	1,100,000
Delta Mendota Canal/Mendota Pool			
Broadview Water District	27,000	0	27,000
Eagle Field Water District	4,550	0	4,550
Fresno Slough Water District	4,000	0	4,000
James Irrigation District	35,300	0	35,300
Laguna Water District	800	0	800
Melvin Hughes - James ID	70	0	70
Mercy Springs Water District	13,300	0	13,300
Oro Loma Water District	4,600	0	4,600
Pacheco Water District	1,000	0	1,000
Panoche Water District	26,963	37	27,000
Reclamation District 1606	228	0	228
San Luis Water District	64,860	140	65,000
Traction Ranch	2,080	0	2,080
Tranquility Irrigation District	13,800	0	13,800
Westlands Water District	50,000	0	50,000
Widren Water District	2,990	0	2,990
Exchange Contractor			
Central California Irr Dist	532,400	0	532,400
Columbia Canal Company	59,000	0	59,000
Firebaugh Canal Company	85,000	0	85,000
Cross Valley Canal			
County of Fresno	3,000	0	3,000
Hills Valley Water District	3,346	0	3,346
Tri-Valley Water District	1,142	0	1,142
Friant Kern Canal/Millerton Lake			
City of Fresno	0	60,000	60,000
City of Orange Cove	0	2,500	2,500
Fresno County WWD18	0	150	150
Fresno Irrigation District (1)	75,000	0	75,000
Garfield Water District	3,500	0	3,500
International Water District	1,200	0	1,200
Orange Cove Irrigation District	39,200	0	39,200
Source: United States Department of the Interior, Bureau of Reclamation CVP Water Service Contracts.			
Note: Class II CVP contract entitlement.			

Other Districts

The source of water supply for water users/districts that do not have a CVP contract entitlement are summarized in Table 5-12. Groundwater is the sole source of supply for:

- Farmers Water District;
- Mid-Valley Water District;
- Pleasant Valley Water District; and
- Raisin City Water District.

The Murphy Slough Association includes:

- Liberty Mill Race Company;
- Reed Ditch Company; and
- Riverdale Irrigation District.

TABLE 5-12		
SOURCES OF WATER SUPPLY AND OTHER IRRIGATION/WATER DISTRICTS		
Fresno County		
1997		
Irrigation/Water Districts	Source of Water Supply	
	Surface Water	Groundwater
Alta Irrigation District (1) (2)	X	X
Consolidated Irrigation District (1) (2)	X	X
Farmers Water District		X
Fresno Irrigation District (2)	X	X
Kings River Water District (2)	X	X
Laguna Irrigation District (2)	X	X
Lone Tree Irrigation District (2)	X	X
Mid-Valley Water District		X
Murphy Slough Association (2)	X	X
Liberty Mill Race Company (2)	X	X
Reed Ditch Company (2)	X	X
Riverdale Irrigation District (2)	X	X
Pleasant Valley Water District (2)		X
Raisin City Water District		X
Source: The Kings River Handbook, KRCD and KRWA, 1994; Montgomery Watson, 1999.		
Notes:		
1. Districts with boundaries partially inside Fresno County.		
2. Districts that also have water rights to Kings River flows.		

Kings River water storage rights at Pine Flat Reservoir and upstream along with the average annual water entitlements/diversions, based on 100 years of Kings River flow records, is summarized in Table 5-13. Storage on the Kings River consists of the share in Pine Flat Reservoir and in the facilities located farther upstream. The total storage share for each

irrigation/water district being the sum of their Pine Flat and upstream storage. The average annual entitlement/diversion is not equal to the storage, but is the storage share plus the natural flow in excess of the amount of storage. James and Tranquility Irrigation Districts have exchanged their Kings River water entitlements for a CVP supply from the Mendota Pool.

TABLE 5-13 KINGS RIVER STORAGE RIGHTS AND AVERAGE SCHEDULED ENTITLEMENT Fresno County 1997			
Irrigation/Water Districts	Storage Share (ac-ft)		Average Annual Diversion (ac-ft)
	Pine Flat	Upstream	
Alta Irrigation District (1)	100,000	19,275	195,964
Consolidated Irrigation District (1)	120,000	23,130	244,036
Fresno Irrigation District	119,000	22,937	452,888
James Irrigation District (2)	20,000	3,855	17,529
Kings River Water District	15,000	2,908	67,926
Laguna Irrigation District	44,000	8,481	69,442
Lone Tree Irrigation	—	—	28,367
Murphy Slough Association	—	—	60,248
Liberty Mill Race Company	14,667	2,827	—
Reed Ditch Company	7,333	1,413	—
Riverdale Irrigation District	22,000	4,240	—
Tranquility Irrigation District (2)	8,000	1,542	17,529
Source: The Kings River Handbook, KRCD and KRWA, 1994.			
Notes:			
1. Districts with boundaries partially inside Fresno County.			
2. Districts that exchanged their Kings River water supply for CVP water delivered from the Mendota Pool.			

5.5 WASTEWATER COLLECTION, TREATMENT AND DISPOSAL

Wastewater collection, treatment, and disposal are regulated by the Central Valley California Regional Water Quality Control Board (Regional Board). Local government and special assessment districts own and operate collection systems (sewers) and wastewater treatment plants. All entities obtain permits from the Regional Board to discharge treated plant effluent and dispose of biosolids (sludge). Residents in rural areas that are not served by sewers most often use on-site septic systems. Industries are required to provide treatment of their waste and obtain separate discharge permits from the Regional Board. The objective of such permits is to preserve surface and groundwater quality for beneficial use and to protect the public health.

There are 362 permitted dischargers in Fresno County. Table 5-14 shows flow volumes of treated waste discharged within Fresno County. Over 70 percent of all discharges are classified as municipal discharges, which is mostly domestic waste, and 90 percent of municipal flows are generated within corporate city limits. Septic systems and non-permitted discharges have not been considered in Table 5-14. Most non-municipal waste is derived from agricultural based industries, primarily fruit packing.

TABLE 5-14
PERMITTED DISCHARGES WITHIN FRESNO COUNTY*

	Design Flow (MGD)	Base Flow (MGD)	Percent of Discharge (based on design flow)
Total of all** permitted discharges	121	100	100%
Total of all** discharges with design and/or base flow greater than 1 MGD	106	91	88%
Total of all municipal discharges	90	71	74%
Total of all municipal discharges from incorporated areas	82	66	68%
Total of all industrial dischargers	24	20	20%
Notes: * Analysis based on Fresno County WDS Listing, June 27, 1996 of 362 permitted dischargers, 28 of which are permitted to discharge greater than 1 MGD. ** Neglecting discharges of 22.6 MGD from San Joaquin Fish Hatchery and 10 MGD from Balsam Meadows Hydroelectric Project			

UNINCORPORATED AREAS

Some unincorporated communities have elected to form special districts to provide services including sewage and wastewater collection and treatment. There are about eighty special districts in Fresno County; approximately thirty of which provide wastewater services. The County owns and operates nine sewerage and wastewater treatment facilities on behalf of water works districts (WWDs) and county service areas (CSAs). The Regional Board actively encourages consolidation of services and increased reclamation of treated effluent as the most economical methods to achieve water quality objectives in the area.

Most treatment facilities currently use evaporation/percolation ponds for effluent disposal. The Regional Board recognizes this as a viable interim disposal solution, but reclamation of treated effluent for irrigation purposes is preferred in order to reduce impacts to groundwater and salts accumulation. Tertiary treatment will likely be required to achieve the reclamation goals, but presently few communities are capable of providing advance levels of treatment. New large development projects are being encouraged by the County to include expandable tertiary facilities to be able to accommodate future growth and anticipated treatment requirements.

Industries, mostly food processing plants, also provide wastewater treatment and discharge in unincorporated areas of the county. The Regional Board issues discharge permits to most industrial facilities for discharge of wastewater. Fresno County has an additional mechanism for permitting discharges and to coordinate the permitting process with the Regional Board's discharge permit efforts to avoid duplication. The regulation of agricultural runoff and irrigation returns is currently being addressed at the federal and state levels. It is unknown at this time what impacts future state and federal regulations may have on the county's operations in this regard. Other agricultural waste, as with industrial waste systems, typically discharge to evaporation/percolation ponds.

Many rural landowners use private on-site septic systems for wastewater treatment and disposal. An average of approximately 500 permits for new individual septic systems have been issued annually in the unincorporated county over the past few years. Septic systems are not allowed to be installed on small parcels. In problem soils, systems must be engineered with one hundred percent redundancy. Failure of private systems has not been a significant problem in Fresno County.

Fresno County's Mandatory Sewer Connection Ordinance requires connection to public sewer systems, where they are available, precluding the issuance of permits for installation individual septic systems in such cases. In areas where public systems become available where they did not previously exist, structures served by individual septic systems must be connected to the public system within three years, or sooner if the existing facilities pose a health risk. In the event that required connections are not made within the required three year period, the County may cause such a connection to be made, with the cost of the connection assessed to the landowner.

Urban areas served by on-site septic systems have had problems with accumulation of nitrates in groundwater (e.g., the Calwa area in southeast Fresno-Clovis Metropolitan Area); however, these problems have been ameliorated when these areas are connected to a sewer utility. In addition, the Sunnyside unincorporated island in southeast Fresno which was historically developed with seepage pits, is planned to be connected to the local sewer system.

In order to maintain functioning of on-site leach fields and leach pits, the accumulated solids must periodically be pumped out of the septic tanks and treated. Since a County ordinance prohibits acceptance of septic tank solids at any County-operated wastewater treatment facility, that leaves the Fresno-Clovis Regional Wastewater Treatment and Reclamation Facility as the only plant available to manage the solids burden.

INCORPORATED AREAS

All incorporated areas within Fresno County are served by local sewer collection and treatment facilities. The majority of treated wastewater is domestic (household type) waste with a small amount (estimated at zero to eleven percent depending on the city) coming from industrial discharges. Most treatment plants provide secondary treatment, but some smaller cities still have primary facilities. Firebaugh, Fresno-Clovis, and Sanger typically experience wastewater flows at or exceeding current design capacity of their facilities. Efforts are currently underway in each of these cities to upgrade facilities to accommodate anticipated flows. Other cities in the county generally have adequate capacity for the foreseeable future. A summary of treatment facilities is shown in Table 5-15. Table 5-16 identifies available sewer collection system maps. The following section is a description of existing wastewater collection, treatment and disposal facilities and related issues of concern for incorporated areas of Fresno County.

TABLE 5-15

MUNICIPAL WASTEWATER TREATMENT FACILITIES
Fresno County General Plan,
February 1997

City/District	Design Capacity (MGD)	Average Flow (MGD)	Level of Treatment
Coalinga	1.34	0.9	primary
Firebaugh	0.5	0.8	secondary
Fresno-Clovis	80.0	68-70	secondary
Huron	0.3	0.3	primary
Kerman	1.2	0.77	secondary
Mendota	1.24	0.8	secondary
Orange Cove	1.0	No Data	secondary
Parlier	2.0	0.8	secondary
Reedley	3.5	2.3	secondary
Sanger	1.8	2.8	secondary
San Joaquin	0.252	0.1	secondary
Selma-Kingsburg-Fowler	8.0	2.5-3.0	secondary

TABLE 5-16
MAPPING DATA AVAILABLE FOR SEWER COLLECTION SYSTEMS AND
TREATMENT FACILITIES
Fresno County
February 1997

Source	Map Description	Scale	Format	Date of Map	Prepared by
City of Clovis	Clovis sewer collection system	No Data	Hardcopy & Electronic	N/A	City of Clovis
City of Coalinga	Coalinga sewer collection system	1" = 300'	Hardcopy	N/A	City of Coalinga
City of Firebaugh	Existing facilities map	1" = 100'	Hardcopy	N/A	Rabe Engineering
City of Fresno	No Data	No Data	No Data	No Data	No Data
City of Fowler	Fowler sewer collection system	1" = 400'	Hardcopy	Nov. 1986	Boyle Engineering
City of Huron	Huron sewer collection system	1" = 200'	Hardcopy & Electronic (AutoCAD 12)	Dec. 1995	No Data
City of Kerman	Long Range Sewer Master Plan	1" = 400'	Hardcopy	N/A	Blair & Church
City of Kingsburg	Kingsburg sewer collection system	1" = 400'	Hardcopy	Nov. 1986	Boyle Engineering
City of Mendota	Mendota sewer collection system	No Data	Hardcopy	N/A	RM Associates (Fresno)
City of Orange Cove	Orange Cove sewer collection system	No Data	Hardcopy	N/A	No Data
City of Parlier	Parlier sewer collection system	1" = 400'	Hardcopy	Rev. Dec. 1995	Girsch & Olsen (Madera)
City of Reedley	Reedley sewer collection system	1" = 200' 1" = 400'	Hardcopy Hardcopy	N/A	No Data
City of Sanger	No system maps available	No Data	No Data	No Data	No Data
City of San Joaquin	San Joaquin sewer master plan	1" = 400'	Hardcopy	Rev. July 1995	Yamabe & Horn (Clovis)
City of Selma	Selma sewer collection system	1" = 400'	Hardcopy	Nov. 1986	Boyle Engineering
Selma-Kingsburg-Fowler County Sanitation District	SKFCSD owned mainlines on aerials	1" = 300'	Hardcopy	1981	Aerial Photogrametrics (Fresno)

Coalinga

The city of Coalinga has a 1.34 million gallon per day (MGD) primary treatment plant located on the southeast side of town near the confluence of Los Gatos and Warthan Creeks. The service area is coincident with the city limits, utilizing a gravity collection system with three pump stations servicing a newer subdivision. The city provides regular maintenance of the system and there are currently no known areas or elements requiring expansion or upgrades.

Inflows to the plant include only domestic wastes, and at an average flow of 0.9 MGD, are well within the capacity of the existing plant. The city has an agreement with the Westhills Community College farm to accept much of the plant's effluent for irrigation. A recent agreement with an adjacent landowner will utilize the remaining effluent for off-season pre-irrigation purposes. Effluent is held in ponds on the treatment plant site until it is required by these users and a small amount is thereby lost to ground water recharge and evaporation. Historically, two biosolids drying beds have been used on an alternating basis and dried biosolids have been stockpiled on site. However, the city foresees a need to dispose of the stockpiled biosolids and is currently investigating alternatives for biosolids disposal.

Firebaugh

The city of Firebaugh has a 0.5 MGD secondary treatment plant located on the southeast side of town, south of the high school between the San Joaquin River and the Delta-Mendota Canal. The collection system serves the communities of Del Rio to the north and Eastside Acres, across the river in Madera County, as well as providing full service within the city limits. The current average flow to the plant is 0.8 MGD, exceeding the plant's design capacity by sixty percent.

The City is planning immediate expansion of the facilities to accommodate this need. Due to the limited size of the system, the plant currently accepts only municipal influent and no trucked in septage. During the cotton growing season, all of the plant effluent is used for irrigation. At off-season time, the effluent is diverted to percolation/evaporation ponds on site at the plant. No effluent is discharged to the river. Biosolids are sent to drying beds and left there, but after fifteen years' deposit, the City recognizes that it will need to address biosolids disposal in the future.

Fresno-Clovis

The cities of Fresno and Clovis have a cooperative agreement for a joint wastewater treatment facility. Each city owns and maintains their own collection system which feeds a jointly owned treatment plant. The plant is operated by the city of Fresno and is located approximately 7 miles west of SR 99 on West Jensen Avenue. The design capacity is 80 MGD and current inflows to the plant are between 68 and 70 MGD. At the current growth rate of the area, this capacity will be exceeded by the year 2005 and plans are underway for further expansion to meet anticipated need. Meanwhile, the City is promoting a public education campaign and water conservation program to encourage reduction of flows to the plant.

Approximately eighty-nine percent of the plant influent is municipal waste and eleven percent industrial waste. The plant provides secondary level of treatment with biological removal of organic material, but no disinfection or filtration processes. Ten percent of the plant effluent is used for irrigation and the remaining 90 percent is diverted to a percolation/evaporation basin. Percolation ponds achieve some level of nutrient reduction and disinfection by filtering effluent through soil and extracting the treated, soil-filtered effluent by means of reclamation wells at the perimeter of the reclamation area. The City has been paying to have biosolids hauled away for compost, but recently completed facilities will provide greater flexibility in operations and they are currently exploring less costly alternatives, such as land spreading.

Huron

The city of Huron has a primary treatment facility approximately one half mile east of town on 9th Street. The service area is coincident with the city limits and the treatment facility consists of a series of ponds. With ample pond area for the community's needs, the capacity of the pump station (0.3 MGD) on the main line is the limiting factor in the system. This pump station is old and in need of upgrading. It typically runs at 0.3 MGD during the off-season, but in April or October can run as high as 0.9 MGD. The city is currently seeking to upgrade this pump station to a design capacity of 1.4 or 1.5 MGD to meet current and future needs. In addition, pipelines in the older part of the city are in need of replacement. The City Council is currently investigating development of a sewer repair and maintenance schedule. Most of the collection system is a gravity flow system with a pump station servicing one subdivision in addition to the previously mentioned main pump station. Industrial facilities within Huron do not discharge any process water or industrial waste to the system, so all of the waste is of the domestic type. There is no effluent from the plant as all the water is evaporated or percolated directly from the ponds. The ponds are occasionally drained and weeded, but no biosolids have been removed during the life of the 20+ year old facility. There has been no significant biosolids accumulation or odor problem.

Kerman

The city of Kerman has a 1.2 MGD secondary treatment facility located approximately one half mile southeast of town near Del Norte and Church Avenues. The service area is coincident with the city limits, and except for a pump station serving one small area, the system is entirely gravity flow. Currently (1997), the city is adequately serviced, although additional capacity may be required in the collection system to provide for future development. All flow into the treatment plant is domestic type and average flow is 0.77 MGD which is well within the capability of the existing treatment facility. All the plant effluent is directed to on site percolation and evaporation ponds. Biosolids are occasionally dredged from the ponds and stockpiled on site.

Mendota

The city of Mendota has a 1.24 MGD secondary treatment facility located northeast of town along Bass Avenue. Current flow to the plant is approximately 0.8 MGD of mostly domestic waste. The service area is coincident with the city limits. There are three pumping stations: the main pump station and force main, and two smaller pump stations, one serving a subdivision and the other serving the high school. The city is currently planning to construct on-site storage basins to contain winter effluent, replace the 18 inch trunk sewer with a 30 inch trunk sewer and is studying financing options for improvements to the existing headworks, main pump station and force main, as well as general collection system maintenance and repair. All effluent is used for irrigation. Biosolids are left in drying beds.

Orange Cove

The city of Orange Cove has a 1.0 MGD secondary treatment facility located one mile southwest of the city. Plant effluent is mixed at least 3:1 with irrigation water and piped to the

Orange Cove Irrigation District. Off season effluent is stored on site in holding basins. Dried biosolids are spread on property controlled by the City or disposed of at a landfill.

Parlier

The city of Parlier has a 2 MGD secondary treatment plant located southwest of town off Bethel Road, one half mile south of Manning Avenue. The service area is coincident with the city limits, but may extend to areas within its sphere of influence to accommodate development. There are 2 pump stations in the system. One is on the east side and pumps about 60 percent of the flow from that area to a gravity line. The other is a larger pump station that pumps the combined flow in a 16 inch force main about one and a half miles out to the treatment plant. Current average flow is 0.8 MGD and is about 98 percent domestic, and two percent industrial from local packing plants. Plant effluent may go to temporary holding ponds on site, but eventually all effluent is used for irrigation. The plant has a biosolids removal system with dewatering beds and a commercial dealer removes it for land spreading. The City is currently pursuing increasing the local industrial and commercial base. The existing treatment plant is adequate to accept increased flows from these sources.

Reedley

The city of Reedley has a 3.5 MGD secondary treatment facility located in the southwest area of town, south of Olsen Road. The service area is coincident with the city limits. Average flow to the plant is approximately 2.3 MGD, most of which is domestic waste, with an increase of about 20 percent during fruit packing season. The City has a program for industrial user permitting. All plant effluent is diverted to percolation/evaporation ponds. Biosolids are dewatered, spread in drying beds and disposed of by land application to orchards and given to local farmers.

Sanger

The city of Sanger has a 1.8 MGD secondary treatment plant located southeast of town near the confluence of Collins Creek and Kings River. The City is currently upgrading and expanding the plant to a 3.0 MGD secondary plant. The plant accepts 1.8 MGD domestic waste plus 1.0 MGD industrial waste from a nearby agricultural processing plant. Currently, these two streams are combined, treated and discharged to on site percolation and evaporation ponds. These ponds are at a low elevation and close to the groundwater table. In order to maintain appropriate separation between percolating effluent and the groundwater, the new treatment plant will treat the flows in separate streams, allowing only the treated industrial effluent (food processing waste) into the existing percolation/evaporation ponds. The domestic effluent will be pumped to new ponds up on the bluff approximately 25 feet above the current discharge point. Biosolids are currently stockpiled on site. New biosolids drying beds will be constructed as part of the upgrade.

San Joaquin

The city of San Joaquin has a 0.25 MGD secondary treatment facility located southwest of town on Springfield Road near Fresno Slough. The service area is coincident with the city limits.

This is mostly a pressurized system with three lift stations, and provides service adequate to the city's current needs. All flow into the treatment plant is domestic and the average flow of 0.1 MGD is well within the capacity of the facility. All the plant effluent is directed to on-site percolation and evaporation ponds. Biosolids are occasionally dredged from the ponds and stockpiled on-site.

Selma-Kingsburg-Fowler

The cities of Selma, Kingsburg and Fowler and the unincorporated areas along the corridor between the cities are part of the Selma-Kingsburg-Fowler County Sanitation District. The District owns and maintains all the sewer collection systems within its jurisdiction plus the main interceptor running the length of the corridor from Fowler to the plant and the 8 MGD treatment facility located west of Kingsburg off Conejo Avenue. There is a small amount of conventional industry, a significant seasonal food processing industry, and most flow to the plant is domestic waste. The average annual flow to the plant is 2.5 to 3 MGD, so there is ample capacity for all projected needs. Plant effluent is discharged to evaporation/percolation ponds with a very small amount used for irrigation. Biosolids are dried, stockpiled, and sold to a local farmer.

5.6 LAW ENFORCEMENT AND FIRE PROTECTION

LAW ENFORCEMENT

The Fresno County Sheriff's Department currently has 329 sworn officers serving the unincorporated population of Fresno County (174,200), for a ratio of 1.89 officers per 1,000 residents. The ratio is below the standard of 2.0 officers per 1,000 residents set by the Federal Bureau of Investigation. The Sheriff's Department has 544 non-sworn clerical and support people.

Law enforcement protection for the unincorporated county and contract cities is divided into three areas. Each area can be divided into as many as eight beats. There is one officer per beat at any one time. On occasion, a Reserve Deputy Sheriff will ride with an officer on his or her beat. Most Fresno County Sheriffs assigned to Patrol Division work the 4-10 Plan. This means they work ten hour shifts, four days per week. Detectives work eight-hour shifts, five days per week.

The Fresno County Sheriff's Department considers the most pressing concerns to be a critical lack of bed space in the County Jail, increasing number of calls for service with no commensurate increase in patrol staff, and a critical lack of patrol vehicles.

FIRE PROTECTION

Unincorporated Fresno County is served by the Fresno County Fire Protection District (Fig Garden Fire Protection District), North Central Fire Protection District, Orange Cove Fire Protection District, Bald Mountain Fire Protection District, Laton Community Service District, Riverdale Public Utilities District, County Service Area 31B (Shaver Lake), and the California Department of Forestry and Fire Protection (CDF).

INSURANCE SERVICE OFFICE (ISO)

The Insurance Services Office (ISO) is an agency that evaluates the fire protection features for all fire departments for the purpose of establishing rates for underwriters. ISO uses a rating system that is based on a scale of one to ten, with one being the best fire protection rating and 10 being the worst. In order to determine an area rating, the ISO uses a formula in which the primary factors are the availability of both water and fire protection services in the area.

Fresno County Fire Protection District

The Fresno County Fire Protection District (FCFPD) was formed in 1993 by the consolidation of the Mid Valley and Westside Fire Protection Districts. As was the case with the preceding Districts, the Fresno County Fire Protection District contracts with the California Department of Forestry and Fire Protection (CDF) for personnel and administration. This contractual relationship dates back to 1949 and has developed into a functionally consolidated Fire Protection Program between CDF and the District.

The FCFPD shares its headquarters with CDF at a complex located at 210 S. Academy, Sanger, CA 93657. The District now serves approximately 3,800 square miles of Fresno County and also provides services to four cities and a variety of other entities.

It is currently estimated that the population of the area served by the FCFPD is approximately 175,000. The land use varies within the District from highly urbanized and industrial lands in the vicinity of Fresno and Clovis, to range and crop lands in the rural area. At the present time the District provides services from 24 fire stations (see Table 5-17). Fifteen of these stations are staffed by career personnel with the other nine being volunteer firefighter stations. The District also relies on volunteers at most of the staffed stations as backup for the career employees.

At the present time, engine staffing standards within the District is two personnel. These engine companies provide a full realm of fire protection and first responder medical services throughout the District. All District career personnel are trained at the Emergency Medical Technician level.

The FCFPD directly funds 102 full time safety employees. This includes four Chief Officers, two Fire Captains assigned to fire prevention, two fire captains assigned to training, three fire captains, and seven dispatchers assigned to the Regional CDF Communications center in Fresno. The FCFPD also equips and trains up to 250 paid-call firefighters (volunteers). These personnel carry pagers and either report directly to the scene of an emergency or to the fire station to operate backup fire equipment.

As a result of the functional consolidation with CDF, the Department (including District Resources) is organized into three divisions and a fire prevention bureau. The Western Operations Division consists of four Battalions and the Fleet Management function. The Eastern Division consists of three Battalions within the eastern foothills of Fresno County, a CDF Conservation Camp and the CDF Air Tactical Program at the Fresno Airport. The third Division consists of the Department's Administrative functions. The three Divisions are directly supervised by a Deputy Chief and the Department Chief (both funded by CDF).

The FCFPD's response standard is five minutes in commercial and residential areas near Fresno and Clovis and 20 minutes in the rural areas. The District normally meets these standards unless multiple incidents are occurring or the incidents are located in a few areas that cannot be reached within the referenced time standard. The FCFPD's ISO ratings are as follows:

- West of SR 99: Generally an ISO rating of 6 applies, except in areas with a municipal water system (Mendota, Huron) where the rating of 5 has been assigned.
- East of SR 99: Generally within the residential and industrial areas around Fresno and Clovis an ISO rating of 5 has been assigned, based on water system availability. In other areas greater than 5 miles from a fire station ratings range from 6 to 8.
- Eastern Foothill Area: An ISO rating of 9 has been assigned to these locations.

Revenue Status

The FCFPD has experienced several factors that have impacted its baseline as well as its ability to receive adequate yearly incremental increases in revenue. These include:

- Annexations: Annexation to the cities of Fresno and Clovis have adversely impacted revenue generation to the District.
- Tax Shifts: Severe reductions occurred as a result of the establishment of the Educational Revenue Augmentation Fund (ERAF). Three fire stations were closed and staffing levels reduced within the residential and commercial areas around the cities of Fresno and Clovis, as a result of this revenue reduction.

The County of Fresno has been indirectly subsidized for this loss up to approximately 70 percent, while special districts have received no relief. The current revenue situation places the District in a position of concern on the ability to continue to meet the needs of the community. In addition, most other entities, including Clovis and Fresno, continue to look to the District for assistance when additional resources are needed for emergencies within these areas.

Fire Protection System Issues

The following planning issues are an immediate concern to the District:

- Reedley Area: As a result of the referenced tax shifts, the District was forced to remove career staffing from the Reedley Station which was co-located with the Reedley City Volunteer Fire Department. This reduction not only affected the unincorporated areas north of Reedley, but also reduced the co-response to Reedley incidents. As a result, the area generally north of Reedley and bounded approximately by the Kings River and Cove Road, experiences abnormally long emergency response times. The District has acquired property for a fire station at Frankwood and Livermore roads, north of the city of Reedley, but has not been financially capable of construction of a fire station or to provide staffing.

- Clovis: District Station #85 located on the northern edge of the city of Clovis has been impacted by annexations. The City of Clovis has constructed a new fire station only a few miles away to serve these annexed areas. Regardless of the annexations, the District continues to have fire protection responsibilities within the unincorporated areas north of Clovis and Fresno, but does not have funds to relocate the existing facility. Regional planning is needed to develop future fire station sites north of Clovis and Fresno to eliminate duplication of expenditures, by assuring the proper location of the facilities. It is also necessary to identify funding sources for the facilities and transition plans, as the cities move north, for personnel funding.
- Impact/
Mitigation
Fees: The District does not have the ability to respond to changing population growth with subsequent changes in fire protection system. Development projects increase fire protection needs and, at times, could require relocation of current facilities. This need is not currently addressed by standard mitigation fees for new construction. The District has petitioned the County for enactment of these fees but has not been successful.
- Urban
Staffing
Standards: As a result of the referenced tax shifts, the District was required to reduce staffing on the engine Companies assigned to the residential and commercial areas around Fresno and Clovis. The present staffing level of two persons on these fire engines is marginal for the mission they are expected to perform. Staffing standards for the city's of Fresno and Clovis consist of a minimum of three person engine company.

TABLE 5-17		
FRESNO COUNTY FIRE PROTECTION DISTRICT		
Station Number	Address	Equipment
71 - Parlier	1300 E., Parlier, CA 93648	*1 Fire Engine *1 Fire Engine *1 Patrol
72 - Friant	4091 E. Millerton, Friant, CA 93626	*1 Fire Engine
73 - Hurley	25627 N. Auberry, Clovis, CA 93612	*1 Fire Engine *1 Water Tender
74 - Morgan Canyon	15339 Skylan Lane, Prather, CA 93651	*1 Fire Engine *1 Patrol
75 - Tollhouse	23087 E. Tollhouse, Clovis, Ca 93612	*1 Fire Engine *1 Patrol
77 - Wonder Valley	6812 Piedra Road, Sanger, CA 93657	*1 Fire Engine
80 - (Fig Garden FPD)	4537 N. Wishon , Fresno, CA 93704	1 Fire Engine 1 Reserve Engine
81 - Reedley	1060 D Street, Reedley, CA 93657	*1 Fire Engine
82 - Del Rey	9700 American Avenue, Del Rey, CA 93616	1 Fire Engine
83 - Selma	11500 E. Mt. View, Selma, CA 93662	1 Fire Engine 1 Water Tender
84 - Sanger	210 S. Academy Ave., Sanger, CA 93657	1 Fire Engine *1 Water Tender
85 - Clovis	4955 E. Nees, Clovis, CA 93612	1 Fire Engine *1 Water Tender *1 Patrol
86 - Clovis Lakes	4925 N. Nelson, Clovis, CA 93612	1 Fire Engine 1 Reserve Engine
87 - South Fresno	4706 E. Drummond Avenue, Fresno, CA 93727	1 Fire Engine
88 - East Fresno	5379 E. Tulare Street, Fresno, CA 93727	1 Fire Engine 1 Reserve Engine
89 - Easton	5810 So. Cherry Avenue, Fresno, CA 93706	1 Fire Engine *1 Water Tender
90 - Caruthers	2701 W. Tahoe, Caruthers, CA 93609	1 Fire Engine *1 Water Tender
91 - Riverdale	10868 Malsbury, Riverdale, CA 93656	1 Fire Engine *1 Fire Engine

TABLE 5-17		
FRESNO COUNTY FIRE PROTECTION DISTRICT		
Station Number	Address	Equipment
93 - Huron	36421 So. Lassen, Huron, CA 93234	1 Fire Engine 1 Reserve Engine *1 Water Tender
94 - Harris Ranch	24125 W. Dorris, Coalinga, CA 93210	1 Fire Engine *1 Patrol
95 - Tranquillity	25101 Morton, Tranquillity, CA 93668	1 Fire Engine *1 Water Tender 1 Reserve Engine
96 - Mendota	100 McCabe, Mendota, CA 93640	1 Fire Engine *1 Fire Engine *1 Fire Engine
96 - Cantua Creek	29595 W. Lotta, Cantua Creek, CA 93608	*1 Fire Engine
99 - San Joaquin	21946 Railroad, San Joaquin, CA 93660	*1 Fire Engine
*Volunteer (PCF) Firefighter Staffing Only		

Laton Community Service District

The Laton Community Service District (CSD) serves the Laton Township, which has a population of 1,750. The Laton CSD has one station located at Dewitty and Fowler Avenues. The station has a staff of one fire chief and ten volunteers. There are no Emergency Medical Technicians. Approximately three to four calls are received each month. The Laton CSD has an ISO rating of 8.

Riverdale Public Utilities District

The Riverdale Public Utilities District contracts with Fresno County Fire Protection District for fire protection services. There is one station within the PUD at 10068 Malsbury in Riverdale. The staff includes one full-time captain, one firefighter, and eight on-call volunteers. Response time within a three-mile radius is approximately five minutes. The Riverdale station has an ISO rating of 6.

County Service Area 31B (Shaver Lake)

County Service Area 31 (Shaver Lake) has one fire station located on Highway 168 near Dorabella. The station serves a permanent population of 1,500 residents, which increases by 2,000 people during the summer months. The station is staffed by one chief and 25 volunteers. Response time is approximately five to seven minutes, and the station's ISO rating is 7.

Fig Garden Fire Protection District

The Fig Garden Fire Protection District (FGFPD) serves an unincorporated area of Fresno County, generally within the Fresno city limits. The District boundaries include:

- on the north by W. Shaw Avenue between N. Maroa on the east and N. Palm on the west;
- on the west by N. Palm between W. Shaw to the north and the Herndon Canal to the south;
- on the south by the Herndon Canal between N. Palm to the west and N. Van Ness to the East; and,
- bounded on the south by E. Griffith between N. Van Ness and N. Maroa.

The District is comprised of 729 residential and commercial parcels within approximately 600 acres.

The Fig Garden Fire Protection District contracts with Fresno County Fire Protection District, which in turn contracts with the California Department of Forestry and Fire Protection for personnel and administration. This contractual relationship allows the residents of the District to have a full realm of fire protection services offered by the Fresno County Fire Protection District and the California Department of Forestry and Fire Protection.

The FGFPD directly funds six full-time safety employees who are all dedicated to engine staffing. It also funds one-fourth of a dispatch position for the Regional CDF Communications Center in Fresno. The District operates one fire engine from its station located at 4537 N. Wishon, Fresno, CA 93704. This fire engine responds with two-person staffing. This District equips and trains six paid-call firefighters (volunteers) who carry pagers and report directly to the scene of emergency incidents when needed.

The FGFPD's response standard is five minutes, with most incidents being answered within this standard. The District has entered reciprocal agreements with surrounding fire protection agencies to ensure response times are minimized and that additional fire protection resources are available. The FGFP ISO Rating is 4.

The District's revenue was impacted severely by the ERAF tax shifts. The District residents have supplemented this revenue with the enactment of a benefit assessment. Currently, this assessment is undergoing revisions based on the requirements of Proposition 218.

North Central Fire Protection District

The North Central Fire Protection District, headquartered in the city of Kerman, serves a 250 square mile area and population of approximately 32,000. The District includes unincorporated areas in the northwest part of the city of Fresno and areas to the west, including the city of Kerman, the town of Biola, and the rural territory in between.

The North Central Fire Protection District has 39 full-time safety personnel. This includes four chief officers, a captain assigned to the Fire Prevention Division, a captain assigned to the

Training Division, and 33 line personnel. North Central Fire District also has 30 paid-call firefighters (volunteer) who carry pagers and respond directly to incidents, using their own vehicles.

The North Central Fire Protection District has five stations: Station Number 1 in Kerman; Station Number 3 in Biola; and Station Numbers 4, 5, and 6 in Fresno. Table 5-18 lists the address and equipment of each station.

The North Central Fire Protection District's average response time to emergency calls is three to four minutes within the commercial and residential areas of the district. In the rural areas along the outer boundaries, the Fire District averages an eight to ten minute response time. The North Central Fire District's ISO rating for the residential areas is 5, and the ISO rating for the rural areas ranges from 6 to 8.

TABLE 5-18		
NORTH CENTRAL FIRE PROTECTION DISTRICT		
Station Number	Address	Types of Equipment
1	15850 West Kearney Boulevard, Kerman, CA 93630	1 Fire Engine 1 60 foot Aerial Ladder 1 Medic/Ambulance 1 Reserve Engine
3	4555 North Biola, Biola, CA 93606	1 Fire Engine 1 Water Tender
4	806 South Garfield, Fresno, CA 93706	1 Fire Engine 1 Water Tender
5	7285 West Shields, Fresno, CA 93722	1 Fire Engine 1 Medic/Ambulance 2 Reserve Engines 1 Rescue Rig
7	1709 West Bullard, Fresno, CA 93711	1 Fire Engine 1 Medic/Ambulance

The North Central Protection Fire District consists of two divisions: Fire Division and Emergency Medical Services (EMS) Division.

The North Central Fire Protection District has indicated that for the type of residential and commercial structures within their district, staff and equipment to handle their typical responses are adequate. The District also has mutual and instant aid agreements with adjoining fire departments.

The Fire District has no plans to hire new staff as of January 1997, but based on the growth of residential developments and commercial properties within the district, the staffing needs are constantly evaluated to determine if hiring is necessary.

The North Central Fire Protection District has no plans for station expansions at this time. However, growth within the district is monitored to determine if fire stations are adequately located and staffed to meet the public's demand for emergency services.

Orange Cove County Fire Protection District

The Orange Cove County Fire Protection District (Fire District), stationed at 550 Center Street in Orange Cove, serves a 22.5 square mile area of southeast Fresno County, including the city of Orange Cove.

The Orange Cove County Fire Protection District is comprised of 26 volunteer firefighters and two full-time firefighters. The Fire District uses the following equipment: one four-wheel drive command vehicle, one four-wheel drive rescue vehicle, one Type 2 structure engine, two Type 2 structure and mobile attack engines, one three-axle water tender (2,500 gallon capacity), and one four-wheel drive brush attack vehicle.

The Orange Cove County Fire District's average response time to emergency calls is two to three minutes within the city of Orange Cove and three to five minutes in the rural areas of the Fire District's region. The Fire District's ISO rating is 5 within the city of Orange Cove, and 8 in the rural areas.

Bald Mountain Fire Protection District

The Bald Mountain Fire Protection District (District) is a volunteer fire department located at 41967 Auberry Road, in Auberry. The District consists of a 14 square mile area, and a sphere of influence of 74 square miles, in northeast Fresno County.

The District currently has 16 volunteer firefighters. The District uses the following equipment: one 1985 Ford Bronco 4x4 Command Vehicle, one 1965 Ford Van Pelt (1,000 gallon per minute (g.p.m.) pumper), one 1975 A.M.G. 6x6 water tender (2,500 gallon tank; 750 g.p.m. pump), one 1975 Chevrolet truck 4x4 (250 gallon tank; 85 g.p.m. pump), and one 1980 Dodge van 4x4; Medical Squad.

The District's average response time to emergency calls is three minutes or less. The District has a ISO rating of 7.

California Department of Forestry

The California Department of Forestry and Fire Protection (CDF) is a state resource agency vested with fire protection responsibilities on wildlands that have been designated as State Responsibility Area (SRA). Within Fresno County, CDF is represented by the Fresno/Kings Ranger Unit which is headquartered at 210 S. Academy, Sanger, CA 93657. In addition to meeting the state goal of wildland protection, CDF contracts with a variety of other agencies within Fresno County for fire protection services. These range from full service, such as those provided to the Fresno County Fire Protection District, to fire dispatch only agreements. However, residents in the area also operate their own fire departments.

SRA in Fresno County consists of 916,303 acres in 1,432 square miles of direct protection area. This SRA is divided into two widely separated geographical areas that generally encompass the eastern and western portions of Fresno County. Within a portion of the SRA and most of the remaining unincorporated area of Fresno County, CDF contracts to protect an additional 1,800,000 acres of local responsibility area.

CDF funded fire protection staffing varies depending on the time of the year. During the fire season period (June-October) CDF staffs 12 fire engines within Fresno County (See Table 5-19). These engines are staffed with a minimum of three personnel and are subject to statewide dispatch on a daily basis. CDF also funds two bulldozers and transport units, four fire crews (Miramonte Conservation Camp), one Air Tactical Unit and one Air Tanker (Fresno Air Attack Base).

During the non-fire season period, CDF is not funded for fire protection staffing. As a result, the County of Fresno has contracted for winter time fire protection at various locations. These include CDF fire stations located at Shaver Lake, Tollhouse, Hurley, Piedra, and Squaw Valley. This contract provides a minimum level of fire protection at a significantly reduced cost to the County. However, staffing on the CDF fire engines under this contract is only one person.

Within Fresno County, CDF directly funds 65 full-time safety employees and up to 80 seasonal employees. CDF's fire protection program is functionally consolidated with the Fresno County Fire Protection District and resources are shared, jointly funded, etc., creating efficiencies for both entities. This consolidated program is organized into three divisions and a Fire Prevention Bureau:

- 1) The Western Operations Division consists of four Battalions and the fleet maintenance program;
- 2) The Eastern Operations Division consists of three Battalions in the eastern foothills of Fresno County, the Miramonte Conservation Camp and the Fresno Air Tactical program; and
- 3) The third Division consists of the departments administrative functions.

The three divisions are supervised by the Deputy Chief and the Department Chief (both funded by CDF).

During 1996, CDF experienced a total of 304 wildland fires with SRA in Fresno County. A total of 36,974 acres were consumed in these fires. Major incidents included early spring fires on the west side of the county and the Trimmer fire in eastern Fresno County.

CDF manages a joint Fire Communications Facility at the Fresno Airport. This facility is co-located with the US Forest Service, Sierra National Forest. In addition, the Fresno County Fire Protection District contracts with CDF for fire dispatch services from this facility. In 1998, CDF dispatched 14,936 calls. Other fire protection entities also served from this center include the Bald Mountain Fire Protection District, Laton CSD, Riverdale PUD, City of Fowler, Orange Cove Fire Protection District, City of Parlier, City of Mendota, City of Huron, City of San Joaquin, CSA31 (Shaver Lake), Big Creek Volunteer Fire Company, Huntington Lake Volunteer Fire Company, Mountain Valley Volunteer Fire Company, and the Auberry Volunteer Fire Company.

TABLE 5-19

**CDF STATIONS AND STAFFING IN
Fresno County**

STATION	ADDRESS	EQUIPMENT
Millerton	4091 E. Millerton Road, Friant, CA 93626	1 Fire Engine
Hurley	25627 N. Auberry Road, Clovis, CA 93612	2 Fire Engines
Blasingame	23087 E. Tollhouse Road, Clovis, CA 93611	2 Fire Engines
Shaver Lake	41640 Dinkey Creek Road, Shaver Lake, CA 93664	1 Fire Engine
Squaw Valley	32515 E. Kings Canyon, Squaw Valley, CA 93646	2 Fire Engines
Piedra	6186 Elwood Road, Sanger, CA 93657	1 Fire Engine
Sand Creek	41998 Sand Creek Road, Squaw Valley, CA 93646	1 Fire Engine
Coalinga	P. O. Box 896, Coalinga, CA 93210	2 Fire Engines 1 Dozer Unit
Sanger	210 S. Academy, Sanger, CA 93657	1 Dozer Unit
Miramonte Camp	49039 Orchard Drive, Miramonte, CA 93616	4 Fire Crews (18 Personnel each)
Fresno Air Base	2307 N. Clovis, CA 93727	1 Air Tanker 1 Air Tac
Note: The above represents fire season staffing levels. Non fire season staffing would consist of one engine at Shaver Lake, Hurley, Blasingame, Piedra, and Squaw Valley as contracted by Fresno County.		

5.7 SCHOOLS

Public school services are provided throughout the county by 35 school districts. Of the 35 school districts, 16 are unified districts providing educational services for grades kindergarten through 12. The remaining 19 districts consist of 16 elementary school districts and three high school districts. Many districts have only one or two schools.

ELEMENTARY SCHOOL DISTRICTS - GRADES K-8

Alvina Elementary School District

Alvina Elementary School District is a one-school district serving the southern part of Fresno County. Alvina has a student enrollment of 157, with a maximum student capacity of 175 (grades K-8), for the 1996-1997 school year. The District has no plans for expansion. Graduates from Alvina Elementary generally attend Caruthers High School.

American Union Elementary School District

The American Union Elementary School District is a one-school district serving the southwest area of Fresno County. The District's 1996-1997 student enrollment is 435 students (grades K-8), with a maximum student capacity of 480. There are plans for modernizing the school, with more portables being brought in as needed. Graduates from American Union usually attend Washington Union High School.

Big Creek Elementary School District

Big Creek Elementary School District is a one-school district serving the northeast area of Fresno County. The District's 1996-1997 student enrollment is 103 (grades K-8), with a maximum student capacity of 180. There are no plans for expansion. Graduates from the Big Creek District generally attend Sierra High School.

Burrel Union Elementary School District

Burrel Union Elementary School District is a one-school district serving the northwest area of Fresno County. The District's 1996-1997 student enrollment is 120 (grades K-8), with a maximum capacity of 150 students. There are no expansion plans at this time. Graduates from the Burrel Union District generally attend Riverdale High School.

Caruthers Union Elementary School District

Caruthers Union Elementary School District is a one-school district serving the south central area of Fresno County. The District's 1996-1997 student enrollment is 835 (grades K-8). The District is at capacity. The District intends to expand by bringing in portable classrooms. Graduates from Caruthers Union generally attend Caruthers High School.

Clay Joint Elementary School District

Clay Joint Elementary School District is a one-school district serving the Kingsburg area south of the city of Fresno. The District's 1995-1996 student enrollment is 200 (grades K-8) with a maximum student capacity of 230. Graduates from Clay Elementary usually attend Kingsburg High School.

Kingsburg Joint Union School District

Kingsburg Joint Union Elementary School District is a four-school district serving the Kingsburg area. The District's 1996-1997 enrollment is 1,840, and is at maximum student capacity. Schools in the district are:

- Johnson (Rafer) Junior High (grades 7-8);
- Lincoln Elementary (grades 2-4);
- Roosevelt Elementary (grades 5-6); and
- Washington Elementary (grades K-1).

Monroe Elementary School District

Monroe Elementary School District is a one-school district serving the southern area of the city of Fresno. The District's 1996-1997 student enrollment is 199 (grades K-8), well below the maximum student capacity of 300. Students graduating from Monroe Elementary generally attend Caruthers High School.

Orange Center Elementary School District

Orange Center Elementary School District is a one-school district serving the southern area of Fresno County. The District's 1996-1997 student enrollment is 344, with a maximum student capacity of 500. The District currently has no plans for expansion. Students graduating from the Orange Center District generally attend Washington High School.

Pacific Union Elementary School District

Pacific Union Elementary School District is a one-school district serving the southwest area of Fresno County. The District's 1996-1997 student enrollment is 502 and is at maximum student capacity. The District uses seven portables to accommodate increasing enrollment, but has no further plans for expansion. Students graduating from the Pacific Union district generally attend Washington Union High School.

Pine Ridge Elementary School District

Pine Ridge Elementary School District is a one-school district serving the northeast region of Fresno County. With 1996-1997 student enrollment of 120 (grades K-8), below the District's maximum student capacity. The District has no plans for expansion at this time. Graduating students from Pine Ridge Elementary generally attend Sierra Unified High School.

Raisin City Elementary School District

The Raisin City Elementary School District is a one-school district located southwest of the City of Fresno. The District's 1996-1997 student enrollment is 282, with a maximum student capacity of 320. The District's expansion plans include bringing in portables as needed. Students graduating from Raisin City Elementary generally attend Caruthers Union High School.

Washington Colony Elementary School District

Washington Colony Elementary School District is a one-school district serving the south area of Fresno County. The District's 1996-1997 student enrollment of 510 (grades K-8) is at maximum capacity. However, the District does not plan to expand at this time. Graduates from the Washington Colony district generally attend Washington Union High School.

West Fresno Elementary School District

The West Fresno Elementary School District has two schools serving the West Fresno area. The District's 1996-1997 student enrollment is 965, with a maximum student capacity of

approximately 1,000 students. The District's expansion plans include bringing in portables as needed. The District's two schools are:

- West Fresno Elementary (grades K-5), and
- West Fresno Middle School (grades 6-8).

Students graduating from West Fresno Middle School generally attend Edison High School, or Washington Union High School.

West Park Elementary School District

West Park Elementary School District serves the southwest area of Fresno County with two schools. The District's 1996-1997 student enrollment is 406, well below existing capacity of 750. The District's schools are:

- West Park Charter Academy (grades K-8), and
- West Park Elementary (grades K-8).

Students graduating from the Westpark Elementary School District generally attend Washington Union High School.

Westside Elementary School District

Westside Elementary School District, a one-school district, serves the southwest area of Fresno County. The District's 1996-1997 student enrollment is 500 (grades K-8), only half of maximum capacity (1,000). The District has no expansion plans. Students graduating from Westside Elementary generally attend Riverdale High School.

HIGH SCHOOL DISTRICTS

Caruthers Union High School

Caruthers Union High School, with two schools, serves the southern region of Fresno County. The District's 1996-1997 student enrollment is 520, and is near the maximum student capacity. The District intends to expand by bringing in portables as needed.

Kingsburg Joint Union High School

The Kingsburg Joint Union High School serves the south central area of Fresno County. The District's two schools have a 1996-1997 student enrollment of 960, and is at maximum student capacity. The District is trying to pass bonds to fund future classroom expansions.

Washington Union High School

The Washington Union High School District has two schools and serves the southwest region of Fresno County. The District's 1996-1997 student enrollment is 874, with a maximum student capacity of approximately 1,200. The District has no current expansion plans.

UNIFIED SCHOOL DISTRICTS

Unified school districts have elementary, intermediate and high schools. The unified school districts in Fresno County are described below.

Central Unified School District

The Central Unified School District serves the northwest region of Fresno County. The District, which has grown by an average of eight percent per year since 1991, has 13 schools with a 1996-1997 total student enrollment of 9,080. Eight of the District's 13 schools operate on multi-track year-round schedules, resulting in a maximum student capacity of 9,771. The District currently has one school under construction, Lidell (Norman) Elementary, which will serve 840 grades K-6 students on a year-round schedule. Other expansion plans include construction of a new middle school in 1999 and a new elementary school in 1999 or 2000. The Central Unified schools are:

- Biola-Pershing Elementary (grades K-8),
- Central High School, East and West Campuses (grades 9-12),
- Central Unified Alternative (grades K-12),
- El Captain Elementary (grades 7-8),
- Herndon-Barstow Elementary (grades K-8),
- Houghton-Kearney Elementary (grades K-8),
- Madison Elementary (grades K-8),
- McKinley Elementary (grades K-6),
- Pershing High (continuation) (grades 7-12),
- Roosevelt Elementary (grades K-6),
- Saroyan (William) Elementary (grades K-6),
- Steinbeck (John) Elementary (grades K-8), and
- Teague Elementary (grades K-6).

Clovis Unified School District

With 32 schools, the Clovis Unified School District is the second largest district in Fresno County. The schools are listed in Table 5-22. The District's 1996-1997 student enrollment is 30,627 students and has increased an average of over 1,200 students per year during the past five years. The maximum design capacity of permanent District facilities is 25,085. With the inclusion of portable classrooms, which are considered to be a temporary measure to alleviate overcrowding and accommodate class size reduction, the District has a student loading capacity of 31,455. Construction has begun on the intermediate school and an elementary school. The intermediate school is scheduled to open in 1999, the high school is planned to be constructed by the year 2000, and the elementary probably will not be constructed until 2003-2005. The District will be building a new elementary school in the central Clovis area, possibly by 1999, to alleviate over-capacity conditions in central area schools. The District's schools are listed below.

- Alta Sierra Intermediate (7-8)
- Buchanan High (9-12)
- Cedarwood (K-6)

- Clark Intermediate (7-8)
- Clovis High (9-12)
- Clovis Primary (K-3)
- Clovis West High (9-12)
- Cole Elementary (K-6)
- Copper Hill (K-6)
- Cox Elementary (K-6)
- Dry Creek Elementary (K-6)
- Enterprise Alternative (1-12)
- Fancher Creek Elementary (K-6)
- Fort Washington Elementary (K-6)
- Garfield Elementary (K-6)
- Gateway High (Continuation) (6-12)
- Gettysburg Elementary (K-6)
- Jefferson Elementary (K-6)
- Kastner Intermediate (7-8)
- Liberty Elementary (K-6)
- Lincoln Elementary (K-6)
- Maple Creek Elementary (K-6)
- Miramonte Elementary (K-6)
- Mountain View Elementary (K-6)
- Nelson Elementary (K-6)
- Pinedale Elementary (K-6)
- Red Bank Elementary (K-6)
- Sierra Vista Elementary (K-6)
- Tarpey Elementary (K-6)
- Temperance-Kutner Elementary (K-6)
- Valley Oak Elementary (K-6)
- Weldon Elementary (K-6)

Coalinga-Huron Joint Unified

The Coalinga-Huron Joint Unified School District is a nine-school district that serves the Coalinga-Huron region. The District's 1996-1997 student enrollment is 4,101, with a maximum student capacity of 4,474 (including portables). The District plans to obtain funding to construct two middle schools in the Coalinga-Huron region through a bond measure.

The District is comprised of nine schools:

- Bishop (Henry F.) Elementary (grades K-4),
- Cambridge High (Cont.) (grades 9-12),
- Cheney (Annie E.) Kindergarten (grade K),
- Chestnut High (Continuation) (grades 9-12),
- Coalinga High (grades 9-12),
- Coalinga Middle (grades 7-8),

- Dawson (Nell) Elementary (grades 2-4),
- Huron Elementary (grades K-6), and
- Sunset Elementary (grades 4-6).

Firebaugh-Las Deltas Unified School District

The Firebaugh-Las Deltas Unified School District serves the western region of Fresno County. The District's five schools have a 1996-1997 student enrollment of 2,137. Enrollment student capacity is 1,806. The District's expansion plans include a new elementary school to be constructed in 1999. Funding would be provided by a bond measure. The District's schools are:

- Bailey (Hazel M.) Primary (grades K-2),
- El Puente High (continuation) (grades 9-12),
- Firebaugh High (grades 9-12),
- Firebaugh Middle (grades 6-8), and
- Mills (Arthur E.) Intermediate (grades 3-5).

Fowler Unified School District

The Fowler Unified School District is a five-school district that serves the south central region of Fresno County. The District's 1996-1997 student enrollment is 2,121, with a maximum student capacity of 1,850. The District plans to expand by building a new middle school to be completed in August 1998. The District's schools are:

- Casa Blanca Continuation (grades 9-12),
- Fowler High (grades 9-12),
- Fremont Middle (grades 5-8),
- Malaga Elementary (grades K-8), and
- Marshall Elementary (grades K-4).

Fresno Unified School District

The Fresno Unified School District is the largest in the county, with 89 schools serving the central Fresno County area. The District's 1996-1997 student enrollment is 78,110. The District is substantially over capacity at the elementary level, at capacity at the middle school level, and approximately 2,000 students over capacity at the high school level.

The District's expansion plans include the construction of three schools at each level. The high school construction will begin in June 1997, and will be completed in September 1999. Middle school construction will also begin in June 1997, but will be completed in December 1999. The elementary school construction will begin during the 1998-1999 school year. The District schools are listed below in Table 5-20.

<p>TABLE 5-20</p> <p>LISTING OF SCHOOLS</p> <p>Fresno Unified School District</p> <p>School Year 1996/97</p>	
Schools	Grade Levels
Addams Elementary	K-6
Ahwahnee Middle	7-8
Anthony (Susan B.) Elementary	K-6
Ayer Elementary	K-6
Aynesworth Elementary	K-6
Baird Elementary	1-6
Balderas (Ezekiel) Elementary	K-6
Bethune Elementary	K-6
Birney Elementary	K-6
Bullard Continuation	NA
Bullard High	9-12
Bullard Talent Project	K-8
Burroughs Elementary	K-6
Calwa Elementary	K-6
Cambridge Continuation High	9-12
Carver Elementary	K-8
Centennial Elementary	K-6
Columbia Elementary	K-6
Cooper Middle	7-8
Dailey Elementary	K-6
Del Mar Elementary	K-6
Dewolf Continuation High	7-12
Duncan (Erma) Polytechnical High	9-12
Easterby Elementary	K-6
Eaton Elementary	K-6
Edison Computech	7-8
Edison High	9-12
Ericson Elementary	K-6
Ewing Elementary	K-6
Fig Garden Elementary	K-6
Forkner Elementary	K-6
Fort Miller Middle	7-8
Fremont Elementary	K-6
Fresno Continuation High	K-12

<p>TABLE 5-20</p> <p>LISTING OF SCHOOLS</p> <p>Fresno Unified School District</p> <p>School Year 1996/97</p>	
Schools	Grade Levels
Fresno High	9-12
Fulton Special Education	7-12
Gibson Elementary	K-6
Heaton Elementary	K-6
Herbert Hoover High	9-12
Hidalgo (Miguel) Elementary	K-6
Holland Elementary	K-6
Homan Elementary	K-6
Jackson Elementary	K-6
Jefferson Elementary	K-6
King Elementary	K-6
Kings Canyon Middle	7-8
Kirk Elementary	K-6
Kisling Center (Special Education)	3-12
Kratt Elementary	K-6
Lane Elementary	K-6
Lawless Elementary	K-8
Leavenworth (Ann B.) Elementary	K-6
Lincoln Elementary	K-6
Lowell Elementary	K-6
Malloch Elementary	K-6
Manchester Gate	2-6
Mayfair Elementary	K-6
McCardle Elementary	K-6
McLane High	9-12
Muir Elementary	K-6
Norseman Elementary	K-6
Powers-Ginsburg Elementary	K-6
Pyle Elementary	K-6
Robinson Elementary	K-6
Roeding Elementary	K-6
Roosevelt Continuation	9-12
Roosevelt High	9-12
Rowell Elementary	K-6

<p>TABLE 5-20</p> <p>LISTING OF SCHOOLS</p> <p>Fresno Unified School District</p> <p>School Year 1996/97</p>	
Schools	Grade Levels
Scandinavian Middle	7-8
Sequoia Middle	7-8
Slater Elementary	K-6
Southeast Middle	7-8
Starr Elementary	K-6
Storey (Edith B.) Elementary	K-6
Sunset Elementary	K-6
Tehipite Middle	7-8
Tenaya Middle	7-8
Thomas Elementary	K-6
Tioga Middle	7-8
Turner Elementary	K-6
Viking Elementary	K-6
Vinland Elementary	K-6
Wawona Middle	7-8
Webster Elementary	K-6
Wilson Elementary	K-6
Winchell Elementary	K-6
Wishon Elementary	K-6
Wolters Elementary	K-6
Yosemite Middle	7-8
Source: Fresno County Board of Education, 1997.	

Golden Plains Unified School District

The Golden Plains Unified School District is a six-school district that serves the southwest region of Fresno County. The District's 1996-1997 student enrollment is 1,900, with a maximum student capacity of 2,444. The District is currently (1997) studying expansion. The District's schools are:

- Cantua Elementary (grades K-8),
- Helm Elementary (grades K-8),
- Rio Del Rey High (continuation) (grades 9-11),
- San Joaquin Elementary (grades K-8),
- Tranquility Elementary (grades K-8), and
- Tranquility High (grades 9-12).

Kerman Unified School District

The Kerman Unified School District is a five-school district serving the Kerman region west of the City of Fresno. The District's 1996-1997 student enrollment is 3,556 students, with a maximum student capacity of 2,723. The District has expansion plans which include constructing a new elementary school, expanding Kerman Middle School and Kerman High School. The District's schools are:

- Kerman High (grades 9-12),
- Kerman Middle (grades 7-8),
- Kerman-Floyd Elementary (grades K-8),
- Nova High (continuation) (grades 7-11), and
- Sun Empire Elementary (grades K-6).

Kings Canyon Joint Unified School District

The Kings Canyon Unified School District is a 16-school district serving the southeast area of Fresno County. The District's 1996-1997 student enrollment is 8,200 and is at maximum student capacity. The District has expansion plans which include 20 modular units by August 1997. The District's schools are:

- Alta Elementary (grades K-8),
- Citrus Middle (grades 6-8),
- Dunlap Elementary (grades K-8),
- General Grant Middle (grades 7-8),
- Great Western Elementary (grades K-6),
- Jefferson Elementary (grades K-6),
- Kings Canyon Continuation (grades 9-12),
- Lincoln Elementary (grades K-6),
- McCord Elementary (grades K-5),
- Miramonte Elementary (grades K-6),
- Mountain View (grades 2-8),
- Navelencia Middle (grades 7-8),
- Reedley High (grades 9-12),
- Riverview Elementary (grades K-8),
- Sheridan Elementary (grades K-5), and
- Washington Elementary (grades K-6).

Laton Unified School District

The Laton Unified School District is a four-school district serving the Laton area of Fresno County. The District's 1996-1997 student enrollment is 845, with a maximum student capacity of 1,050 (as of 1994). The District has no expansion plans. The District's schools are:

- Conejo Middle (grades 6-8),
- Laton Elementary (grades K-5),
- Laton High (grades 9-12), and
- Oak View High (continuation) (grades 9-12).

Mendota Unified School District

The Mendota Unified School District is a five-school district that serves the Mendota area in the western region of Fresno County. The District's 1996-1997 student enrollment is 1,999, and is not near its maximum student capacity. The District's schools are:

- McCabe Elementary (grades 3-6),
- McCabe Junior High (grades 7-8),
- Mendota Continuation High (grades 10-12),
- Mendota High (grades 9-12), and
- Washington Elementary (grades K-3).

Parlier Unified School District

The Parlier Unified School District, which serves the Parlier area southeast of the city of Fresno, has five schools. The District's 1996-1997 student enrollment is 2,700, well over the enrollment capacity of 2,000. The district has expansion plans to construct a new middle school, with a completion date of September 1998. The District's schools are:

- Brletic (Mathew J.) Elementary (grades 4-6),
- Chavez (Caesar E.) Elementary (grades K-3),
- Martinez (John C.) Junior High (grades 7-8),
- Parlier High (grades 9-12), and
- San Joaquin Valley High (continuation; grades 5-12).

Riverdale Joint Unified School District

The Riverdale Joint Unified School District is a four-school district in the southern area of Fresno County. The District's 1996-1997 student enrollment is 1,410. Maximum student capacity is 1,710. The District is acquiring portables and constructing classrooms at Fipps Primary to accommodate over-enrollment. The District's schools are:

- Fipps Primary (grades K-3),
- Horizon Continuation High (grades 10-12),
- Riverdale Elementary (grades 4-8), and
- Riverdale High (grades 9-12).

Sanger Unified School District

The Sanger Unified School District has 14 schools in the Sanger area east of the city of Fresno. The District's 1996-1997 student enrollment is 8,300, slightly over the maximum student capacity of 8,200. The District has plans to build a new high school expected by August of 1999. The District's schools are:

- Centerville Elementary (grades K-8),
- Del Rey Elementary (grades K-8),
- Fairmont Elementary (grades K-8),

- Jackson Elementary (grades K-6),
- Jefferson Elementary (grades K-6),
- Kings River High (continuation)(grades 7-12),
- Lincoln Elementary (grades K-6),
- Lone Star Elementary (grades K-8),
- Madison Elementary (grades K-6),
- Sanger High (grades 9-12),
- Taft High (native) (grades K-8),
- Wash (John S.) Elementary (grades K-6),
- Washington Academic Middle (grades 7-8), and
- Wilson Elementary (grades K-6).

Selma Unified School District

The Selma Unified School District serves the Selma region southeast of the city of Fresno. With 11 schools, the District has a 1996-1997 student enrollment of 5,151. Maximum student capacity is 5,100. The District plans on acquiring portables on an as needed basis. The District's schools are:

- Garfield (James) Elementary (grades K-6),
- Heartland High (continuation) (grades 7-12),
- Indianola Elementary (grades K-6),
- Jackson (Andrew) Elementary (grades K-6),
- Lincoln (Abraham) Elementary (grades 7-8),
- Roosevelt Elementary (grades K-6),
- Selma High (grades 9-12),
- Terry Elementary (grades K-6),
- Washington (George) Elementary (grades K-1),
- White (Eric) Elementary (grades 2-6), and
- Wilson (Woodrow) Elementary (grades K-6).

Sierra Unified School District

The Sierra Unified School District is an eight-school district serving the Auberry region in the northeastern area of Fresno County. The District's 1996-1997 student enrollment is 2,250, and is near the maximum student capacity, except the newly constructed Foothill Middle School which has a maximum student capacity of 1,500, and currently has 500 students enrolled. The District is in the process of reconstructing buildings at Sierra High School, but does not have plans for expansion. The District's schools include:

- Auberry Elementary (grades K-5),
- Balch Camp Elementary (grades 1-7),
- Foothill Middle (grades 6-8),
- Lodge Pole Elementary (Alternative) (grades 1-8),
- Pole Corral Elementary (grades K-6),
- Sandy Bluffs Educational Center (continuation.) (grades 9-12),
- Sierra Elementary (grades K-5), and
- Sierra High (grades 9-12).

5.8 SOLID WASTE AND HAZARDOUS WASTE COLLECTION AND DISPOSAL

SOLID WASTE FACILITIES

Fresno County operates two active solid waste disposal facilities, or landfills: the American Avenue Landfill and the Coalinga Landfill. These landfills serve 6,000 square miles, with a population of 760,900 people. The county of Fresno generated 130,120 tons of solid waste between the third quarter of 1995 and the third quarter of 1996. The average solid waste generation rates for residential, commercial, and industrial land uses are as follows:

- Residential (.39)
- Commercial (.23)
- Industrial (.34)

Portions of the unincorporated areas of the county use the Clovis Landfill and the Orange Avenue Landfill. Only a small portion of the unincorporated county's solid waste is taken to these facilities, as the Clovis Landfill serves mainly the city of Clovis, and the Orange Avenue Landfill serves mainly the city of Fresno.

American Avenue Landfill

The American Avenue Landfill is located at 18950 West American Avenue, in Kermen. The American Avenue Landfill is a Class III Landfill, and will only accept standard municipal waste. The landfill has a total capacity of 41.1 million cubic yards and handles on average 1,700 tons per day. As of January 1997, the landfill is at eight percent of capacity with a life expectancy of approximately 32-40 years.

The American Avenue Landfill is undergoing expansion plans consisting of three phases. Phase I includes the 30-acre landfill at the current site, which will continue to accept waste as the landfill expands. Phase II is being constructed and used. The Phase II expansion plan calls for constructing eight modules around the existing landfill, and is scheduled to be completed in year 2002. Module 4 is completed, with modules 5 through 8 to be constructed. Phase III consists of constructing modules 9 through 20, with module 9 being completed in year 2006.

Coalinga Landfill

The Coalinga Landfill is located at 30825 Lost Hills Road in Coalinga. The Coalinga Landfill has a capacity of 3,348,262 cubic yards, with 37 to 38 tons per day of solid waste disposed there. The landfill has a life expectancy of approximately 40 years, and there are no expansion plans at this time (January 1997).

Recycling Programs

The American Avenue Landfill has an oil recycling program, a triple-rinse pesticide container recycling program, and a greenwaste recovery program. The County sponsors a countywide recycling education program through schools and public contact. The County has also

established a Recycling Market Development Zone for businesses that use recyclable goods, and has a used oil recycling program with centers throughout the county.

Household Hazardous Waste Facilities

Household hazardous wastes such as paint, waste motor oil, non-commercial pesticides, aerosols, wood preservatives, and solvents are disposed of through a County-sponsored program. In 1996, the County contracted with the Laidlaw-Greenfield Company, which provided three temporary collection sites twice during the year for household hazardous wastes. The wastes were recycled or disposed of outside Fresno County.

In 1996, 750 people participated in the program and 44,686 pounds of household hazardous waste were collected.

5.9 OTHER PUBLIC UTILITIES

ELECTRICAL SERVICES

The Southern California Edison Company serves the northeast area of Fresno County in the communities of Shaver Lake and Big Creek where the company has generating facilities. The company has no problems serving their customers and does not anticipate future problems serving the communities.

The Pacific Gas and Electricity Company (PG&E) is meeting their customers' electrical demands in the county, and will have the resources to meet their customers' demands in the future.

Natural Gas and Electricity Services

Pacific Gas & Electricity (PG&E) provides gas and electric service to the majority of Fresno County, including the majority of the San Joaquin Valley and the foothills. The communities of Shaver Lake and Big Creek are served by Southern California Edison. Electrical facilities include both overhead and underground lines. Both utilities indicate that additional service should be available to new development, depending on the necessary load, voltage and services requested. However, increasing demands on the existing electrical system due to continued and cumulative development in Fresno County are a source of concern for PG&E. Fees are charged for extending and connecting new service.

Telephone Services

The county has four telephone companies: Pacific Bell, Ponderosa Telephone Company, General Telephone Company (GTE), and Kerman Telephone Company.

The Pacific Bell Telephone Company (Pac Bell) has approximately 350,000 customers within Fresno County.

The Ponderosa Telephone Company serves the northern areas of Fresno County including the towns of Auberry, Shaver, Big Creek, Huntington, and the southern half of Friant. The company has approximately 5,000 customers.

The General Telephone Company (GTE) serves the Sanger, San Joaquin, Tranquility, Reedley, Pine Flat, and Squaw Valley areas of Fresno County.

The Kerman Telephone Company serves the town of Kerman, with 5,324 customers.

5.10 OTHER SOCIAL SERVICES

GENERAL SERVICES

The Fresno County Department of Social Services had a client population totaling 220,284 as of December 1995. The client population includes recipients of Aid to Families with Dependent Children (AFDC), Non-Assistance Food Stamps, General Relief and a small number of other welfare recipients (419). In 1995, 28 percent of Fresno County's 764,810 residents received some sort of County aid, compared with the statewide average of 13 percent of California's 32.3 million residents.

The County's Social Service client profile consists of 43.4 percent adults (95,603), and 56.6 percent children (124,681). The most common adult age is 18 years old, and the most common language of the clients is English (157,283, or 71.4 percent), with Spanish the second most common language (38,990, or 17.7 percent).

The County had 123,635 AFDC clients in 1995. Of these, 35,779 (28.9 percent) were adults, and 87,856 (71.1 percent) were children. The most common age was 18 years old, and the most common level of education was a high school graduate at 8,152 (22.9 percent).

Non-assistance food stamps were provided to 34,350 clients in 1995. Of these, 19,648 (57.2 percent) were adults, and 14,702 (42.8 percent) were children. The most common adult age was 34 years old. The most common monthly food stamp allotment was \$119.

For General Relief in 1995, the total number of clients was 1,293. Of these, 1,196 (92.5 percent) were adults, and 97 (7.5 percent) were children. The average number of people per case was 1.5, and the most common monthly food stamp allowance was \$202.

In 1995, the County provided medical services to 202,130 people, including 36.9 percent adults (74,515) and 63.1 percent children (127,615). Over \$147 million of Medical Services were provided from July 1995 through December 1995.

Fresno County Social Services is able to meet client demand for assistance, and does not foresee problems in the future meeting their client's needs.

LIBRARY SERVICES

The Fresno County Public Library System is comprised of interdependent branches providing services to all residents. Branches are grouped by services, geography and usage patterns to provide efficient and economical services to the residents of the county. At present there are two regional libraries, five branch libraries, 19 neighborhood libraries, six station libraries (satellite libraries with less books, and operating hours than the branch libraries), one corrections library, the Central Library (which is the main county library and the largest), and

one Bookmobile. Together, these libraries house a total of 858,278 books. Figure 5-1 shows the locations of the libraries in Fresno County.

Library hours range from seven hours per week at the Laton Library to 55 hours per week at the Central Library. Seating capacities range from zero at the Miramonte Station Library to 261 at the Central Library. Total square footage at the various libraries range from 39 square feet at the Miramonte Station Library to 82,716 square feet at the Central Library.

According to library staff and comments by the Friends of the Fresno County Public Library, the Fresno County libraries level of service are not adequate for the county's population. The libraries are open approximately one-half the hours that are considered adequate, and the budget is approximately one-third the amount desired by Library Administration. These facilities are inadequate as reflected in the *Facilities Long Range Plan* adopted by the County Board of Supervisors in 1990.

The Coalinga Library District is comprised of the District Library in Coalinga and the Huron Branch Library in Huron. The library collection includes approximately 70,600 volumes, periodicals, and nonbook materials such as cassette books, videos, microfilm, and compact discs. The Coalinga Library is open five days a week for 47 hours and, the Huron branch is open five days a week for 41 hours.

COUNTY COURTS

The Fresno County Courts system is composed of the main Courthouse, three other Courthouses located in the City of Fresno, and 13 branch facilities located throughout the County.

The County Courts organized a Facilities Committee to identify methods of improving service to the public, evaluate the efficient and effective utilization of available space, improve appearance of the Courthouse, develop preliminary plans for growth and expansion, and conduct needs assessment for the Courthouse and branch facilities.

The Facilities Committee has identified a crucial need for additional judgeships and courtrooms. Based on estimated population growth, by the year 2000, the County Courts will need ten additional judgeships and a corresponding number of support staff (court clerks, court reporters, interpreters, and clerical staff), and additional courtrooms to maintain current service levels.

The County Courts is having difficulty maintaining efficient levels of service because of staff reductions.

AMBULANCE SERVICES

Fresno County is served by six ambulance services or agencies: American, which serves the Fresno/Clovis areas; Coalinga, which serves the Coalinga area; Selma, which serves the Selma area; Sanger, which serves the Sanger area; Sequoia Safety Council, which serves the Reedley area; and Kingsburg, which serves the Kingsburg region. Most fire protection districts provide

paramedic or emergency medical response. This services is critical, especially for children and the elderly.

The service population for the various agencies ranges from 20,000 in the Kingsburg region to 450,000 in the Fresno/Clovis area. The average response time for emergency calls ranges from five minutes in the Sanger area to eight minutes in the Fresno/Clovis area. The average number of runs per day varies from three in the Kingsburg area to 185 in the Fresno/Clovis area.

Fresno County Department of Health does not have concerns or problems providing service to Fresno County. As the County's population grows, the Department of Health Services does not anticipate problems providing adequate service to the County residents.

5.11 FINDINGS

- The Arroyo Pasajero stream system (including Los Gatos, Warthan, Jacalitos, and Zapato-Chino Creeks) carries large flows and poses imminent flooding problems in and around the communities of Coalinga and Huron.
- Creeks draining western Fresno County pose flooding and sediment deposition problems for the California Aqueduct and I-5, but as the area is sparsely populated, pose little threat to life and personal property. State and federal agencies are studying appropriate solutions.
- The storm drainage and flood control systems for incorporated areas within Fresno County range from simple systems composed of storm drain inlets, storm drains, and ponding basins to complex systems composed of storm drain inlets, storm drains, ponding basins, pump stations, open ditches/canals, and levees.
- Much of the downstream reach of the San Joaquin River is confined by levees and incapable of containing large storm flows. Breached levees are a significant flooding concern during storm events.
- Kings River water can be diverted through a series of sloughs and canals to irrigation districts and water users throughout the Kings River Service Area. The flood control facilities include many miles of levees in central Fresno County. This enables the river to carry very large flows without flooding. Such diversion requires coordination with multiple agencies across broad geographic areas.
- The North Fork of the Kings River (also known as Fresno Slough and James Bypass) is normally dry, but flows from the Kings River to Mendota Pool on the San Joaquin River during storm events. In very large storm events, excess Kings River Water is diverted to the Tulare Lakebed.
- The Redbank-Fancher Creek Flood Control Project, together with the Big Dry Creek Dam and Reservoir, completes a Fresno-Clovis area flood control effort designed to protect the metropolitan area from flood damages of a 200-year storm.
- Each incorporated area operates its own storm drainage and flood control system, except Fresno and Clovis. The Fresno Metropolitan Flood Control District operates and manages the storm drainage and flood control systems for the cities of Fresno and Clovis.
- Local governments and special assessment districts own and operate the collection systems and treatment plants.
- Wastewater collection, treatment and disposal is regulated by the Regional Board. Regional Board objectives include increased reclamation of wastewater treatment plant effluent (agricultural irrigation) and consolidation of small systems to benefit from economies of scale.
- Over 70 percent of treated wastewater in the county is domestic type waste with significant seasonal waste from food processing industries.

- The communities of Firebaugh, Fresno-Clovis, and Sanger typically experience wastewater flows at or exceeding current design capacity of their facilities. Efforts are currently underway in each of these cities to upgrade facilities to accommodate anticipated flows. Other cities in the county generally have adequate capacity for the foreseeable future. Treatment facilities in communities in slower growing areas typically have ample capacity for anticipated growth.
- The major concerns facing the Fresno County Sheriff's Department include lack of bed space at the county jails, increase in number of calls without commensurate increase in patrol staff, and not enough patrol vehicles.
- Currently, all Fire Districts serving Fresno County report that they can accommodate current demand in their districts.
- Many of the county's school districts are facing overcrowding and space limitation problems. In schools where this is a concern, portable classrooms have been acquired or plans for expansion are in progress. However, overcrowding and space limitations may continue to be a problem in many districts due to rapid enrollment growth and the uncertainty of funding for school facilities.
- The landfills used by the county currently have adequate space to handle existing demand. The American Avenue Landfill is undergoing module expansion to increase the life expectancy of that landfill.
- Fresno County Department of Social Services is adequately serving its clients, and does not expect problems servicing its clients in the future. The Fresno County Department of Health Services is adequately serving the county and does not anticipate problems in the future.
- The Fresno County Library system's service hours and operating budget are considered inadequate by the community and library staff.
- The Fresno County Court system has experienced reduction in staffing, making efficient service to the county difficult. With the anticipated growth in population, the County Courts has identified the need for additional judgeships, support personnel, and courtrooms.

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5.14 GLOSSARY

Acre-feet (acre-ft) - 43,560 cubic feet of water. The amount of water required to cover one acre of land to a depth of one foot.

Alluvial Fan - The fan shaped area created by a stream as it changes from a channelized stream to overland flow. The characteristic fan shape is created by the deposition of sediments as the water slows and spreads over a large area.

Biosolids drying bed - A constructed shallow pond or "lagoon" which receives biosolids slurry. The liquid evaporates or drains off and the biosolids dry. The process can usually be repeated several times before it is necessary to remove the accumulated biosolids.

Biosolids - Solid material removed during the treatment process. Also referred to as solids, or sludge.

California Aqueduct - Also called the San Luis Canal. Jointly funded by federal and state sources, the California Aqueduct crosses through western Fresno County. It is managed by the California Department of Water Resources (DWR).

Canals - Lined or unlined open channels used to convey stormwater and/or irrigation water.

Capacity - Volume of flow for which a treatment facility has been designed. Also referred to as "design capacity". Actual flow through the facility may be more or less than the design capacity. However, flows exceeding the design capacity may not be treated as effectively as flows at or below design capacity. The capacity of natural streams and channels refers to the volume of flow that the channel is known or has been calculated to be able to contain without over-topping its banks. Normally, the capacity of a channel allows for flow volume plus freeboard.

Collection system - Also referred to as a sewer system. A pipe network, which may be gravity and/or pressurized, to collect wastewater and transport it to a central location for treatment and disposal.

Cone of Depression - A localized lowering of the groundwater table in response to well pumping rates exceeding the recharge rate of the groundwater basin.

Cubic Feet per Second (cfs) - Standard flow measurement denoting the number of cubic feet of water that passes a given point across the full cross section of the flow during a one second period.

Discharger - The occupant of a site from which wastewater is discharged. Generally refers to a discharge permit holder.

Domestic waste - The type of wastewater (sewage) that can be expected from residences.

Drainage Basin - A geographic area that includes all the area from which surface water and precipitation will drain to a common discharge point.

Drainage Ditches - Unlined or lined open channels used to collect and convey storm water.

Effluent - Treated flow leaving a treatment facility (generally no longer referred to as wastewater).

Endangered Species - Any species or sub-species whose survival is threatened with extinction.

Freeboard - An allowance between the estimated free water surface of a water body and the top of the wall, dam, or levee that contains it. The freeboard is calculated to allow for wave action, eddies and other anomalies and is generally on the order of 2-5 feet.

Groundwater Gradient - Groundwater moves by gravity from areas of higher elevation to areas of lower elevation in response to regional landforms or well pumpage, which may create localized areas of low groundwater elevation or depressions. The direction of groundwater flow is referred to as the gradient.

Groundwater Recharge - Water from precipitation, irrigation, or other sources that infiltrates the soil and percolates downward below the root zone to the groundwater reservoir.

Household Hazardous Wastes - Any unwanted or discarded materials that are disposed of at a separate waste facility and not disposed of at municipal solid waste facility because of their potentially toxic composition. These include, but are not limited to, paints, waste motor oil, non-commercial pesticides, aerosols, wood preservatives, and solvents.

Insurance Service Office (ISO) Rating - An ISO rating is based upon an evaluation by the Insurance Service Office which evaluates fire protection features for departments for purposes of establishing rates for insurance underwriters. ISO uses a rating system that is based on a scale of one to ten, with one being the best fire protection rating and ten being the worst. In order to determine an area's rating, the ISO uses a formula where the primary factors are the availability of both water and fire protection services in the area.

Industrial Waste - Process water discharged from industrial uses.

Inflow or Influent - Wastewater (sewage) flow entering a treatment facility.

Land Spreading - Application of dewatered biosolids to land as fertilizer.

Maximum Student Capacity - Refers to the maximum number of students that can attend a school based on available square footage and any plans to expand the size of existing structures or to build new structures.

Municipal Waste - Wastewater (sewage) flows from commercial and domestic types of waste.

Ponding Basin - A constructed waterbody designed to recharge groundwater and/or temporarily hold stormwater until it can percolate into the soil, evaporate, or be pumped out.

Precipitation - Includes any moisture falling from the atmosphere in liquid form as rain or drizzle, or in the frozen form as snow, sleet, or hail. Usually expressed as the measurable depth of water in a day, month or year.

Pump Stations - Facilities used to transport storm water from one area and convey it elsewhere. Pump stations may be used to move water from one pipe to another or to remove water from ponding basins.

Retention Basin - A reservoir constructed for flood control purposes to retain upstream flows which may or may not be released later at moderated flow.

Riparian Habitat - An area where a plant or animal lives on or adjacent to a water supply such as a riverbank, lake, or pond.

Runoff - Water that is removed from the soil by surface drainage or subsurface drainage.

Sediment - Soil and other suspended solids carried by a stream or overland flow and redeposited downstream.

Service Area - Geographic area in which a collection system is intended to serve.

Solid Waste - Unwanted or discarded material that is not a liquid or gas. Includes organic wastes, paper products, metals, glass, plastics, cloth, brick, rock, soil, leather, rubber, yard wastes, and wood, but does not include sewage and hazardous materials. Organic wastes and paper products comprise about 75 percent of typical urban solid waste.

Solid Waste Generation Rates - Generation rates used to determine the amount of solid waste in tons per year, generated by different land use types (residential, industrial and commercial).

Storage to Runoff Ratio - Relation of the storage capacity of a reservoir to the estimate volume of surface runoff expected to drain from a reservoir's drainage basin.

Storm Drain Inlets - Openings in storm drains, usually located in street gutters, through which water enters underground storm drain pipelines.

Storm Drains - Pipelines, usually located underground, used to convey stormwater from streets to a central collection system.

Stream System - Multiple streams that drain a common drainage basin and discharge into the same or an adjacent body of water.

Subsidence - The gradual vertical displacement (lowering) of a large portion of land due to long-term withdrawals of groundwater, oil or natural gas. Subsidence caused by groundwater withdrawal occurs where the groundwater basin is overdrafted and long-term recharge is inadequate to maintain the water table. Some areas of the Central Valley have subsided more than 20 feet over the past 50 years.

CHAPTER 6: RECREATION, HISTORICAL, AND ARCHEOLOGICAL RESOURCES



6.1 INTRODUCTION

This chapter reviews existing recreational, historical, and archaeological resources in Fresno County. Information on these resources is important in determining how they should be managed and preserved. This chapter includes information on parks and recreation facilities, facility design standards, and Park Division staffing levels. Background information is also provided on historical and cultural resources including the historical development of Fresno County, historical sites and structures, and the region's prehistory and archeological data.

Fresno County has a wide variety of recreational and cultural resources. The variety of recreational experiences in Fresno County is due to its rich history, cultural diversity, and natural environment.

6.2 PARKS AND RECREATION

PARK AND RECREATIONAL FACILITIES

Fresno County has a variety of recreational opportunities that are not only scenic and functional, but also involve significant natural resources. The county has several regional parks, in addition to state and national parks, national forest, wilderness areas, and ecological reserves.

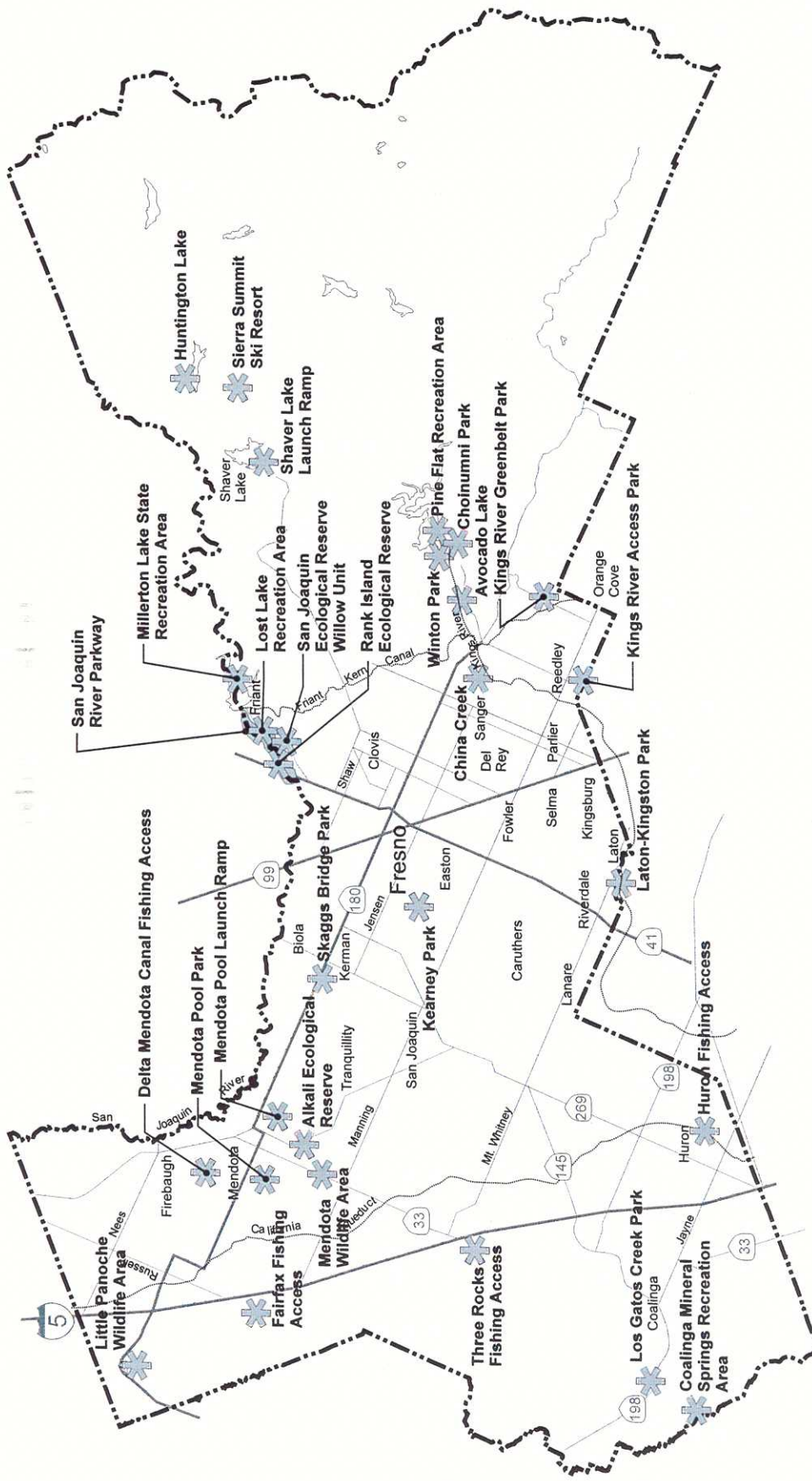
The primary responsibility of the Fresno County Parks Division is to provide, develop, and maintain regional parks and landscaped areas. Regional recreational facilities maintained by the division include 10 developed and three undeveloped park sites, five fishing access areas, and one boat launching ramp. These areas are used for a variety of activities, including: picnicking, fishing, hiking, jogging, bird watching, nature study, non-organized sports, barbeques, overnight camping, and other passive recreation. County parks include approximately 1,165 acres of parkland, approximately 800 acres of which is developed. Table 6-1 lists park and recreation facilities owned and maintained by Fresno County. Figure 6-1 shows the location of parks and recreation areas in the county.

Fresno County does not own or operate any public golf courses, nor does it provide or manage any organized sports, education, or special events or programs. County Parks Division staff is limited to park maintenance, with 13 full-time staff members, and 14 additional seasonal/summer employees.

TABLE 6-1

**PARKS AND RECREATIONAL FACILITIES
Fresno County
1997**

Park - Recreation Facility	Acres	Facilities	Location
1. Avocado Lake Park	210	<ul style="list-style-type: none"> Day use picnic areas Group reservation area Swimming & fishing 83-acre fishing lake 	23 miles east of Fresno via SR180 on Piedra Road
2. China Creek	120	Undeveloped park	16 miles east of Fresno via Hwy. 180
3. Choinumni Park	170	<ul style="list-style-type: none"> Day use area and picnic sites 75 overnight campsites 20 overflow campsites One group camping area Hiking trails Trailer dump station Playground area Fishing (nearby) 	33 miles east of Fresno on the Kings River
4. Coalinga Mineral Springs Recreation Area	35	<ul style="list-style-type: none"> Day use area Picnic sites and BBQs Overnight facilities BLM land access Hunting Hiking trails Restrooms 	18 miles west of Coalinga off SR-198 on Coalinga Mineral Springs Rd.
5. Fairfax Fishing Access	N/A	<ul style="list-style-type: none"> 12 miles of fishing access to CA Aqueduct Restrooms 	Fairfax Ave., Mendota on California Aqueduct
6. Huron Fishing Access	N/A	<ul style="list-style-type: none"> Fishing access to California Aqueduct 	3.5 miles north of Huron near Lassen Ave.
7. Kearney Park	225	<ul style="list-style-type: none"> Day use and picnic facilities Group reservation areas Soccer fields Horseshoe pits Softball fields Four playground areas Kearney Mansion historic building 	7 miles west of Fresno on Kearney Blvd.
8. Kings River Access Park	4.5	<ul style="list-style-type: none"> Undeveloped land 	17 miles east of Fresno on Hwy. 180 at Kings River crossing
9. Kings River Green Belt Park	139	<ul style="list-style-type: none"> Undeveloped land 	20 miles east of Fresno along Kings River
10. Laton-Kingston Park	22	<ul style="list-style-type: none"> Sheltered day use and picnic facilities Playground area Soccer fields 	25 miles southeast of Fresno on Fowler Avenue
11. Los Gatos Creek Park	35	<ul style="list-style-type: none"> Day use area Large group picnic area 44 campsites 17 overflow campsites Baseball field 	18 miles west of Coalinga on Los Gatos Creek Road
12. Lost Lake Recreation Area	305	<ul style="list-style-type: none"> Day use and picnic areas 70-acre nature study area 38-acre lake Fishing Hiking Bird watching 42 campsites Group areas Little league and softball field Playground 	19 miles north of Fresno below Friant Dam along San Joaquin River
13. Pine Flat Recreation Area	120	<ul style="list-style-type: none"> Five day use and picnic areas 52 campground sites 60 overflow campsites 	37 miles east of Fresno on Kings River, below Pine Flat Dam
14. Shaver Lake Launch Ramp	N/A	<ul style="list-style-type: none"> Two-lane boat launch ramp Parking lot - 100 boat trailer spaces 	50 miles northeast of Fresno on SR168
15. Skaggs Bridge Park	17	<ul style="list-style-type: none"> Day use and picnic areas Fishing Playgrounds 	Hwy. 145 on the San Joaquin River



Recreation Area

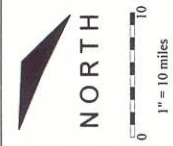


TABLE 6-1

PARKS AND RECREATIONAL FACILITIES
Fresno County
1997

Park - Recreation Facility	Acres	Facilities	Location
16. Three Rocks Fishing Access	N/A	• Fishing	50 miles west of Fresno on Clarkson Ave.
17. Winton Park	26	• Day use and picnic areas • Overflow campsites • Fishing	27 miles east of Fresno on the Kings River at intersection of Trimmer Springs and Piedra Roads
Total Park Acres	1,428.5		

In addition to county facilities, Fresno County benefits from many other significant recreational opportunities. The county also contains several State and Federal operated parks, forest lands, and recreational facilities associated with dams, reservoirs, and reserves. (Table 6-2 itemizes the non-County owned recreational facilities available to the citizens of Fresno County.) Many of these facilities are internationally recognized national park and wilderness areas, which draw from visitors nationally and internationally.

The cities in Fresno County also operate a range of recreational facilities. Most of these facilities serve neighborhoods or communities within incorporated city limits, but there are several that are regional in nature such as the Fresno Zoo in Roeding Park. Privately operated facilities are not included in the recreational facilities inventories, although several, including private golf facilities, are discussed.

San Joaquin River Parkway

One of Fresno County's greatest recreational opportunities is the San Joaquin River. The major recreational facilities along this river corridor include the Riverside Municipal Golf Course, the San Joaquin Country Club, the Fig Garden Golf Course, Woodward Park, Lost Lake Regional Park, and Bridge Regional Park. Opportunities for fishing are available at Lost Lake Regional Park and along the San Joaquin River just below Friant Dam. Other recreational amenities include a bike trail along Friant Road and local elementary school playgrounds which are open to public use after hours and on the weekends.

In 1990, the Governor and State Legislature recognized the unique qualities of this corridor by establishing a Task Force to advise in the formation of the San Joaquin River Parkway. (See Figure 6-1 for the location of the proposed parkway). The Task Force's duty is to oversee the formation a parkway plan that enhances recreational opportunities and balances the many land uses along the river, such as urban uses, wildlife habitat, mineral extraction, and agriculture.

**TABLE 6-2
OTHER RECREATIONAL FACILITIES
Fresno County
1997**

Sierra National Forest			
Campgrounds			
1. Camp Edison	14. Upper Kings	26. Portal Forebay	39. Lily Pad
2. Dorabelle	15. Sawmill Flat	27. College	40. Jackass Meadow
3. Swanson Meadow	16. Marmot Rock	28. Bosillo	41. Ward Lake Camp
4. Dinkey Creek	17. Wee Mee Kute	29. Vermillion	42. Fence Meadow
5. Britz	18. Trapper Springs	30. Mono Creek	43. Mono Hot Springs
6. Duff Creek	19. Voyager Rock	31. Island Park	44. Badger Flat
7. Billy Creek	20. Kirch Flat	32. Trimmer	45. Sample Meadow
8. Catavee	21. Black Rock	33. Big Creek	46. Kaiser Diggins
9. Deer Creek	22. Bear Wallow	34. Oak Flat	47. Wishon Village
10. Kinnikinick	23. Ross Crossing	35. Tenmile	48. Kirch Flat
11. Rancheria	24. Gigntea	36. Camp Sequoia YMCA	49. Lakeview
12. Kokanee (group)	25. Buck Meadow	37. Kokanee	50. W.Kaiser
13. Midge Creek			
Wilderness Areas			Ski Resort
51. Ansel Adams	53. Monarch	55. John Muir	56. Sierra Summit
52. Kaiser	54. Jernie Lakes		
Sequoia National Forest			
Campgrounds			
57. Camp No. 4	60. Mill Flat Creek	62. Hume Lake	64. Aspen Meadow
58. Camp No. 4½	61. Landslide	63. Princess	65. Logger Flat
59. Green Cabin			
Kings Canyon National Park			
Campgrounds			
66. Sentinel	67. Canyon View	68. Sheep Creek	69. Moraine
California State Park			
70. Millerton Lake Recreation Area/Campgrounds			
U.S. Army Corps of Engineers			
Campgrounds		Dams/Reservoirs	
71. Island Park	73. Deer Creek Point	74. Mendota	76. Pine Flat
72. Sycamore Flat 1 & 2		75. Little Panoche Detention Reservoir	
Boat Launching Ramps			
77. Deer Creek	78. Trimmer	79. Island Park	80. Lakeview
California Department of Fish and Game Reserves/Natural Areas			
81. Little Panoche Wildlife Area	82. Alkali Sink Ecological Reserve	83. Mendota Wildlife Area	84. Kerman Ecological Reserve
85. Willow Unit Ecological Reserve		86. Rank Island Ecological Reserve	
Southern California Edison Dams			
87. Shaver	88. Huntington	89. Florence	90. Edison

PARK DESIGN STANDARDS

In 1963, the County established park standards in the *Fresno County Recreation and Park Plan*, which is also incorporated into the *Fresno County General Plan, Parks and Recreation Element*. (The Plan suggests four recreation zones.) Using the California Outdoor Recreation Plan as a guide, each zone identifies different types of recreation activities to be included in each zone. The zones and uses are as follows:

Zone 1. The recreation facilities in Zone 1 are those close to the user and include playgrounds, city parks, zoos, and pools. They receive intensive "day-use" during weekends and after work hours and are generally man-made areas. In Fresno County these areas are normally the responsibility of cities, service, or recreation districts.

Zone 2. The recreation areas in Zone 2 are outside the community or urban areas but within an hour's (40 miles) drive and accessible for one day (usually weekend) outings. The areas should have natural attractions for picnicking, camping and a "natural" environment. Its service is regional or area-wide rather than being aimed at a community or single urban area.

Zone 3. Zone 3 includes exceptional recreation resources, such as those within the national forest parks, serving overnight visitors from 125 + miles distance for weekend or longer vacation stays.

Zone 4. An area extending beyond Zone 3, for vacation trips of 10 nights or longer.

The majority of the park and recreational facilities under County jurisdiction provide services for Zone 2 users: such as, picnicking, boating and water sports, swimming, hiking, camping, and general sports. Park standards for Zone 2 Recreation Facilities are shown in Table 6-3.

Although State and Federal public lands accommodate demand for activities oriented to dispersed natural resources, Fresno County provides limited acreage to meet the demand for neighborhood, community, and regional parks. The *Fresno County General Plan Parks and Recreation Element* does not include a standard for the number of park acres or facilities per person required in Zone 2. At present, the unincorporated areas of Fresno County have a population of approximately 174,200 persons (California State Dept. of Finance, Population Estimates, File: E-4, 1996). The County Parks Department reports that the unincorporated areas currently have approximately 1,165 acres of parkland.

TABLE 6-3

PARK DEVELOPMENT STANDARDS FOR ZONE 2
Fresno County
1997

Activity	Type	Development ^{1,2}	Parking Spaces
Camping	Family, tent or trailer	Net 4 units per acre; Gross 3 units per acre	1 per unit
Swimming	Shoreline	25 feet per 150 people per day	—
Boating	Trailered and non-trailered	50 boats per each 160 surface acres of water, 1 launching facility per 50 boats	1 per boat
Picnicking	Family outside community	Net 8 units per acre; Gross 4 units per acre	1 per unit
	Group	25 units per acre	50 per 25 units
	Wayside	16 units per acre (minimum 4 per location)	1 per unit, plus overflow for non-picnickers
Golf	18-hole	120 acres including auxiliary facilities	200
	9-hole	60 acres including auxiliary facilities	100

Source: *Fresno County Recreation Parks and Plan*, 1963.

¹Net units per acre: number of units per actual used area. One family, 3.5 persons, per unit.

²Gross units per acre: allows for parking open space, buffer strips, sanitation facilities and the like.

The 1990 *Park and Open Space Standards and Guidelines*, published by the National Recreation and Park Association (NRPA) provides suggested facility design standards as guidelines that can be adapted to local needs. It suggests park standards and a ratio of park space to population. The NRPA recognizes that parkland standards and needs vary widely for different communities, and that the NRPA design standards are only suggestions. Actual facility size and standards should be based on current survey data and parks and recreation needs assessment. The NRPA design standards are shown in Table 6-4. Zone 2 park use criteria are most similar to the Community Park use criteria, described in Section A (Local/Close-To-Home Space) of Table 6-4.

Therefore, based on 1,428 acres of unincorporated area parkland serving a population of 174,200, the ratio of parkland and facilities to population for unincorporated Fresno County is approximately 8.2 acres per 1,000 population. The NRPA recommended design standards suggest approximately 5-8 acres per 1,000 population for Community Parks.

It should be recognized that although cities are generally responsible for the provision and maintenance of municipal parks, county residents may use their facilities. For instance, the City of Fresno provides approximately 430 acres of regional park land and the Chaffee Zoological Gardens. These facilities and perhaps other municipal facilities in other cities expand the amount of park land available for use by county residents. It is also recognized that city residents use county park facilities, thus expanding the amount of park land available for their use. In addition, county and city residents have a significant amount of state and national forest land available to them for recreational purposes within Fresno County.

TABLE 6-4

NATIONAL RECREATION & PARKS ASSOCIATION RECOMMENDED PARKLAND DESIGN STANDARDS

Component	Use	Service Area	Desirable Size (acre)	Acres per 1,000 Population	Desirable Site Characteristics
A. LOCAL/CLOSE-TO-HOME SPACE					
Minipark	Specialized facilities that serve a concentrated or limited population or specific group, such as teens or senior citizens	Less than ¼-mile radius	1 or less	0.25-0.5	Within neighborhoods and in close proximity to apartment complexes, townhouse developments, or housing for the elderly
Neighborhood park/playground	Area for intense recreational activities, such as field games, court games, crafts, playground apparatus, skating, picnicking, wading pools	¼ to ½-mile radius to serve a population up to 5,000 (per neighborhood)	15+	1.0-2.0	Suited for intense development; easily accessible to neighborhood population; geographically centered, with safe walking and bike access; may be developed as a school-park facility
Community park	Area of diverse environmental quality; may include areas suited for intense recreational facilities, such as athletic complexes, large swimming pools; may be an area of natural quality for outdoor recreation, such as walking, viewing, sitting, or picnicking; may be any combination of the above, depending on site suitability and community need	Several neighborhoods; 1- to 2 mile radius	25+	5.0-8.0	May include natural features, such as water bodies, and areas suited for intense development; easily accessible to neighborhood served
Total Close-to-Home = 6.25-10.5 acres per 1,000 population					
B. REGIONAL SPACE					
Regional/metropolitan park	Area of natural or ornamental quality for outdoor recreation, such as picnicking, boating, fishing, swimming, camping, and trail uses; may include play areas	Several communities; 1 hour driving time	200+	5.0-10.1	Contiguous to or encompassing natural resources
Regional park reserve	Area of natural quality for nature-oriented outdoor recreation, such as viewing and studying nature, wildlife habitat, conservation, swimming, picnicking, hiking, fishing, boating, camping, and trail uses; may include active play areas; generally, 80% of the land is reserved for conservation and natural resource management, with less than 20% used for recreation development	Several communities; 1 hour driving time	1,000+; sufficient area to encompass the resource to be preserved or managed	Variable	Rivers or unique natural resources, such as lakes, streams, marshes, flora, fauna, topography
Source: National Recreation and Park Association 1983.					
Total regional space = 15-20 acres per 1,000 population					

6.3 ARCHAEOLOGICAL RESOURCES

The prehistory of indigenous cultures that once occupied the Fresno County area are known to have included many Native American tribe, including but not limited to, the Mono, Yokut, Chukchansi, Choinumi, Wachumni, and Wahtokes. The federal government created *rancherias* near the turn of the 20th century. Local tribes have centered themselves in and near the *rancherias* since then. There are three *rancherias* in Fresno County including, Big Sandy, Table Mountain, and Cold Springs.

Records indicate that most tribes in the area lived in the foothill territories near rivers and streams, and other wildlife resources, since there are archeological sites in these areas. Development in the county has brought with it exploration of Native American archeological resources. Thus, discussion of the exact location of these resources is not provided since it might have the effect of further impacting the ability to protect and preserve these resources.

6.4 HISTORIC AND CULTURAL RESOURCES

SUMMARY OF FRESNO COUNTY HISTORY

Fresno County has an interesting and colorful past that includes Native American, Spanish, Mexican, and American period historic sites and cultural resources. Many archeological and historical sites and resources have been identified and evaluated, and are available for study and enjoyment by county resident and visitors.

The Fresno County area of the San Joaquin Valley was once a vast undisturbed land, located between the forested Sierra Nevada and the Coastal Range. The expansive valley grassland once supported an abundance of wildlife such as antelope, black-tailed deer, and jack rabbits. The grasslands had meandering rivers and creeks which provided life support for riparian habitats and extensive marshes. As noted above, records indicate that at least five Native American tribes resided in the area, living primarily near rivers and streams.

The first European explorers visited the region in 1776 under Juan de Anza, Captain of the Tubac, who traveled inland from Sonoma to Monterey and named the San Joaquin River. The area remained relatively unsettled by Europeans during the Spanish period until the 1820s and the Mexican period, which lasted until 1845.

The Gold Rush stimulated settlement and the development of new towns in Fresno County. Miners migrated south from the Columbia-Sonora goldfields in search of gold in places in the Sierra named Hildrath and Grub Gulch. Eventually, many miners settled on the valley floor and established a garrison named Rootville, to protect them from the Native Americans already living in the region. The Garrison also attracted non-mining settlers who in 1866 established a town later named Millerton, with the area's first courthouse. Millerton was eventually renamed the city of Fresno. Fresno County was established in 1851.

During the late 19th century, the Fresno area gained recognition as a refuge for cattle when it was used for cattle grazing during cattle drives between Texas and "old Mexico" to Stockton. Cattle ranching activities led to the settlements of Centerville, Kingston, Laton, and Kings River. Miller and Lux cattle ranch and the James cattle ranches were also established at this time. Along with grazing and sheep raising farming, wheat cultivation grew during the late 1860s, and quickly became the Valley's dominant industry.

The development of transportation and public works infrastructure contributed to rapid growth in the valley during the late 19th century. The Central Pacific Railroad was established in the San Joaquin Valley in 1872. During this same period the idea of transporting water via irrigation canals gained interest from several progressive farmers and land speculators. Prominent figures who ushered in the development of irrigation canals for crop growing were: W.S. Chapman; Harvey Akers; M.J. Church; A.Y. Easterby; and F. Roeding. The realization of widely developed irrigation canals was a turning point for growth and development in Fresno County. The Fresno Canal and Irrigation Company was a primary force in developing the new irrigation canals. It supplied irrigation water diverted from Kings River.

From 1880 to 1890, the new infrastructure permitted Fresno County to grow from 926 farms to 2,352 farms. The early farmers harvested primarily raisin grapes, fruit trees, and alfalfa. At this time, farmers lived in settlements called colonies (geographical settlement areas). At the time these settlement areas were described as follows: "They are not colonies in the sense of their being any commitment of financial interests. Each man owns and works his own land. There are a number of colonies, laid off in 20-acre lots, each provided with a perpetual water right. The three most important are, in order of age: the Central, containing six sections of land; the Washington, with eleven; and the Fresno with four." (California Homes and Industries, Fresno Illustrations, p.20).

HISTORICAL AND CULTURAL RESOURCES

Fresno County's rich history has produced a large stock of historically significant homes, public buildings, and landmarks. There are many historical buildings in the unincorporated area of the County and in the incorporated cities, 193 structures listed in the *Index of Historic Properties in Fresno County*. Twenty-one sites are listed in the index of the *National Register of Historic Places*. Fresno County hosts seven California State Historic Landmarks.

The California Department of Parks and Recreation, Office of Historic Preservation, has documented 16 ethnic historical sites in the publication, *Five Views: An Ethnic Historic Site Survey for California*. The ethnic historical sites include: four Black American sites; 10 Japanese American sites; and two Mexican American sites. The California Department of Parks and Recreation also identified 12 points of historical interest in Fresno County.

Appendix 6A of this Section lists: the *Index of Historic Properties in Fresno County*; index of the *National Register of Historic Places*; seven California State Historic Landmarks; 16 ethnic historical sites; a list of historic walking and driving tours for the Fresno County area, and a list entitled the *Fresno County Centennial Farms Inventory*.

There are 13 museums in Fresno County, most of which are located in the city of Fresno. They are all privately owned and operated, non-profit organizations. Fresno County provides funding support to several of the museums. Table 6-5 lists museums in Fresno County. There are 12 county branch libraries distributed throughout the county, in addition to library and reference resources available at the Henry Madden Library, California State University, Fresno City & County Historical Society, and Fresno City Community College Library.

TABLE 6-5 FRESNO COUNTY MUSEUMS Fresno County 1997	
Museum	Location
African-American Museum	Fresno
Centro Bellas Artes	Fresno
Clovis-Big Creek Historical Museum	Clovis
Discovery Center	Fresno
Forestiere Underground Gardens	Fresno
Fresno Arts Center and Museum	Fresno
Fresno Metropolitan Museum	Fresno
German Museum	Fresno
Kearney Mansion Museum	Fresno
Meux Home Museum	Fresno
R.C. Baker Memorial Museum	Coalinga
Reedley Museum	Reedley
Sanger Depot Museum	Sanger

6.5 FINDINGS

- The County Parks Division maintains 20 regional recreation facilities including: 10 developed and three undeveloped parks; five fishing access areas; and one boat launching ramp. These areas are used for a variety of activities, such as: picnicking; fishing; hiking; jogging; bird watching; nature study; non-organized sports; barbeques; overnight camping; and other passive recreation activities.
- County parks include approximately 1,165 acres of parkland including approximately 800 developed acres. County Parks Division staff has 13 full-time park maintenance employees and 14 seasonal summer employees.
- County parks are aimed at providing services primarily for "Zone 2" park users including: picnicking; boating and water sports; swimming; camping; general sports such as tot lots, baseball fields, horseshoe pits, tennis, soccer, etc.; hiking; and sightseeing.
- The *County Parks and Recreation Element* of the General Plan does not establish standard criteria for the ratio of park facilities and park size to population. The ratio of population in unincorporated Fresno County to regional parks is approximately 8.2 acres to 1,000 population. This is comparable to the standards established by the National Recreation and Park Association park and open space standards and guidelines (1990) which recommend 5-8 acres to 1,000 population.
- Native Americans of the Fresno area are known to have included many Native American tribes, including but not limited to, the Mono, Yokut, Chukchansi, Choinumi, Wachumni, and Wahtokes. There are three remaining rancherias or reservations, and at least 7,119 Native Americans residing in Fresno County.
- Growth and development of Fresno County was established in various periods of history. The following represents a linear picture of the major historical, cultural, and economic influences in Fresno County: Native Americans; Spanish exploration; Mexican settlement; miners; cattle ranchers; sheep ranchers; wheat farms; railroad development; installation of irrigation canals; and raisin grapes and fruit tree crops.
- Fresno County was established in 1851. As a result of the establishment of the Central Pacific Railroad line through the San Joaquin Valley in 1872, Fresno County experienced a rapid growth rate between 1870 and 1910. This growth spurred development of agriculture and resulted in a large number of historical public buildings and homes still remaining. Many of the structures are on the Local and National Historical Registers.
- Fresno County has 13 museums and 12 County branch libraries. There are 193 structures listed in the Index of Historic Properties in Fresno County; 21 properties on the National Register of Historic Places; 16 ethnic historical sites; seven California Historical Landmarks; and 12 point of Historical interest in Fresno County.

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Baldwin, Adele, Southern San Joaquin Valley Information Center, California State University,
Bakersfield

Janiel, Charlie, Parks and Grounds Superintendent, Parks Division, Fresno County

Kallenberg, John, Librarian, Fresno County Library

McGraw, Adrienne, Fresno County Historical Society

6.8 GLOSSARY

Archeological - Relating to the material remains of past human life, culture, or activities.

Historic; Historical - An historic building or site that is noteworthy for its significance in local, state, or national history or culture because of its architecture or design, or its works of art, memorabilia, or artifacts; historical refers to noteworthy resources or resources.

Parks - Open space lands for the primary purpose of recreation.

Recreation, Active - Recreation or activity that requires the use of organized play areas including, but not limited to softball, baseball, football and soccer fields; tennis and basketball courts; and various forms of children's play equipment.

Recreation, Passive - Recreation or activity that does not require the use of organized play areas.

APPENDIX 6A

HISTORIC RESOURCES

APPENDIX 6-A HISTORIC RESOURCES

NATIONAL REGISTER OF HISTORIC PLACES

- Knapp Cabin
- Maubridge Apartment
- Neux House
- Old Administration Building, Fresno City College
- Old Fresno Water Tower
- Orange Cove Santa Fe Railway Depot
- Pantages, Alexander, Theater
- Physicians Building
- Reedley National Bank
- Reedley Opera House Complex
- Y.W.C.A. Building
- Rehorn House
- Remain, Frank, House
- Santa Fe Hotel
- Santa Fe Passenger Depot
- Shorty Lovelace Historic District
- Southern Pacific Passenger Depot
- Stoner House
- Tower Theatre
- Twining Laboratories
- Warehouse Row

CALIFORNIA HISTORIC LANDMARKS

- Arroyo De Cantua (No. 344)
- Site of the First Junior College in California (No. 803)
- Site of the Fresno Free Speech Fight of the Industrial Workers of the World (No. 873)
- Temporary Detention Camps for Japanese Americans; Fresno & Pinedale Assembly Centers (No. 934)
- Fort Miller (No. 584)
- Forestiere Underground Gardens (No. 916)
- Fresno City (No. 488)

HISTORIC PROPERTIES IN FRESNO COUNTY

- | | |
|---|--|
| Academy | Bank of Italy (Fresno) |
| Alamo/ Helm House | Bank of Italy (Reedley) |
| Alexander Home | Barkdale Home |
| American Self Storage (denied by city) | Old <u>Barn</u> "M" Street |
| Anderson Home | Barton Opera House (non extant) |
| Arioto, Thomas; Home | Basque Hotel |
| Armenian Presbyterian Church (demolished) | Bauder Home |
| Arroyo De Cantua | Bean Home |
| Aten Residence | Beeler/Thorton Shop (denied by City) |
| Back (Beck) Home | Bekins Van & Storage |
| Baker Valley Historic District | Bernhauer House |
| Bank of America Building | Berry Home |
| Berven Rug Mills | Brix Home |
| Besaw Home | Brix Apartments (removed from city list) |
| Bethel Lutheran Church | Boole Tree |
| Bing Kong Tong Asso. Building | Bow On Ton Asso. Building |
| Long/ <u>Black</u> Home | Booker House |
| Black Market (denied by city) | Burks, Drs.; Home |
| Bonsel / Rush / Hunt Home (relocated) | Caldwell Home |

HISTORIC PROPERTIES IN FRESNO COUNTY (continued)

California Products Company
 Camp Barbour Blockhouse
 Campbell's Store
 Carnegie Library
 Central Packaging / Supply
 Centennial Stump
 Old Clovis Courthouse
 Grant Tree / Nations Christmas Tree
 City Fire Alarm Station
 Clements Service Station
 Clovis Carnegie Library
 Old Clovis Courthouse
 Cobb Home
 Clovis Cole Home
 Collins Residence
 Converse Basin Grove
 Converse Hoist Site
 Cowdrey Home
 Craycroft Home
 Fig Garden Women's Club
 City Fire Alarm Station
 Firebaugh's Ferry
 First Church of Christian Science
 First Congressional Church
 First Mexican Baptist Church
 First Presbyterian Church (proposed)
 First Store, James Pager 1872
 First United Methodist Church (proposed)
 Forestiere Underground Gardens
 Forkner Home

 Fort Miller Blockhouse
 Fort Miller Site
 Fort Washington Site
 Forthcamp Home
 Fowler's Switch
 Frankenau Home (proposed)
 Free Speech Fight Site
 Fresno Trolley Cars
 Old Fresno Water Tower
 Water Works Assoc.
 First Store in Fresno
 Gamlin Cabin

 Gerlitz Home
 Gerner Home
 Gibbs Home

Cardwell Home
 Carlson Home
 Carmel Saddlery
 Centerville
 Chicago Stump
 Chorbajian Home (demolished)
 Davidson Home
 Frank Dusy Home Site
 Einstein Home
 El Camino Viejo
 Elkhorn Springs
 Eules Home (denied by city)
 Evinger Home
 Ewing Home (denied by city)
 Eymann, A.C. Home
 Eymann, J.J. Home
 First Fresno Store
 Farr Residence
 Fassett Home (demolished)
 Freemont, John C.; Kearney Park
 Fresno Bee Building
 Fresno Brewery Company
 Fresno Buddhist Temple
 Fresno City College Library
 Fresno Fire Alarm Station
 Fresno City Hall
 Fresno Copper Mine
 Fresno County Seat
 Fresno County Hall of Records
 Fresno Irrigation District / Moses J.
 Church
 Fresno Junior College
 Fresno Memorial Auditorium
 Fresno Planning Mill
 Fresno Republican / Print Building
 Old Fresno Unified School Building
 Fresno Temple Church of God
 Fresno Traction Company
 Giffen Home (denied by city)
 Gilbert Residence (denied by city)
 Goodman Residence
 Graff Home
 Grant Tree / Nations Christmas
 Tree
 Grant House
 Green Bush Spring Plaque
 Gregory Home

HISTORIC PROPERTIES IN FRESNO COUNTY (continued)

Griffen Home; Blackstone Ave
 Groundwater Irrigation Plaque
 Guarantee Savings Building
 Hanger Home
 Hansen, Jens; House
 Hare, Drs., Home
 Hayhurst Home
 Hays Home
 Helm Building
 Hero Home
 Hewitt Residence
 Hines Home
 Hines Home; Blackstone Ave
 Hobbs Parsons Produce Co.
 Holt Lumber Company
 Holy Trinity Armenian Apostolic Church
 Hoover Residence
 Hotel California
 Johnson Home
 Johnson, N.M., Home
 Kearney Mansion
 Kern Kay Hotel
 Kindler, Paul House
 Kingsburg Railroad Depot
 Kutner Home
 Laguna de Tache Land Office (burned)
 Laton Library Building
 Letcher
 Long / Black Home
 Main Post Office
 Yost & Webb Mortuary/Martin
 Masonic Hall
 Maubridge Apartments
 McCollum Home
 McIndoo / Phillips Home
 Meux Home, Museum
 Mill Ditch
 Millerton Site
 Mink Home
 Mundroff Home
 Nestel Home
 Newman Home
 Ohannesian Home
 Okamoto's Dept. Store
 Old Administration Building
 Old Clovis Courthouse
 Old Fresno Unified School

Gundelfinger, Louis, Home
 Gundelfinger, Herbert, Home
 Gundelfinger, Henry, Home
 Hansen House
 Liberty Theatre / Hardys
 Hotel Fresno
 Hotel Virginia
 Howard, Dr. Oliver, Home
 Hughes Home
 Hume Lake Dam
 Hunt / Bonsel Home (relocated)
 Huntington / Douglas Stump
 Ingmire, Ovid; Home
 I.O.O.F. Hall
 Jamieson Home
 Japanese American Detention Site
 Jensen Home
 Johnson Home; Illinois Ave
 Leslie House
 Kearney Boulevard
 Kerman Union High School
 King Solomon Lodge
 Kings River Irrigation Plaque
 Knapp Cabin; Cedar Grove
 La Libertad
 Pueblo de las Juntas
 Legler Residence
 Liberty Theatre / Hardys
 Main Home
 Maracci, Joseph, Home
 Mason Building
 Mattei Building
 McAlpine Home
 McKay Home
 Twin Sisters / McVey Home
 Meux, John, Home (burned)
 Miller Home
 Millwood Site
 Mosgrove Home
 National Warehouse
 Neverman Home
 Nye, Judge, Home
 Oil City
 Okonogi Home
 Old Barn "M" Street
 Old Fresno City Site
 Old Fresno Water Tower

HISTORIC PROPERTIES IN FRESNO COUNTY (continued)

Orangedale Odd Fellow's Lodge 211 (proposed)	Owen Home
P.G.&E. Building	Prescott, F.K. Home
Pantages, Alexander; Theater	Parret Home
Patterson, T.W., Building	Pattison House
Peden Home	J.C. Penny Store
Peterson Home	Phelan, James, Building
McIndoo / Phillips Home	Physicians Building
Pinedale Elementary Plaque	Pine Flat Dam Plaque
Pollasky Railroad	Poole's Ferry
Porteous Home	Posa de China Site
Post Office; Tulare	Post Office Substation; Inyo
Prescott, F.K. Home	
Pueblo de las Juntas	Rainbow Ballroom
Radin-Kamp Dept. Store	Ramona Apartments (demolished)
Railroad Anniversary Plaque; 100 Anniversary	Reedley Opera House
Reedley National Bank	Reyburn Home
Rehorn Residence	Riverview Ranch House
Rheingans Home	Robinson Home
Roessler Home	Roessler Winery
Romain Home	Rowell Building
Rowell Home	Rustigan Building
Rutherford Home (not extant)	Saddler Office Supply
San Joaquin Grocers Wholesale	San Joaquin Valley Coal Mine
San Joaquin Valley Railroad	Sanger Depot Museum
Sanger Lodge #316 (proposed)	Sanger Womens Club
Santa Fe Depot, Fresno	Santa Fe Depot; Orange Cove
Santa Fe Motel	Saroyan Home; El Monte Way
Saroyan Home; Griffith Way	Schmidt Home
Schutz Residence (non extant)	Scottish Rite Temple
Scottsburg Site	Security Bank Building
Selma Flouring Mill	Sharer Home
Selma, Townsite	Shipp Home
Shorty Lovelace Hist. District	Shuttera Home
Solorio Residence	Southern Pacific Depot
Spencer Home	Squaw Leap Archeological Dit.
Old St. Agnes Hospital	St. Alphonsus Catholic Church
St. Ansgar's Lutheran Church	St. Genevieve's Catholic
St. John's Cathedral	St. John's Hall School
St. John's Rectory	St. Paul's Armenian Church
Staley House	Station "A" Postal Service
Steinwand Home	Stone Home
Stoner House	Sun Maid Raisin Growers (demolished)
Sun Stereo Warehouse	Swedish Methodist Church
Swift Home	Sycamore Bend
Teilman Home	Temple Beth Israel
Theatre 3	Thomas, Montgomery; Home

HISTORIC PROPERTIES IN FRESNO COUNTY (continued)

Thompson Residence
 Tollhouse Grade
 Tranquility Site
 Turner Building
 Twin Sisters / McVey House
 Forestiere Underground Gardens
 Van Volkenburgh Home
 Vincent Home; San Pablo Ave
 Warehouse Row
 Warehouse Row Storehouse
 Old Fresno Water Tower
 Weems House
 Wilson Theater Building
 Wishon, A.G.; Home
 Woolfolk Home
 Yost & Webb Mortuary
 Zacky Farm Grain Elevator

ETHNIC HISTORIC SITES

Burr Ranch / Smith Brothers Ranch (Black American)
 Gabriel Moore Ranch (Black American)
 First Mexican Baptist Church (Mexican American)
 Fresno Nihonmachi (Japanese American)
 Iseki Labor Camp (Japanese American)
 Nihin Byoin-Hashiba Sanitarium (Japanese American)
 Reedley Kyogi-Kai Hall (Japanese American)
 Selma Japanese Mission Church (Japanese American)

CENTENNIAL FARMS

The Harlan Ranch
 The Charles B. Drake Ranch
 The Richard W. And Barbara J. Milton Farm
 The Levis Ranch

POINT OF HISTORICAL INTEREST

Millwood Townsite
 Coaling Station A
 Tollhouse
 Fowlers Switch
 Brix Mansion
 Former Einstein Home

Tinkler Mission Chapel
 Towne Apartments
 Traveler's Hotel
 Turpin Home
 Twining Laboratories
 Van Ness Gate
 Vartanian Home
 Vincent Home
 Warehouse Row Packing
 Warnor's/Pantages Theater
 Webb House
 Welsh Home
 Wishon Home
 Wishon, A.G.; Home, Fulton St
 Y.W.C.A. Residence Hall
 Young Home
 Zellerbach Paper Co.

Fowler City Park (Black American)
 Young's Place (Black American)
 Fresno Buddhist Church (Japanese American)
 H. Sumida Company (Japanese American)
 Kamikawa Brothers (Japanese American)
 Okonogi Hospital Site (Japanese American)
 Bowles (Japanese American)
 KGST (Mexican American)

The Schultz Ranch, Inc.
 The Missouri Hill Ranch
 The Reese Davis Ranch

M. Theo Kearney Park and Mansion
 Settlement of Academy
 Sycamore Point
 Meux Home
 Y.W.C.A. Residence
 Kingsburg Railroad Depot

NATIONAL REGISTER OF HISTORIC PLACES SITES IN FRESNO DRIVING TOUR

This tour visits all National Register of Historic Places sites in Fresno. Total distance is about 15 miles.

The tour begins at the Fresno Brewing Company at 100 M Street (corner of M and Heaton). Since this building is located on the southern edge of downtown Fresno, most people will find it easiest to get there on Freeway 41 South. From the freeway, take the O Street exit. At the light, cross O Street and proceed southwest on Santa Clara Street. Turn left on M Street and go to the end of that street. The Fresno Brewing Company building is on the left. Free parking is available throughout the area.

Return in the opposite direction on M Street. Turn left on Los Angeles Street and right on Van Ness, crossing under the 41 Freeway. Turn right on Ventura Avenue. The Holy Trinity Armenian Apostolic Church is on the right at 2226 Ventura Avenue. Free parking is available on M street beyond the church.

Continue northeast on Ventura. Turn left on P Street. The Warehouse Row Buildings are on the right at 702-764 P Street. Free parking is available on side streets.

Turn left on Inyo Street, right on L Street and left on Kern Street. The Fresno Republican Printery (now the Downtown Club) is immediately on the left at 2130 Kern Street. Metered parking is available throughout the area.

Continue southwest on Kern Street. Turn right on Van Ness Avenue and left on Tulare Street. The Bank of Italy Building is on the right at the corner of Tulare Street and Fulton Mall (1101 Fulton Mall). There isn't any easy parking near this building, though there are a variety of lots and parking structures in the area.

Continue southwest on Tulare Street to the Southern Pacific Railroad Depot on the right at 1713 Tulare Street. Metered parking is available on Tulare Street.

Turn around and proceed northeast on Tulare Street to the Maubridge Apartment Building on the right at 2344 Tulare Street. Metered parking is available on side streets.

Continue northeast on Tulare Street. Turn right on Santa Fe Street. The Santa Fe Railroad Depot is to the left on the corner of Tulare and Santa Fe streets at 2650 Tulare. The Santa Fe Hotel is across the street at 935 Santa Fe Street. Metered parking is available.

Return northwest on Santa Fe Street to Tulare Street. Turn right on Tulare Street. The Meux Home is on the left at 1007 R Street. Turn left on R Street to reach a public parking lot just beyond the Meux Home.

Continue northwest on R Street. Turn right on Mariposa Street. The Rehorn Home is on the right at the corner of Mariposa and S streets (1050 S Street). Free parking is available on all streets in this area.

Turn left on S Street. The Brix Home is on the left at the corner of S and Fresno streets (2844 Fresno Street). Free parking is available on S Street.

Turn left on Fresno Street and cross the railroad tracks. The Physician's Building is on the right at 2607 Fresno Street. Metered parking is available in the area. The next three stops are within about one block of the Physician's Building, so you might want to leave your vehicle and walk to them.

Immediately across P Street is the Twining Laboratories, on the right at 2527 Fresno Street. Immediately across O Street is the Old Fresno Water Tower, on the left at 2444 Fresno Street. The Fresno Memorial Auditorium is across the street at 2424 Fresno Street.

Return to your vehicle and continue southwest on Fresno Street. Turn right on Van Ness. The Fresno Bee Building (now the Fresno Metropolitan Museum) is on the left at the corner of Calaveras Street and Van Ness Avenue (1555 Van Ness Avenue). Free parking is available on the left across Calaveras Street.

Turn left on Calaveras Street and left on Fulton Street. The Pantages (Warnor's) Theatre is on the left at 1400-1430 Fulton Street (the corner of Fulton and Tuolumne streets). Metered parking is available.

Turn left on Tuolumne Street, left on L Street, right on Calaveras Street, and left on M Street. The Einstein Home is on the right at 1600 M Street, immediately followed on the right by the Y.W.C.A. Residence Hall at 1660 M Street. Free parking is available.

Turn left on San Joaquin Street, immediately beyond the Y.W.C.A. Residence Hall. The Romain Home is on the right at the corner of Van Ness Avenue and San Joaquin (2055 San Joaquin). Free parking is available.

Proceed north on Van Ness Avenue. Continue on Van Ness for 1.1 miles. Turn left on Olive Avenue. The Tower Theatre is on the right at the corner of Wishon and Olive avenues (1201 N. Wishon). Free parking is available to the west and north of the theater.

Return east on Olive Avenue to the Kindler Home, on the right at 1520 E. Olive Avenue. Free parking is available on side streets.

Return west on Olive Avenue. Turn right on Van Ness Avenue, which becomes Maroa Avenue soon after it crosses McKinley Avenue. The Fresno City College Old Administration Building is to the right on the Fresno City College campus (1101 E. University Avenue). Free parking is available in this area, though it may be difficult to find if classes are in session.

You only have one more stop to go, but almost half the driving is yet to be done. There are two suggested routes to the next stop, one of them quick, the other scenic. Anyone bicycling this tour should take the scenic route, since the quick route involves several miles of freeway driving.

For the quick route, continue north on Maroa Avenue. Turn left on Clinton Avenue and proceed 2.1 miles to Highway 99. Take Highway 99 North 3.7 miles to the Shaw Avenue exit. Turn left on Shaw Avenue. The Forestiere Underground Gardens are on the right at 5021 W. Shaw Avenue.

For the scenic route, continue north on Maroa and turn left on Weldon Avenue shortly after the Administration Building. Turn right on Van Ness Avenue and drive 2.3 miles through Fresno's Old Fig Garden district. None of the buildings in this area are on the National Register, though several of them probably should be. Turn left on Rialto Avenue and right on Palm Avenue. At the light, turn left onto Shaw. The Forestiere Underground Gardens are on the left after 4.1 miles at 5021 W.

Shaw Avenue.

End of tour.

Guide to Historic Architecture in the West Lowell Neighborhood, Fresno, California

Walking Tour

Prepared by the Preservation Committee of the Fresno City and County Historical Society

Please refer to the accompanying map for locations of the buildings on this tour.

This tour includes structures on the following streets:

Broadway Avenue (#1) Fulton Avenue (#8-19) Nevada Avenue (#35)
Yosemite Avenue (#2-6) Van Ness Avenue (#20-30)
Mildreda Avenue (#7) College Avenue (#31-34)

CHAPTER 7: NATURAL RESOURCES



7.1 INTRODUCTION

This chapter discusses and describes the natural resources of Fresno County. Natural resources include both the consumptive "commodity" resources such as water, timber and minerals (including soils), as well as biological natural resources. The biological resources describe Fresno County in terms of vegetation and wildlife (habitat types), fish, and the interaction between past and present human use and influences that have shaped the county as it is today. Rare, threatened, or endangered species are discussed primarily as indicators of remaining areas of natural habitats that should be considered in planning for Fresno County's future.

7.2 WATER RESOURCES

Fresno County is large and geographically diverse. The mountainous eastern region receives up to 70 inches precipitation annually, mostly in snowfall. Many small mountain lakes and streams are tributaries to the San Joaquin and Kings Rivers which flow into the Central Valley. The valley and western portion of the county, by contrast are very arid, with less than 10 inches of annual rainfall and seasonal streams. The foothills east and northeast of the city of Fresno have areas of vernal pools. The valley trough has large wetlands and wildlife refuge areas of importance to the Pacific Flyway. Additional areas in western Fresno County are being converted to wetland areas from retired agricultural land.

RIVERS AND STREAMS

San Joaquin River

The San Joaquin River originates in the Sierra Nevada and flows westerly forming the border between Fresno and Madera Counties downstream from Mammoth Pool Reservoir. The North and Middle Forks originate in Madera County near Devils Postpile National Monument. The South Fork begins at Martha Lake in northern Kings Canyon National Park within Fresno County. Average annual precipitation in the upper reaches of the river falls mainly in the form of snow and is as high as 70 inches. In the arid San Joaquin Valley, average annual rainfall is as low as six inches near Mendota.

Friant Dam is the most significant of the several dams on the San Joaquin River. It was completed in 1942 by the U.S. Bureau of Reclamation (USBR) for conservation purposes (agricultural irrigation) and is part of the Central Valley Project (CVP). There are several dams upstream of Friant owned and operated by Southern California Edison (SCE) and Pacific Gas & Electric Company (PG&E) for power generation. The combined storage capacity of the dams upstream of Friant is 609,530 acre-feet and the storage capacity of Millerton Lake (formed by Friant Dam) is 520,500 acre-feet. The storage capacity of Millerton Lake is inadequate for full flood protection during wet years and emergency releases may result in flooding problems downstream. In 1997, emergency releases from Friant Dam combined with large storm events and several levee breaks

contributed to flooding along the San Joaquin River. It is important to note that although Friant Dam does serve to reduce release volumes in the main San Joaquin River channel, it was not sited, designed or engineered for the purpose of flood control. Any flood control capability of the Friant Unit is incidental to its function as a diversion facility. By contract, the USBR must provide a continuous flow of 5 cubic feet per second (cfs) at each parcel, or in practical terms, 5 cfs at Gravelly Ford after users between Friant and Gravelly Ford have taken water.

From Friant to Gravelly Ford, the San Joaquin River is part of the Designated Floodway Program administered by the State Reclamation Board. Land use restrictions and river management practices allow the river to meander, flood the overbanks, and remain in a relatively natural state. Downstream of Gravelly Ford, the river is confined by levees. The design capacity of the San Joaquin River from Friant Dam to Chowchilla Bypass is in excess of 8,000 cfs while the channel capacity downstream is reduced. The major San Joaquin River "choke point" in Fresno County is the reach near Mendota and Firebaugh, which has a channel capacity of 8,000 cfs. Beyond that point, San Joaquin River channel capacity continues to decrease for some distance due to lack of annual flooding and natural channel clearing since Friant Dam was constructed. Further downstream, the river channel has been deepened and widened by historic flows of the Merced River, Tuolumne River and other tributaries.

In addition to release from Friant Dam, two uncontrolled streams, Cottonwood Creek and Little Dry Creek, add significantly to the river flows below Friant during heavy precipitation. Historically, large areas within the Central Valley were within the river's flood plain. Development has encroached on the flood plain and the flow is now confined to a relatively narrow channel constrained by levees, reducing the carrying capacity of the river. Most of the flow (as much as 5,500 cfs) from Friant Dam is diverted to the Chowchilla Bypass which branches off the San Joaquin River about 11 river miles upstream from Mendota Dam. Over time, encroachment of vegetation, substantial sedimentation and land subsidence has considerably reduced channel capacity. Erosion, seepage, and prolonged high water compromise levee integrity. Levee maintenance is generally under the jurisdiction of local reclamation or irrigation districts. State and federal regulations aimed at preserving ecological integrity greatly restrict maintenance activities in and around the river and it is difficult for these districts to sustain an adequate levee maintenance program.

Downstream of the Chowchilla Bypass, the river is not confined by levees (within Fresno County) and generally carries no more than 2,500 cfs. For further information on water rights and water use of San Joaquin River water, refer to Chapter 5, Section 4, *Water Supply and Distribution Facilities*. Recreational facilities around the San Joaquin River include campgrounds, boat launch facilities, picnic areas, and golf courses.

Flood control measures that have been taken along the main stem of the river have impacted riparian and wetland wildlife habitat areas. Levee construction and sediment and vegetation removal can damage streamside vegetation, divert floodwater from wetlands and riparian areas, and reclaim natural wetlands for other uses.

Sand and gravel extraction has occurred along both the San Joaquin River and Kings River in Fresno County, although most of this aggregate mining has occurred outside of the main river channels. The hydrologic effect of the mining and subsequent reclamation activity generally has been to increase the overall hydraulic capacity of the rivers to accommodate major flood events.

Kings River

The Kings River originates high in the Sierra Nevada Mountains near the Inyo County line. It has a large drainage basin including most of Kings Canyon National Park and most of the area between Shaver and Florence Lakes in the north to the Fresno/Tulare County border in the south. Most mountain precipitation falls as snow. The average annual precipitation for the mountain region has not been consistently recorded but, it is probably greater than the 43 inches that falls in Giant Grove on the southern reaches of the Kings River watershed. Downstream average precipitation is approximately 7-10 inches per year. The major portions of the upper reaches feed into Pine Flat Lake, a 1,000,000 acre-feet reservoir constructed by the U. S. Army Corps of Engineers (Corps) in 1944 for flood control purposes. There are additional reservoirs upstream of Pine Flat that are owned and operated by PG&E for the purpose of hydroelectric power generation. These facilities have a combined storage capacity of about 252,000 acre-feet.

Two uncontrolled creeks, Hughes Creek and Mill Creek, flow into the Kings River below Pine Flat Dam. Pine Flat Reservoir has adequate storage capacity to avoid emergency releases in most storm events, but these downstream creeks can add significant flow to the river. The Kings River can convey 13,000 cfs. The watermaster, on behalf of the Kings River Water Association (KRWA), an association of 28 irrigation and water districts in the Kings River service area, coordinates releases from Pine Flat Dam and deliveries to points of diversion and downstream water users.

The Corps is responsible for managing flood releases. The Kings River branches to the north toward Mendota Pool and to the south toward Tulare Lakebed in Kings County. Water is usually held in the main river by weirs. The North Fork, also known as Fresno Slough and James Bypass, is normally dry except for groundwater seepage and irrigation returns. Flood flows up to 4,750 cfs are diverted to the North Fork which flows along the valley trough to converge with the San Joaquin River at Mendota Pool. Flows over 4,750 cfs are diverted to the South Fork. The South Fork can take up to 2,500 cfs, after which flows can be diverted to the Crescent Bypass. Flows above 10,000 cfs are split equally between the North and South Forks. In practice, flow management on the Kings River is carefully coordinated between anticipated weather, upstream flows, and ability of downstream users to receive the water. Recreational facilities along the Kings River include campgrounds, golf courses, boat launches, and day use facilities.

Eastern County Streams

There are many creeks and lakes in the high Sierra Nevada within Fresno County, all of which eventually feed into either the Kings River or the San Joaquin River. In addition, several creeks drain the foothill areas and flow into developed areas in central Fresno County. Most of these streams (i.e., Redbank, Fancher, Dry and Dog Creeks) have been controlled by efforts of the Corps and the Fresno Metropolitan Flood Control District to protect the city from damage of flooding from a 200-year storm. Other creeks (such as Wahtoke Creek) are uncontrolled. Some foothill areas of southeastern Fresno County are tributary to the Orange Cove Stream Group, and to Sand Creek which is tributary to the Kaweah River.

Western County Streams

Western Fresno County is significantly different from the rest of the County in climate and character. The region is quite dry, with an average annual rainfall of only 6-8 inches, yet the stream systems are prone to high flows and flooding because they drain a very large watershed. The soils

in the Coast Range are subject to erosion. As a result, stormwater runoff typically carries large volumes of sediment and naturally occurring minerals, such as selenium, arsenic, boron and asbestos, which may be undesirable to downstream users. Some creeks are seasonal and may be plowed into local fields. The California Department of Water Resources (DWR) is currently working with landowners to improve watershed management practices and reduce erosion. Western Fresno County contains five major stream systems: Little Panoche Creek, Panoche Creek, Tumey Gulch and Arroyo Ciervo, Cantua Creek, and Arroyo Pasajero.

Little Panoche Creek

Little Panoche Creek, located in the northwestern corner of Fresno County, is managed for flood control purposes by the California Department of Water Resources (DWR). DWR operates and maintains a detention dam and reservoir (Little Panoche Reservoir) on the creek. The facility was constructed by USBR to provide flood protection for the California Aqueduct. The reservoir also serves as a wildlife preserve.

Panoche Creek

Panoche Creek is located just south of Little Panoche Creek. It flows under I-5 and across the California Aqueduct which is siphoned in large pipes under the creek bed. On the east side of the aqueduct, the water is not channelized and flows overland. During high creek flows, stormwater floods vast tracks of agricultural land and portions of the city of Mendota. The water may reach the Mendota Wildlife Management Area and Mendota Pool. Panoche Creek is known to carry high levels of selenium and arsenic.

Cantua Creek System

This creek system includes Arroyo Hondo, Cantua Creek, Salt Creek, Martinez Creek, and Domingue Creek in central-western Fresno County. These creeks drain the east side of Joaquin Ridge. Tumey Gulch and Arroyo Ciervo are two uncontrolled streams that flow easterly from Ciervo Mountain. The California Aqueduct obstructs their flow, and during major storm events, sediment laden flood water may form ponds on the east side of the aqueduct. These ponds may then spill large quantities of stormwater and sediment into the aqueduct. As with Tumey Gulch and Arroyo Ciervo, stormwater from the Cantua Creek system ponds on the east side of the California Aqueduct during periods of high flow, dumping large quantities of sediment and storm runoff into the aqueduct. Cantua Creek has inundated I-5 during large storm events.

Arroyo Pasajero Stream System

The Arroyo Pasajero stream system encompasses the largest drainage area in the western San Joaquin Valley. The major creeks in the system are Los Gatos, Warthan, Jacalitos, and Zapato-Chino Creeks. They flow through the city of Coalinga, under I-5 to a small ponding basin on the west side of the California Aqueduct. Arroyo Pasajero carries large quantities of sediment containing naturally occurring asbestos. The sediment is washed downstream, filling the ponding basin and then spilling into the aqueduct. Also, high flows may undermine or otherwise threaten the integrity of the aqueduct. Downstream, Arroyo Pasajero is prone to flooding the main road serving the city of Huron. DWR and the Army Corps of Engineers (Corps) are currently studying

the situation and have proposed construction of a 143,000 acre-foot detention basin as well as supplementary upstream facilities to control this stream system.

GROUNDWATER BASINS

Groundwater conditions vary considerably from eastern to western Fresno County. Aquifers east of the valley trough are generally semi-confined to unconfined. Water quality is good with the exception of some localized areas. Overdraft and recharge conditions vary considerably. Groundwater overdraft is occurring in the vicinity of the major cities (most notably Clovis and Fresno) and the irrigation and water districts that rely exclusively on groundwater (such as Raisin City Water District and Mid-Valley Irrigation District). A significant groundwater mound has developed in the vicinity of the Fresno-Clovis Wastewater Treatment Plant located southeast of Fresno.

Aquifers west of the valley trough are generally semi-confined to confined and water quality is often affected by naturally occurring concentrations of minerals such as sodium, chloride, boron and selenium. Most pumping occurs below a naturally occurring subterranean clay, although considerable pumping also occurs above the layer, depending upon location and water quality issues. This layer is several hundred feet below the ground surface and pumping costs are high. Groundwater overdraft is a problem in western Fresno County, especially in the Westlands Water District and in the Pleasant Valley Water District near Coalinga, because of limited groundwater recharge, periodic droughts, and inadequate surface water supplies. Long-term recharge is inadequate to maintain water table elevations.

DWR has estimated groundwater overdraft at 650,000 acre-feet for 1990 in the Tulare Lake Region, which generally includes Fresno County. Groundwater overdraft conditions vary annually based on demand, surface water availability, and climate. Long-term projections indicate a continuing annual overdraft of the basin underlying most of Fresno County.

Subsidence

In some areas along the valley trough and in parts of western Fresno County, groundwater pumping has caused subsidence of the land surface. This usually occurs in areas where the groundwater basin has historically been subject to overdraft and long-term recharge is inadequate to maintain the water table elevation. Subsidence can impact conjunctive use programs by reducing storage capacity and changing transmissivity. In general, subsidence in Fresno County has stabilized, except during droughts. Areas in Fresno County where subsidence has been a problem generally include the Westlands Water District and the Pleasant Valley Water District.

Groundwater Recharge

Surface and groundwater resources are closely managed in Fresno County in an effort to maintain groundwater balance. Artificial recharge programs have been in place in Fresno County since at least the 1930s. The largest recharge program in the county, which has been in place since the 1970s, is implemented through the combined efforts of the Fresno Irrigation District (FID), the Fresno Metropolitan Flood Control District (FMFCD), and the cities of Fresno and Clovis. The major element of this program is the joint recharge effort by the City of Fresno and FID, whereby the City's surface water allocations of San Joaquin River and Kings River water are conveyed by

FID to recharge basins in the Fresno area. This replenishes groundwater pumped by the City's municipal wells. In addition, the FMFCD operates 350 ponding basins, which serve the dual purposes of retaining stormwater drainage for flood protection and capturing surface water flows for groundwater recharge. These efforts have addressed the overdraft problem to the point where groundwater in the in Fresno-Clovis area is almost in a state of balance. In addition, treated effluent produced by the Fresno-Clovis Regional Wastewater Treatment and Reclamation Facility is conveyed to a large evaporation/percolation pond. This has resulted in the formation of a groundwater mound southwest of Fresno. This groundwater is reclaimed by wells and used for agricultural irrigation only since it does not meet drinking water requirements for municipal use.

Most other cities in the county also utilize ponding basins for flood control and incidental groundwater recharge. The cities and special districts also dispose of treated wastewater effluent through evaporation/percolation ponds, which provide groundwater recharge. While this effluent is not suitable for irrigation of food crops, some of the effluent is used directly in the irrigation of cotton. The Central California Regional Water Quality Control Board (Regional Board) encourages reclamation (i.e., direct use of treated wastewater effluent for agricultural irrigation) as the preferred practice over evaporation/percolation ponds, where reclamation consists of extracting the effluent from the groundwater table after it filtered through the soils. However, such use would require advanced treatment which is prohibitively expensive for small communities. In addition, it would not reduce elevated levels of salts and other minerals from accumulating in the groundwater, since this would depend on the salt levels in the effluent regardless of disposal method. The only means of keeping wastewater salts out of the ground or out of the aquifer would be to remove these fully soluble constituents from wastewater by means of reverse osmosis or distillation, which would be economically infeasible.

Large agricultural operations and food processing industries located in the rural areas also utilize evaporation/percolation ponds to dispose of treated effluent, which provides additional recharge. Agricultural irrigation also provides a significant amount of groundwater recharge as a portion of the applied water moves below the root zone. In the eastern portion of the valley, irrigation recharge is critical to maintaining local groundwater supplies.

Groundwater Management

Groundwater management in California is accomplished by adjudication in court over the respective rights of users and exporters or by local management of rights to extract and use groundwater as authorized by statute or agreement. In 1992, the State Legislature adopted new water code sections (AB 3030) to authorize any local agency that provides water service to adopt a groundwater management plan if the groundwater is not subject to management under other provisions of law or a court decree. Several agencies in Fresno County have recently prepared and adopted water management plans under AB 3030.

Fresno County adopted its Groundwater Management Plan in 1997, pursuant to AB 3030. The County plan presents a comprehensive strategy to enhance and maintain the quantity and quality of local groundwater resources. The plan document states that the county's groundwater-related issues can be addressed through currently available means without intrusive regulation and/or restrictions on groundwater pumping. Efforts related to conservation, water recycling, groundwater banking, management of groundwater contamination, and development of

additional surface water storage can provide means to meet future increases in demand while reducing or eliminating overdraft within the county.

WETLANDS

Wetlands are habitats in which soils are intermittently or permanently saturated or inundated. The resulting anaerobic conditions in these soils allows only select plant species to adapt to such conditions. Wetland habitats vary from rivers to seasonal ponding of alkaline flats and include swamps, bogs, marshes, vernal pools and riparian woodlands, each supporting a unique flora. Wetlands are identified by the presence of hydrophytic vegetation, hydric soils and wetland hydrology according to methodologies outlined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*.

Wetlands (including vernal pools and other seasonal wetland habitats) are considered to be *Waters of the United States* and are subject to the jurisdiction of the Corps according to provisions of Section 404 of the Clean Water Act. The Corps has jurisdiction over that portion of a channel or waterbody defined by high water marks which can be identified by shelving, scour lines, drift lines and exposed roots. The bed and bank of rivers and streams are subject to the jurisdiction of the California Department of Fish and Game (CDF&G) under Sections 1601 and 1603 of the *Fish and Game Code*. The discharge of fill into *Waters of the United States* or the removal of riparian vegetation is regulated by the Corps and the CDF&G. Where these waters provide habitat for federally endangered species, the U.S. Fish and Wildlife Service may also have permit authority. One or more permits are usually required to grade or fill any portion of rivers, creeks (including seasonal creeks), riparian habitats, vernal pools, seasonally wet alkaline desert scrub and grassland, fresh emergent wetlands, and mountain meadows. Procurement of a permit from one agency does not preclude the necessity of obtaining permits from other jurisdictional agencies.

Notable categories of wetlands found in Fresno County include wet meadows in the mountainous region, vernal pools in the foothills, marshes in the valley trough, and reclaimed agricultural lands in western Fresno County. The CDF&G manages several of the major identified wetlands in Fresno County including Mendota Wildlife Management Area, Kerman Ecological Reserve, Alkali Sink Ecological Reserve, and smaller wetlands management units along the San Joaquin River. While these lands are currently being adequately protected, environmental concern is primarily focused on two issues: wetlands which are not yet identified, and protection of remaining vernal pools.

Vernal Pools

A vernal pool is a rare habitat that supports a unique flora and fauna ecosystem including some endangered species. Vernal pools are formed in soils with a defined iron-silica hardpan or claypan layer one to two feet below the soil surface. Depressions in the topography fill with runoff during the winter forming seasonal pools perched on an impervious hardpan. The pools gradually shrink and dry from evaporation at the end of the rainy season. The deepest depressions may retain some ponded water through May and into June.

In Fresno County, several vernal pool complexes are located near Friant between Friant Road and the Friant-Kern Canal and in the area south of Academy and east of Red Mountain. A large concentration of very high quality vernal pools are found in these areas and they are considered

to be some of the best examples of vernal pools in the state. Fresno County's vernal pools are threatened by urban development or conversion to intensive agriculture.

Reclaimed Agricultural Land

The Wetland Reserve Program, administered by the U.S. Department of Agriculture (USDA), is a voluntary program to restore and protect wetlands on private property. It is an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land. There is currently one such wetland of approximately 2,000 acres in western Fresno County.

7.3 WATER QUALITY CONDITION

Water quality is generally defined in terms of salinity and concentrations of harmful trace elements. In Fresno County, most water sources have excellent quality and are available for most uses after conventional treatment. Many communities are able to pump and use groundwater, although groundwater in certain areas contain contaminants from both natural and introduced sources and is unsuitable for irrigation and municipal and industrial (M & I) uses. Bacterial counts (coliform bacteria) and parasite cysts loads of surface water sources is an emerging concern, and regulations for managing and monitoring these contaminants have been promulgated.

SURFACE WATER

The quality of local surface water from the Kings and the San Joaquin Rivers is excellent for both irrigation and municipal and industrial (M&I) uses. The concentration of total dissolved solids (TDS) and other mineral constituents is typically low and harmful levels of trace elements are not present. Because of the excellent quality water from these sources, conventional water treatment processes can be used. Conventional water treatment typically includes:

- flocculation
- sedimentation
- clarification
- filtration
- disinfection

The TDS of water at Mendota Pool tends to be higher than the other surface water sources because the USBR allows water from groundwater pumping to be discharged into the Delta-Mendota Canal and Mendota Pool. The Exchange Contract contains provisions that set forth requirements that the USBR must meet regarding the quality (salinity) of water delivered through the Delta-Mendota Canal and Mendota Pool. These contractual water quality requirements are:

- Daily - quality of water shall not exceed 800 parts per million (ppm) TDS;
- Monthly - quality of water shall not exceed a monthly weighted mean value of 600 ppm TDS;
- Annual - quality of water shall not exceed a weighted mean annual (calendar year) value of 450 ppm TDS; and

- 5-Year - quality of water shall not exceed a weighted mean value of 400 ppm TDS for any 5 consecutive years.

Additional criteria for monitoring and managing surface water quality include microbial counts (coliform bacteria) and parasite cyst loads.

The Delta Mendota Canal and Mendota Pool are not used to provide water for M&I uses in Fresno County.

Western Streams

Streams draining the western portion of the county carry large volumes of sediment and naturally occurring minerals, such as selenium, arsenic, boron and asbestos, which may be undesirable to downstream users. In particular, Panoche Creek is known to carry high levels of selenium and arsenic. Arroyo Pasajero contains high levels of sulfates, boron, and TDS. Arroyo Pasajero also carries asbestos. Several studies have been conducted on asbestos levels in soil and water samples from Arroyo Pasajero and other streams and retention basins in the region by Dr. R. G. Coleman of Stanford University, Woodward Clyde Consultants, DWR, and others. These studies indicate that although some samples contain elevated asbestos levels, in general, the asbestos levels in the Arroyo Pasajero detention basin are not any higher than those in the rest of the watershed area.

GROUNDWATER

Groundwater quality is affected by withdrawals, recharge, and agricultural and industrial practices. Most poor quality groundwater is located along the western side of Fresno County. Concentrations of TDS, sodium, sulfate, boron, chloride and carbonate/bicarbonate, and trace elements (such as selenium) limit the beneficial use of groundwater in this area. Contaminants such as pesticides, petroleum products and industrial solvents also occur in groundwater in localized areas in Fresno County. Dibromochloropropane (DBCP), a pesticide, is present in large areas in eastern Fresno County. DBCP has exceeded the maximum contaminant level (MCL) in groundwater in many locations.

DBCP is gradually diminishing as a groundwater problem for the Fresno-Clovis area, as well as for the cities of Sanger, Reedley, Parlier, and Selma, and for untreated private water wells in the county. The problem is decreasing because DBCP was banned in 1977, and has been diluted and extracted from the aquifer since then. However, as discussed in Section 5 - Public Facilities, the MCL for DBCP has been reduced under Assembly Bill 21, which will result in the need for enhanced wellhead treatment for the affected areas. Communities like Fresno and Clovis have begun to construct well head treatment facilities to reduce DBCP levels to acceptable concentrations. As long as DBCP concentrations decline and do not exceed the MCL, the cities of Fresno and Clovis will be able to manage the problem.

Nitrate levels in rural groundwater wells have been increasing from fertilizers used in agriculture. Many of these wells have nitrate concentrations that exceed the MCL for nitrate in drinking water.

Nitrate levels may also be elevated in areas served by domestic septic systems, on-site industrial wastewater disposal facilities (when processes involve nitrogen-containing materials), and in areas where dairy operations do not have state-of-the-art treatment for cattle waste. There also appear

to be sections of Fresno County where native soil or rock strata have imparted nitrogenous compounds to the aquifer.

In addition, naturally-occurring groundwater contaminants are prevalent in the eastern and central portions of the county. These include radon gas and gross alpha radiation from dissolved uranium in the Sierra fractured rock aquifer and in the Kings Groundwater Basin areas in central Fresno County. This type of contamination is expensive to monitor and very difficult to resolve.

SUBSURFACE DRAINAGE

Agricultural lands in western Fresno County are becoming increasingly impacted by rising saline in shallow groundwater. This is a result of irrigation with imported surface water primarily from the CVP and caused by a combination of:

- Geologic and soil conditions that restrict downward movement of water below the crop root zone;
- Native soil salinity; and
- Inefficient irrigation water management.

The San Luis Unit Authorization Act (PL 86-488) included facilities required to dispose subsurface drainage flows. The USBR started construction of the San Luis Drain in 1968 and about 85 miles were completed along with the first phase of the Kesterson Reservoir. The project was halted in 1975 due to funding problems and environmental concerns over drainage water discharge impacts to the Delta. Following disclosure of bird mortalities in the Kesterson Reservoir caused by selenium from the introduced drainage waters and concern for public health, the U.S. Department of the Interior (USDI) in a March 1985 agreement with Westlands Water District called for the cessation of drainage flows to Kesterson Reservoir by June 30, 1986. A long-term solution to the subsurface drainage problem is needed to sustain agricultural crop production in western Fresno County.

7.4 REVIEW AND DESCRIPTION OF SOILS

This section summarizes the soils classification and generalized distribution of soils in Fresno County. The discussion of soils focuses often on its value as an agricultural resource. There are, however, a number of soil properties that have important implications for urban development. Erosion, drainage, runoff, septic limitations, shrink-swell potential, and depth to water table can constitute important development constraints. If these constraints are not considered in land use planning, they can lead to environmental problems and require constant maintenance or costly mitigation measures.

The basis for the soils discussion and mapping for Fresno County are the 1971 *Soil Survey, Eastern Fresno Area, California* and the 1950 *Soils of Western Fresno County California*. These two sources of soils information cover the areas of the county subject to the majority of agricultural production and urbanization. Federal lands such as the Sierra and Sequoia National Forests in the eastern county are not covered by this soils analysis. The federal lands are managed for their timber, recreational, and wilderness values through a separate planning and management process. Figures

2-3 and 2-4 in Chapter 2 illustrates the approximate location and extent of the soil associations described below.

WESTERN AREA SOILS

The portion of western Fresno County covered by this discussion, comprises an area of approximately 1,410 square miles or 902,400 acres.

The area lies east of the San Joaquin River and Fresno Slough, and extends to the 1,000 foot contour of the Coast Range foothills flanking the west side of the valley. This area lies within a prominent physiographic division of the state known as the Central Valley. This valley is an elongated trough or basin paralleling the eastern and western boundaries of the state in a northwest-southeast trend, stretching more than 500 miles from above Redding on the north to below Bakersfield on the south. Its average width is 40 miles. The Valley is enclosed by mountain ranges, except for one break on the west side of the Delta Region north of its center, through which the drainage waters find an outlet to San Francisco Bay and the Pacific Ocean.

Actually, the Central Valley is composed of two valleys. The northern and smaller, known as the Sacramento Valley, is drained by the Sacramento River, while the southern, the San Joaquin Valley, is drained by the San Joaquin River. The Kings River enters the southern end of the Valley and originally emptied all of its waters into Tulare Lake. At present, however, much of the Kings River water is artificially diverted into the main drainage system by a course northwestward through Fresno Slough along the eastern boundary of the western soils survey area to the San Joaquin River. This is the only drainage outlet for the upper San Joaquin Valley, since none of the other valley's rivers or streams south of the San Joaquin River have any connection with the main drainage system.

The Coast Range flanking the west side of the valley is comprised of comparatively low parallel ridges that rarely reach an elevation above 3,000 feet. The range is built up almost entirely of sedimentary sandstones and shales that may or may not be calcareous. In forming a natural barrier against coastal winds and fogs, this mountain range creates a rain shadow on the west side of San Joaquin Valley.

More than 80 percent of the soils of the western Fresno County area have good or excellent surface and subsoil drainage. The remaining 20 percent of the area is comprised of basin and semibasin soils subject periodically to high water table.

A monotonously uniform relief of gently sloping and coalescing recent alluvial fans is characteristic of western Fresno County. The broad plain is bordered on the west, in the vicinity of Pleasant Valley, by short and relatively steep, sloping alluvial fans lying at the base of low-lying foothills, a geographical feature generally lacking in the central part of the area. North of Panoche Creek there is a relatively large area of old alluvial fan soils. A few areas of terrace soils also lie above the fans and adjacent to the foothills.

The valley as a whole is a great structural trough or basin that previously contained a large body of water. Alternate periods of uplifting and subsidence were accompanied by intervals of erosion and deposition, especially along the western border. These deposits are generally considered to have been marine during early and middle Tertiary periods. During the later Tertiary and

Pleistocene periods, when the valley was supposedly outlined by the development of the Coast Range, the marine deposits were covered with other deposits laid down in succeeding bodies of fresh waters, or with alluvial deposits distributed over the older deposits which had been exposed by elevation.

The present valley floor has been built up with recent Quaternary stream deposits or with the sediments of fluctuating Pleistocene lakes that are dependent upon streams, and is composed of eroded materials transported from the drainage areas of the surrounding mountains.

The soils of the western area have been arranged into five divisions that roughly coincide with the natural physiographic divisions of the region. Soils formed in place from soft sedimentary rocks comprise the first division and include members of the Kettleman series and a complex of Kettleman and Linne soils. These soils are primarily upland soils derived principally from calcareous and gypsiferous sandstones and shales of the upper Cretaceous marine sediments.

The second division of soils is that developed on old unconsolidated mixed terrace materials. These soils, which occur at elevations ranging from 300 to 700 feet, are confined to a relatively small area along the edge of the foothills north of Little Panoche Creek. The relief is gently undulating, with steeply sloping escarpments. The moderately dense vegetation is typical of the well-drained sites of the area, and the parent material is somewhat mixed.

Soils on older alluvial fans constitute the third division, which includes members of the Lost Hills and Ortigalita series. The Lost Hills and Ortigalita soils normally occupy relatively steep and short alluvial fans of hummocky microrelief. The Ortigalita soils consist largely of outwash material derived from the Franciscan formation, which is an inclusive geologic formation of metamorphic rocks that may contain sandstone and shales, jasper, glaucophane schist, serpentine, and several basic igneous intrusions. The Lost Hills soils are derived solely from sedimentary rock alluvium and often have an unusually deep and friable upper subsoil overlying the compacted lower subsoil.

The fourth and most extensive of the divisions in this area contains the soils on recent alluvial fans and river flood plains represented by members of the Panoche, Parhill, Oxalis, Sorrento, and Columbia series.

The fifth division includes soils of the Merced, Rossi, Temple, and Traver series occupying the valley basin proper, and the Lethent, Levis, and Crestimba soils on the rim of the basin. Soils within the fourth and fifth division generally exhibit restricted drainage due to stratification and slow permeability, and in some areas, a high (less than six feet) perched water table. It is interesting to note that in this, as in other areas, the basin rim soils in most instances contain higher concentrations of alkali than do the soils in the valley basin proper. Alkali salts concentrate along the rim of the basin where alternate wetting and evaporation by ground waters are most intense. The term alkali, refers to the presence of sodium in the soil in quantities sufficient to affect injuriously the growth of economic plants. The type of natural vegetation, character of crop growth, and certain structural features of the soils are general indicators of the degree of alkali concentrations in the soil.

EASTERN AREA SOILS

The eastern Fresno area comprises the central third of Fresno County. The area is close to the geographic center of California and occupies part of the San Joaquin Valley and the western slope of the Sierra Nevada. It is bounded on the west by the Fresno Slough; on the east by the western boundaries of the Sierra and Sequoia National Forests; on the north by the San Joaquin River, which is the Madera County line; and on the south by Kings and Tulare Counties.

The total extent of the area is about 1,109,156 acres. It is roughly 34 miles wide and 53 miles long, and is generally oriented in a northeast-southwest direction. Because of the variation in climate, the diversity of parent rock in the foothills, and the distribution pattern of alluvium in the San Joaquin Valley, the soils vary greatly.

Good to excellent soils, an abundant supply of water of good quality, and the favorable climate make the eastern Fresno area well suited to many kinds of farming.

The following is a discussion of the general soil associations in the eastern area of Fresno County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

The eastern Fresno area consists of three main physiographic sections:

- Soils of the Valley Basin;
- Soils of the Eastside Valley Alluvial Plains; and
- Soils of the Uplands of the Sierra Nevada foothills.

The valley basin is subdivided into the basin flood plain and the basin rim. The Eastside Valley Alluvial Plains are subdivided into recent alluvial fans and flood plains, young alluvial fans, low alluvial terraces, and high alluvial terraces. The uplands of the Sierra Nevada foothills are not subdivided physiographically, but is divided on the basis of climate into the lower Sierra Nevada foothills and the upper Sierra Nevada foothills. The three sections roughly coincide with one or a combination of two or more soil associations. Each soil association, however, is in only one physiographic section.

Soils of the Valley Basin

This physiographic section includes lands that form an axial trough of the San Joaquin Valley. It consists of poorly drained soils of the basin flood plain and somewhat excessively drained to poorly drained soils of the basin rim (see Figures 2-2 and 2-3 in Chapter 2).

Poorly Drained Soils of the Basin Flood Plain

Under natural conditions this part of the valley trough was seasonably flooded and marshy, and much fine-textured material was deposited. Soils of the flood plain formed mainly from areas of granitic rock in the Sierra Nevada, and were deposited at flood stage by the waters of the Kings River and by small streams draining the gently sloping fans to the east. The flood plain makes up about 46,000 acres, or nearly four percent of the survey area. Elevations range from 160 to 210 feet.

This flood plain is traversed by the meandering channel of the Fresno Slough, an intermittent tributary of the Kings River that joins the San Joaquin River near Mendota. Many other meandering drainage ways cut across the flood plain. Present day stream control, flood protection, and deep well pumping have lowered the water table to about 60 feet. As a result, drainage has been improved, but surface runoff remains slow to very slow. One soil association is in this subdivision.

Merced-Temple association: Deep and very deep clay loams and clays

The Merced and Temple soils contain much organic matter from decayed marsh vegetation that grew on the soils prior to drainage and improvement. The Merced soils make up about 52 percent of this association; the Temple soils, 41 percent; water areas, 4 percent; and minor soils, 3 percent. Most of the soils in this association have been leveled and are now intensively cultivated. Leveling has filled in most drainage ways and has mixed the Piper and Rossi soils with the Merced and Temple soils. Levees along the Fresno Slough, and a diversion of the slough southeast of Helm into a floodway, protect the soils from flooding.

Somewhat Excessively Drained to Poorly Drained Soils of the Basin Rim

The soils of the basin rim are next to and east of the basin flood plain. They occupy a broad, irregular area bordering the lower part of extensive young alluvial fans along the San Joaquin and Kings Rivers. The alluvium deposited by the two rivers is predominantly of granitic origin. The basin rim covers about 134,000 acres, or about 12 percent of the survey area. Elevations range from about 175 to 275 feet. Runoff is slow, and in places water becomes ponded in small depressions or playas. In the past most areas were above seasonal inundations of the basin flood plain, though the water table often rose to less than six feet from the surface and remained at this level for long periods. This permitted capillary rise and evaporation of moisture within the soil and the accumulation of soluble materials. As a result, most of the soils are saline-alkali affected. The natural cover consists of annual grasses and forbs and of plants that tolerate salts and alkali, such as saltgrass, spikeweed, and pickleweed. Three soil associations are in this subdivision.

Rossi-Waukena association: Deep, somewhat poorly drained and poorly drained, dominantly fine sandy loams that are saline-alkali

The soils of this association are closely intermingled and occupy a narrow area long the western part of the basin rim. The Rossi soils make up about 70 percent of this association; the Waukena soils, about 25 percent; and minor soils, the remaining five percent.

Rossi soils are above the flood plain. In the past they were subject to frequent shallow flooding. Their surface layer is thin, gray to dark gray, fine sandy loam to clay loam, and moderately alkaline to strongly alkaline. The Waukena soils have a surface layer of very thin, grayish-brown to light-gray, calcareous fine sandy loam or loam.

Only parts of the soils in this association have been leveled and reclaimed. Depth to the water table ranges from about 40 to 60 feet, and it is unlikely that further salinization or alkalization of the soils will occur. The soils are difficult to leach and reclaim. Reclaimed areas are fairly well suited to cotton, rice, sugar beets, and irrigated barley. Fairly good irrigated pasture also can be developed. Unreclaimed areas are used for alkali pasture. Near Whitesridge and Tranquillity some areas have

been diked and flooded by private gun clubs to attract game waterfowl. Some areas of this association are in the protective floodway for the Fresno Slough and cannot be cultivated.

Fresno-El Peco association: Somewhat poorly drained fine sandy loams that are saline-alkali and that are shallow or moderately deep to a hardpan

The principal soils of this association have a hardpan that is cemented with lime and silica and is fractured in places. The hardpan consists of cemented layers separated by uncemented permeable alluvium that severely restricts penetration of roots and water. Fresno soils make up about 70 percent of this association; El Peco soils, about 20 percent; and minor soils, the remaining ten percent.

Fresno soils have a light gray, sandy loam to clay loam, strongly alkaline and calcareous surface layer. The hardpan ranges from 2 to 18 inches in thickness. El Peco soils are similar to the Fresno soils, but lack a moderately developed subsoil. The soils in this association are very gently sloping, but because of microrelief of the Fresno, El Peco, Pond, and Traver soils, the surface is rough and uneven and contains many small depressions that lack external drainage. Runoff therefore is very slow or may form playas in the gentle depressions. On the smooth sloping Calhi soils runoff is very slow because permeability of their surface layer is rapid.

Many of these soils have been leveled and reclaimed. Lowering the regional water table by pumping is the key to successful reclamation. Other methods needed to complete reclamation are shattering the hardpan, applying large amounts of gypsum, and thoroughly leaching the solid with good quality water. Soils that are reclaimed are fairly well suited to alfalfa, cotton, field corn, irrigated barley, irrigated pasture, and sugar beets. Unreclaimed soils are used for alkali pasture or are left idle.

Traver-Calhi association: Somewhat poorly drained to somewhat excessively drained fine sandy loams and loamy sands that are saline-alkali and that are moderately deep or deep to compact silt

In extent, this association is similar to the Fresno-El Peco association. It includes most of the basin rim land southeast of McMullin Grade, and part of the area near the San Joaquin River. Traver soils make up 50 percent of this association; Calhi soils, 30 percent; and minor soils, 20 percent.

The Traver soils occupy fairly large areas on alluvium and are affected by salts and alkali. The largest areas are near the San Joaquin River on more recent alluvium or are near intermittent streams entering the basin rim. The Calhi soils are in the southeastern half of the basin rim. These soils formed on low-lying, stabilized dunes derived from sandy material deposited by prevailing northwesterly winds. The Calhi soils are generally not saline, but in some places are affected by an excess of adsorbed sodium in the subsurface.

Soils of the Eastside Valley Alluvial Plains

This physiographic section includes all land in the San Joaquin Valley between the basin rim and the Sierra Nevada foothills. It consists of the following: excessively drained to somewhat poorly drained soils of recent alluvial fans and flood plains; somewhat excessively drained to moderately well drained soils of young alluvial fans; well-drained soils of low alluvial terraces; and well-

drained soils of high alluvial terraces. Elevations generally range from 165 to 500 feet, but in places where this section extends along valleys into the foothills, the elevations range to 650 feet.

These alluvial plains consist of a sequence of deposits washed from the Sierra Nevada by rivers and streams. Many of the alluvial fans that formed coalesced into broad alluvial aprons with gentle westerly slopes. The alluvium ranges from new deposits to deposits many hundreds of thousands of years old. The recent and young alluvial fans or aprons still retain most, and in some places all, of their original form. The older alluvial fans or aprons retain little of their original shape or size. Most of the older alluvial fans were partly eroded away before the subsequent period of deposition. These older landforms are the alluvial terraces, and their form and general surface level have been controlled mainly by the rivers. The sequence of alluvial deposits of minor streams within the area has tended to conform to the more extensive alluvial areas of similar age formed by the rivers.

Excessively Drained to Somewhat Poorly Drained Soils of Recent Alluvial Fans and Flood Plains

The areas on recent alluvial deposits are extensive and are distributed throughout the Eastside Valley Alluvial Plains. They make up about 89,000 acres, or nearly eight percent of the survey area. Elevations range from about 156 to 650 feet, including parts of two large recent alluvial fans deposited by the Kings and San Joaquin Rivers. These fans spread westward into the valley trough from the narrow mouths of secondary valleys cut by the rivers into the older alluvial surfaces of the San Joaquin Valley. Small fans and minor secondary flood plains have been formed by streams draining from both the Sierra Nevada foothills and older, higher lying fans or terraces in the valley.

Grangeville-Chino association: Deep and very deep, somewhat poorly drained sandy loams to loams

Some areas of this association are on fans and flood plains along the San Joaquin River and the Kings River, and others are along smaller streams. The soils formed in alluvium derived mainly from granitic rock. Drainage was originally somewhat poor or poor, but the pumping of ground water for irrigation has lowered the water table in these soils and improved drainage.

Grangeville soils have formed in the slightly higher lying, somewhat better drained areas of the association. They are deep, grayish-brown, neutral to mildly alkaline soils that have a sandy loam or fine sandy loam surface layer. The Chino soils have formed in the more poorly drained areas. They are deep, gray, neutral to moderately alkaline soils that have a sandy loam to loam surface layer. About ten percent of the acreage in this association is affected by salts and alkali, but reclamation of most of this acreage is feasible. Also, a small acreage on river bottoms near Sanger is kept saturated to a depth of two to four feet by seepage or irrigation water. This acreage is next to a small swamp.

Soils of this association that are free of salts and alkali, and those that have been reclaimed are used for agriculture. Soils affected by salts and alkali are used mainly for native pasture and for irrigated pasture but some other crops are grown. Some of the rough areas adjacent to streams have been leveled and are used for irrigated pasture. Areas not leveled are used for browse or recreation, but in some places sand and gravel are mined for use in engineering projects.

Hanford-Tujunga association: Deep, well-drained to excessively drained, dominantly loamy sands to fine sandy loams

The soils of this association are on benches in river valleys and on flood plains of minor streams. They formed in recent alluvium derived mainly from granitic rock. Hanford soils make up about 70 percent of this association; Tujunga soils, about 15 percent; and minor soils, the remaining 15 percent. The Hanford soils are deep, permeable, and range from coarse sandy loam to fine sandy loam texture. The Tujunga soil texture ranges from loamy coarse sand to sand that is gravelly or cobbly in places. Tujunga soils are deep, very permeable, and have low water-holding capacity.

The Hanford soils are well suited to irrigated crops. The low water-holding capacity of the Tujunga soils limit their use for field crops and for tree fruit crops. Where irrigation water is not available, the soils in this association are used for grazing or browse.

Somewhat Excessively Drained to Moderately Well Drained Soils of Young Alluvial Fans

A sequence of deposits washed mostly from granitic rock in the Sierra Nevada by rivers and streams has formed the young alluvial fans in this physiographic section. This subdivision makes up about 359,586 acres, or nearly 27.5 percent of the survey area. Elevations range from about 200 to 450 feet. Large areas of soils on young alluvial fans of the San Joaquin River and the Kings River are west and south of the City of Fresno. Soil material deposited by Dry Creek, Fancher Creek, and other small streams coalesced and formed an irregularly shaped part of the area east and northeast of Fresno and Clovis. A similar area has formed near Reedley and Orange Cove. Entrenchment of the rivers and streams has lessened the flood hazard.

Soils of this subdivision are generally well drained, but minor areas are moderately well drained to poorly drained. Some soils near the basin rim or in poorly drained areas are affected by salts and alkali. Four soil associations are in this subdivision.

Hanford-Hesperia association: Well-drained sandy loams and fine sandy loams that are moderately deep or deep to compact silt

A large part of this association is south of the San Joaquin River and extends from the terraces near Herndon to the basin rim west of Kerman, and includes a smaller area northeast of Pinedale. The Hanford and Hesperia soils each made up about 45 percent of this association; the remaining 10 percent consists of Tujunga soils. These gently sloping soils on young alluvial fans are part of an area known locally as "white ashland."

The Hanford soils occupy fairly large areas throughout the associations, but the largest areas are in the eastern half. These soils are neutral in reaction and have a surface layer of sandy loam or fine sandy loam. The Hesperia soils are similar to Hanford soils, but they have a subsurface layer that is slightly to moderately calcareous and overlies compact silty material. Most of the Hesperia soils are lower, western part of the fans, and some are saline-alkali affected but can easily be reclaimed.

Hanford-Delhi-Hesperia association: Deep, somewhat excessively drained and well-drained sands to fine sandy loams; partly wind modified

The soils in this association occupy most of the young alluvial fan of the Kings River, and also a small area near Reedley. The Hanford, Delhi, and Hesperia soils each make up slightly less than one-third of the association; the remainder is made up of Dello and Tujunga soils. These soils have a rougher, more uneven surface than the soils of association 7 on the young fan of the San Joaquin River. The remnants of at least four large, dry channelways dissect this soil association. They are part of a former flood tributary system of the Kings River. Parts of these remnants are filled with coarse sandy alluvium. Wind deposited material has blocked unfilled parts of these channelways and formed closed depressions. Other depressions were formed by wind scouring. In large areas the wind has piled the sandy soil material into undulating or rolling relief. The soils in this association generally are somewhat excessively drained and well drained, except in the depressional areas where drainage is somewhat poor or poor.

The Delhi soils are deep, pale-brown, neutral sand or loamy sand that in places overlay a compact silty layer at a depth of more than three feet. Their water-holding capacity is low. The wind-formed patterns are not so strongly developed in areas east of State Route 99 as in other parts of the association. Saline-alkali affected areas of the Hesperia and Dello soils are near the basin rim in the western part of the association.

Most of the Hesperia soils are in the lower, western part of the fans, and some are saline-alkali affected but can easily be reclaimed.

Pachappa-Hesperia association: Well-drained and moderately well-drained fine sandy loams or loams that are moderately deep or deep to compact silt

Soils of this association are on young fans along Fancher Creek and Dry Creek. The surface layer is commonly loam to fine sandy loam. The alluvium from both creeks was deposited along a very gently depressed area marking the confluence of the young fan deposits from the rivers. In the western part of this association, southwest of Kearney Park, are soils that are somewhat saline-alkali affected.

Pachappa soils make up about 60 percent of this association; Hesperia soils, about 25 percent; and minor soils, about 15 percent. In some areas of the Pachappa soils, the water table formerly was near the surface and salts and alkali accumulated in the soil. Many of these areas have been reclaimed since the water table has been lowered. Most of the Hesperia soils are in the lower, western part of the fans, and some are saline-alkali affected but can easily be reclaimed.

Greenfield-Atwater association: Well-drained loamy sands and sandy loams that are moderately deep or deep to compact sandy material; partly wind modified

Some soils in this association are on young alluvial plains formed by deposits from small streams that drained the Sierra Nevada foothills. Others are on wind-laid material blown from the sandier alluvial areas and from dry channels by prevailing northwesterly winds. The winds laid the material down only a short distance from its source as a sandy mantle of varying thickness in a large, undulating area, or as low finger-like ridges oriented with the prevailing direction of the

wind. The Greenfield soils formed on stratified alluvial material, and the Atwater soils on the more uniformly sorted, wind-laid material.

The Greenfield and Atwater soils are nearly equal in extent, and together they make up about 95 percent of this association. The remaining five percent consists of minor soils. The Greenfield soils are brown to pale brown, are generally neutral in reaction, and have a sandy loam surface layer. The Atwater soils are like the Greenfield soils but are undulating to rolling. Their surface layer ranges from loamy sand to sandy loam and is somewhat grayer than that in the Greenfield soils.

Well-drained Soils of Low Alluvial Terraces

Remnants of old fans of the rivers and streams occur as alluvial terraces well above the streams from which they were deposited. They are above the streams because of a minor uplift of the area some time ago, the entrenchment of the rivers and streams, and the washing away of part of the area. This subdivision makes up about 151,400 acres, or nearly 14 percent of the survey area. Elevations range from about 250 to 550 feet. Prominent terrace escarpments border the secondary valleys of the rivers. Less prominent escarpments border the contact of the terraces with fans formed from more recent alluvium. In some places water is seasonally ponded in depressions. In other large areas runoff is slow to rapid and drainage varies accordingly. Two soil associations are in this subdivision.

San Joaquin-Exeter-Ramona association: Sandy loams and loams that are shallow or moderately deep to a hardpan and deep sandy loams and loams

Most soils of this association have a hardpan that is cemented with iron and silica. The hardpan occurs at a depth of 12 to 48 inches and is impermeable to roots and water. If the hardpan is not broken, the soils are waterlogged, both in wet years and when over-irrigated. In dry years crops are likely to be damaged by drought. The soils that have a hardpan are the San Joaquin, Exeter, and Madera. The Ramona soils have a moderately restrictive subsoil but lack a hardpan. Some of the Ramona soils, however, have a compact sandy substratum at a depth of three to four feet. The substratum restricts penetration of roots and water, but not so much as a hardpan. All soils in this association formed in material from old granitic alluvium.

The San Joaquin soils make up about 50 percent of this association; the Exeter soils about 25 percent; and the Ramona soils about 20 percent. The remaining five percent is minor soils. The San Joaquin soils have a surface layer of brown to reddish-brown, slightly acid to medium acid loam to sandy loam. They have a thin clay subsoil, about 8 inches thick, that rests abruptly on a cemented hardpan at a depth of 18 to 36 inches. The hardpan is 6 to 24 inches thick and overlies sandy or silty material. The Exeter soils are similar to the San Joaquin soils, with slightly finer texture than the surface layer. The Ramona soils are widely distributed in the association within larger areas of hardpan soils.

Non-irrigated soils in this association are used for dry farmed barley. After deep ripping the hardpan and leveling the surface, the soils are suited to cotton, grain sorghum, sugar beets, orchard crops, and vineyards.

Academy-Yokohl association: Loams that are moderately deep to a compact layer and soils of similar texture that are shallow to a cemented hardpan

Soils of this association are on dissected low terraces and formed in old alluvium derived mainly from gabbro and metamorphic basic igneous rocks. Subsequent dissection of these stream terraces produced areas of soils that were undulating to gently rolling. The Academy soils formed in the material exposed. The Yokohl soils, on crests of knolls and low ridges, have a hardpan and are remnants of more extensive areas of soil that had formed on the original surface of the terraces.

The Academy soils make up about 60 percent of this association; the Yokohl soils, about 35 percent; and the minor soils, the remaining five percent. Academy soils have a surface layer of dark-brown, slightly acid loam. The subsoil grades fairly abruptly into old, compact, sandy sediment many feet thick. Depth to the sediment ranges from about two to three feet. Yokohl soils have a surface layer of reddish-brown, slightly acid loam to clay loam that is gravelly in a few places. Their subsoil is dense, reddish-brown clay that has prismatic structure. It ranges from slightly acid to mildly alkaline, and rests abruptly on a strongly cemented hardpan at a depth of one to two feet. The hardpan is cemented by iron oxides, silica, and lime, and it seriously restricts penetration of roots and water.

Well-drained Soils of High Alluvial Terraces

Small areas of alluvium, older than the low terraces, are on both sides of the San Joaquin and Kings Rivers close to the entrance to their canyons at the edge of the Sierra Nevada foothills. This subdivision makes up about 5,570 acres, or about 0.5 percent of the survey area. Elevations mostly range from 450 to 900 feet, though in small areas the elevation is as high as 1,200 feet.

These terraces are all that remain of the more extensive fan deposits made up of mixed alluvium that is cobbly or gravelly in many places. They are called high alluvial terraces, because their relative position is above other alluvial deposits in the San Joaquin Valley. The high terrace remnant north of Centerville is the best preserved part of this old landform. Excavations show that these older materials were deposited on older weathered bedrock. Two soil associations are in this subdivision.

Centerville-Keyes association: Clays that are moderately deep to compact sandy material and cobbly clay loams that are shallow to a cemented hardpan

Soils of this association are on high terraces near Centerville and Tivy Valley. These soils formed from a mixture of old deposits of feldspar sand that weather readily and of cobblestones and pebbles that resist weathering. Centerville soils make up about 75 percent of this association; the Keyes soils, about 20 percent; and minor soils, the remaining five percent. The Centerville soils consist of dark reddish-gray clay and cobbly clay that in many places have lime nodules in the subsurface layer. The Keyes soils have a surface layer of dark grayish-brown cobbly clay loam. Their subsoil, a dense cobbly clay, rests on a reddish or yellowish, cobbly, cemented hardpan at a depth of one to two feet.

Positas-Redding association: Gravelly loams that are moderately deep to a compact layer or a cemented hardpan

Soils of this association are near the town of Friant and near Tivy Valley and formed on eroded high terraces from mixed gravelly or sandy material. The material was deposited by ancient rivers whose channels have long since been obliterated. The Positas soils make up about 65 percent of this association, and the Redding soils the remaining 35 percent. Positas soils have a surface layer of brown to grayish-brown, acid gravelly loam. Redding soils have a surface layer of reddish-brown, acid gravelly loam. The subsoil is dark reddish-brown, strongly acid clay. It rests abruptly on a gravelly hardpan. Depth to the strongly cemented hardpan is one to three feet. The hardpan is underlain by thick beds of gravelly material. The soils of this association are poorly suited to irrigated or dry farmed crops and range reuses. Local sources of water are limited, though some is available for livestock.

Soils of the Uplands of the Sierra Nevada Foothills

This section includes that part of the Sierra Nevada foothills that comprises the eastern quarter of the survey area. It consists of excessively drained to well-drained soils of the lower foothills and somewhat excessively drained and well-drained soils of the upper foothills. The soils in this section formed mainly from granitic, metamorphic, serpentine, and basic igneous rocks. Small areas formed on colluvium, and many small valleys formed on local alluvium.

The foothills extend to the east from the edge of the San Joaquin Valley. Relief ranges from undulating to very steep, and elevation increases to the east. Except where canyons have been cut, the soils formed in material from granitic rock tend to have smoother, less steep slopes than the other soils. The areas derived from metamorphic, serpentine, or basic igneous rocks generally have rougher, steeper slopes.

The uplands of the Sierra Nevada foothills are not divided physiographically, but are divided on the basis of climate into the lower and upper Sierra Nevada foothills. The gradual increase in average annual temperature is closely related to the increase in elevation. The lower foothill area is warmer and drier than the upper foothill area.

Excessively Drained to Well-drained soils of the Lower Foothills

The soils of the lower foothills formed in material weathered from several different kinds of rock. They make up about 186,000 acres, or nearly 17 percent of the survey area. This part of the foothills extends from the eastern edge of the San Joaquin Valley where the elevation is about 500 feet to areas where the elevation is about 3,000 feet. The upper boundary is determined by the elevation, shape, and aspect of the land surface which, in turn, controls the local climate and local development of the soils.

Most of the soils in the lower foothills have an open to very open cover of annual grasses and forbs. Trees and shrubs grow in many places, though they are not dominant in the natural vegetation. Nearly all of the soils are used for range, but some are used for watershed purposes and as habitat for wildlife. The areas also have some recreational and aesthetic value. The lower foothills contain four soil associations.

Vista-Fallbrook association: Well-drained sandy loams that are shallow to moderately deep over granitic rock

The soils of this association have formed mainly from granitic rock. The topography ranges from rolling to hilly areas that have some outcrops of rock to steep, rocky areas. Vista soils make up about 60 percent of this association, Fallbrook soils, about 30 percent; and minor soils, about 10 percent. The Vista soils have a surface layer of pale-brown, neutral to slightly acid coarse sandy loam that is massive and hard when dry. Depth to weathered parent rock ranges from one to three feet. The Fallbrook soils generally are somewhat deeper, are redder in color, and have a more strongly developed subsoil than the Vista soils. The surface layer is similar to that of the Vista soils, but it is brown in color and in places is sandy loam.

The soils in this association are used mainly for range. Forage yields are good in years of favorable moisture and poor in years of unfavorable moisture. Citrus is grown in areas where irrigation water is available and where the frost hazard is low.

Blasingame-Millerton-Tivy association: Well-drained and somewhat excessively drained fine sandy loams to clay loams that are over basic igneous rock

The soils of this association formed chiefly in material from gabbroid or metamorphosed volcanic rock. These soils are somewhat darker colored, somewhat finer textured, and generally are more hilly and steeper than the soils of the Vista-Fallbrook association. These differences in soil characteristics reflect differences in the parent rocks. Low irregularly shaped outcroppings of rock make up about one-third of each soil area. The Blasingame soils make up about 50 percent of this association; the Millerton soils, about 25 percent; Tivy soils, about 20 percent; and minor soils, the remaining five percent.

Blasingame soils have a surface layer of brown to reddish-brown, neutral or slightly acid loam to clay loam. The Millerton soils are typically shallow to weathered parent rock. Their surface layer is fine sandy loam, but is otherwise similar to that in the Blasingame soils. It is massive and is hard when dry. Tivy soils have a surface layer of dark-brown to grayish-brown, neutral or slightly acid loam that is massive and is hard when dry. These soils are used for range. During years of favorable moisture, forage yields are good to very good. Forage yields are poor during years of unfavorable moisture, though they are somewhat better than on soils formed in material from granitic rock.

Cibo-Porterville association: Well-drained and somewhat excessively drained clays that are moderately deep to deep over basic igneous rock and permeable sediment

Soils of this association formed from basic igneous rocks that weathered readily. They are clay in texture. The areas are along the lower edge of the foothills or are on outliers of the foothills surrounded by alluvial material of the San Joaquin Valley. Cibo soils make up about 50 percent of this association; Porterville soils, about 45 percent; and Mt. Olive soils, the remaining five percent.

The Cibo soils are undulating to very steep and are extremely rocky. They consist of dark grayish-brown to dark-gray, blocky clay. Deep, wide cracks tend to form in the Cibo soils upon drying. Porterville soils formed in the colluvium that surrounds most of the knolls, hills, or ridges on which the Cibo or Mt. Olive soils formed. Porterville soils are nearly level to sloping. These deep

soils consist of dark reddish-brown, fine clay that is granular or blocky and has accumulations of lime deep in their profile. Some areas are cobbly or gravelly, and some contain coarse rock fragments.

Fancher-Delpiedra association: Well-drained to excessively drained loams that are shallow to moderately deep over serpentine rock

The soils of this association formed in material from altered serpentine rock. The proportion of magnesium to calcium is lower in these soils than in other soils formed from similar parent rock. These steep to very steep soils occur on ridges and hills. Fancher soils make up 75 percent of this association, and Delpiedra soils, 25 percent. Included in this association are several landslide areas. The Fancher soils are stony and moderately deep. The surface layer is reddish, neutral loam, and the subsoil is dense, gravelly clay. The Delpiedra soils are thin and stony. Their surface layer is reddish, neutral loam.

These soils are used entirely for range. Production of forage is fair in years of favorable moisture and poor in years when rainfall is low or is poorly distributed throughout the growing season. These soils are not as fertile as nearby foothill soils, but they produce more grass than other soils on serpentine rock. Annual grasses, forbs, and some clusters of perennial grasses grow on most areas of these soils. Oaks and shrubs grow on some protected slopes at higher elevations.

Somewhat excessively drained and well-drained soils of the upper foothills

The soils in the upper foothills formed in material weathered from rocks similar to those in the lower foothills, except that no serpentine rock is in the area. The upper foothills make up about 138,000 acres, or nearly 17 percent of the survey area. The lower boundary is not sharply defined and is dependent upon aspect or the protective influence of prominent outlying hills or ridges in the lower foothills.

Soils typical of the upper foothills at elevations much lower than normal are on the canyon slopes of both the Kings and San Joaquin Rivers. The upper foothill zone joins the middle mountain conifer forests beyond the eastern boundary of the survey area. A few middle mountain soils are included, however, in the upper foothills. The elevation ranges from about 1,500 to about 4,000 feet.

The soils in the upper foothills differ in some respects from those in the lower foothills because they formed under a cooler, more moist climate. The upper foothill soils are somewhat more leached, generally are deeper, and have more organic matter in their surface layer. Also, structure of the surface layer is granular instead of massive.

These soils are used for range, watershed, wildlife habitat, recreation, and residences. The vegetation is mainly woodland grass, woodland shrub, and dense chaparral. The upper foothills contain three soil associations.

Auberry-Ahwahnee association: Well-drained and somewhat excessively drained sandy loams that are moderately deep and deep over granitic rock

The soils in this association formed in material from granitic rock. These soils occur on rocky ridges or canyon slopes. Some areas are rolling to hilly, and others are steep to very steep. In places where rocks crop out, Auberry soils make up about 60 percent of this association; Ahwahnee soils, about 20 percent; and minor soils, the remaining 20 percent. The surface layer of the Auberry soils is grayish-brown, slightly acid coarse sandy loam that has granular structure. The subsoil restricts penetration of roots and water. Ahwahnee soils have a surface layer of grayish-brown, slightly acid, coarse sandy loam that has granular structure.

The soils in this association are used mainly for grazing. Forage production is very good in years of favorable moisture and fair in years of unfavorable moisture. On limited areas of the gently sloping soils, woodland-shrub or chaparral is being converted to dryland pasture or dry farmed grain-hay. Irrigated pasture has been developed where water is available. Many turkey farms are in this association. Most residential development in the upper foothills is also in this association.

Coarsegold association: Somewhat excessively drained fine sandy loams that are deep over metasedimentary rock

Soils of this association formed in material from metamorphosed sedimentary rock. Coarsegold soils make up almost all of this association. Small areas consist of Ahwahnee and Trimmer soils and outcrops of metamorphic rock. Coarsegold soils commonly have slopes of more than 45 percent. The surface layer is brown, slightly acid, micaceous fine sandy loam. These soils are used chiefly for range in spring, because the steep slopes provide poor footing for livestock during other seasons.

Trimmer-Trabuco association: Well-drained and somewhat excessively drained sandy loams to loams that are moderately deep and deep over basic igneous rock

Soils of this association formed in material from metamorphic volcanic rocks and other basic igneous rocks. They are steep to very steep and occur on hills and ridges. Many of the areas are very rocky. The natural vegetation ranges from woodland-grass to dense chaparral. Trimmer soils make up about 50 percent of this association; Trabuco soils, about 25 percent; and minor soils, the remaining 25 percent. Trimmer soils have a surface layer of brown to grayish-brown, slightly acid loam that generally is granular in the upper part.

Soils of this association are used for range. Forage production is very good in years of favorable moisture, and good in years of unfavorable moisture. Converting areas of brush to range is a good way to gain valuable grazing areas. These soils have high value for use as watershed areas.

GENERAL SOILS CHARACTERISTICS

Expansive Soils

Expansive soils are those that greatly increase in volume when they absorb water and shrink when they dry out. Expansion is measured by shrink-swell potential, which is the relative volume

change in soil with a gain in moisture. If the shrink-swell potential is rated moderate to high, damage to buildings, roads, and other structures can occur.

As identified in the *Soil Survey for Eastern Fresno County* prepared in 1971 by the Natural Resources Conservation Service (formerly the Soil Conservation Service), soils exhibiting a high to moderately high shrink-swell potential include the Merced-Temple, Academy-Yokohl, Centerville-Keys, Positas-Redding, Vista-Fallbrook, Blasingame-Millerton-Tivy, Cibo-Porterville, and the Trimmer-Trabuco associations. With the exception of the Merced-Temple association, these expansive soils are present in a northwest-trending belt approximately parallel to the Friant-Kern Canal foothills in Kings Canyon National Park in the Sierra Nevada. The Merced-Temple soils are located along Fresno Slough from Madera County to Kings County. The locations of these soil associations that exhibit high to moderately high expansion potential in eastern Fresno County are shown in Figure 7-1. Information regarding expansive soils in the western part of Fresno County (west of Fresno Slough) is not provided in the soil survey report published in 1950 for that area (*Soils of Western Fresno County California*). A more recent report has not been published, and no other area-wide assessments have been prepared as of March 1997. However, more recent local investigations conducted under the auspices of the NRCS Hanford Office for the Westlands Water District have identified three specific soil units not delineated in the soil survey report or on the Westlands Water District general soil map that are considered to have a high expansion potential (Tachi, Gepford, and Lillis). These soil units are part of two larger soil associations (Tachi-Armona-Gepford and Ciervo-Cerini-Lillis) that roughly parallel the San Luis Drain west of Tranquility and San Joaquin. The information presented in Figure 7-1 is generalized; the results of site-specific geotechnical investigations would more precisely define the boundaries of expansive soils at a specific location in the unincorporated county.

Erosion

Natural forces, both chemical and physical, are continually at work breaking down soils. Erosion poses two hazards: it removes soils, thereby undermining roads and buildings and producing unstable slopes; and it deposits eroded soil in reservoirs, lakes, drainage structures, and on roads as mudslides. Natural erosion is frequently accelerated by human activities such as clearing and grading.

In the eastern Fresno County area, soils of the Positas-Redding, Vista-Fallbrook, Blasingame-Millerton-Tivy, Fancher-Delpiedra, Auberry-Ahwahnee, Coarsegold, and the Trimmer-Trabuco associations have been identified as exhibiting moderately high to high erosion potential. These soils are located in the Sierra Nevada and the foothills, as shown on Figures 7-2 and 7-3, and generally coincide with land slope areas that exceed 30 percent. Many of the soils are located within the boundaries of the Sierra National Forest, Sequoia National Forest, or Kings Canyon National Park, which would limit their availability for intensive development. Within the valley, erosion is generally not problematic except for areas containing Rossi soil (Rossi-Waukena association) east of the Fresno Slough from approximately Mendota to Fish Slough near Helm. Severe erosion potential has been identified along the San Joaquin River Bluff. Along the main bypass floodway of Fresno Slough, widely spaced gullies in a trellis pattern have eroded the soils where subsiding floodwaters drain back into the deeper main flood channel.

In western Fresno County, most soils associated with the Kettleman series appear to be subject to moderate to severe sheet and gully erosion potential. Areas where Kettleman soils are present are

located primarily west of Interstate 5 in the Coast Range foothills. As noted in the *Soils of Western Fresno County* report, although the Panoche and Panhill soils are classified as exhibiting no erosion under natural conditions, their physical properties make them particularly susceptible to erosion as a result of human activity. As found on Figure 7-4, these soils are located extensively throughout the western area, as noted above, and are especially prevalent in areas on recent alluvial fans in the central part of the western area.

7.5 AGRICULTURAL LAND

Since Fresno County is California's top-ranked agricultural producing county, agricultural lands, soils, water, and vegetation contribute tremendously to the county's economy. Chapter 2 presents background information on Fresno County's agricultural resources, including agriculture and soil resources.

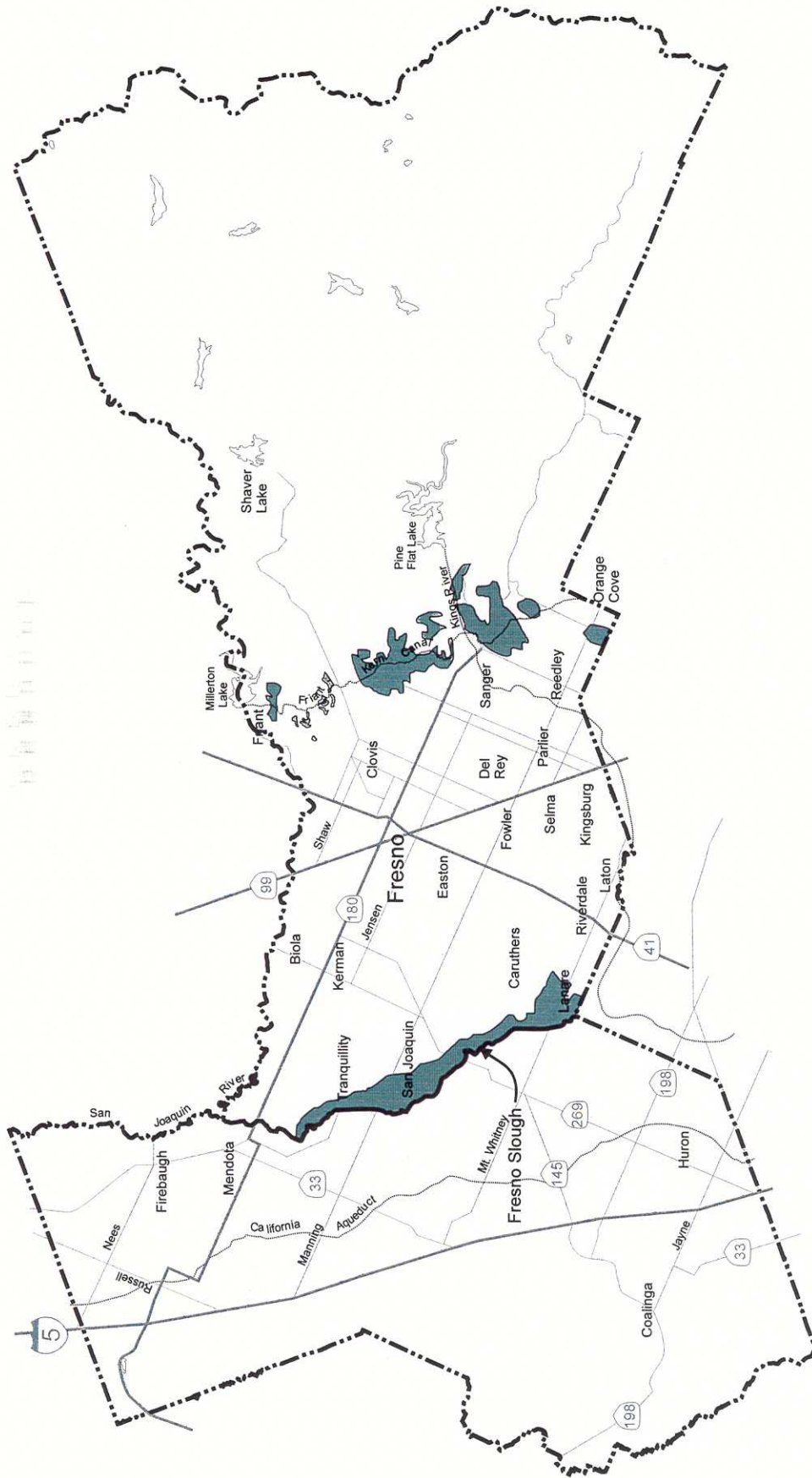
7.6 BIOLOGICAL RESOURCES

BIOTIC REGIONS OF FRESNO COUNTY

Fresno County is unique among California counties. The county cuts an east/west cross section across central California that includes the spine of the Sierra Nevada Mountains, the expansive Central Valley, and a small portion of the inner Coast Range. The county's physical characteristics generates a large diversity of vegetation and wildlife. To better understand this physical and biological diversity, the following analysis utilizes Hickman and Sawyer and Keeler-Wolff's descriptions of the county's geographic regions in terms of 29 habitat types, and four biotic regions, subregions, and districts. The regional overview also provides a broad-brush setting for the county. The Wildlife Habitat Relationship System(WHR) habitat types provide the basis for vegetation diversity, wildlife diversity, habitat suitability for special-status species, and overall values for biological resources.

Fresno County's four biotic regions used in this analysis include from west to east: the Central Coast Range Region; the San Joaquin Valley Floor Region; the Central/Southern Sierra Nevada Foothill Region; and the Central/Southern High Sierra Nevada Region. Each region hosts specific habitats (varying aggregations of trees, shrubs, and herbaceous plant species) that provide the necessary food, water, cover, and migration and dispersal corridors for a large diversity of wildlife species. The WHR describes 29 habitat types in Fresno County in terms of the composition and structure of dominant vegetation. The WHR computer database associates 405 wildlife species to the habitat types described below for Fresno County. A list of wildlife species for Fresno County generated by the WHR is provided in Appendix 7A.

The following descriptions of biotic regions and habitat types within Fresno County reference habitat values. For the purposes of this analysis, habitat values are based on the condition of an area of land, region, or specific habitat type to provide essential habitat elements that are used by wildlife for all or a part of their life cycles. Key habitat elements contributing to habitat values include the abundance and availability of food and water, cover for migration and dispersal corridors, escape, nesting, and thermal cover. The greater number of essential elements on an area of land contributes to the greater number and diversity of species; therefore, it can be considered to be of a higher habitat value for wildlife. For example, an active agricultural field provides food

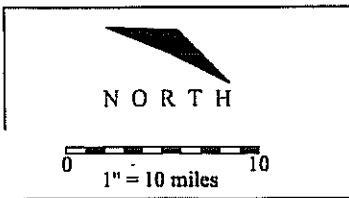
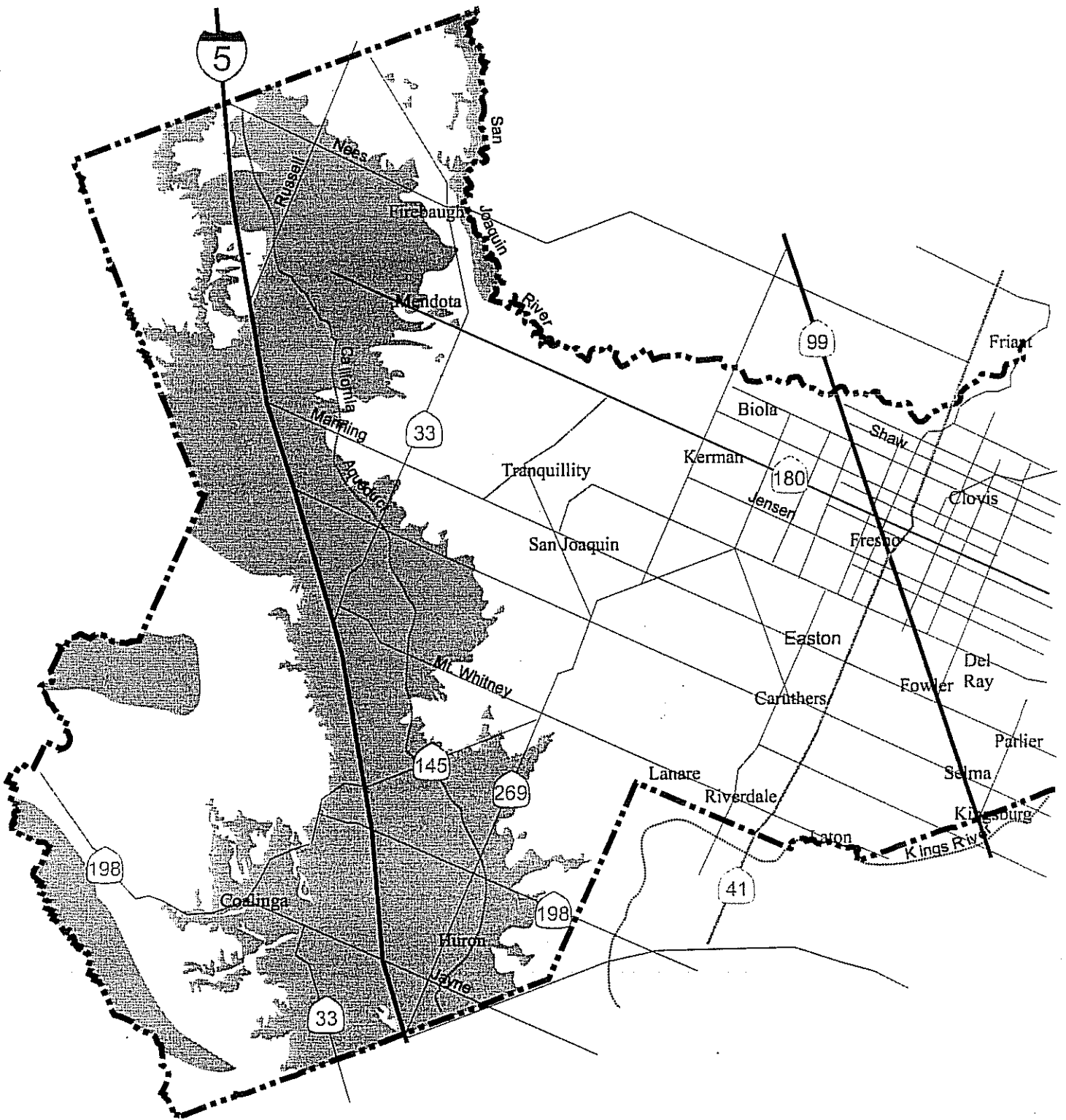


Expansive Soils

Figure 7-1

Soils Exhibiting Moderately High to High Expansion Potential (Generalized Locations)





 Generalized Hazard Area

Fresno County General Plan

**Erosion Hazards in
Western Fresno County**

Figure 7-4

Source: U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey Western Fresno Area, California, 1950*

and cover for rodents and foraging habitat for raptors with little cover for nesting, movement, or escape (low to moderate values for wildlife), whereas a riparian corridor would support virtually all of the elements described above and is considered to have a high value for wildlife.

Central Coast Range Region

Only a small portion of the far western edge of Fresno County lies in the Central Coast Range Region. This small portion of the eastern edge of the inner south coast range district supports a mosaic of summer dry grassland, blue oak and blue oak-foothill pine woodland, and chaparral habitat types. Western Fresno County transitions from the grasslands and agriculture of the Central Valley to the inner coast region. Mostly ephemeral and intermittent streams flow from the inner coast range to the valley floor. Some can support riparian habitat that provides additional value to both resident and migratory wildlife.

San Joaquin Valley Floor Region

Greater than 50 percent of Fresno County lies in the southern San Joaquin Valley subregion of the Central Valley. This southern subregion is generally hotter and drier than that to the north and supports some desert elements. The valley floor region has undergone extensive conversion of native habitats that existed before European settlement of the state. Presently, this region supports extensive amounts of agriculture and urban development around the Fresno, Clovis, Sanger, and Hanford areas.

In the few remaining areas not converted to urban or agriculture use, unique biological features persist. Mixed in with areas of grassland habitat are freshwater and alkaline vernal pools that support a unique native flora and fauna. A few small isolated areas of sodic vernal pools occur in the northwestern part of the county, primarily at the Kerman reserve. Concentrations of freshwater vernal pools occur in a belt along the northeast edge of the valley floor region north of the Kings River. In the highly modified Central Valley, vernal pool areas are often grazed but remain a unique biological relic of native California species in the natural landscape.

The rivers and streams that flow from the mountains in the east historically meandered through broad floodplains. Because of urbanization and agriculture, these broad floodplains have been restricted to narrower belts along the rivers and streams or otherwise modified for flood control. In the upper San Joaquin River, the floodplains are naturally constrained by high bluffs bordering the river. Within this modified landscape, remaining riparian habitat is of great value to resident and migratory wildlife that provides corridors and linkages to and from the biotic regions of the county. The San Joaquin and Kings River systems and the Fresno Slough are the major waterways in the county.

Central/Southern Sierra Nevada Foothills

Fresno County includes a portion of the central and southern subregions of the Sierra Nevada Mountains that can be further divided into a central/southern Sierra Nevada foothill and central/southern high Sierra Nevada district. The foothill district is best differentiated from the high Sierra and the San Joaquin Valley areas by habitat types that change with topography. The foothills that are the transition from the valley floor to the high Sierra can be characterized by blue oak and blue oak-foothill pine woodlands, and chaparral habitats dotted with areas of serpentine

soils. Density and canopy coverage of tree species is highly variable depending on natural conditions such as soils, topography, slope and aspect, and human influences from grazing, hardwood harvesting, and other land clearing activities. Moderate gradient perennial and intermittent streams and rivers support a varied amount of riparian habitat that provide valuable habitat for wildlife.

Central/Southern High Sierra Nevada

The transition from the foothills to the high Sierra Nevada can be characterized by the addition of ponderosa pine at the low elevations into the dominant plant species composition (from around 2,000 feet). The foothills to high Sierra biotic regions make a transition through a mixed hardwood conifer habitat to those habitats dominated by conifers such as ponderosa pine, white fir, and giant sequoia. In the higher elevations, Jeffrey pine, lodgepole pine, and treeless alpine communities dominate. Rivers and streams are at a higher gradient than their foothill or valley floor reaches and support a montane riparian habitat that, like the others, provides valuable habitat for resident and migratory wildlife. The majority of the high Sierra Region in Fresno County is included in the Sequoia and Sierra National Forests and Kings Canyon National Park and managed by their respective federal agencies for recreational, timber, tourism and wilderness values.

HABITAT TYPES AND DESCRIPTIONS OF FRESNO COUNTY

The following description of Fresno County habitat types provides a brief description of the composition and structure of vegetation along with associated wildlife species and values, and a generalized description of the location of these habitat types within the County. Table 7-1 provides a list of Fresno County habitat types by biotic region and Figure 7-5 illustrates the generalized location and extent biotic regions and habitat mosaic within Fresno County.

TABLE 7-1			
FRESNO COUNTY HABITAT TYPES BY BIOTIC REGIONS			
Central Coast Range	San Joaquin Valley Floor	Central/Southern Sierra Nevada Foothills	Central/Southern High Sierra Nevada
- Annual/Ruderal Grassland	- Annual/Ruderal Grassland	- Annual/Ruderal Grassland	- Montane Chaparral
- Valley Oak Woodland	- Vernal Pool	- Pasture	- Montane Hardwood-Conifer
- Pasture	- Alkali Scrub	- Cropland	- Montane Riparian
- Cropland	- Pasture	- Orchard-Vineyard	- Sierran Mixed Conifer
- Valley-Foothill	- Cropland	- Urban	- Ponderosa Pine
- Riparian/Riverine	- Orchard-Vineyard	- Valley-Foothill	- Jeffrey Pine
- Fresh Emergent	- Urban	- Riparian	- White Fir
- Wetland	- Valley-Foothill	- Fresh Emergent	- Red Fir
- Lacustrine	- Riparian	- Wetland	- Lodgepole Pine
- Blue Oak Woodland	- Fresh Emergent	- Lacustrine	- Subalpine Conifer
- Blue Oak-Foothill Pine Woodland	- Wetland	- Blue Oak Woodland	- Alpine Dwarf Scrub
- Mixed Chaparral	- Lacustrine	- Blue Oak-Foothill Pine Woodland	- Wet Meadow
- Chamise-Redshank Chaparral		- Mixed Chaparral	- Bitterbrush
		- Chamise-Redshank Chaparral	- Juniper

Source: EIP Associates, March 1997.

Annual/Ruderal Grassland

Introduced annual grasses, favored by livestock ranchers, dominate the plant species in this habitat. Ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), wild oats (*Avena fatua*), rat tail fescue (*Vulpia myuros*), and foxtail barley (*Hordeum murinum* var. *leporinum*) are the most common annual grassland species. Red-stemmed and broad leafed filaree (*Erodium cicutarium* and *E. botrys*) are generally the most common introduced forbs in this habitat type. Native forbs (broad leaf herbaceous plants) to this habitat are rusty popcorn flower (*Plagiobothrys nothofolius*), fiddle neck (*Amsinkia intermedia* var. *menzesii*), and numerous species of clover (*Trifolium tridentatum*, *T. ciliolatum*, *T. depauperatum*, *T. amplexens*). In the late summer, common plants found are tarweeds, (*Holocarpha* sp., *Hemizonia* sp.), telegraph weed (*Heterotheca grandiflora*), yellow star-thistle (*Centaurea solstitialis*), turkey mullin (*Eremocarpus setigerous*) and vinegar weed (*Trichelostema lanceolatum*).

Annual/ruderal grassland habitat consists largely of non-native annual plant species that have become naturalized as a climax community and have effectively excluded the growth of native perennial grass species. The composition of the annual/ruderal grassland habitat consists largely of non-native introduced annual grasses and forbs. Because of the aggressive nature of these introduced plants, continued land disturbance, and virtual extirpation of many native species, non-native species have become naturalized as the dominant species and have excluded the growth of native perennial grassland species that occurred prior to settlement and cultivation of the area. The location and quality of annual/ruderal grassland habitat changes as agricultural uses of fields change and as they are plowed or mowed for weed control.

Annual/ruderal grassland habitat occurs throughout Fresno County from the western rangelands in the inner coast district to the Sierra Nevada foothills. Annual and ruderal grassland habitat is found in open non-irrigated pastures, along the edges of roads and fields, vacant uncultivated areas, and along fallow fields. Ruderal grassland exists in areas disturbed by past or current road and levee maintenance, or earth moving activities. Annual grassland is a less disturbed habitat type (than ruderal grassland) typically occurring as an open treeless grassland composed primarily of annual grasses and forbs. This habitat type can be found in the coast range, valley floor, and as the dominant understory vegetation type in the valley oak, blue oak, and oak-foothill pine woodlands. Most of the grassland habitat that once existed in the Central Valley has been converted to cropland, orchards, vineyards, or urban uses. The type of land use and yearly variations in weather patterns dictate the structure of annual grasslands, but generally the vegetative structure of annual grassland is open, dominated by annual plant species.

A wide variety of resident and migratory terrestrial vertebrates breed, forage, and winter in annual grassland habitat. Within the areas of active fields, some fallow lands and unmaintained field edges have become colonized by annual grasses and forbs. These areas are an important habitat element that provides food and cover for resident and migratory wildlife. Grassland edges to the fields and roads provide food, cover, and movement corridors for resident and migratory wildlife species. Small mammals, reptiles, and birds can be found in this habitat type. As many as 25 species of reptiles and amphibians, more than 100 species of birds, and 50 species of mammals are known to use grassland habitats such as those found in Fresno County. Annual grassland habitat provides suitable habitat for large populations of small mammals. The large rodent-prey base that occurs in this habitat provides suitable foraging for resident predator species like the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), San Joaquin kit fox (*Vulpes macrotis mutica*) and raptors like the red

tailed hawk (*Buteo jamainensis*), white tailed kite (*Elanus caeruleus*), and northern harrier (*Circus cyaneus*). The grasslands in the Fresno County also provide wintering, foraging habitat for the golden eagle (*Aquila chrysaetos*) and ferruginous hawk (*Buteo regalis*).

Vernal Pools

Within annual grassland, unique vernal pool wetlands can be found where subsurface soil hardpan layers cause a perched water table. Unlike the upland annual grassland habitat that is dominated by introduced annuals, one of the unique values of vernal pools is that they support a native annual and perennial flora that is adapted to surviving the seasonal ponding and drying regime. Specialized invertebrate species such as the fairy shrimp and aquatic insects, and amphibians such as frogs, toads, and salamanders rely on these seasonal ponds for reproduction in what is otherwise a very dry landscape. These invertebrate species survive the dry periods as specialized eggs that can withstand the dry months and adult and juvenile amphibians will estivate underground in the moisture of rodent burrows.

Vernal pools are ephemeral wetlands that form in shallow depressions in the ground which are underlain by a substrate that restricts water percolation. These depressions fill with rainwater during the fall and winter and can remain inundated until spring or early summer, sometimes filling and emptying numerous times during the wet season. Vernal pools are generally recognized by a showy flowering community dominated by annual native perennial wetland plants and no shrubs or trees. Seasonal wetland species within the study area include winged water-starwort (*Callitriche marginata*), annual hairgrass (*Deschampsia danthonioides*), Solano downingia (*Downingia ornatissima*), Vasey's coyote thistle (*Eryngium vaseyi*), bractless hedge-hyssop (*Gratiola ebracteata*), hyssop loosestrife (*Lolium hyssopifolium*), slender popcorn flower (*Plagiobothrys stipitatus*), Carter's butter-cup (*Ranunculus bonariensis*), and purslane speedwell (*Veronica peregrina*).

Seasonal wetlands are distinguished from vernal pools in that they contain a greater abundance of species more likely found in upland areas and grassy species, and can not be inundated for as long a period as vernal pools. The extent to which special-status plant and animal species can use these habitats is variable, but conservatively any species present in vernal pools could be present in seasonal wetlands.

Vernal pools can be found in the eastern valley floor and foothills on the north and south terraces above the San Joaquin River. Unplowed sections of the landscape support the highest densities of vernal pool habitat as found east of SR 41 near Table Mountain and near the Madera and Friant-Kern Canals.

Valley Oak Woodland

This habitat is composed almost exclusively by oaks and other broad leaved species with a savanna-like to forest-like canopy cover. Valley oak (*Quercus lobata*) is the most dominant tree species and other associates are California sycamore (*Platanus racemosa*), black walnut (*Juglans californica* var. *hindsii*), interior live oak (*Quercus wislizenii*), boxelder (*Acer negundo* var. *californica*), and blue oak (*Quercus douglassii*). Depending on grazing practices, the understory can be well developed in valley oak woodland with a shrub layer that can be composed of poison-oak (*Toxicodendron diversiloba*), toyon (*Heteromeles californica*), coffeeberry (*Rhamnus* sp.), blue elderberry (*Sambucus mexicana*), California wild grape (*Vitus californicus*), and California blackberry (*Rubus*

ursinus). The herbaceous understory of oak woodland typically consists of annual grassland, including wild oat (*Avena fatua*), soft brome, Italian rye grass (*Lolium multiflorum*), blue dicks (*Dichelostemma* sp.), filaree, and clovers.

Valley Oak Woodland habitat occurs in the western most portion of Fresno County where deep, well-drained alluvial soils occur on the valley bottoms. Remnant Valley Oak Woodland occurs in the Kings River floodplain on the valley floor where scattered large valley oak trees can be found. The climate that this habitat thrives in is Mediterranean with mild, wet winters and hot, dry summers.

The complex structure, abundance of food, shade, and nesting sites make oak woodlands attractive to mammals such as Townsend's big eared bat (*Plecotus townsendi*), Pallid bat (*Antrozous pallidus*), and western gray squirrel (*Sciurus griseus*), as well as birds such as acorn and Nuttall's woodpeckers (*Melanerpes formicivorus*, *Picoides nuttalli*), scrub jays (*Aphelocoma coerulescens*), yellow-billed magpie (*Pica nuttalli*), and many warblers and flycatchers. Abundant insects in oak woodland attract plain titmouse (*Parus inornatus*), white breasted nuthatch (*Sitta carolinensis*), and northern oriole (*Icterus galbula*). Cavities in oak trees are important nesting sites for American kestrel (*Falco sparverius*), screech owl (*Otus asio*), tree swallow (*Tachycineta bicolor*), Bewicks wrens (*Thryomanes bewickii*), house wrens (*Troglodytes aedon*), and western bluebirds (*Sialia mexicana*). The trees also provide nesting platforms for red-tailed hawks, white-tailed kites or Cooper's hawks (*Accipiter cooperii*).

Alkali Scrub

Vegetation in Alkali Scrub consists of two distinct phases with xerophytic (dry tolerant) and halophytic (salt tolerant) type plant species. Generally, members of the goosefoot family or Chenopods dominate the vegetation because the alkaline soils and seasonally perched water on a shallow claypan severely limit the type of plants that can survive. The plants that are adapted to this habitat are tolerant of high alkalinity. The commonly occurring species are all-scale (*Atriplex polycarpha*), five-hook (*Bassia hyssopifolia*), fat hen (*Atriplex patula*), saltgrass (*Distichlis spicata* var. *stricta*), and viny pepper-grass (*Lepidium dictyotum* var. *actuidens*). Marshy areas can also support yerba mansa (*Anemopsis californica*) and occasionally alkali bulrush (*Scirpus robustus*).

Alkali Scrub occurs in a band that runs north to south through central Fresno County around Fresno Slough. This habitat intergrades with a number of other arid and semi-arid wildlife habitats and will intergrade with annual grassland habitat. The climatic conditions associated with Alkali Scrub include generally low precipitation and relative humidity, high summer temperatures, rather cool winter temperatures, and very high levels of solar radiation all year round.

Since Alkali Scrub has been converted to cropland, orchards, and vineyards, the species that depend on the vegetation in this habitat have declined in populations. As many as 10 species of reptiles and amphibians, 44 species of birds, and 34 species of mammals are known to occur in this habitat.

Pasture

A mixture of perennial and annual grasses suitable for livestock foraging are found in pasture in Fresno County. Depending on the irrigation system, soil type, and management practices, pasture

lands can support a variety of plant species which include Kentucky fescue (*Festuca arundinaceae*), dallisgrass (*Paspalum dilatatum*), perennial rye grass (*Lolium perenne*), bermuda grass (*Cynodon dactylon*), and white clover (*Trifolium repens*). Non-irrigated pasture is best classified as annual grassland (see discussion under annual grassland).

Pasture lands can be found throughout Fresno County, but are predominantly located in the valley floor and are associated with cropland and annual grassland habitats. Pasture is used for livestock grazing and can not be leveled, regularly disked, or irrigated. Pasture vegetation is typically a grassland-like ground cover. Habitat value varies according to pasture size and grazing intensity. Small pastures with lots of livestock can be void of vegetation and provide little habitat for wildlife; larger fields with fewer animals and more ground cover provide some value to wildlife.

Wildlife in Pasture habitat is often the same types of species as found in annual grassland, but other species can be found in flooded pastures such as Brewer's blackbird (*Agelaius phoeniceus*), great blue heron (*Ardea herodias*), great egret (*Casmerodias labus*), and near the San Joaquin River, the white-faced ibis (*Plegadis chihi*). The same predators as found in annual grassland maybe attracted to the small mammal that are found in pasture such as the deer mouse (*Peromyscus maniculatus*), California meadow vole (*Microtus californicus*), and Botta's pocket gopher (*Thomomys bottae*).

Cropland

Cropland is used for cultivation of annual or short-lived crops and is a dynamic landscape feature that is frequently altered or disturbed throughout the year. Cultivated vegetable, fruit and grain crops are grown on cropland in Fresno County and can consist of corn, cotton, or grapes in this part of the valley. Croplands can vary from 10 feet high with corn fields to only a few inches high with strawberry crops. Fields can also be planted with annual crops like rice, wheat and lettuce or perennial crops like alfalfa, asparagus, and artichokes. In addition to cultivated crops, weedy non-native annual and biennial plants are favored by the yearly disturbance associated with ploughing, disking, and harvesting. Native flora do not compete well in this habitat. The non-natives that frequently dominate the disturbed croplands are field bindweed (*Convolvulus arvensis*), common purselane (*Portulaca oleracea*), and barnyard grass (*Echinochloa crusgali*). On roadsides, turkey mullein (*Eremocarpus setigerous*), telegraph weed (*Heterotheca grandiflora*), and horseweed (*Conyza canadensis*) are commonly observed plant species.

Cropland is found predominately in the valley floor region, interspersed with the orchards and vineyards that dominate the valley floor, and occasionally into the surrounding foothills. Flat to gently rolling terrain is preferred so that leveling and irrigation is easily facilitated.

Croplands provide habitat for a variety of resident and migratory wildlife species that are capable of exploiting the various crop types and cycles of cultivation for their survival. Within the areas of active fields, some fallow lands and unmaintained field edges have become colonized by annual/ruderal grassland habitat and are an important habitat element that provides food and cover for resident and migratory wildlife. Cropland provides food and cover for wildlife species such as song birds and small rodents, and foraging opportunities for raptors due to the frequent flooding, mowing, or harvesting of the fields that make the prey more visible. The State-listed threatened Swainson's hawk relies heavily on cropland for foraging. Plant species associated with cropland habitat include cultivated crops and non-native herbs, shrubs, and trees associated with

landscaped or disturbed edges along roads, irrigation ditches, and agricultural fields. Additional habitat elements that contribute to the value of cropland when present are isolated oak trees and tree-lined, vegetated, or landscaped borders of fields and along roads. Habitat is provided by cropland mostly for terrestrial vertebrates, but reptiles and amphibians are poorly represented.

Approximately 110 bird species, and 40 mammal species are known to use this habitat in Fresno County. Cropland supports migratory water fowl where rice fields and other grain crops are flooded in the winter while perennial alfalfa fields with a large rodent population near riparian habitat are the preferred foraging habitat for Swainson's hawks.

Orchard-Vineyard

A large percentage of Fresno County is occupied by orchard-vineyard habitat that grows crops such as almonds, nectarines, figs, and table wine and raisin grapes. There is little development of an understory in orchards and vineyards because mowing or discing prevent growth under the crop during the growing season. Some annual grasses and forbs are found in orchard-vineyard such as ripgut brome, wild oats, and fiddleneck and many of the weedy species common to cropland will be found also. Little native vegetation is found in orchard-vineyard because of the high frequency of disturbance.

Orchard-vineyard occur on the valley floor and western slope of the Sierras and can intergrade with many habitats including riparian, cropland, pasture, and urban settings. There is little habitat for terrestrial vertebrates in orchard-vineyard due to the absence of an herbaceous understory. Little to no cover or food is provided for small mammals, reptiles, or amphibians.

Urban

Urban development occurs mostly in the valley floor and Sierra Nevada foothill regions. Urban habitats of Fresno County consist of cities, towns, and subdivisions where native habitats have been modified such that the assemblage of plants and animals living in the area are substantially different than the other natural habitats described in this section. In an urban setting the vegetative structures can fall into these categories: tree grove, street strip, shade/lawn tree, lawn, and shrub cover. Native plants are usually replaced by ornamental trees and shrubs such as eucalyptus, pines, pyracantha, and oleander, although remnant stands of native trees can be found incorporated into urban development. The height, canopy cover, and understory can vary significantly by street.

Numerous species can also be found using habitat created from landscape vegetation, tree-lined streets and other roadside vegetation, and vacant lots in the urban and rural areas associated with the cities, towns, and farms in the County. Remaining riparian corridors in the urban areas that are dominated by native trees and shrubs, provide essential habitat elements (food, water, thermal and nesting cover, and movement corridors); therefore, it is a haven in the urban landscape for an abundance of wildlife species.

Mammals, reptiles, and amphibians are poorly represented in urban habitats, but up to 120 bird species can pass through urban settings during migration periods. In the more developed sections of the urban environment, the species diversity is lower and resident species such as rock dove, house sparrows, and European starlings comprise over 90 percent of the birds. Outside of the

urban center, bird diversity increases and species such as white-crowned sparrows, dark-eyed juncos, and scrub jays reside in lower density urban areas. Often, introduced species like house sparrows, starlings, the house mouse, and the Norway rat out compete native birds and mammals for breeding opportunities in the urban environment.

Eucalyptus

Eucalyptus habitat may range from single species thicket/forest with little or no shrubby understory to scattered trees over a well developed herbaceous and shrubby understory. Eucalyptus habitat generally occurs where eucalyptus trees are planted in rows and in clusters as wind breaks. Once established the trees often become naturalized and the area surrounding the original planting becomes colonized by the offspring of the parent trees. The most commonly planted eucalyptus species are blue gum (*Eucalyptus globulus*) and red gum (*Eucalyptus camaldulensis*). Generally, these trees are known for their rapid growth and may reach their maximum height within 15 to 20 years. These trees are limited to the lower elevations where freezing does not occur frequently. Usually these trees are planted as wind breaks or timber lots and border urban and rural areas.

Although this habitat is not considered high quality for most wildlife, mature eucalyptus trees are often important roost or nest sites for a few bird species including crow, raven, barn owl, and red-tailed and red-shouldered hawks.

Valley-Foothill Riparian and Riverine

Valley-foothill riparian habitat is found intermittently along rivers and lakes in Fresno County. This forest-type habitat is typically composed of deciduous riparian tree species. The dominant trees consist of Fremont's cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), western sycamore (*Platanus racemosa*), white alder (*Alnus rhombifolia*), and Oregon ash (*Fraxinus latifolia*). Other riparian trees that occur in the riparian corridor are shining willow (*Salix lucida* ssp. *lasianдра*), Goodding's black willow (*Salix gooddingii*), sand bar willow (*Salix exigua*), and arroyo willow (*Salix lasiolepis*). The understory in the mixed riparian areas is composed of vines and shrubs like California grape, black berry (*Rubus* sp.), buttonwillow (*Cephalanthus occidentalis*), and blue elderberry.

The community is generally found on relatively fine-textured alluvial soils along active and former floodplains away from the active river channels. This habitat often naturally reinvades many disturbed areas along rivers and gravel ponds as long as the hydraulic regime necessary for riparian tree growth is maintained. Valley-foothill riparian habitat is found along the drainages of the valley floor creating corridors to the east into the low foothills.

Riverine habitat consists of the open water habitat off the perennial and intermittent streams and rivers associated with the riparian habitat which is the terrestrial component of this interdependent system. In Fresno County, the San Joaquin and Kings Rivers, the Fresno Slough, and other tributaries to these major water courses comprise the majority of riverine habitat in Fresno County. The aquatic habitat in rivers and streams is highly influenced by the seasonally variable flow regimes. Discharge from the reservoirs can vary drastically from week-to-week and year to year causing significant water level changes in a river system.

Compared to the highly modified agricultural lands, the numerous essential habitat elements provided by the remaining riparian/riverine corridors makes them perhaps the most significant contributor to wildlife habitat throughout the county. From a wildlife habitat perspective, the valley-foothill riparian/riverine habitat provides food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife species. Of particular significance is the state-listed threatened Swainson's hawk use of tall trees in riparian habitats for nesting.

Wildlife values of riparian/riverine habitat are high, where many migratory bird species use the dense vegetation for nesting during the summer months. Neo-tropical migrant birds such as the blue grosbeak (*Guiracea caerulea*), Lazuli bunting (*Passerina amoena*), Wilson's warbler (*Wilsonia pusilla*), yellow warbler (*Dendroica petechia*), and yellow breasted chat (*Icteria virens*) use the riparian corridor for protection during the breeding season. Also raptors like the red-tailed and red-shouldered hawks (*Buteo lineatus*) and Swainson's hawk (*Buteo swainsoni*) nest in the canopy of cottonwoods or oak trees. Barn owls (*Tyto alba*) nest in hollowed tree trunks or other cavities while great-horned owls (*Bubo virginianus*) can build nests in the tree canopy.

The open water zones of rivers in the county provide habitat for many species of water fowl such as ducks, grebes, and coots as well as predatory birds like the osprey and bald eagle. Near the shoreline, the birds that use the shallow waters are egrets, herons, shorebirds, and belted-kingfishers. Common mammals that can be found on the river are river otters (*Lutra canadensis*), beaver (*Castor canadensis*), and muskrat (*Ondatra zibellinus*). Native and non-native fish, tree frogs (*Hyla regilla*), bullfrogs (*Rana catesbeiana*), crayfish, and an abundance of aquatic invertebrates occur in the riverine habitat. Rank Island is home to an active heron and egret rookery.

Fresh Emergent Wetland

The vegetation in fresh emergent wetland is best characterized as erect, rooted herbaceous hydropytes (water loving plants). The vegetation found in this habitat is inundated by water for a long portion of the year or is flooded frequently so their roots are adapted to an anaerobic environment. The plant species are usually perennial monocots that grow in slow moving creeks, canals, or ponds. Vegetation is characterized by plants such as bulrush (*Scirpus acutus*), cattails (*Typha latifolia*), arrowhead (*Sagittaria latifolia*), rushes (*Juncus* sp.), and sedges (*Carex* sp.). Vegetation can vary in size from small patches of emergent growth to vast areas of marshes.

Fresh emergent wetland once covered significant portions of the Central Valley, but was reduced as farmers channelized, leveed, or dammed rivers in the state. This habitat can occur anywhere water is perched, ponded, or periodically flooded in Fresno County. They are generally most common on the valley floor on clay soils that perch water during the winter, but can be found in the foothills and higher elevations where ponding occurs.

Since fresh emergent wetland is one of the most productive habitat types in California, it supports a very high number of birds and mammals. It provides cover, breeding, and foraging habitat for as many as 10 species of reptiles and amphibians, more than 100 species of birds, and 25 species of mammals. Significant numbers of migratory waterfowl overwinter in the Central Valley and depend on this habitat for their winter feeding. A variety of special-status and other wildlife species occur in emergent wetlands. The giant garter snake (*Thamnophis gigas*) requires dense cover

to hunt, and to escape predation in wetlands associated with sloughs and canals. Snakes also use fallen cattails and woody debris to bask and maintain body temperature. Red-winged blackbirds (*Agelaius phoeniceus*) and Brewer's blackbirds (*Euphagus cyanocephalus*) are known to use cattail outcrops for nesting, as are marsh wrens (*Cistothorus palustris*) and many other more common species.

Lacustrine

Lacustrine habitat is composed of lakes, and in-channel and off-channel ponds on rivers, and stock ponds in Fresno County. Pine Flat Lake, Shaver Lake, Lake Kaweah, and Millerton Lake are a few of the larger lacustrine water bodies in the county. The various small stock ponds provide year-round to seasonal habitat for wildlife in the area. Game fish such as rainbow trout, channel catfish (*Ictalurus lacustris*), striped bass (*Marone saxitalis*), and spotted bass (*Micropterus punctulatus*) make the larger reservoirs popular fishing areas. In the ponds and lakes, non-native freshwater fish are generally abundant. Often these areas are detrimental to the native fishery because the non-native fish that occur in the ponds are aggressive predators. Water fowl such as gulls, terns, ducks, egrets, and herons may also be found in this habitat.

Blue Oak Woodland

Vegetation in blue oak woodland is best characterized as an open canopied woodland composed primarily of blue oak, California juniper (*Juniperus californica*), interior live oak, buckeye (*Aesculus californicus*) and Foothill pine (*Pinus sabiniana*). Canopy closure is uncommon due to the scattered pattern of the trees and the understory is dominated by a blanket of annual grassland habitat. Shrubs are uncommon but poison oak, California coffee berry (*Rhamnus californicus*), buckbrush (*Ceanothus cuneatus*), and redberry (*Rhamnus crocea*) can occur.

The inner Coast Range and the Sierra Nevada foothills between 400 and 1,500 feet typically support blue oak woodland on shallow, rocky, well drained soils. The climate is Mediterranean with mild, wet winters and hot, dry summers. Climactic extremes are generally great in this habitat. Blue oak trees are especially tolerant of drought conditions and can shed their leaves in extremely dry summers.

Wildlife that uses blue oak woodland are similar to annual grassland species since there is a high percentage of annual grasses and forbs in the habitat. Additional species are supported by this habitat due to the increased nesting, foraging and cover opportunity provided by the blue oak trees. Blue oak woodland provides wintering and breeding habitat for several migratory birds. Large resident mammals are also supported by this habitat including mule deer (*Odocoileus hemionus*), bobcat (*Lynx rufus*), and mountain lion (*Felis concolor*).

Blue Oak-Foothill Pine Woodland

The blue oak-foothill pine habitat is structurally diverse with a mixture of hardwoods, conifers, and shrubs. Blue oak and foothill pine typically comprise the overstory of this habitat with blue oak being most abundant. Other tree species associated with this habitat are interior live oak, California juniper, and California buckeye. In the lower elevations, the understory of blue oak-foothill pine woodland is composed of annual grasses and forbs. In the higher elevations, shrubs are found in addition to grassland species. Typical shrub species in this habitat include buckbrush,

manzanita, whiteleaf manzanita, parry manzanita (*Arctostaphylos* sp.), redberry, and California coffeeberry. Foxtail Pine (*Pinus balfouriana*) can be found sporadically throughout this habitat.

Blue oak-foothill pine woodland occurs at the elevations ranging from 1,500 to 3,000 feet and are found associated with blue oak woodland in the Coast Range and Sierra Nevada foothills. The habitat occurs in a Mediterranean climate with hot, dry summers and cool, wet winters.

These woodlands provide breeding habitat for a large variety of wildlife species due to the complex vegetation structure that can be found in blue oak-foothill pine woodland. Cavities that occur in living oak trees are used often by nesting birds. Acorns are also an important food source for the animals that live in the woodland. It is estimated that 29 species of reptiles and amphibians, 79 species of birds, and 22 species of mammals can be found in the mature stages of this habitat.

Mixed Chaparral

Vegetation in mixed chaparral is dominated by shrubs that are adapted to hot dry conditions. The plants typically have thick leathery leaves and are fire adapted to stump sprout once burned. Mature stands of mixed chaparral are floristically rich with approximately 240 species of woody plants that can occur in the habitat. Vegetation can include scrub and leather oak (*Quercus berberidifolia*, *Q. durata*), manzanita, interior live oak, California buckeye, flannel bush (*Fremontia californica*), and chamise (*Adenostomata fasciculatum*). The structure of chaparral is dense with occasional small openings where non-native annual grasses and forbs occur.

Mixed chaparral habitat is found between 2,000 and 3,000 feet in elevation on the western slope of the Sierra Nevada foothills and in the Inner Coast Range. The habitat generally occupies more mesic (moist) sites or north facing slopes than other chaparral types and can be associated with blue oak-foothill pine woodland and chamise-redshank chaparral habitats. This vegetation type occurs in the Mediterranean climate characterized by cool, wet winters and hot, dry summers.

Most species found in mixed chaparral habitat are also observed in other shrub dominated habitats. Mixed chaparral is known to provide habitat for 30 reptiles and amphibians, 100 species of birds, and 55 species of mammals. The habitat also is an important winter foraging habitat for mule deer, especially following fires, when lush new growth of chaparral shrubs provides abundant browse.

Chamise-Redshank Chaparral

The vegetation in chamise-redshank chaparral habitat is single layered, generally lacking a well developed herbaceous ground cover and overstory trees. This habitat consists of pure stands of chamise (*Adenostomata fasciculatum*) or redshank (*Adenostomata sparsifolium*). The shrub canopies frequently overlap, producing a nearly impenetrable layer of interwoven branches. Associated plant species that are found in this habitat are ceanothus, manzanita, scrub oak, and laurel sumac (*Malosma laurina*).

This habitat type occurs on south and west facing slopes on soils that are thin with little organic accumulation between 2,000 and 3,000 feet in elevation in the Sierra Nevada foothills and Inner Coast Range. The Mediterranean climate influences the growth pattern of these plants with hot, dry summers and wet, cool winters. Wildlife species are similar to those found in mixed chaparral.

Montane Chaparral

The vegetation in montane chaparral habitat can occur as tree-like up to 15 feet high or as a low growing prostrate form. Composition of vegetation can vary greatly as this habitat type can be found at elevations ranging from 3,000 to 10,000 feet above sea level. Typical dominant species include ceanothus (*Ceanothus* spp.), manzanita (*Arctostaphylos* spp.), huckleberry oak (*Quercus vaccinifolia*), Sierra chinkapin (*Castanopsis sempervirens*), mountain mahogany (*Cercocarpus montanus*), toyon (*Heteromeles arbutifolia*), sumac (*Rhus* spp.), and California buckthorn (*Rhamnus californica*).

Montane chaparral is found in the high Sierra Nevada region in Fresno County between 3,000 and 10,000 feet above sea level. This habitat type often occurs contiguous with other habitat types in this region depending on microclimate and natural or human disturbances such as fires and logging.

Montane chaparral provides habitat for a wide variety of wildlife. Numerous rodents inhabit chaparral along with deer and other herbivores. Deer are strongly associated with montane chaparral as it provides critical summer range foraging areas, escape cover, and fawning habitat. The chaparral shrubs provide forage, summer shade, and winter cover for rabbits, hares, and other small mammals. Many birds find a variety of seeds, fruits, insects, and protection from predators and climate for roosting and nesting.

Montane Hardwood

Montane hardwood is characterized by extensive stands of canyon live oak (*Quercus crysolepis*) and at higher elevations, California black oak (*Quercus kelloggii*). There is an absence of an understory shrub stratum and the herbaceous layer is generally sparse. Mature canyon live oaks occupy most of the canopy but seldom overlap. Ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus occidentalis*), and white fir (*Abies concolor*) are sometimes associated with these stands. The shrub layer can be composed of scattered California rose (*Rosa californica*), snowberry (*Symphoricarpos albus* var. *laevigatus*), and sword fern (*Polystichum munitum*).

Steep-sided and rocky south facing slopes ranging from 3,500 to 6,000 feet in elevation often support extensive stands of montane hardwood forest on the western slope of the Sierra Nevada foothills. The hardwood species are found on a wide range of slopes, especially those that are steep to moderate.

Wildlife found in this forest are generally species for which acorns are a major component of their diet. Birds like acorn woodpeckers (*Melanerpes formicivorus*), scrub jay (*Aphelocoma coerulescens*), wild turkey (*Meleagris gallopavo*), and mountain quail (*Oreotyx pictus*) are inhabitants of this forest type. Also mammals such as gray squirrel (*Sciurus griseus*), black bear (*Ursus americanus*), mountain lion (*Felis concolor*) and mule deer use the food sources found in montane hardwood forest.

Montane Hardwood-Conifer

Montane hardwood-conifer habitat includes the same plant species found under montane hardwood habitat, but this forest is differentiated by the mix of conifers that occur in the habitat.

Ponderosa pine, incense cedar, sugar pine (*Pinus lambertiana*), and white fir provide at least one-third of the canopy.

This habitat occurs at elevation ranging from 3,500 to 6,000 feet on the western slope of the Sierra Nevada foothills. Wildlife in this forest is similar to that found in Montane hardwood forest.

Montane Riparian

Montane riparian habitat occurs along the creeks and rivers that flow from the Sierra as a narrow band of riparian trees and shrubs. Cottonwood (*Populus* sp.) willows, and aspen provide the tree overstory of many montane riparian habitats. Shrubby species could include western azalea, various willows, creek dogwoods (*Cornus* sp.), and mountain alder (*Alnus tenuifolia*).

Montane riparian habitat areas are associated with seeps, bogs, lakes, and meadows as well as rivers, streams, and springs in the Sierra. The habitat supports many wildlife species and provides water, cover, migration corridors, and diverse feeding and nesting opportunities. Mule deer and other wildlife use the montane riparian corridors during the migratory seasons.

Sierran Mixed Conifer

Sierran mixed conifer habitat is composed of a mixture of conifer and hardwood species that form a multilayered forest. Many canopy layers result from logging and burning and both even aged stands and uneven aged stands are present in the forest. This forest is composed of white fir, Douglas-fir (*Psuedotsuga menziesii*), Ponderosa pine, sugar pine, incense cedar, and black oak. The understory can consist of deerbrush, manzanita, tan oak, bitter cherry, mountain whitethorn, gooseberry (*Ribes* sp.), and mountain misery (*Chamaebatia foliolosa*).

This forest occurs at elevations from 4,000 to 6,000 feet and typically adjoins the Ponderosa pine-Douglas fir forests at higher elevations in the western Sierra. Foothill pine, blue oak savannah, and chaparral types can border this habitat at the low, drier elevations. Soils that support this habitat type area vary and are derived from granitic, sedimentary and volcanic rocks. The soils can vary from deep to shallow.

The structural diversity of this habitat favors a diversity of wildlife, particularly birds. Approximately 110 species of birds, including neo-tropical migrants breed in this habitat throughout the Sierra Nevada mountains. Western Mastiff bat (*Eumops perotis*) can be found in the mixed conifer forests.

Ponderosa Pine

The density of Ponderosa pine in this habitat type can be between 50 percent to pure stands. The associated tree species are white fir, incense cedar, Jeffrey pine (*Pinus jeffreyi*), sugar pine, Douglas fir, canyon live oak, and California black oak. Shrubs that can be found in the understory include manzanita, ceanothus, mountain misery, Pacific dogwood (*Cornus nuttallii*), and Sierra gooseberry (*Ribes tulareense*). The herbaceous layer consists of grasses, forbs, carex, lupine, nightshade, wild iris, and bracken fern.

This habitat is found on the slopes of the western Sierra Nevada between 3,000 and 5,000 feet elevations and occurs above blue oak woodland and blue oak-foothill pine woodland but below the mixed conifer forest. Montane hardwood stands can be interspersed or bordering Ponderosa pine forest. Ponderosa pine forest is found at all aspects depending on soils and location within the local elevational range.

Nearly 30 species of reptiles and amphibians, 130 species of birds, and 65 mammals use this habitat. The habitat is sometimes a transitory or migrational habitat for deer and can be extremely important to deer nutrition in migration holding areas.

Jeffrey Pine

Jeffrey pine is the dominate species in this habitat and usually forms pure stands but can have associates such as Ponderosa pine, white fir, red fir (*Abies magnifica*), incense-cedar, sugar pine, and lodgepole pine. On moist sites the forest is generally composed of two layers, the first composed of Jeffrey pine and the second of deciduous hardwood species. The structure of this forest is often open and a complete crown cover is seldom observed. Shrub layers can occur in Jeffrey pine forest and can consist of a variety of species depending on location. Vegetation in the understory in Fresno County can consist of huckleberry oak (*Quercus vaccinifolia*), manzanita, and mountain misery. The herbaceous species common to this forest are rockcress (*Arabis* sp.), buckwheat (*Eriogonum* sp.), fritillary (*Fritillaria* sp.), ivesia, lupine, penstemon, (*Penstemon* sp.) and needlegrass (*Nassella* sp.).

This forest varies over its distribution but is characterized by a single tree layer on moderately dry sites. On the western slope of the Sierra Nevada it is associated with sierra mixed conifer at its lower elevations and subalpine conifer or alpine dwarf shrub at its higher elevations. These trees are self perpetuating under a regime of periodic surface fires and old growth stands can be up to 450 years old. These trees are tolerant of a variety of physical settings and can be found in topographic frost pockets and high cold ridges. Jeffrey pine is not restricted by aspect or slope.

Jeffrey pine forest is intermediate in wildlife species richness between warmer forests at low elevations and colder forests at higher elevations. Jeffrey pine seeds are a valuable food source in this forest and the seeds are included in the diet of almost as many animal species as oaks.

White Fir

Vegetation in white fir forest is usually dominated by white fir (*Abies concolor*) and occurs within the mixed conifer forest, usually on north-facing slopes between 5,000 and 7,000 feet. The understory can consist of occasional scattered grasses, forbs, and shrubs and often white fir seedlings. These trees regenerate in their own shade so dense thickets of white firs are often intermixed with mature trees where fire has been excluded for many years. When understory is present, shrubs like manzanita, snowbush ceanothus, mountain whitethorn, and deerbrush can be present.

This habitat occurs in between mixed conifer and red fir habitats on the western side of the Sierra Nevada. Wildlife uses are high and the forest supports many bird species. The absence of well developed shrub layer does decrease the use of the forest by animals that forage or seek cover in shrubs.

Red Fir

Red fir is the dominant tree in this forest type and often is the only tree present. Associates can include white fir, Jeffrey pine, and lodgepole pine. Depending on the solar exposure, tree densities vary. On north-facing slopes red fir stands can be dense while on southwest facing or dry slopes the canopy can be open with a developed understory.

This forest occurs between elevations of 7,000 and 9,000 feet and are found on a variety of soils. Red fir forest provides habitat for up to 12 reptiles and amphibians, 104 birds, and 53 mammals. This habitat is important to several water birds and several special-status, rare or endangered raptors in the spring and summer.

Lodgepole Pine

Lodgepole pine (*Pinus muricata*) dominates the vegetation in this habitat type and typically forms open stands with similarly aged specimens. Other associated tree species that can be found in this habitat are aspen (*Populus tremuloides*), mountain hemlock (*Tsuga mertensiana*), and white pine (*Pinus monticola*). The understory species frequently observed consist of scattered shrubs and herbs including bush chinquapin (*Chrysolepis sempervirens*), pinemat manzanita, Sierra bilberry (*Vaccinium nivictum*), and occasionally in mesic areas low, growing alpine willow (*Salix angelorum*).

In Fresno County, Lodgepole Pine Forest can be found on the western slope of the Sierra Nevada above the red fir forest generally confined to elevations between 7,000 and 9,000 feet. This forest type is associated with meadow and creek margins and can occur as nearly pure stands where it is invading new areas. Lodgepole pine can occupy a variety of landscapes within its zone of adaptation. These trees can be found on soils with poor drainage and in wet meadows.

Animal diversity is lower in Lodgepole pine habitat due to the low structural diversity in the forest stands. When the forest is composed of similarly sized specimens of the same species there is less wildlife habitat. Many species found in Lodgepole pine are associated with meadow habitat on the forest edge. This habitat is suitable for 6 reptiles and amphibians, 49 birds, and 35 mammals.

Subalpine Conifer

The subalpine conifer habitat is an open woodland habitat that supports needle leaved evergreen trees of low to medium stature. Several species can dominate canopies of this habitat type including Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa* var. *lasiocarpa*), mountain hemlock, western white pine, lodgepole pine, whitebark pine (*Pinus albicaulis*), and bristlecone pine (*Pinus longaeva*). These species will occur singly or in mixtures of two or more species. Shrub and herbaceous layers can occur but are sparse or lacking. Plant species that would be found in the understory are alpine willow, Sierra bilberry, red heather (*Phylodoce breweri*), white heather (*Cassiope mertensiana*), and sedges or rushes.

The subalpine conifer habitat occurs between 9,500 to 11,000 feet in elevation and does not provide the habitat required to support many wildlife species. The sparseness of the vegetation and the harsh climatic conditions generally lead to low wildlife diversity.

Aspen Forest

Aspen forest is composed of mature stands of quaking aspen (*Populus tremuloides*) with a relatively open canopy that is often shared by other deciduous trees and a few conifer species, typically pine. Since the canopy layer is usually an open structure an understory layer is usually present including a meandering shrub layer. This forest is typically composed of clones representing one or more genetic lines, and the vegetation may consist of a few stems in a small area to more than a thousand stems over a larger region. Aspen forest is an early successional stage that reinvades wet areas after fire or other disturbance events have cleared the original vegetation.

This habitat forms at higher elevations near seeps, streams, and meadows typically on the eastern slope of the Sierras. Soils that may support aspen forest consist of shallow stony soils, loamy sandy soils and heavy clays. The growing season is very short in the high Sierra Nevada region where this habitat persists and the climate is rigorous with long winters, heavy snows, and very cold temperatures.

No wildlife species are exclusively dependant upon aspen, but this habitat adds significantly to the richness of the wildlife in areas where it occurs. For example, when associated with meadow areas, the shrubby layers of vegetation found in the understory of Aspen forest provide additional nesting habitat for several species that would not normally be present. Also the mesic sites that support Aspen forest are host to a variety of insects that are especially attractive to birds. Generally, there are a high number of insect eating birds using this habitat due to the abundant food source.

Alpine Dwarf Shrub

Vegetation in the alpine dwarf shrub is characterized by low growing grass and forb plant species and occur above the timber line or over 10,000 feet in elevation. The vegetation is highly resistant to intense cold, solar radiation, and desiccating summer winds. Low growing plants like alpine willow (*Salix eastwoodiae*), red heather, white heather, short hair sedge (*Carex exserta*), and Parry's rush (*Juncus parryi*) occur in this habitat.

The alpine dwarf shrub habitat has a harsh climate with a short growing season and the resultant vegetation is sparse. Likewise the wildlife diversity in this habitat is limited to those species that are adapted to the extreme conditions. The unique species that can be found are Clark's nutcracker (*Nucifraga columbiana*), rosy finch (*Leucosticte arctica*), and alpine chipmunk (*Tamias alpinus*).

Wet Meadow

Wet meadow vegetation consists of perennial grasses (*Agrostis* sp., *Poa* sp., *Deschampsia* sp., *Calamagrostis* sp., *Oryzopsis* sp., *Trisetum* sp., *Danthonia*), sedges, and rushes. Corn lily (*Veratrum californicum*), meadow penstemon (*Penstemon rydbergii*), Jeffrey shooting star (*Dodecatheon jeffreyi*), and primrose monkey flower (*Mimulus primuloides*) also occur. Trees are generally absent from these meadows except for occasional colonizers like Fremont's cottonwood, quaking aspen (*Populus tremuloides*), and lodgepole pines.

Wet meadow occurs in Fresno County at elevations between 4,000 and 10,000 feet. They occur where water is at or near the surface most of the growing season, following spring runoff. The structure of the meadow is simple with a layer of herbaceous plants.

Larger mammals, insects, and birds can be found foraging in meadows; however, this habitat is generally too wet to provide suitable habitat for small mammals.

Bitterbrush

Small widely spaced shrubs to large, closely spaced shrubs make up this vegetation type. Two species occur and differ in stature and stand structure. Antelope bitterbrush (*Purshia* sp.) is slightly larger and generally grows in more mesic sites than desert bitterbrush. Antelope bitterbrush often occurs as a codominant with big sagebrush (*Artemisia biglovii*), Douglas rabbitbrush (*Chrysothamnus* sp.), Mormon tea (*Ephedra californica*), and curleaf mountain mahogany (*Cercocarpus ledifolius*). The understory plants vary greatly in composition between annual and perennial grasses and forbs. The overstory plants can consist of Jeffrey pine (*Pinus jeffreyi*), lodgepole pine (*Pinus contorta*), or western juniper (*Juniperous occidentalis*).

In Fresno County this habitat is found on the east side of the Sierra Nevada on the county boundary line. Generally, stands result from a single catastrophic disturbance and the life expectancy of the habitat is 40 to 50 years. The plants are generally found on flats and slopes with slightly acidic, deep, well drained, rapidly permeable soils.

Plants in the bitterbrush habitat are highly digestible and contain leaf moisture, calcium, phosphorus, and fat. Mule deer, pronghorn, cattle, sheep, and horses favor the leaves and twigs of these plant species. Bitterbrush is an excellent source of protein for animals in the winter. Many species of birds, rodents, and insects use seeds and feed on the vegetative parts of the plants.

Juniper

Juniper habitats are open to dense woodlands that are characterized by juniper (*Juniperous* sp.) and associated pine species like white fir, Jeffrey pine, Ponderosa and whitebark pine. Shrub species usually associated with juniper habitat are antelope bitterbrush, California buckwheat (*Eriogonum fasciculatum*), wax currant (*Ribes cereum*), gray horsebrush (*Tetradymia* sp.), and Mormon-tea (*Ephedra californica*). The herbaceous layer can be composed of annual and perennial grasses and forbs.

This habitat is found at middle elevations on the eastern side of the Sierra and in Fresno County can occur in the north eastern portion of the county. The climate of juniper habitat is semi-arid with hot, dry summers and cold winters. Juniper habitat occurs on virtually all exposures and slopes but are common on level to gently rolling topography.

Animals that find foraging habitat in juniper habitat use juniper berries as their primary food source. Approximately 17 bird species use juniper berries in the winter. Also juniper foliage is consumed by several mammals and can be important for winter feeding.

FISH SPECIES IN FRESNO COUNTY

Fresno County supports a wide variety of fish habitats and species. According to the California Department of Fish and Game (CDFG), the county includes 2,074 miles of streams and 26,373 acres of lakes and reservoirs. The eastern portion of the county lies in the Sierra, where dozens of cold water lakes and small streams support native and planted cold-water species. The foothills have several large reservoirs (Pine Flat Reservoir and Millerton Lake) supporting cold and warmwater species groups, most of which are introduced species. The two major rivers exiting these reservoirs are the Kings and San Joaquin Rivers. Downstream of the reservoirs, these rivers are maintained primarily by flows generated for irrigation. Cold water released from the dams support cold water species during the irrigation season which transition to a warm-water assemblage at lower elevations. Once in the Central Valley (roughly west of SR 99), both the Kings and San Joaquin Rivers support only warm water fisheries, as they are channelized through irrigation canals, diversions, and sloughs either to their confluence with the San Joaquin River during high flows, or to percolate underground during most summers. Historically, the Kings River discharged to a large alkaline lake in northern Kings County. Flow to the lake was diverted for agriculture and the entire lake-bed area now supports agriculture. Most of the Kings River flow is diverted through various canals and the Fresno Slough system to the San Joaquin River.

Cold Water Species Assemblages in Eastern Fresno County

Streams in eastern Fresno County are typical of cold water high Sierra Nevada streams. They tend to flow perennially, fed by the annual winter snowpack. Conditions are clear, moderately productive, highly oxygenated and temperatures seldom exceed 50 degrees fahrenheit. Substrates are cobble, gravel, or bedrock. Banks are shaded and crowded with riparian vegetation. Aquatic vegetation is generally sparse. These conditions are ideal for supporting both a native and introduced rainbow trout fishery (*Oncorhynchus mykiss ssp*). Other native species in this area would include speckled dace (*Rhinichthys osculus*) and sculpin (*Cottus gulosus*). Less common are lower elevation species such as Sacramento squawfish (*Ptychocheilus grandis*) and native Sacramento suckers (*Catostomus occidentalis*). Widespread planting and use of live bait have increased the range and diversity of species present. Brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*) and introduced golden trout (*Salmo aguabonita ssp.*) are widely found in this system, as well as bait fish such as golden shiner (*Notemigonus crysoleucas*).

High elevation reservoirs are almost exclusively inhabited by introduced rainbow, golden, and brook trout. Mid-elevation reservoirs can support both these species and various warmwater fish including bluegill (*Lepomis macrochirus*), hardhead (*Mylopharodon conocephalus*), Sacramento squawfish, and Sacramento suckers.

Mid-Elevation Streams and Reservoirs in Central-Eastern Fresno County

Mid-elevations streams, which are primarily tributaries to the San Joaquin and Kings River transition from the trout-dominated assemblage to a more diverse fish assemblage. Water conditions can be clear to somewhat turbid, productivity is generally limited by seasonal warm temperatures and low flows. Algae and diatom growth can be dense and cause wide swings in dissolved oxygen. Substrates are gravel or sandy, and temperatures can exceed 50 degrees fahrenheit in late summer. These conditions support some native rainbow trout, but primarily planted rainbow trout and a greater population of species more tolerant of high temperatures and

low oxygen conditions. Sacramento squawfish and hardhead are common, as are bluegill and native California roach (*Lavinia symmetricus*). Bait fish such as golden shiners are relatively common, and green sunfish (*Lepomis cyanellus*) and fathead minnows (*Pimephales promelas*) occasionally dominate the species assemblage in warmer streams and pools.

Two large mid-elevation reservoirs, Millerton Lake and Pine Flat Reservoir capture nearly all the flow from the San Joaquin and Kings Rivers. These reservoirs have cold deep water and warm shallow habitat. They support both cold water species such, as rainbow trout, and warmwater species including bass (*Micropterus salmoides* and *M. dolomieu*), sunfish, crappie (*Pomoxis nigromaculatus*), golden shiners, and mosquito fish (*Gambusia affinis*). Downstream of the reservoirs, generally from the reservoirs to SR 99, cold water releases support planted rainbow trout, squawfish, hardhead, and roach. In the downstream portions of this segment, stocked channel catfish (*Ictalurus lacustris*), Sacramento squawfish and hardhead, Sacramento sucker, and exotic game species such as largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), green sunfish (*Lepomis cyanellus*), mosquito fish (*Gambusia affinis*), and carp (*Cyprinus carpio*), gradually replace the trout as water temperatures warm and dissolved oxygen contents decrease.

The San Joaquin River demarcates the northern boundary of Fresno County. The river in this section transitions from cobble substrates with abundant riparian vegetation and cold water to an incised silt-bottomed slow and open river. This segment is particularly important because before the construction of Friant Dam in 1942, the San Joaquin River supported 19 native fish species, 12 of which were endemic to the San Joaquin. The Kern Brook lamprey (*Lampetra hubbsi*), three subspecies of rainbow trout (*Oncorhynchus mykiss whitei*, *O.m. aquabonita*, and *O.m. gilbertii*), and a number of distinctive populations of California roach (*Lavinia symmetricus*) were unique to the San Joaquin drainage. This section of the river probably once supported several runs of chinook salmon (*Oncorhynchus tshawytscha*).

Historically, the spring run was the largest of the San Joaquin River chinook salmon runs, with hundreds of thousands of fish entering San Francisco Bay each spring and running up the main river and its tributaries. These runs were so large that "Because of its location along the banks of the San Joaquin River, the sleep of the townspeople of Millerton was disturbed each year by the tremendous numbers of salmon which came up the river to spawn. Their leaping over the sandbars created a noise comparable to a large waterfall." In 1946, the sport catch records show a take of at least 20,000 chinook attributable to the Upper San Joaquin alone. The USFWS, CDFG, and various private and non-governmental organizations are working to restore some of these fish resources in this segment of the river.

Construction of Friant Dam, which began in 1942, dewatered nearly 62 miles of river downstream of the dam and extirpated the native species in this section. Of the special-status fish formerly present, only the Kern brook lamprey (*Lampetra hubbsi*) is still known from this segment. The Kern brook lamprey (*Lampetra hubbsi*), a species of special concern in California, was discovered in the Friant-Kern Canal and probably occurs in the San Joaquin River downstream of Millerton. This non-parasitic lamprey is endemic to the San Joaquin drainage and normally occurs in silty backwaters of large rivers in the foothill region.

The Kings River historically flowed to Tulare Lake, which supported its own endemic fish fauna. Unlike the San Joaquin, the Kings River dries up in most years as its flow is diverted through

hundreds of irrigation canals and ditches. The river never supported an anadromous salmon run. Currently, in very high flow years (spring 1997, for example) water flows down the old South Fork of the Kings to the former Tulare Lake. During high flow years, water is conveyed through the Fresno Slough to the San Joaquin, but practically this is an infrequent event.

Downstream of Pine Flat Reservoir, the current fish species assemblage is very similar to the San Joaquin below Millerton Dam. Trout are planted in the first 12 miles (down to near the town of Sanger). Interestingly, the Kern brook lamprey is relatively common in the Kings River, both upstream and downstream of the reservoir in this cold water zone. Downstream of Sanger, the river supports bass, sunfish, catfish, sucker, squawfish, and carp as does the lower San Joaquin. There is at present no program to restore the Tulare Lake-Kings River endemic fish community.

Low-Elevation Delta Streams and Canals in Central Fresno County

The Kings River, Fresno Slough, and dozens of irrigation canals and ditches comprise the available fish habitat in central Fresno County. The Kings River is used primarily for irrigation and, as such, is so heavily channelized and diverted that it does not generally join any larger body of water. Flows are slow, sporadic and undependable. Water quality is generally poor, salinity is very high, turbidity is very high, toxic contaminants are common, dissolved oxygen swings widely, and is often below levels necessary to support fish species. Aquatic vegetation is sometimes abundant, or often precluded entirely by turbid conditions, physical, or chemical channel maintenance. Canals and irrigation ditches tend to be trapezoidal in shape, with either concrete or packed mud or sand bottoms, with no riparian vegetation, and little or no in-channel structure. The fish species that survive in these harsh conditions are diverse, but virtually none are native.

The species that can be expected in these lower segments include bass, sunfish, catfish, brown bullhead, suckers, squawfish, shiners, mosquito fish, carp, goldfish, and introduced and exotic species such as white bass, tilapia, and cichlids. This assemblage is referred to by most fishermen as "trash fish," and are not considered valuable.

Low-Elevation Streams and Canals in Western Fresno County

The west side of Fresno County is very dry, and has no natural perennial streams. As a result there is no native fish fauna. The California aqueduct and various irrigation canals support a similar assemblage to that described above in the delta streams and canals in central Fresno County.

7.7 SPECIAL-STATUS SPECIES

For the purposes of this section, special-status species include those plants and animals that are:

- Listed as rare, threatened, or endangered by the CDFG or the USFWS;
- Candidates for either state or federal listing;
- Designated as "fully protected" or "species of special concern" by USFWS and CDFG; and
- Other species that are tracked by the California Natural Diversity Data Base (CNDDB) or California Native Plant Society (CNPS), but do not fall into any of the categories cited above.

The CNDDDB and the CNPS *Inventory of Rare and Endangered Vascular Plants of California* was reviewed to determine the recorded occurrences or potential for occurrence of any special-status plant or wildlife species within Fresno County. The USFWS and CDFG were also contacted to obtain a list of special-status species of concern from each agency. The CNDDDB and CNPS inventories are based on actual recorded occurrences and do not constitute an exhaustive inventory of every resource. In addition, the USFWS list is also predictive in nature based on the best available information for Fresno County. Table 7-2 lists special-status species with recorded occurrences or potential habitat within Fresno County.

While only species that are actually listed as threatened or endangered under the state and/or federal Endangered Species Acts are afforded legal protection against take, other special-status species are considered in this analysis as indicators of remaining areas of natural habitat and overall habitat diversity. Federally threatened or endangered plant species are afforded legal protection from take only when a federal action is undertaken or federal land is involved.

In general, special-status species occurrences are associated with a specific habitat type or habitat element within the four biotic regions. Specific habitat elements that can be used as indicators of the potential for conflict with special-status species include groves of tall riparian trees, alkaline soils, clay soils, serpentine soils, grasslands in the western part of the county, or vernal pools, marshes and other wetlands.

Biological resources within the lands under the ownership or jurisdiction of the federal government by the U.S. Forest Service or National Park lands are managed by these agencies for their recreational, wilderness, and consumptive resource values (timber and mining). Human impacts on these federal lands are regulated and managed by the federal agencies and are not subject to the local government policies. Private land inholdings within the federal lands are subject to local, state, and federal laws and policies depending on the types of uses or changes in use that a private landowner may choose. Figure 7-6 illustrates the generalized special-status species habitat locations in Fresno County.

TABLE 7-2
SPECIAL-STATUS SPECIES OF FRESNO COUNTY

Scientific Name ¹ Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
PLANTS				
<i>Acanthomintha obovata</i> ssp. <i>obovata</i> Obovate-leaved thornmint	SC/-/4	April-July	Chaparral, valley and foothill grassland; heavy clay, alkaline, serpentine	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Amsinckia vernicosa</i> var. <i>furcata</i> Forked fiddleneck	SC/-/4	March-May	Cismontane woodland, valley and foothill grasslands	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Arabis bodiensis</i> Bodie hills rock cress	-/-/1B	June-August	Alpine boulder and rock field, Great Basin scrub, Pinyon and juniper woodland, subalpine coniferous	Western slope of Sierra Nevada and high Sierra Nevada
<i>Atriplex cordulata</i> Heartscale	-/-/1B	April-October	Chenopod scrub, meadows, valley and foothill grassland (sandy)/saline or alkaline	San Joaquin Valley floor
<i>Astragalus monoensis</i> var. <i>ravenii</i> Ravin's milk vetch	-/-/1B	July-September	Alpine boulder and rock field, upper montane coniferous forest/gravelly	Western slope of Sierra Nevada and high Sierra Nevada
<i>Atriplex depressa</i> Brittlescale	-/-/1B	May-October	Chenopod scrub, playas, valley and foothill grassland; alkaline clay	San Joaquin Valley floor
<i>Atriplex minuscula</i> Lesser saltscale	-/-/1B	May-October	Chenopod scrub, playas, valley and foothill grassland; alkaline, sandy	San Joaquin Valley floor
<i>Atriplex vallicola</i> Lost hills crownscale	-/-/1B	May-August	Chenopod scrub, playas, valley and foothill grassland; alkaline	Inner Coast Range and San Joaquin Valley floor
<i>Calyptidium pulchellum</i> Mariposa pussypaws	PE/-/1B	April-August	Cismontane woodland (sandy)	Western slope of Sierra Nevada and high Sierra Nevada
<i>Calystegia collina</i> ssp. <i>venusta</i> South Inner Coast Range morning glory	SC/-/4	May-June	Chaparral, cismontane woodland, valley and foothill grassland; serpentine or sedimentary	Inner Coast Range, western slope of Sierra Nevada, and high Sierra Nevada
<i>Camissonia benitensis</i> San Benito evening primrose	FT/-/1B	May-June	Chaparral, cismontane woodland/serpentine alluvium, clay or gravelly	Western slope of Sierra Nevada and San Joaquin Valley floor, known only from the New Irldia area
<i>Camissonia sierrae</i> ssp. <i>alticola</i> Mono hot springs evening primrose	-/-/1B	June-August	Upper montane coniferous forest (gravel and sand pans)	Western slope of Sierra Nevada and high Sierra Nevada
<i>Carex tompkinsii</i> Tompkin's sedge	-/R-1B	May-July	Chaparral, cismontane woodland, lower coniferous forest, upper montane coniferous forest/sometimes granitic	Western slope of Sierra Nevada and high Sierra Nevada
<i>Carpenteria californica</i> Tree anemone	P/T/ST/1B	May-July	Chaparral, cismontane woodland/granitic	Western slope of Sierra Nevada and high Sierra Nevada

TABLE 7-2
SPECIAL-STATUS SPECIES OF FRESNO COUNTY

Scientific Name ¹ Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
<i>Castilleja campestris</i> ssp. <i>succulentata</i> Succulent owl's clover	PT/SE/1B	April-May	Vernal pools	San Joaquin Valley floor
<i>Californiella californica</i> California jewelflower	FE/SE/1B	February-May	Chenopod scrub, pinyon and juniper woodland, valley and foothill grassland; sandy	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Chorizanthe biloba</i> var. <i>immemora</i> San Benito spineflower	-/-/1B	May-September	Chaparral, cismontane woodland	Western slope of Sierra Nevada
<i>Cordylanthus palmatus</i> Palmdale-bracted bird's-beak	FE/SE/1B	May-October	Chenopod scrub, valley and foothill grassland, alkaline	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Cordylanthus tenuis</i> ssp. <i>barbatus</i> Fresno County bird's beak	SC/-/4	July-August	Lower coniferous forest	Western slope of Sierra Nevada
<i>Delphinium inopinatum</i> Unexpected larkspur	-/-/1B	May-July	Upper montane coniferous forest (rocky)	Western slope of Sierra Nevada and high Sierra Nevada
<i>Delphinium recurvatum</i> Recurved larkspur	-/-/1B	March-May	Chenopod scrub, cismontane woodland, valley and foothill grassland, vernal pools/alkaline	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Draba stansmithii</i> Mt. Whitney draba	-/-/1B	July-August	Alpine boulder and rock field	High Sierra Nevada
<i>Epilobium howellii</i> subalpine fireweed	-/-/1B	July-August	Meadows, subalpine coniferous forest/mesic	High Sierra Nevada
<i>Eriogonum hooveri</i> Hoover's eriastrum	FT/-/4	March-July	Chenopod scrub, pinyon and juniper woodland, valley and foothill grassland	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Eriogonum nequifolius</i> Hall's daisy	-/-/1B	July-August	Broadleaved upland forest, lower and upper montane coniferous forest, pinyon and juniper woodland, rocky	Western slope of Sierra Nevada
Keil's daisy <i>Eriogonum inornatum</i> var. <i>keilii</i>	-/-/1B	June-September	Lower montane coniferous forest, meadows	Western slope of Sierra Nevada
<i>Eriogonum nudum</i> var. <i>nurinum</i> Mouse buckwheat	SC/-/1B	June-November	Chaparral, cismontane woodland, valley and foothill grassland; sandy	Western Slope of Sierra Nevada and San Joaquin Valley floor
<i>Eriogonum nudum</i> var. <i>regitrium</i> Kings River buckwheat	-/-/1B	August-November	Cismontane woodland	Western slope of Sierra Nevada, known only from Kings River Canyon
<i>Eryngium spinospermum</i> Spiney-sepal'd coyote-thistle	SC/-/1B	April-May	Valley and foothill grassland, vernal pools	Western slope of Sierra Nevada and San Joaquin Valley floor

TABLE 7-2
SPECIAL-STATUS SPECIES OF FRESNO COUNTY

Scientific Name ¹ Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
<i>Gratiola heterosepala</i> Boggs Lake hedge hyssop	-/SE/1B	April-August	Marshes and samps (lake margins), vernal pools/clay	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Hemizonia halliana</i> Hall's tarplant	-/-/1B	April-May	Chenopod scrub, cismontane woodland, valley and foothill grassland; clay	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Hollisteria lanata</i> Hollisteria	SC/-/-	March-June	Valley and foothill grassland	San Joaquin Valley floor
<i>Ivesia unguiculata</i> Yosemite ivesia	-/-/1B	June-September	Meadows, subalpine coniferous forest, upper montane coniferous	Western slope of Sierra Nevada and high Sierra Nevada
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i> Delta tule-pea	SC/-/1B	May-June	Marshes and swamps (freshwater and brackish)	San Joaquin Valley floor
<i>Layia discoides</i> Rayless layia	-/-/1B	May	Chaparral, cismontane woodland, lower montane coniferous forest/serpentine, talus and alluvial terraces	Western slope of Sierra Nevada
<i>Layia heterotricha</i> Pale-yellow layia	-/-/1B	March-June	Cismontane woodland, pinyon and juniper woodland, valley and foothill grassland; alkaline or clay	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Layia munzii</i> Munz's tidy-tips	-/-/1B	March-April	Chenopod scrub, valley and foothill grassland (alkaline clay)	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Lembertia condonii</i> San Joaquin woollythreads	FE/-/1B	February-May	Chenopod scrub, valley and foothill grassland (sandy)	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Lepidium jaredii</i> ssp. <i>album</i> Panoche pepperglass	-/-/1B	February-June	Valley and foothill grassland (alluvial fans, washes)	San Joaquin Valley floor
<i>Lewisia condonii</i> Congdon's lewisia	-/R/1B	April-June	Chaparral, cismontane woodland, lower montane coniferous forest, upper montane coniferous forest/granitic, mesic	Western slope of Sierra Nevada
<i>Lewisia longipetala</i> Long-petaled lewisia	-/-/1B	July-August	Alpine boulder and rock field, subalpine coniferous forest, (mesic, rocky) /granitic	Western slope of Sierra Nevada and high Sierra Nevada
<i>Linanthus serrulatus</i> Madera linanthus	-/-/1B	April-May	Cismontane woodland, lower montane coniferous forest	Western slope of Sierra Nevada
<i>Lupinus citrinus</i> var. <i>citrinus</i> Orange lupine	-/-/1B	April-May	Chaparral, cismontane woodland, lower montane coniferous forest/granitic	Western slope of Sierra Nevada
<i>Lupinus lepidus</i> var. <i>cullbertsonii</i> Hockett meadows lupine	-/-/1B	July-August	Meadows, upper montane coniferous forest (mesic, rocky)	Western slope of Sierra Nevada and high Sierra Nevada

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<i>Madia radiata</i> Showy madia	-/-/1B	March-May	Cismontane woodland, valley and foothill grassland	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Malacothamnus aboriginum</i> Indian valley bush mallow	-/-/1B	April-October	Chaparral, cismontane woodland/rocky	Western slope of Sierra Nevada
<i>Mimulus norrisii</i> Kaweah monkeyflower	-/-/1B	March-May	Chaparral, cismontane woodland/carbonate, rocky	Western slope of Sierra Nevada
<i>Navarretia nigelliformis</i> ssp. <i>radians</i> Shining navarretia	-/-/1B	May-June	Cismontane woodland, valley and foothill grassland, vernal pools	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Orcuttia inaequalis</i> San Joaquin Valley orcutt grass	PE/SE/1B	May-September	Vernal Pools	San Joaquin Valley floor
<i>Pseudobahia bahiifolia</i> Hartwig's golden sunburst	FE/SE/1B	March-April	Cismontane woodland, valley and foothill grassland; clay	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Pseudobahia peirsonii</i> San Joaquin adobe sunburst	FT/SE/1B	March-April	Cismontane woodland, valley and foothill grassland; adobe	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Raillardiopsis muirii</i> Muir's raillardella	-/-/1B	July-August	Chaparral (montane), lower montane coniferous forest, upper montane coniferous forest	Western slope of Sierra Nevada
<i>Sagittaria sanfordii</i> Sanford's arrowhead	-/-/1B	May-October	Marshes and swamps (assorted shallow freshwater)	San Joaquin Valley floor
<i>Sidalcea keckii</i> Kecks checkerbloom	-/-/1B	April	Cismontane woodland, valley and foothill grassland; serpentine	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Streptanthus fenestratus</i> Tehipte Valley jewel-flower	-/-/1B	April-July	Lower montane coniferous forest, upper montane coniferous forest	Western slope of Sierra Nevada
<i>Trifolium bolanderi</i> Parasol clover	SC/-/4	June-August	Lower coniferous forest, meadows, Upper coniferous forest; mesic	Western slope of Sierra Nevada and San Joaquin Valley floor
<i>Tuckermia greenii</i> Green's tuckeria	PE/R/1B	May-July	Vernal Pools	San Joaquin Valley floor
INVERTEBRATES				
Bohart's blue butterfly <i>Philotiella speciosa bohartorum</i>	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor
Ciervo aegilian scarab beetle <i>Aegilia concinna</i>	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor

TABLE 7-2

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Dry Creek cliff strider bug <i>Orvelina pege</i>	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor
Hoppings blister beetle <i>Lytta hoppingi</i>	SC/-	Resident	Not available at this time	San Joaquin Valley floor, inhabits the foothills at the southern end of the Central Valley
Kings Canyon cryptochian caddisfly <i>Cryptochia excella</i>	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada
Molestan blister beetle <i>Lytta molesta</i>	SC/-	Resident	Flowers and foliage of various plants in grassland	San Joaquin Valley Floor
Morrison's blister beetle <i>Lytta morrisoni</i>	SC/-	Resident	Flowers and foliage of various plants	San Joaquin Valley Floor
Redheaded sphecoid wasp <i>Eucerceris ruficeps</i>	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor
San Joaquin tiger beetle <i>Cicindela tranquebarica</i> sp.	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor
San Joaquin dune beetle <i>Coelus gracilis</i>	SC/-	Resident	Not available at this time	San Joaquin Valley floor
Sierra pygmy grasshopper <i>Tetrix sierrana</i>	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor
Tight coin (Yate's snail) <i>Ammonitella yatesi</i>	SC/-	Resident	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	ST/-	Resident	Elderberry plants; riparian habitat	San Joaquin Valley floor
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	ST/-	Resident seasonal	Vernal pools, and other seasonal ponds	San Joaquin Valley floor
Vernal pool tadpole shrimp <i>Lepidurus packardii</i>	FE/-	Resident seasonal	Vernal pools, and other seasonal ponds	San Joaquin Valley floor
Wolly hydromorphus diving beetle <i>Hydromorphus</i> sp.	FE/-	Resident seasonal	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor

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FISH				
Central Valley steelhead <i>Oncorhynchus mykiss</i>	PE/-	Migratory seasonal	Cold headwaters, creeks, rivers, and lakes	San Joaquin Valley floor
Delta smelt <i>Hypomesus transpacificus</i>	FT/-	Resident	Open brackish and fresh water of large channels	San Joaquin Valley floor
Green sturgeon <i>Acipenser medirostris</i>	SC/-	Resident	Eustaries, lower reaches of large rivers, salt or brackish water off river mouths.	San Joaquin Valley floor
Kern Brook lamprey <i>Lampetra hubbsi</i>	SC/-	Resident	Spawning adults in gravel riffles and runs clear coastal streams; feeding adults usually in ocean. Ammocoetes in silt, mud, and sand of shallow eddies and back waters of streams.	San Joaquin Valley floor
Lahontan cutthroat trout <i>Oncorhynchus clarki henshawii</i>	FT/-	Resident	Cold headwaters, creeks, rivers, and lakes	San Joaquin Valley floor
Longfin smelt <i>Spirinchus thaleichthys</i>	SC/-	Resident	Nearshore, bays and estuaries, ascends coastal streams to spawn	San Joaquin Valley floor
Pacific lamprey <i>Lampetra tridentata</i>	SC/-	Resident	Spawning adults in gravel riffles and runs clear coastal streams; feeding adults usually in ocean. Larval forms in silt, mud, and sand of shallow eddies and back waters of streams.	San Joaquin Valley floor
Paiute cutthroat trout <i>Oncorhynchus (=salmo) clarki seleniris</i>	FT/-	Resident	Gravel bottomed creeks and small rivers and lakes. Anadromous in many coastal streams.	Western slope of Sierra Nevada and San Joaquin Valley floor
River lamprey <i>Lampetra ayresi</i>	SC/-	Resident	Spawning adults in clear riffles of streams; feeding adults in estuaries and ocean. Larval forms occur in sandy and muddy pools of spawning streams.	San Joaquin Valley floor
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	PT/-	Resident	Backwaters and pools of rivers and lakes. Tolerant of brackish waters.	San Joaquin Valley floor

TABLE 7-2
SPECIAL-STATUS SPECIES OF FRESNO COUNTY

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AMPHIBIANS				
California red-legged frog <i>Rana aurora draytonii</i>	T/CSC	Resident	Pools/ponds/slow streams/marshes	Inner Coast Range, located primarily in wetlands and streams in coastal drainages of California. Mostly extirpated from valley floor and Sierra Nevada foothills.
California tiger salamander <i>Ambystoma californiense</i>	C/-	Resident	Annual grasslands and grassy understory of valley-foothill hardwood habitats in central and northern California, vernal pools and other seasonal water sources	Western slope of Sierra Nevada, San Joaquin Valley floor and inner Coast Range.
Foothill yellow-legged frog <i>Rana boylei</i>	SC/CSC	Resident	Valley and foothill hardwood forests, mixed conifer and coastal scrub, wet meadows; riffles in streams, pools, ponds, slow streams	Western slope of Sierra Nevada
Mount Lyell salamander <i>Hydromantes platycephalus</i>	SC/-	Resident	Massive rock areas in mixed conifer, red fir, lodgepole and subalpine habitats; seeps, deep rock fissures or under slabs of exfoliating granite	High Sierra Nevada
Mountain yellow-legged frog <i>Rana muscosa</i>	SC/-	Resident	Montane coniferous forests; riparian, subalpine and wet meadows; riffles in streams, pools, ponds, slow streams	Western slope of Sierra Nevada
Western spadefoot toad <i>Scaphiopus hammondi</i>	SC/-	Resident	Wetlands and grasslands; near vernal pools	Western slope of Sierra Nevada, San Joaquin Valley floor and inner Coast Range
Yosemite toad <i>Bufo canorus</i>	SC/	Resident	Wet meadows and subalpine coniferous forests; seasonal ponds	Wet meadows in the central high Sierra Nevada
REPTILES				
Blunt-nosed leopard lizard <i>Gambelia (=crotophytus) silus</i>	FE/	Resident	Sparsely vegetated scrub and grassland; sandy washes	San Joaquin Valley floor and inner Coast Range
California horned lizard <i>Phrynosoma coronatum frontale</i>	SC/-	Resident	Valley foothill hardwood, annual grassland; logs, rocks, sandy	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Giant garter snake <i>Thamnophis gigas</i>	FT/-	Resident	Marshes and slow moving creeks, sloughs and irrigation canals	San Joaquin Valley floor
Western pond turtle <i>Clemmys narmorata</i>	SC/-	Resident	Ponds, slow moving creeks, sloughs, rivers and irrigation canals	San Joaquin Valley floor, Sierra Nevada foothills and inner Coast Range

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San Joaquin coachwhip <i>Masticophis flagellum rudlocki</i>	SC/-	Resident	Grass, scrub chaparral, and pasture habitats; arid open	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Silver legless lizard <i>Anniella pulchra pulchra</i>	SC/-	Resident	Valley foothill and chaparral; moist substrate, leaf litter, sandy soil	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
BIRDS				
Common loon <i>Gavia immer</i>	-/CSC	Migrant	Estuarine and subtidal marine habitats as well as inland lakes	Western slope of Sierra Nevada and San Joaquin Valley floor
Double crested cormorant <i>Phalacrocorax auritus</i>	-/CSC	Resident	Inland lakes, fresh and saltwater estuaries	Western slope of Sierra Nevada and San Joaquin Valley floor
Aleutian Canada goose <i>Branta canadensis leucopareia</i>	FT/-	Migratory	Fresh emergent wetlands, annual grasslands and agricultural fields	San Joaquin Valley floor
Fulvous whistling duck <i>Dendrocygna bicolor</i>	-/CSC	Migrant	Fresh emergent wetland, shallow lakes and pastures	Western slope of Sierra Nevada and San Joaquin Valley floor
Harlequin duck <i>Histrionius histrionicus</i>	-/CSC	Migrant	Coastal habitats and rivers	Western slope of Sierra Nevada and San Joaquin Valley floor
Barrow's goldeneye <i>Bucephala islandica</i>	-/CSC	Migrant	Estuaries, lakes and rivers; brackish waters	Western slope of Sierra Nevada and San Joaquin Valley floor
American white pelican <i>Pelecanus erythrorhynchos</i>	-/CSC	Migrant	Large open bodies of water, lakes, estuaries and salt ponds	San Joaquin Valley floor
California gull <i>Larus californicus</i>	-/CSC	Resident	Estuaries, lakes, inter-tidal zones, emergent wetlands and agricultural fields	San Joaquin Valley floor
Lack tern <i>Chlidonias niger</i>	-/CSC	Migrant	Fresh emergent wetlands	San Joaquin Valley floor
White faced ibis <i>Plegadis chihi</i>	SC/-	Local and distant migrant	Fresh emergent wetland, wet meadows, flooded agricultural fields and pastures	San Joaquin Valley floor
Greater sandhill crane <i>Grus canadensis tabida</i>	-/CT	Migrant	Valley and foothill grasslands, estuaries, emergent wetlands, agricultural fields	San Joaquin Valley floor
Mountain plover <i>Chondestes montanus</i>	C/-	Migratory	Annual grassland and agricultural fields	Western slope of Sierra Nevada and San Joaquin Valley floor
Long-billed curlew <i>Numenius americanus</i>	-/CSC	Migrant	Coastal estuaries, inland agricultural fields, grasslands	San Joaquin Valley floor
Northern harrier <i>Circus cyaneus</i>	-/CSC	Resident	Valley and foothill grassland, marshes and swamps, meadows	San Joaquin Valley floor

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SPECIAL-STATUS SPECIES OF FRESNO COUNTY

Scientific Name' Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
Cooper's hawk <i>Accipiter cooperi</i>	-/CSC	Resident	Valley and foothill grassland, oak woodland, lower coniferous forests	Western slope of Sierra Nevada and San Joaquin Valley floor
Sharp-shinned hawk <i>Accipiter striatus</i>	-/CSC	Resident	Valley and foothill grassland, upper and lower coniferous forests	Western slope of Sierra Nevada and San Joaquin Valley floor
Northern goshawk <i>Accipiter gentilis</i>	SC/-	Resident	Lower and Upper coniferous forests; dense forest	Western slope of Sierra Nevada and high Sierra Nevada
Swainson's hawk <i>Buteo swainsoni</i>	-/ST	Migratory	Riparian forest, oak woodland, agricultural fields and pastures	San Joaquin Valley floor
Ferruginous hawk <i>Buteo regalis</i>	SC/-	Migratory	Annual grasslands, low foothills, pinyon-juniper forest	Western slope of Sierra Nevada and San Joaquin Valley floor
Golden eagle <i>Aquila chrysaetos</i>	-/CSC	Resident	Valley and foothill grasslands, open woodland	Western slope of Sierra Nevada and San Joaquin Valley floor
Bald eagle <i>Haliaeetus leucocephalus</i>	FT/-	Migratory	Lakes, rivers, streams; large trees	Western slope of Sierra Nevada and San Joaquin Valley floor
Osprey <i>Pandion haliaetus</i>	-/CSC	Resident	Open bodies of water, lakes and rivers	Western slope of Sierra Nevada and San Joaquin Valley floor
American peregrine falcon <i>Falco peregrinus anatum</i>	FE/-	Resident	Breeds on cliff faces, generally near water or forest, forages over several different habitat types; wetlands, coastal	Western slope of Sierra Nevada and San Joaquin Valley floor
Prairie falcon <i>Falco mexicanus</i>	-/CSC	Resident	Valley and foothill grasslands; cliff nester	Western Slope of Sierra Nevada and San Joaquin Valley floor
Merlin <i>Falco columbarius</i>	-/CSC	Migrant	Valley and foothill grassland	San Joaquin Valley floor, inner Coast Range and low Sierra Nevada foothills
Great grey owl <i>Strix nebulosa</i>	-/SE	Resident	Old growth red fir, mixed conifer forest, lodgepole pine forest; associated with wet meadows	High Sierra Nevada
Long-eared owl <i>Asio otus</i>	-/CSC	Resident	Riparian forest, oak woodland; dense stands of trees	Western slope of Sierra Nevada and San Joaquin Valley floor
Short-eared owl <i>Asio flammeus</i>	-/CSC	Resident	Valley and foothill grassland	San Joaquin Valley floor
Western burrowing owl <i>Athene cunicularia</i>	SC/-	Local and distant migrant	Open annual grassland, open shrub; burrows	San Joaquin Valley floor

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Scientific Name ¹ Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
California spotted owl <i>Strix occidentalis occidentalis</i>	SC/-	Resident	Upper and Lower coniferous forests	Western slope of Sierra Nevada and high Sierra Nevada
Western yellow billed cuckoo <i>Coccyzus americanus occidentalis</i>	-/SE	Migrant	Riparian forest; dense forest, multi-canopied riparian "jungle"	San Joaquin Valley floor
Little willow flycatcher <i>Empidonax traillii brewsteri</i>	SE/-	Resident	Riparian forest, willow thickets, and montane meadows	Western slope of Sierra Nevada and San Joaquin Valley floor
California horned lark <i>Eremophila alpestris actin</i>	-/CSC	Resident	Valley and foothill grassland	San Joaquin Valley floor
Black swift <i>Cypseloides niger</i>	-/CSC	Migrant	Steep, rocky, moist cliffs, coastal bluffs	Western slope of Sierra Nevada and San Joaquin Valley floor
Vaux's swift <i>Chaetura vauxi</i>	-/CSC	Migrant	Coniferous forest; burned out tree stubs	Western slope of Sierra Nevada
Bank swallow <i>Riparia riparia</i>	-/ST	Migratory	River and stream cliff banks; fine textured soil	San Joaquin Valley floor
Least Bell's vireo <i>Vireo bellii pusillus</i>	FE/SE	Migrant	Riparian habitats with thickets of willows or other dense shrubs	San Joaquin Valley floor
Yellow warbler <i>Dendroica petechia</i>	-/CSC	Migrant	Riparian habitat	Western slope of Sierra Nevada and San Joaquin Valley floor
Tricolored blackbird <i>Agelaius tricolor</i>	SC/-	Resident, Nomadic	Marshes, freshwater emergent wetland, blackberry thickets, tules and cattails	San Joaquin Valley floor
Yellow-breasted chat <i>Icteria virens</i>	-/CSC	Migrant	Riparian habitat and open woodlands	San Joaquin Valley floor
MAMMALS				
California bighorn sheep <i>Ovis canadensis californica</i>	SC/-	Resident	High elevations of southern Sierra Nevada Mountains	High Sierra Nevada
Ringtail <i>Bassariscus astutus</i>	-/FP	Resident	Riparian habitat	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley Floor
American badger <i>Taxidea taxus</i>	-/CSC	Resident	Valley and foothill grassland; friable soils and prey base	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley Floor
Sierra Nevada Mountain beaver <i>Aplodontia rufa californica</i>	-/CSC	Resident	Montane riparian with thickets of alder and willows, especially near meadows	Western slope of Sierra Nevada
San Joaquin kit fox <i>Vulpes macrotis nuntica</i>	FE/ST	Resident	Valley grasslands, agricultural fields	San Joaquin Valley Floor and inner Coast Range

TABLE 7-2
SPECIAL-STATUS SPECIES OF FRESNO COUNTY

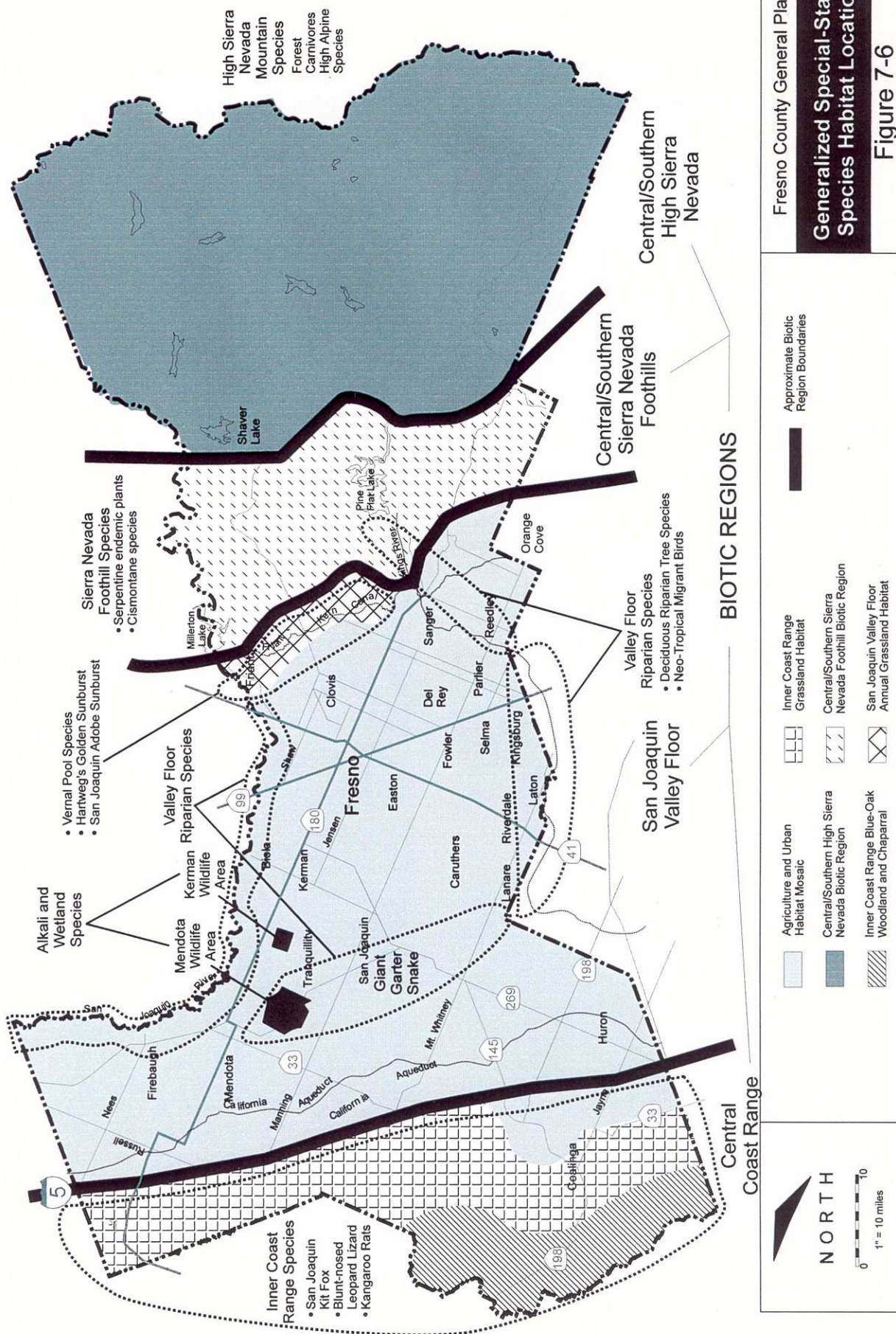
Scientific Name ¹ Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
Pacific fisher <i>Martes pennanti pacifica</i>	SC/-	Resident	Lower and upper coniferous forests	Western slope of Sierra Nevada and high Sierra Nevada
Sierra Nevada red fox <i>Vulpes vulpes nector</i>	SC/ST	Resident	High elevations of Sierra Nevada Mountains, upper coniferous forest, alpine scrub, subalpine conifer, montane riparian	High Sierra Nevada, above 7,000 feet
Small-footed myotis bat <i>Myotis ciliolabrum</i>	SC/-	Resident	Roosts in caves, mines, tunnels, buildings and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Long-eared myotis bat <i>Myotis evotis</i>	SC/-	Resident	Roosts in caves, mines, tunnels, buildings, trees and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Pallid bat <i>Antrozous pallidus</i>	--/CSC	Resident	Roosts in caves, mines, and man-made structures	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Western mastiff bat <i>Eumops perotis californicus</i>	SC/CSC	Resident	Roosts in structures, trees, cliffs, tunnels, and caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley Floor
Spotted bat <i>Euderma maculatum</i>	SC/-	Resident	Roosts in caves, mines, tunnels, buildings and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Fringed myotis bat <i>Myotis thysanodes</i>	SC/-	Resident	Roosts in caves, mines, tunnels, buildings and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Long-legged myotis bat <i>Myotis volans</i>	SC/-	Resident	Roosts in caves, mines, tunnels, buildings and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Yuma myotis bat <i>Myotis yumanensis</i>	SC/-	Resident	Roosts in caves, mines, tunnels, buildings and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Townsend's big-eared bat <i>Plecotus townsendii pallascens</i>	SC/CSC	Resident	Roosts in caves, mines, tunnels, buildings and other man-made structures	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Pacific western big-eared bat <i>Plecotus townsendii townsendii</i>	SC/-	Resident	Roosts in caves, mines, tunnels, buildings and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor
Mt. Lyell Shrew <i>Sorex lyelli</i>	SC/-	Resident	High elevations in the southern Sierra Nevada Mountains	High Sierra Mountains and inner Coast Range
San Joaquin Valley woodrat <i>Neotoma fuscipes riparia</i>	C/-	Resident	Chaparral, riparian, streamside thickets	San Joaquin Valley floor and inner Coast Range
Short-nosed kangaroo rat <i>Dipodomys nitroideus brevicaudus</i>	SC/-	Resident	Arid often alkaline, plains with sparse growth of grass or low shrubs	San Joaquin Valley floor and inner Coast Range
Fresno kangaroo rat <i>Dipodomys nitroideus exilis</i>	FE/SE	Resident	Desert alkali scrub; friable soils	San Joaquin Valley floor, alkali sink communities of western Fresno County

TABLE 7-2
SPECIAL-STATUS SPECIES OF FRESNO COUNTY

Scientific Name ¹ Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
Giant kangaroo rat <i>Dipodomys nitraoides ingens</i>	FE/SE	Resident	Open grassland, sparse vegetation; fine soils	San Joaquin Valley floor
Tipton kangaroo rat <i>Dipodomys nitraoides nitraoides</i>	FE/SE	Resident	Open grassland, sparse vegetation; fine soils	San Joaquin Valley floor, all all sink communities of western Fresno County
Nelson's antelope ground squirrel <i>Ammospermophilus nelsoni</i>	SC/-	Resident	Valley and foothill grasslands; dry sparsely vegetated areas	San Joaquin Valley floor
Southern grasshopper mouse <i>Onychomys torridus ramona</i>	SC/-	Resident	Hot arid valleys and scrub deserts	San Joaquin Valley floor
Heermann's Kangaroo rat <i>Dipodomys heermanni</i>	E/E	Resident	Valley foothill grassland	Inner Coast Range, San Joaquin Valley floor, western slope of Sierra Nevada foothills
San Joaquin pocket mouse <i>Perognathus inornatus inornatus</i>	-/CSC	Resident	Dry open grassland, scrub areas; fine textured soils between 350 feet and 650 feet in elevation	Western slope of Sierra Nevada and San Joaquin Valley floor
Tulare grasshopper mouse <i>Onychomys torridus tularensis</i>	SC/-	Resident	Hot arid valleys and scrub deserts	San Joaquin Valley floor

TABLE 7-2
SPECIAL-STATUS SPECIES OF FRESNO COUNTY

Scientific Name ¹ Common Name	Status ² (Fed/ CA/ CNPS)	Season ³	Habitat Requirements ⁴	Habitat Distribution in Fresno County
Sources: California Department of Fish and Game, <i>California Natural Diversity Database</i> , 1996; California Native Plant Society, <i>Electronic Inventory of Rare and Endangered Vascular Plants of California</i> , March 1994; Federal Register Vol 61, No. 40, February 28, 1996. Peterson Field Guides, <i>Freshwater Fishes</i> , 1991.				
NOTES:				
¹ Scientific names are based on the following sources: ABA 1995, Jennings 1989, Hickman 1993, Zeiner <i>et al.</i> 1990.				
² Status of species relative to the Federal and California State Endangered Species Acts and Fish and Game Code of California. Fed Federal status.				
FE Federally listed as endangered.				
FT Federally listed as threatened.				
PE Proposed endangered.				
PT Proposed threatened.				
C As of February 28, 1996 (Federal Register Vol 61, No. 40), the USFWS has reclassified former Candidate Category 1, 2, and 3 species as "Candidates." Species formerly considered Category 1 are generally now considered Candidate species. Species formerly considered Category 2 and 3 are of concern to the agency but have no specific status with regard to the Federal Endangered Species Act.				
CA California status.				
CE Endangered; Species whose continued existence in California is jeopardized.				
CT Threatened; Species that although not presently threatened in California with extinction, is likely to become endangered in the foreseeable future.				
CSC California Department of Fish and Game "Species of Special Concern". Species with declining populations in California.				
FP Fully protected against take pursuant to the Fish and Game Code Section 3503.5.				
- No California or federal status.				
CNPS California Native Plant Society Listing (does not apply to wildlife species).				
1B Plants, rare, threatened or endangered in California and elsewhere and are rare throughout their range. Plants constituting List 1B meet the definitions of Section 1901, Chapter 10 (Native Plant Protection) of the California Department of Fish and Game Code and are eligible for state listing.				
2 Plants rare, threatened or endangered in California but more common elsewhere.				
3 Plants about which we need more information-a review list. List 3 is an assemblage of taxa that have been transferred from other lists or that have been suggested for consideration. Information that would allow an assignment to one of the other lists or to reject them is lacking.				
4 Plants of limited distribution-a watch list. Plants in this category are of limited distribution in California and their vulnerability or susceptibility to threat appears low at this time. However, they are uncommon enough that their status should be monitored regularly.				
³ Season = Blooming period for plants. Season of use for animals.				
⁴ Habitat Requirements = Primary habitat type(s) and most likely habitat element association				



REGULATORY BACKGROUND

The following is a brief summary of the regulatory context under which biological resources are managed at the federal, state, and local level. Agencies with responsibility for protection of biological resources in Fresno County are:

- U.S. Army Corps of Engineers (wetlands and other waters of the United States),
- U.S. Fish and Wildlife Service (endangered species and migratory birds),
- California Department of Fish and Game (waters of the State, endangered species, and other protected plants and wildlife),
- U.S. Forest Service,
- U.S. National Park Service, and
- Fresno County (General Plan Conservation Element Goals and Policies).

A number of federal and state statutes provide a regulatory structure that guides the protection of biological resources. The following discussion provides a summary of those laws that are most relevant to biological resources for the Fresno County General Plan Update process.

U.S. Army Corps of Engineers

Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (Corps) has authority to regulate activity that could discharge fill or dredge material or otherwise adversely modify wetlands or other waters of the United States. Perennial and intermittent creeks are considered waters of the United States and are within the regulatory jurisdiction of the Corps. The Corps implements the federal policy embodied in Executive Order 11990, which is intended to result in no net loss of wetlands values or acres. In achieving the goals of the Clean Water Act, the Corps seeks to avoid adverse impacts and to offset unavoidable adverse impacts on existing aquatic resources. Any fill or adverse modification of wetlands can require a permit from the Corps prior to the start of work. Typically, permits issued by the Corps are a condition of a project as mitigation to offset unavoidable impacts on wetlands and other waters of the U.S. in a manner that achieves the goal of no net loss of wetland acres or values.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) implements the Migratory Bird Treaty Act (16 USC Section 703-711), the Bald and Golden Eagle Protection Act (16 United States Code (USC) Section 668), and the Federal Endangered Species Act (FESA; 16 USC § 153 *et seq.*). Projects that would result in a "taking" of any federally listed threatened or endangered species are required to obtain permits from the USFWS through either Section 7 (interagency consultation) or Section 10(a) (incidental take permit) of FESA, depending on the involvement by the federal government in permitting or funding the project. The permitting process is used to determine if a project would jeopardize the continued existence of a listed species and what mitigation measures would be required to avoid jeopardizing the species.

Take under federal definition means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect a list of species, or to attempt to engage in any such conduct. Candidate species do not have the full protection of FESA; however, the USFWS advises project applicants that they could be elevated to listed status at any time. For this reason, federal candidate species are addressed in this analysis.

California Department of Fish and Game

The California Department of Fish and Game (CDFG) derives its authority from the Fish and Game Code of California. Species listed under the California Endangered Species Act (CESA; Fish and Game Code Section 2050 *et seq.*) prohibits take of listed threatened or endangered species. Take under CESA is restricted to direct killing of a listed species and does not prohibit indirect harm by way of habitat modification.

California Fish and Game Code Sections 3503, 3503.5, and 3511 describe unlawful take, possession, or needless destruction of birds, nests, and eggs. Fully protected birds (Section 3511) may not be taken or possessed except under specific permit. Section 3503.5 of the Code protects all birds-of-prey and their eggs and nests against take, possession, or destruction of nests or eggs.

Species of Special Concern (CSC) is a category conferred by CDFG for those species which are considered to be indicators of regional habitat changes or are considered to be potential future protected species. Species of Special Concern do not have any special legal status except that afforded by the Fish and Game Code. The CSC category is intended by the CDFG for use as a management tool to take these species into special consideration when decisions are made concerning the development of natural lands.

The CDFG also has authority to administer the Native Plant Protection Act (Fish and Game Code Section 1900 *et seq.*). The Act requires DFG to establish criteria for determining if a species, subspecies, or variety of native plant is endangered or rare. Under Section 1913(c) of the Act, the owner of land where a rare or endangered native plant is growing is required to notify the department at least 10 days in advance of changing the land use to allow for salvage of plant.

Perennial and intermittent streams also fall under the jurisdiction of the CDFG. Sections 1601-1603 of the Fish and Game Code (Streambed Alteration Agreements) gives the CDFG regulatory permitting authority over work within the stream zone (which could extend to the 100-year flood plain) consisting of, but not limited to, the diversion or obstruction of the natural flow or changes in the channel, bed, or bank of any river, stream or lake.

7.8 FORESTRY AND TIMBER RESOURCES

Timber lands are defined as land available for timber production and capable of growing at least 20 cubic feet of industrial quality wood per acre per year. Almost all of the timberlands in Fresno County lie within the southern part of the Sierra National Forest and the northern portion of the Sequoia National Forest. The National Forest system falls within the jurisdiction of the U.S. Forest Service (USFS) under the U.S. Department of Agriculture. The boundaries of the Sierra National Forest include portions of Fresno, Inyo, Madera, Mariposa, and Mono counties. The boundaries

of the Sequoia National Forest include portions of Fresno, Kings, Tulare, and Inyo counties. Chapter 1, Land Use and Population, details the acreage of both the public and private land holdings within each forest.

Within the Sierra National Forest, timber land occurs in four major forest types: ponderosa pine, mixed conifer, red fir, and subalpine. Ponderosa pine ranges from 2,500 to 3,500 feet in elevation and occurs in pure stands or with varying mixtures of incense cedar and hardwoods. Mixed conifer is composed of mixtures of ponderosa pine, Jeffrey pine, sugar pine, white fir and incense cedar. Red fir is the dominant conifer at the 6,000 to 8,500 foot level and is found in pure stands or in mixtures with white fir. Sugar pine, Jeffrey pine and lodgepole pine also occur in this red fir forest type. Subalpine forest occurs above 8,500 feet and is characterized by stands of lodgepole pine interspersed with occasional stands of western white pine, mountain hemlock or white bark pine. A fifth forest type located in the foothills below 2,500 feet is the hardwood-grassland which yields occasional fuelwood harvests.

Two management methods are used to regulate harvesting of timber resources, uneven-aged and even-aged management. Uneven-aged management results in trees of different ages intermingled throughout a stand. Even-aged management results in trees in a stand being essentially the same age. The current Timber Management Plan in the Sierra National Forest prescribes even-aged management, but both methods are used. Considering silvicultural characteristics of trees, compositions and conditions of various kinds of timber stands, and uncertainties of uneven-aged management, even-aged management appears most capable of sustaining optimum yields into the future.

Timber from the Sierra, Sequoia, and other adjacent National Forests is the only long-term supply for the local wood products industry. The Sierra National Forest supplies 20 to 25 percent of the lumber manufactured in the San Joaquin Valley. Interest in biomass as an energy source is increasing.

Local government has very little influence over projects, planning, and management of lands within the jurisdiction of the U.S. Forest Service. Typically, the USFS will send copies of Environmental Assessments and Environmental Impact Statements (EIS's) for USFS projects to local governments for their review, comment, and records but usually do not receive any significant amount of input from the local governments. If a proposed project on National Forest land is determined to be incompatible with the direction of an adopted Forest Plan, the project will be revised or not permitted. Conflicts that recur will result in a review of the relevant management direction of the Forest Plan according to its monitoring an evaluation process, and may lead to an amendment or revision to the Forest Plan. Projects on private lands that could affect USFS land "downstream" of the project would be evaluated by the USFS for cumulative or indirect impacts on federal lands. Timber harvests on private lands are required to submit and get approval of a Timber Harvest Plan from the California Department of Forestry and Fire Protection (CDF).

Of the income generated within the National Forest, from timber, grazing, mining, and recreation uses, 25 percent of all gross receipts are divided up proportionally to local government based on acreage of each local jurisdiction within the forest boundaries. The use of this source of revenue is required to be only for roads and schools.

Annual yields within the Sierra National Forest have averaged approximately 88 million board feet but have scaled down to approximately 40 million board feet in recent years. The reduction in acreage available for logging is partially a result of recent endangered species regulations pertaining to the California spotted owl and the red-legged frog requiring immediate land set asides to preserve suitable habitat for these species. President Clinton has assigned a new study team to analyze the current guidelines relating to timber harvests and endangered species. It is expected that yields will remain at the 40 million board foot level for the next several years.

The timber industry affects the economics of Fresno County in several ways. In addition to the portion of the 25 percent of gross receipts given to the counties, the fluctuation of employment with the USFS and with private forestry products industry employers is contingent on the timber industry market and affects employment in the county. Most of the timber cut in Sierra National Forest is processed at two plants, one in Madera and one in Fresno County. Two other mills have closed in the last several years. Smaller logging operations and harvesters will likely continue relatively unaffected. With cutbacks and reorganizing in federal government nationwide, and reduction in local timber yields, the USFS employment has been substantially reduced and will likely continue to decline over the next several years.

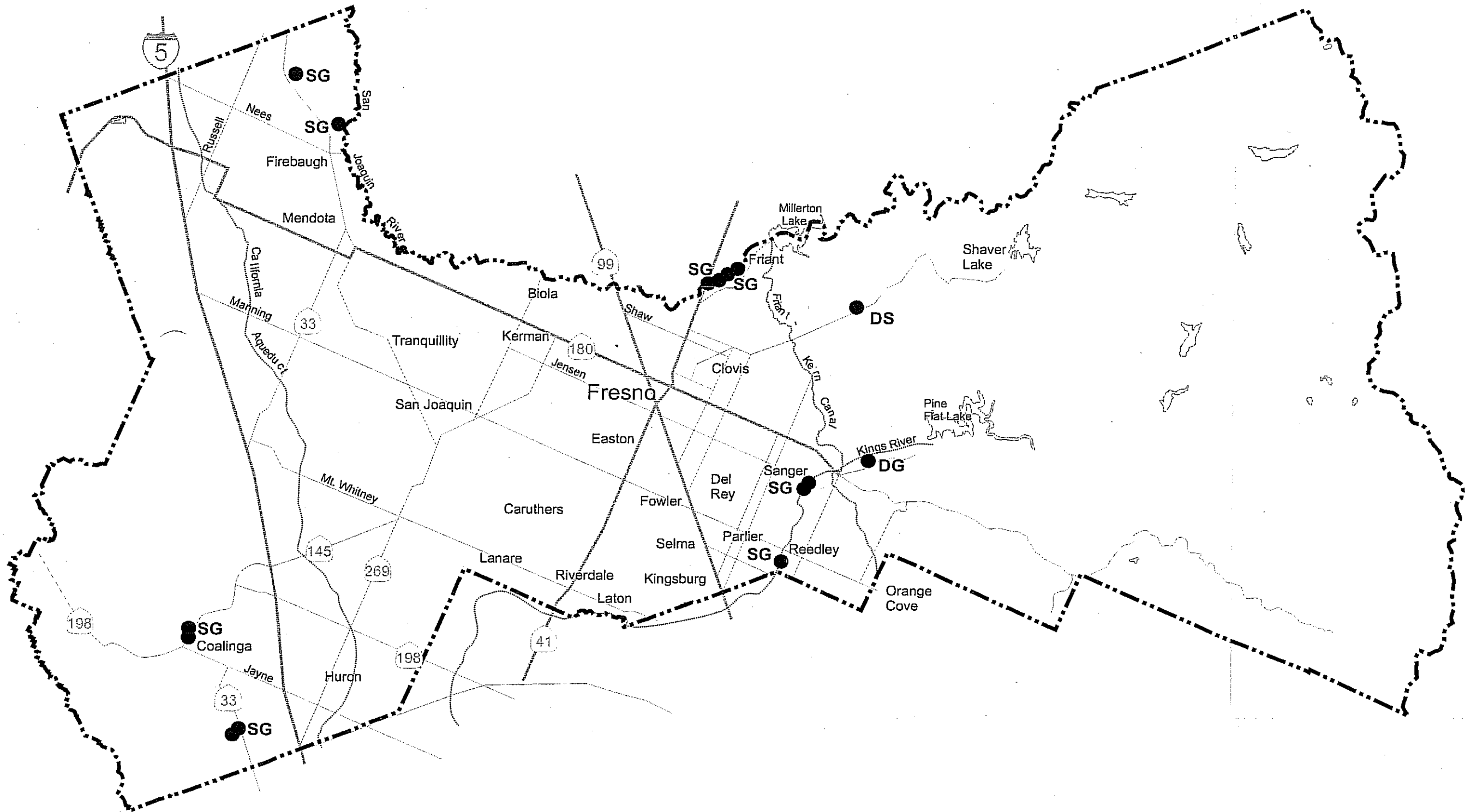
7.9 MINERAL RESOURCES


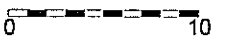

Fresno County has been a leading producer of minerals because of the abundance and wide variety of mineral resources that are present in the county. Extracted resources include aggregate products (sand and gravel), fossil fuels (oil and coal), metals (chromite, copper, gold, mercury, and tungsten), and other minerals used in construction or industrial applications (asbestos, high-grade clay, diatomite, granite, gypsum, and limestone). Figure 7-7 Mineral Resource Locations, illustrates the general distribution of minerals throughout the county. For the period 1997 - 1998, there were 15 active mines and mineral producers in Fresno County. The principal mineral producing locations and commodities are shown in Figure 7-8. Fluctuating markets have affected the rate of extraction, but the potential for meeting future market demand remains good for several of the minerals. Aggregate and petroleum are considered the county's most significant extractive mineral resources.

MINERAL RESOURCES MANAGEMENT

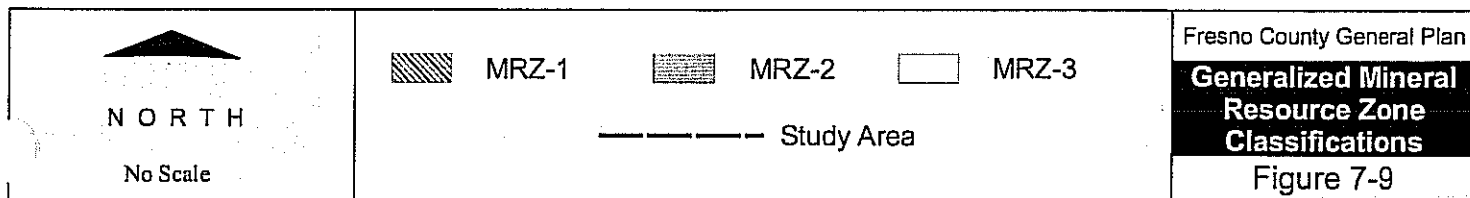
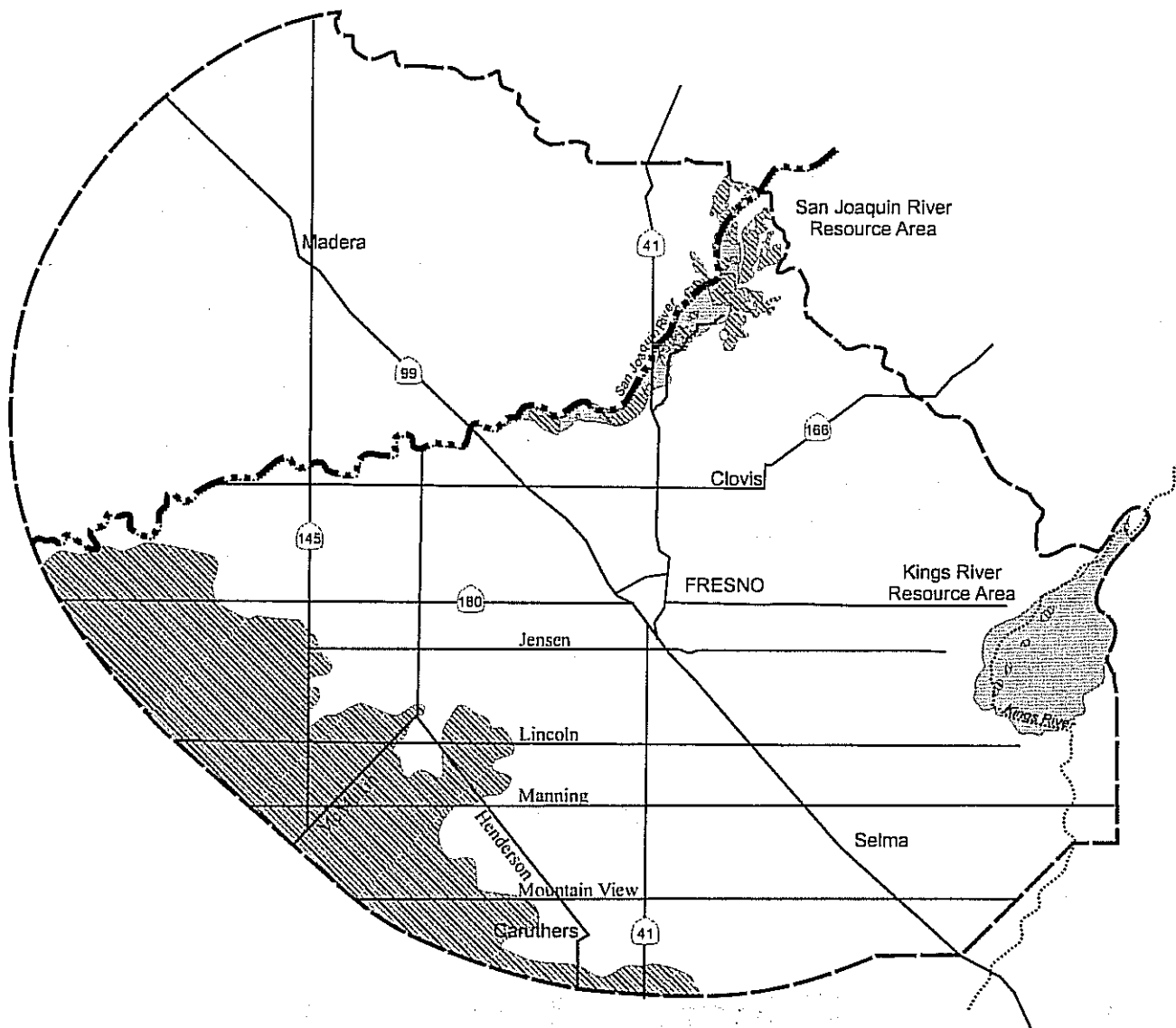
Surface Mining and Reclamation Act

Sections 2761(a) and (b) and 2790 of the *Surface Mining and Reclamation Act (SMARA)* provide for a mineral lands inventory process termed classification-designation. The California Division of Mines and Geology, and the State Mining and Geology Board are the state agencies responsible for administering this process. The primary objective of the process is to provide local agencies, such as cities and counties, with information on the location, need, and importance of minerals within their respective jurisdictions. It is also the intent of this process, through the adoption of general plan mineral resource management policies, that this information be considered in future local land-use planning decisions. Under SMARA, local land use jurisdictions are the enforcing lead agencies for mineral resource issues, while State agencies guide and regulate city and county enforcement of SMARA.

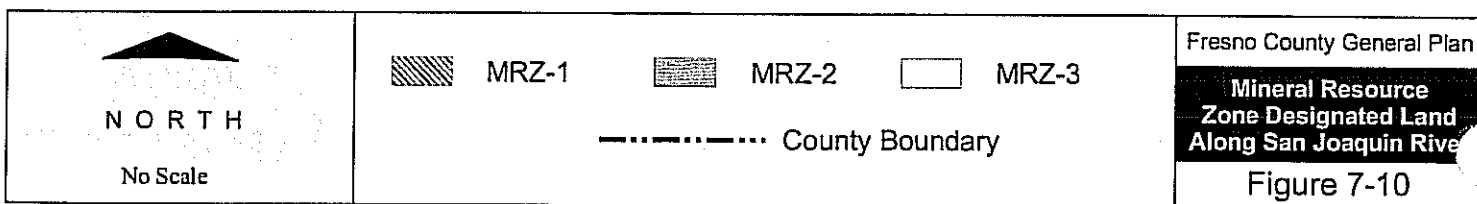
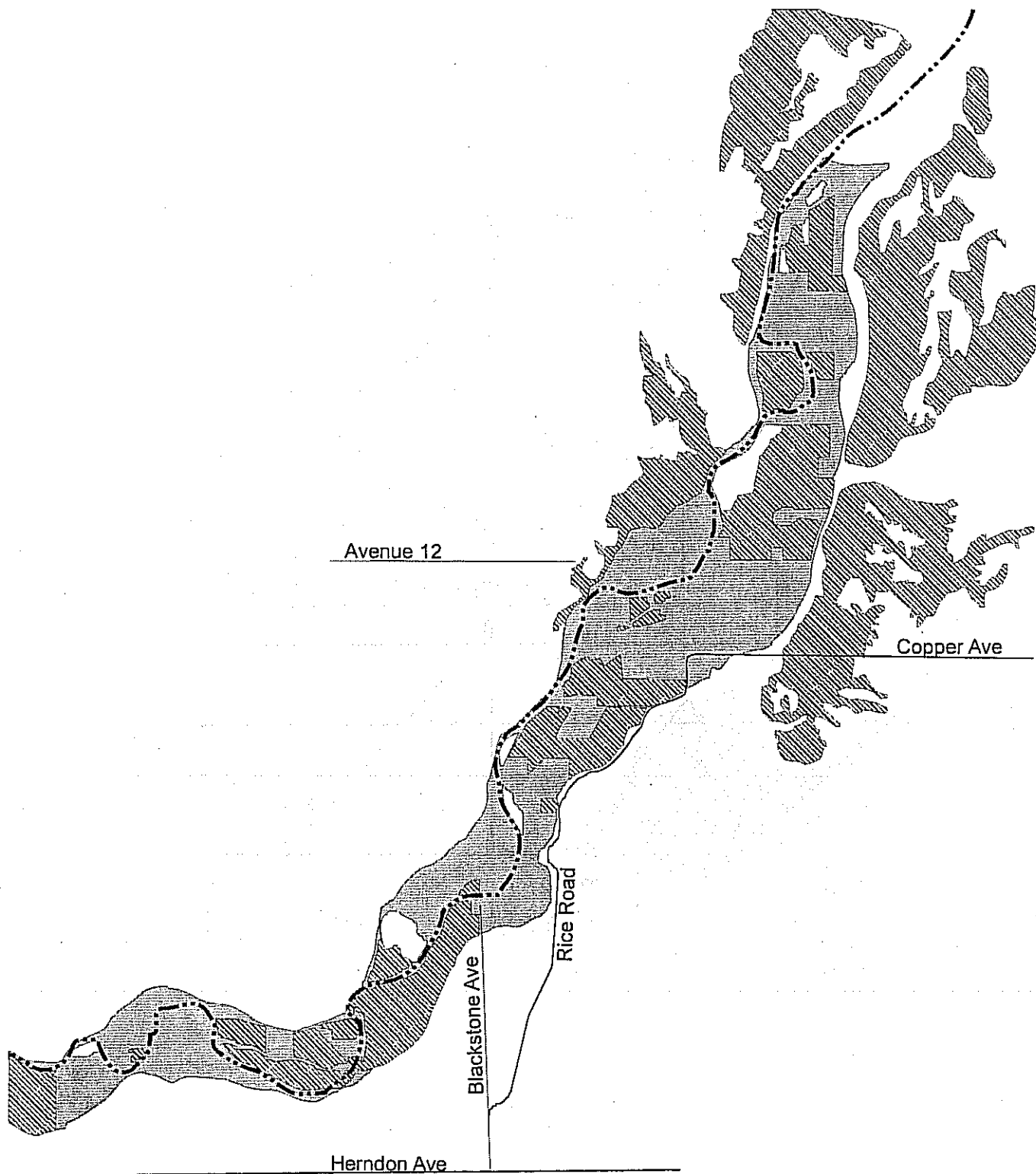


  1" = 10 miles	SG Sand and Gravel		DG Decomposed Granite		Fresno County General Plan Principal Mineral Producing Locations (1997-1998) Figure 7-8
	DS Dimension Stone		 Mineral Producing Locations		

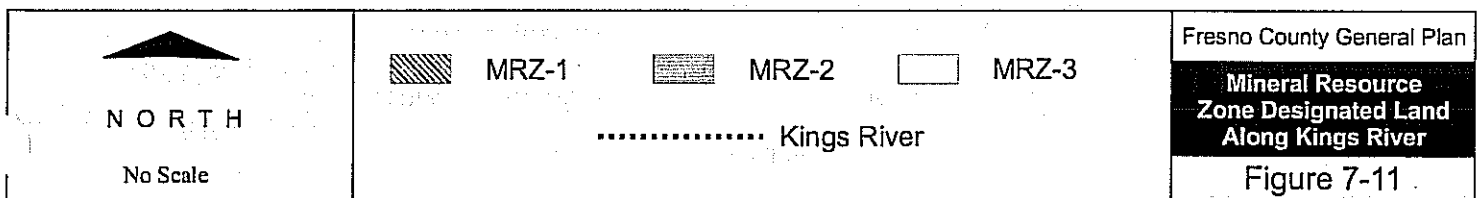
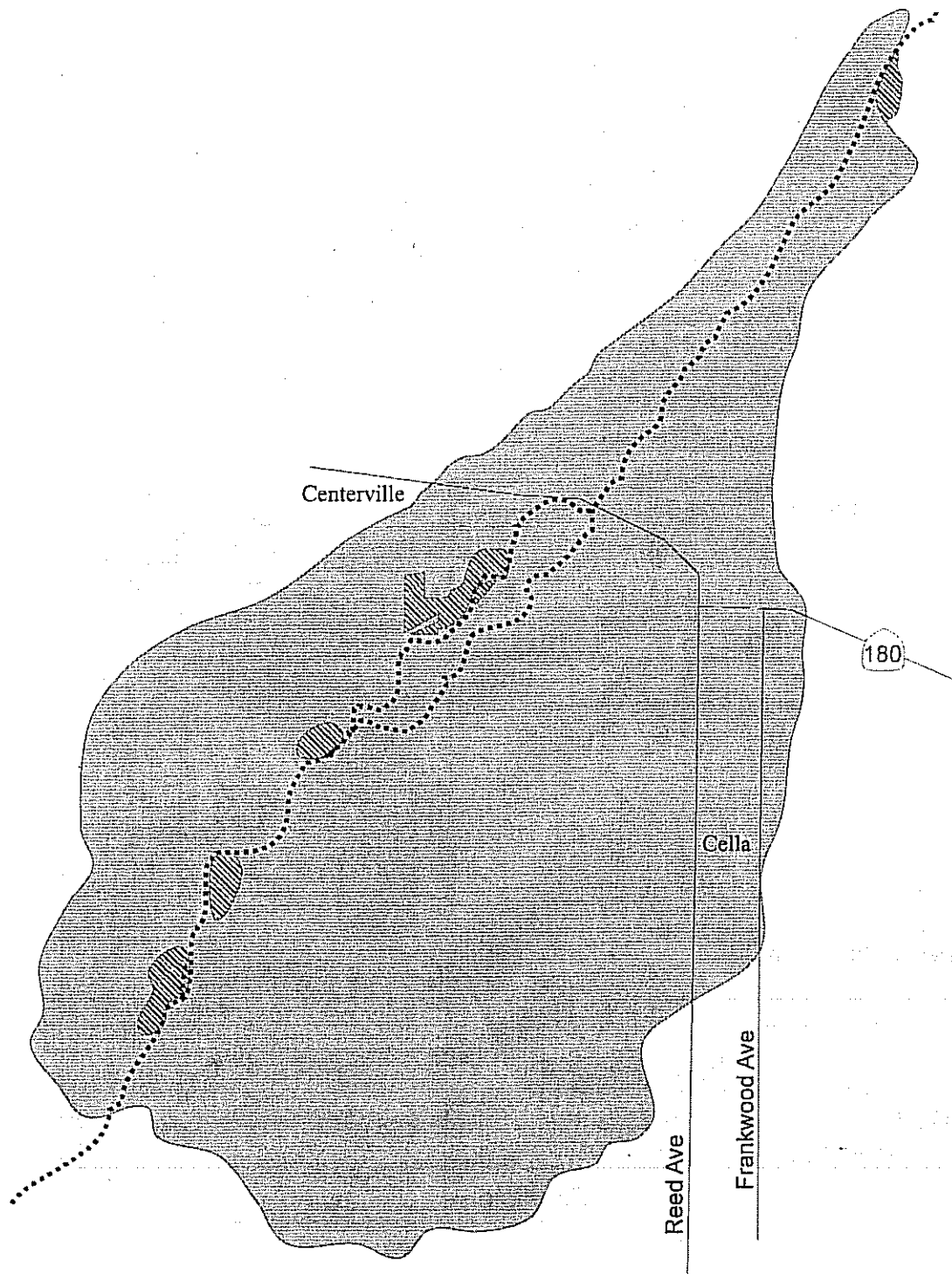
Source: California Division of Mines and Geology, *Mines and Mineral Producers Active in California (1997-1998)*, Special Publication 103 (Revised 1999)



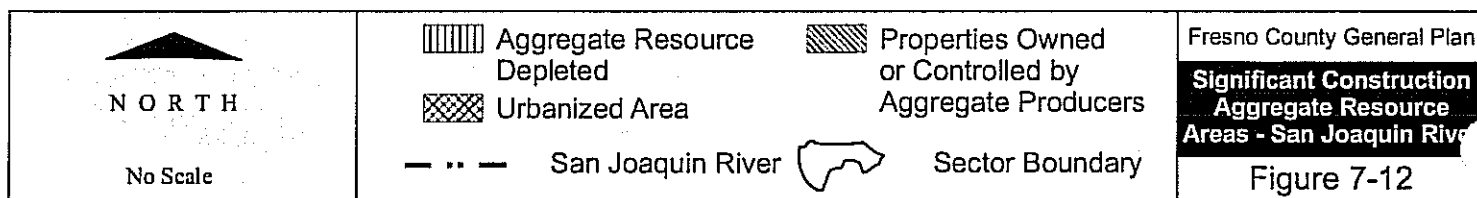
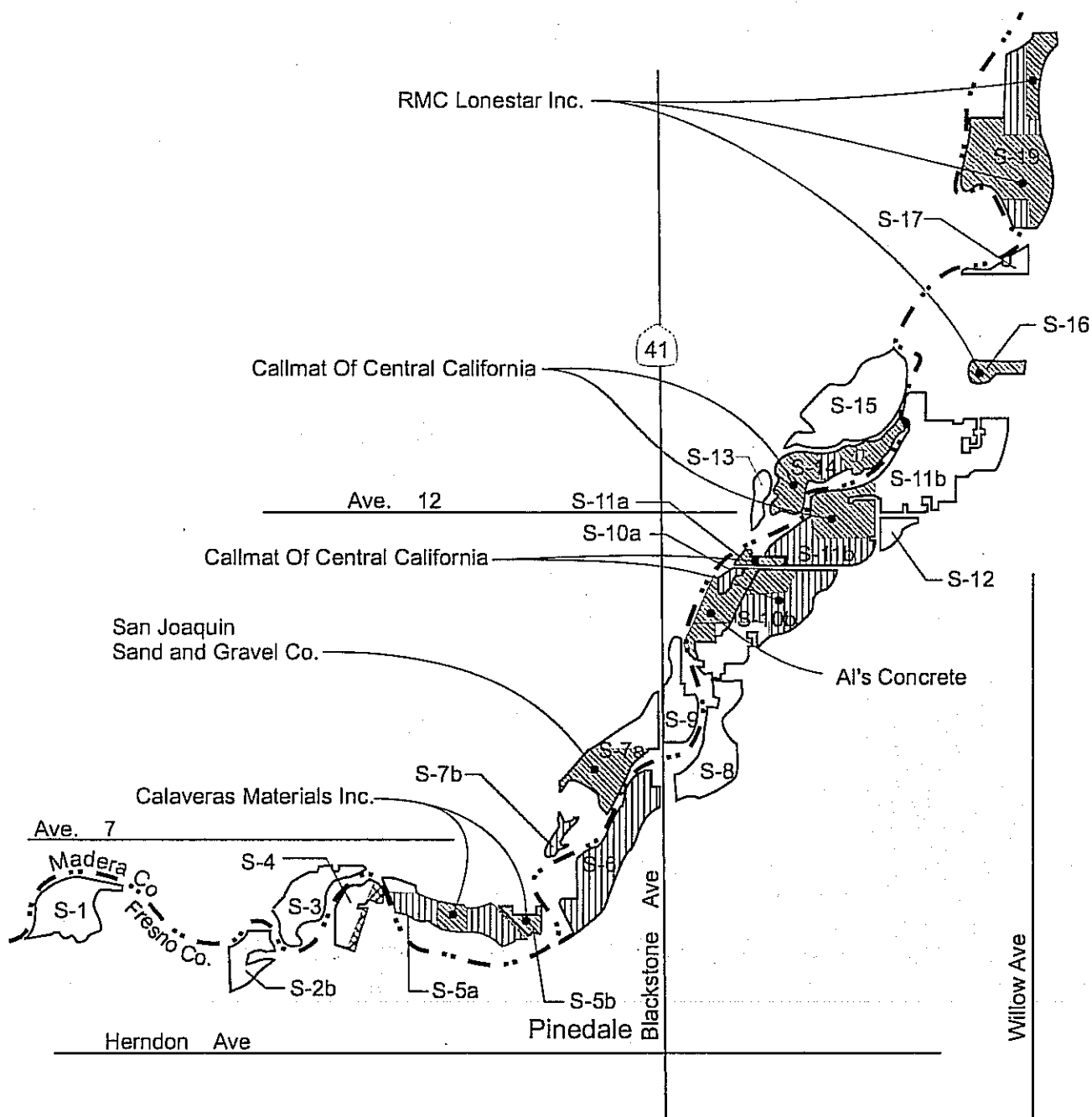
Source: California Division of Mines and Geology, Update of Mineral Land Classifications: Aggregate Materials in the Fresno Production-Consumption Region, California, (OFR 99-02) 1999, Plate 1

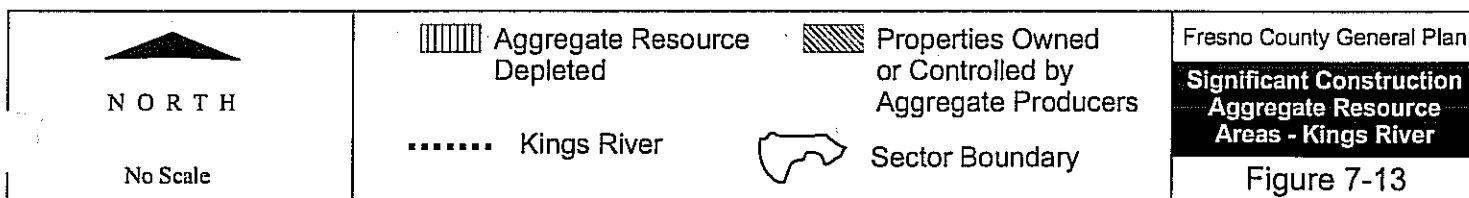
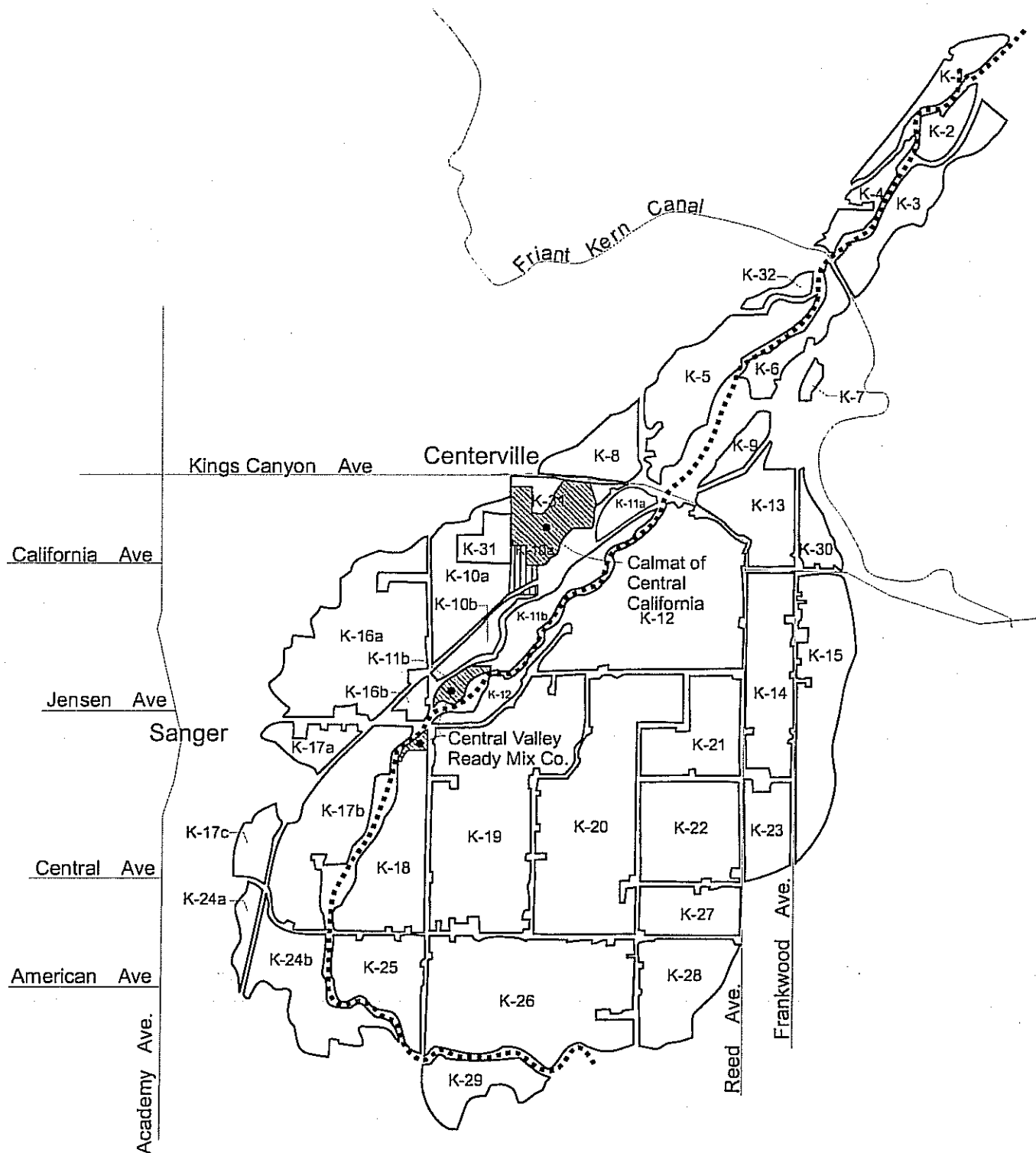


Source: California Division of Mines and Geology, *Update of Mineral Land Classification: Aggregate Materials in the Fresno Production-Consumption Region California*, OFR 99-02 1999, Plates 2, 3 and 4



Source: California Division of Mines and Geology, Update of Mineral Land Classification: Aggregate Materials in the Fresno Production-Consumption Region, California, (OFR 99-2) 1999, Plate 5; California Division of Mines and Geology, Mineral Land Classification: Aggregate Materials in the Fresno Production-Consumption Region, California, (Special Report 158) 1999, Plates 7,8, and 9.





Source: California Division of Mines and Geology, *Update of Mineral Land Classification Aggregate Materials in the Fresno Production-Consumption Region California*, OFR 99-02 1999, Plate 7

Areas are classified on the basis of geologic factors, without regard to existing land use and land ownership. The areas are categorized into four mineral resource zones (MRZ) as follows:

MRZ-1 – Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

MRZ-2 – Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that there is a high likelihood for their presence.

MRZ-3 – Areas containing mineral deposits the significance of which cannot be evaluated from available data.

MRZ-4 – Areas where available information is inadequate for assignment to any other mineral resource zone.

Of these four categories, lands classified as MRZ-2 are of the greatest importance because they identify significant mineral deposits of a particular commodity. MRZ-3 areas are also of interest because they identify areas that may contain additional resources of economic importance.

Areas designated by the Mining and Geology Board as "regionally significant" are incorporated by regulation into Title 14, Division 2 of the California Code of Regulations.

San Joaquin River Parkway Master Plan

The San Joaquin River Parkway was initiated by State legislation in 1988 when people concerned with the future of the San Joaquin River formed the San Joaquin River Parkway and Conservation Trust (the River Trust), a private nonprofit organization. An Interim Master Plan (Parkway Plan) was adopted in December 1995 by the San Joaquin River Conservancy.

The Parkway Plan is a regional resource management plan for the San Joaquin River. It contains fundamental and specific goals, policies and component designations to be considered and acted on by the San Joaquin River Conservancy and presented for consideration by the local jurisdictions. The Conservancy's objectives are to protect natural resources, and provide public education and low-impact recreation use of the San Joaquin River. The goals, policies and component designations will also guide the Conservancy to carry out its responsibilities to designate priorities in land acquisition and to manage Parkway operations on a regionally consistent basis. The Parkway Plan contains the following mineral resources goals and objectives that support the Parkway purposes:

Goals

- Promote the reclamation of land after removal of sand and gravel deposits in ways that will enhance or complement the Parkway and its natural resources and recreational opportunities.

- Assure that Parkway facilities are designed, constructed and operated in such a way that sand and gravel mining operations are not adversely affected and that they will not preclude future extraction in all MRZ-2 designated areas.

Objectives

- Promote a consistent approach among the jurisdictions to permitting, reclamation plan requirements, and reclamation monitoring such that owners of sand and gravel resources maintain the ability to mine them, if they choose.
- Cooperate with local land use control agencies in the development of standards concerning mining operations, processing sites and haul routes proposed within the Parkway.

RESOURCES

Aggregate Resources

The California Division of Mines and Geology (CDMG) has classified the Fresno Production-Consumption (P-C) Region according to the presence or absence of significant Portland cement-concrete (PCC)-grade aggregate deposits. The land classification, originally published in 1988, is presented in the form of MRZs. The boundaries of the Fresno P-C Region, which covers an area of 1,400 square miles, and generalized locations of MRZs are shown in Figure 7-9. In 1999, changes were made to some of the mineral land classifications to reflect 1997 conditions. Fifteen reclassifications from MRZ-2 and MRZ-3 to MRZ-1 resulted from the depletion of reserves by mining. Most of the reclassifications were along the San Joaquin River. Two areas were classified from MRZ-1 and MRZ-3 to MRZ-2. Figures 7-10 and 7-11 show the updated MRZ classifications for areas along the San Joaquin and Kings Rivers, respectively.

The original classification of MRZs assisted the State Mining and Geology Board in a subsequent process called "designation." Based on the 1988 classification, CDMG delineated two large "resource sectors" along the San Joaquin and Kings Rivers. Resource Sector "S" encompasses a large portion of the active stream channel and adjacent floodplains of the San Joaquin River extending from near the community of Herndon upstream to the base of Friant Dam. Resource Sector "K" includes a large portion of the Kings River active stream channel and floodplain extending from approximately Avocado Lake downstream to an area south of Goodfellow Avenue. Revised maps for the San Joaquin and Kings River sectors, based on 1997 data compiled by CDMG, are shown in Figures 7-12 and 7-13, respectively.

Updated (1997) data indicate that, within designated lands, revised estimates show there are presently 2.2 billion tons of PCC-grade aggregate resources available. The total includes 2.107 billion tons of unpermitted resources and 93 million tons of reserves permitted for PCC aggregate production. In 1997, annual demand was approximately 4.7 million tons, based on a population of 748,000. The calculated annual per capita consumption was 6.5 tons. All of the aggregate produced within the Fresno P-C Region is consumed within the region. The anticipated consumption of aggregate in the Fresno P-C Region for the next 50 years (to 2047) is estimated to be 528 million tons, of which 50 percent or 264 million tons must be PCC quality. This is nearly double the 50-year consumption estimate presented in the 1998 classification report. Based on

current estimates, the 93 million tons of presently permitted PCC-grade aggregate resources (reserves) with the Fresno P-C region will supply regional demand until the year 2011. Although no imports from neighboring production areas into the Fresno P-C Region were reported up to December 1997, one company in the Fresno P-C Region began importing aggregate from the Coalinga area.

As of December 1997, seven mines, operated by six different companies, were producing PCC-grade aggregate in the Fresno P-C Region. The aggregate resources on the San Joaquin River, which have been the primary source of construction materials for almost all of the construction in the Fresno region are almost depleted, as evidenced by their reclassification to MRZ-1. Designated resources on the Kings River deposits are the only other locally available sources for aggregate in the most densely urbanized areas where most of the future growth is anticipated to occur. Calaveras Minerals, Inc. (CMI) is currently seeking an Unclassified Conditional Use Permit for extraction and processing operations on the Kings River. Projected processing volumes are estimated to be 2 million tons per year by approximately 2006.

Petroleum Resources

Oil production has long been a major industry in western Fresno County, particularly in the Coalinga area. Extensive oil recovery operations are located mostly to the north of the city of Coalinga. Oil companies such as Chevron USA, Union Oil Company, Shell Production, and Santa Fe Energy have substantial land holdings in the area. Natural gas and natural gas liquids occur in oil sands or with oil in an overlying gas cap or as dry gas in separate zones in oilfields and in separate gas fields.

Coal, in the form of lignite, occurs northwest and southwest of Coalinga but has not been commercially mined for one hundred years. The Priest Valley coal field is partially within Fresno County, but most mining occurred in Monterey County.

Metals and Other Minerals

Other identified mineral resources in Fresno County include metals and other mineral commodities. The CDMG has not established MRZ classifications for these minerals.

Asbestos

Asbestos is surface-mined in large quantities about 20 miles northwest of Coalinga. The serpentine host rock in which it is found covers approximately 2,000 square miles, and as much as 50 percent of this rock could be asbestos. The total reserves are not known, but the deposit has been estimated to contain more than 100 million tons of ore. This area is one of the nation's principal producers of asbestos and contains one of the world's largest deposits of short-fiber asbestos. Two of the state's five producers of commercial asbestos are located in the Coalinga area.

Chromite

Chromite, which was once mined in significant quantities, is no longer considered profitable, although abundant reserves of low-grade ore remain. Each of the sites shown on Figure 7-7 have produced over 150 tons of chromite.

Copper

Copper occurs at several locations in the Foothill Copper Belt. It is generally associated with various other minerals of minor value. There was a considerable amount of copper mining before 1917, but there has been no significant production in recent years.

Diatomite

Diatomite occurs in western Fresno County. There was a significant amount of production prior to 1935, but there was little for the succeeding 25 years. In 1961, it ranked eleventh in value of mineral products in the County, but it has not been ranked since that time.

Gold

Gold has been mined in eastern Fresno County from the days of the California Gold Rush and continues to be a significant product today. Although much of the county's gold production area was lost with the separation of Madera County, continued production at sand and gravel operations have kept the income for the mineral at a low but constant level. Production is expected to continue at least as long as the sand and gravel operations remain.

Granite

Granite for monuments has been quarried in Fresno County in the vicinity of Academy for almost 70 years. The stone is a dark hornblende diorite, known commercially as "black granite." Since 1940 decomposed granite has been quarried for crushed rock intermittently near Friant. Production is expected to continue at a steady pace.

Gypsum

Gypsum occurs in numerous low-grade deposits in the westside foothills. The gypsum in the county is generally the impure form called gypsite, but it is considered to be one of the most important non-metals, with some production annually since 1930. It is useful as a soil additive, as an agricultural mineral, as a cement retarder, and for wallboard and other building construction materials. Production is expected to increase in the future.

Limestone

Limestone occurs in a variety of forms and locations throughout the county ranging from marl deposits in the younger formations on the east side of the Valley to hard limestone and marble deposits in the Sierra Nevada. Much of the valley land is underlain by "white hardpan," consisting

partly of calcium carbonate and magnesium carbonate. Many marl deposits have been developed for sale to farmers for soil treatment. Limestone has been crushed for poultry grist, stock feed, and foundry use. Production for local use is expected to continue.

Mercury

Mercury was first produced in the county around 1905 and has contributed to the county's income from minerals at a steady pace over the years. It occurs in the western foothills. Although there is no production at present, operation could resume if market demand increases.

Tungsten

Tungsten has been mined in the Sierra Nevada foothills at various times. As with several other minerals, market demand has not been sufficient to make development and operation of mines feasible. Deposits extend from Mud Lakes toward Dinkey Creek and at the Garnet Dike Mine on the Kings River.

7.10 FINDINGS

- Highly expansive soils are generally present in eastern Fresno County in a northwest-trending belt east and approximately parallel to the Friant-Kern Canal in the Sierra Nevada foothills and in the Kings Canyon National Park, and along Fresno Slough between approximately Madera County and Kings County. Area-wide formal studies to evaluate expansive properties of soils west of Fresno Slough have not been published. Consequently, locations of soils exhibiting a high expansion potential have not been identified in that area. Site-specific studies would be needed for any development project to more accurately determine local conditions.
- Soils exhibiting high erosion potential are predominantly located in the Sierra Nevada and the foothills and generally coincide with land slope areas that exceed 30 percent. Many of the soils are located within the boundaries of the Sierra National Forest, Sequoia National Forest, or Kings Canyon National Park, which would limit their availability for intensive development. Kettleman soils, located primarily west of I-5 in the Coast Range foothills, are also subject to moderate to severe sheet and gully erosion. Panoche and Panhill soils, which are extensively distributed throughout the western area in areas of moderate to little relief, have physical properties that make them particularly susceptible to erosion as a result of human activity.
- Soils can be used as a predictor of potential occurrence of special-status species. Areas mapped as alkaline soils can be reviewed for the presence of natural habitat that has not been converted to agriculture that could support alkaline-dependent rare plants. The fifth division Western Area soils including the Merced, Rossi, Temple, and Traver series could characterize this situation.
- Soils associations that indicate the presence of hardpan layers (primarily just before the foothills in the northcentral part of the county) can indicate the presence of vernal pools where urbanization or conversion to intensive agriculture has not modified the vernal pool topography and subsurface hardpan soil layer. Eastern Area soils associations where well drained soils of low alluvial terraces occur, such as the San Joaquin-Exeter-Ramona, Academy-Yokohl, Centerville-Keyes, and Positas-Redding associations, can be used as indicators of this situation.
- Fresno County supports a large diversity of habitats for vegetation and wildlife in four generalized biotic regions. Goals and policies should be directed at management strategies to protect, preserve, conserve, and restore the biodiversity in the county.
- Areas that are outside of federal ownership, and, therefore, most subject to development include the Coast Range, Valley floor, and lower Sierra Nevada foothill biotic regions.
- Sensitive biological resources are associated with specific habitat types (natural habitat areas not intensively farmed, wetlands, riparian, vernal pools, etc.) or habitat elements such as specific soil types (clay, alkaline, serpentine).

- Approximately one third of the county lies within land under federal jurisdiction. The USFS and NPS manage these lands for recreation, biology, wilderness, tourism, timber, and mining under guidelines, policies, and laws separate from local government. (Although some federal laws apply to projects approved by local government.)
- The county supports populations of resident and migratory rare, threatened and endangered species.
- Some species or groups of species occur at precise locations based on the presence of existing habitat with specific habitat elements.
- The western valley floor and Coast Range biotic regions have special planning concerns because of the San Joaquin kit fox, kangaroo rats, and blunt-nosed leopard lizard. Regional habitat planning efforts (*Pleasant Valley HCP* was started but has been on hold for some time now) could be used as the basis for addressing sensitive biological resources in the area.
- Some species or groups of species are wide-ranging migratory species that breed in the county. These species tend to be habitat-specific in their use of the county.
- Some species or groups of species are wide ranging non-breeding season migrants that take advantage of a wide variety of habitats and conditions. Migratory waterfowl, shorebirds, and some raptor species that use the vast agricultural landscape during the winter will require less rigorous planning considerations than species associated with a specific habitat type.
- Fresno County has been a leading producer of minerals because of the abundance and wide variety of mineral resources that are present in the county. Extracted resources include aggregate products (sand and gravel), fossil fuels (oil and coal), metals (chromite, copper, gold, mercury, and tungsten), and other minerals used in construction or industrial applications (asbestos, high-grade clay, diatomite, granite, gypsum, and limestone).
- Some areas along the San Joaquin and Kings Rivers have been classified MRZ-2 for aggregate resources by the California Division of Mines and Geology. All of the aggregate produced within the Fresno area is consumed within the region. Annual demand in 1997 was approximately 4.7 million tons. There are 93 million tons of permitted aggregate resources, which are estimated to supply regional demand until 2011.
- Stream systems in Western Fresno County pose erosion problems in the watershed and sedimentation problems downstream.
- Groundwater overdraft is occurring near major cities and in certain water and irrigation districts.
- In general, subsidence in Fresno County has stabilized, except during droughts.
- Several agencies in Fresno County have recently prepared and adopted water management plans under AB 3030.

- Wetlands are considered jurisdictional Waters of the U.S. and most activities in and around them require permitting by Corps and possibly other agencies.
- The Army Corps of Engineers and CDF&G encourage protection of wetlands habitats, but believe many wetlands within Fresno County have never been identified.
- A large concentration of very high quality vernal pools is located near Friant, within Fresno County, and are acclaimed as some of the best examples of vernal pools.
- Retired agricultural land is being reclaimed for constructed wetlands in some areas in western Fresno County.
- The quality of local surface water from the Kings and San Joaquin Rivers is excellent for both irrigation and municipal and industrial (M&I) uses.
- Concentrations of TDS, sodium, sulfate, boron, chloride and carbonate/bicarbonate, and trace elements (such as selenium) limit the beneficial use of groundwater in western Fresno County.
- Agricultural lands in western Fresno County are becoming increasingly impacted by rising saline in shallow groundwater that occurs as a result of irrigation with imported surface water primarily from the CVP.

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7.13 GLOSSARY

Agriculture - The use of land for the production of food and fiber, including the growing of crops and/or the grazing of animals on natural prime or improved pasture lands.

Alkaline - An area with soils high in salt concentrations.

Alluvial - Soils or sedimentation that are derived from upstream erosion and are composed from various parent rock sources (e.g. granite, limestone, etc.) in the Sierras.

Annual - Plants that germinate, grow, and reproduce seed and die or otherwise complete their life cycle in one growing season.

Browse - Plant foliage and vegetation that is found suitable for grazing by deer.

Community - The association and distribution of plants that form a habitat in a natural setting.

Estivate - The action of moving to underground burrows during the summer months to escape desiccation.

Floodplain - The area in which flood waters extend during storm events. This area may be considerable distances beyond the normal or low flow channel and outside the river or waterway corridor.

Halophytic - The unique adaptation of a plant or animal to persist in an environment that contains high salt levels that usually deter or are inhospitable to other species.

Herbaceous - Non-woody vegetation that may be composed of annual or perennial plant species.

Hydrophyte - A plant that is specially adapted to life in aquatic habitats.

Mesic - A environmental condition where the soil is seasonally to perennially wet or saturated.

Microclimate - An area in which a specific soil, aspect, slope, or water content makes it different from the surrounding environment and thus able to support a set of plant or animal species unique to the immediate area.

Mineral Resource Zone - Areas classified by the California Division of Mines and Geology on the basis of geologic factors, without regard to existing land use and land ownership. The areas are categorized into four mineral resource zones (MRZ).

Ornamental - Trees or shrubs that are non-native and planted in an urban setting are called ornamental.

Perennial - A plant species that grows and reproduces year after year. These plants do not die after the growing season and may become dormant during the winter months.

Prostrate - A plant growth form that is lying flat or trailing on the ground.

Special-status - Plants or animals that are considered rare, endangered or threatened by the federal or state government are considered special-status. This label may include plant and animal species that are on watch lists established by various private, state or federal agencies.

Stump sprout - New shoot growth that originates at the base of mature but damaged perennial vegetation.

Urban - An area with dense human development composed of roads, buildings, housing or other structures that replace the natural habitat.

Xerophytic - The adaptation of a plant or animal to tolerate extremely low moisture levels.

APPENDIX 7A

CALIFORNIA WILDLIFE HABITAT RELATIONSHIP SYSTEM

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SPECIES DETAIL REPORT

ID	SPECIES NAME	STATUS				SEASON IN LOCATION OR HABITAT	LOCATIONS, HABITATS AND SPECIAL ELEMENTS	IMPORTANCE TO...		
		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
001	TIGER/CALIF. TIGER SALAMANDER		5	6		Yearlong	FRESNO			
007	CALIFORNIA NEWT			6		Yearlong	FRESNO			
012	ENSATINA			6		Yearlong	FRESNO			
015	BLACK-BELLIED SLENDER SALAMANDER					Yearlong	FRESNO			
016	PAC/RELICTUAL SLENDER SALAMANDER			6		Yearlong	FRESNO			
022	ARBOREAL SALAMANDER					Yearlong	FRESNO			
023	MOUNT LYELL SALAMANDER			5	6	Yearlong	FRESNO			
028	WESTERN SPADEFOOT			5	6	Yearlong	FRESNO			
032	WESTERN TOAD					Yearlong	FRESNO			
033	YOSEMITE TOAD			5	6	Yearlong	FRESNO			
039	PACIFIC TREEFROG					Yearlong	FRESNO			
040	RED-LEGGED FROG	2		5	6	Yearlong	FRESNO			
043	FOOTHILL YELLOW-LEGGED FROG			5	6	Yearlong	FRESNO			
044	MOUNTAIN YELLOW-LEGGED FROG			5	6	Yearlong	FRESNO			
046	BULLFROG				9	Yearlong	FRESNO			
003	COMMON LOON			6		Fall-Winter	FRESNO			
0	WED-BILLED GREBE					Yearlong	FRESNO			
007	HORNED GREBE									

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
						Fall	FRESNO			
009	EARED GREBE					Yearlong	FRESNO			
010	WESTERN/CLARK'S GREBE					Yearlong	FRESNO			
042	AMERICAN WHITE PELICAN			6		Fall-Winter	FRESNO			
044	DOUBLE-CRESTED CORMORANT			6		Fall-Winter	FRESNO			
049	AMERICAN BITTERN					Yearlong	FRESNO			
050	LEAST BITTERN			6		Spring-Summer	FRESNO			
051	GREAT BLUE HERON					Yearlong	FRESNO			
052	GREAT EGRET					Yearlong	FRESNO			
053	SNOWY EGRET					Yearlong	FRESNO			
057	CATTLE EGRET					Yearlong	FRESNO			
058	GREEN HERON					Yearlong	FRESNO			
059	BLACK-CROWNED NIGHT HERON					Yearlong	FRESNO			
062	WHITE-FACED IBIS			6		Yearlong	FRESNO			
067	TUNDRA SWAN					Fall-Winter	FRESNO			
070	GREATER WHITE-FRONTED GOOSE			9		Fall-Winter	FRESNO			
071	SNOW GOOSE			9		Fall-Winter	FRESNO			
072	ROSS' GOOSE			9		Fall-Winter	FRESNO			

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
0075	CANADA GOOSE		2		9	Fall-Winter	FRESNO			
0076	WOOD DUCK				9	Yearlong	FRESNO			
0077	GREEN-WINGED TEAL				9	Fall-Winter	FRESNO			
0079	MALLARD				9	Yearlong	FRESNO			
0080	NORTHERN PINTAIL				9	Yearlong	FRESNO			
0082	BLUE-WINGED TEAL				9	Fall-Winter	FRESNO			
0083	CINNAMON TEAL				9	Yearlong	FRESNO			
0084	NORTHERN SHOVELER				9	Yearlong	FRESNO			
0085	GADWALL				9	Yearlong	FRESNO			
0086	EURASIAN WIGEON				9	Winter	FRESNO			
0087	AMERICAN WIGEON				9	Yearlong	FRESNO			
0089	CANVASBACK				9	Fall-Winter	FRESNO			
0090	REDHEAD				9	Yearlong	FRESNO			
0091	RING-NECKED DUCK				9	Fall-Winter	FRESNO			
0094	LESSER SCAUP				9	Fall-Winter	FRESNO			
0101	COMMON GOLDENEYE				9	Fall-Winter	FRESNO			
0101	JUFFLEHEAD				9	Fall-Winter	FRESNO			

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		FE=1	FT=2	CE=3	C						
		CT=4	CP=5	CS=6	P						
		FS=7	BS=8	H=9	S						
104	HOODED MERGANSER				9		Winter	FRESNO			
105	COMMON MERGANSER				9		Yearlong	FRESNO			
107	RUDDY DUCK				9		Yearlong	FRESNO			
108	TURKEY VULTURE						Yearlong	FRESNO			
110	OSPREY			6			Summer	FRESNO			
111	WHITE-TAILED KITE			5			Yearlong	FRESNO			
113	BALD EAGLE	2 3		5			Winter	FRESNO			
114	NORTHERN HARRIER			6			Yearlong	FRESNO			
115	SHARP-SHINNED HAWK			6			Yearlong	FRESNO			
116	COOPER'S HAWK			6			Yearlong	FRESNO			
117	NORTHERN GOSHAWK			6 7			Yearlong	FRESNO			
119	RED-SHOULDERED HAWK						Yearlong	FRESNO			
121	SWAINSON'S HAWK			4			Spring-Fall	FRESNO			
123	RED-TAILED HAWK						Yearlong	FRESNO			
124	FERRUGINOUS HAWK			6			Winter	FRESNO			
125	ROUGH-LEGGED HAWK						Winter	FRESNO			
126	GOLDEN EAGLE			5 6			Yearlong	FRESNO			
127	AMERICAN KESTREL										

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
						Yearlong	FRESNO			
128	MERLIN			6		Winter	FRESNO			
129	PEREGRINE FALCON	1	3	5		Yearlong	FRESNO			
131	PRAIRIE FALCON			6		Yearlong	FRESNO			
132	CHUKAR				9	Yearlong	FRESNO			
133	RING-NECKED PHEASANT				9	Yearlong	FRESNO			
134	BLUE GROUSE				9	Yearlong	FRESNO			
135	AGE GROUSE			6	9	Yearlong	FRESNO			
138	WILD TURKEY				9	Yearlong	FRESNO			
140	CALIFORNIA QUAIL				9	Yearlong	FRESNO			
141	MOUNTAIN QUAIL				9	Yearlong	FRESNO			
145	VIRGINIA RAIL					Yearlong	FRESNO			
146	SORA					Yearlong	FRESNO			
148	COMMON MOORHEN				9	Yearlong	FRESNO			
149	AMERICAN COOT				9	Yearlong	FRESNO			
150	SANDHILL CRANE			4 5		Fall-Winter	FRESNO			
151	BLACK-BELLIED PLOVER					Fall-Winter	FRESNO			
154	SNOWY PLOVER	2		6		Summer	FRESNO			

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D	SPECIES NAME	STATUS				SEASON IN LOCATION OR HABITAT	LOCATIONS, HABITATS AND SPECIAL ELEMENTS	IMPORTANCE TO...		
		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
158	KILLDEER					Yearlong	FRESNO			
159	MOUNTAIN PLOVER		6			Winter	FRESNO			
163	BLACK-NECKED STILT					Yearlong	FRESNO			
164	AMERICAN AVOCET					Yearlong	FRESNO			
165	GREATER YELLOWLEGS					Fall-Winter	FRESNO			
168	WILLET					Fall-Winter	FRESNO			
170	SPOTTED SANDPIPER					Yearlong	FRESNO			
172	WHIMBREL					Spring	FRESNO			
173	LONG-BILLED CURLEW		6			Fall-Winter	FRESNO			
183	WESTERN SANDPIPER					Winter	FRESNO			
185	LEAST SANDPIPER					Fall-Winter	FRESNO			
191	DUNLIN					Fall-Winter	FRESNO			
197	LONG-BILLED DOWITCHER					Fall-Winter	FRESNO			
199	COMMON SNIFE				9	Fall-Winter	FRESNO			
200	WILSON'S PHALAROPE					Spring	FRESNO			
214	RING-BILLED GULL					Yearlong	FRESNO			
215	CALIFORNIA GULL		6			Yearlong	FRESNO			

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
0216	HERRING GULL					Fall-Winter	FRESNO			
0217	THAYER'S GULL					Yearlong	FRESNO			
0221	GLAUCOUS-WINGED GULL					Fall-Winter	FRESNO			
0227	CASPIAN TERN					Summer	FRESNO			
0233	FORSTER'S TERN					Spring-Summer	FRESNO			
0235	BLACK TERN			6		Spring-Summer	FRESNO			
0250	ROCK DOVE					Yearlong	FRESNO			
0251	BAND-TAILED PIGEON			9		Yearlong	FRESNO			
0253	SPOTTED DOVE			9		Yearlong	FRESNO			
0255	MOURNING DOVE			9		Yearlong	FRESNO			
0260	GREATER ROADRUNNER					Yearlong	FRESNO			
0262	BARN OWL					Yearlong	FRESNO			
0263	FLAMMULATED OWL					Spring-Summer	FRESNO			
0264	WESTERN SCREECH OWL					Yearlong	FRESNO			
0265	GREAT HORNED OWL					Yearlong	FRESNO			
0267	NORTHERN PYGMY OWL					Yearlong	FRESNO			
0268	BURROWING OWL			6		Yearlong	FRESNO			
0270	SPOTTED OWL	2		6 7						

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
						Yearlong	FRESNO			
271	GREAT GRAY OWL		3	7		Yearlong	FRESNO			
272	LONG-EARED OWL			6		Yearlong	FRESNO			
273	SHORT-EARED OWL			6		Yearlong	FRESNO			
274	NORTHERN SAW-WHET OWL					Yearlong	FRESNO			
275	LESSER NIGHTHAWK					Spring-Summer	FRESNO			
276	COMMON NIGHTHAWK					Spring-Summer	FRESNO			
277	COMMON POORWILL					Spring-Summer	FRESNO			
279	BLACK SWIFT			6		Spring-Summer	FRESNO			
281	VAUX'S SWIFT			6		Spring-Summer	FRESNO			
282	WHITE-THROATED SWIFT					Yearlong	FRESNO			
286	BLACK-CHINNED HUMMINGBIRD					Spring-Summer	FRESNO			
287	ANNA'S HUMMINGBIRD					Yearlong	FRESNO			
288	COSTA'S HUMMINGBIRD					Summer	FRESNO			
289	CALLIOPE HUMMINGBIRD					Spring-Summer	FRESNO			
290	BROAD-TAILED HUMMINGBIRD					Summer	FRESNO			
293	BELTED KINGFISHER					Yearlong	FRESNO			
294	LEWIS' WOODPECKER					Yearlong	FRESNO			

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SPECIES DETAIL REPORT

ID	SPECIES NAME	STATUS				SEASON IN LOCATION OR HABITAT	LOCATIONS, HABITATS AND SPECIAL ELEMENTS	IMPORTANCE TO...		
		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
296	ACORN WOODPECKER					Yearlong	FRESNO			
298	RED-NAPED SAPSUCKER					Winter	FRESNO			
299	RED-BREASTED SAPSUCKER					Yearlong	FRESNO			
300	WILLIAMSON'S SAPSUCKER					Yearlong	FRESNO			
302	NUTTALL'S WOODPECKER					Yearlong	FRESNO			
303	DOWNY WOODPECKER					Yearlong	FRESNO			
304	AIRY WOODPECKER					Yearlong	FRESNO			
305	WHITE-HEADED WOODPECKER					Yearlong	FRESNO			
306	BLACK-BACKED WOODPECKER					Yearlong	FRESNO			
307	NORTHERN/GILDED FLICKER		3			Yearlong	FRESNO			
308	PILEATED WOODPECKER					Yearlong	FRESNO			
309	OLIVE-SIDED FLYCATCHER					Spring-Summer	FRESNO			
311	WESTERN WOOD-PEWEE					Spring-Summer	FRESNO			
315	WILLOW FLYCATCHER		1 3	7		Summer	FRESNO			
317	HAMMOND'S FLYCATCHER					Spring-Summer	FRESNO			
318	DUSKY FLYCATCHER					Spring-Summer	FRESNO			
319	RAY FLYCATCHER					Summer	FRESNO			

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		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
320	PAC.-SLOPE/CORDILLERAN FLYCATCHER					Spring-Summer	FRESNO			
321	BLACK PHOEBE					Yearlong	FRESNO			
323	SAY'S PHOEBE					Yearlong	FRESNO			
326	ASH-THROATED FLYCATCHER					Spring-Summer	FRESNO			
331	CASSIN'S KINGBIRD					Spring-Summer	FRESNO			
333	WESTERN KINGBIRD					Spring-Summer	FRESNO			
337	HORNED LARK			6		Yearlong	FRESNO			
338	PURPLE MARTIN			6		Spring-Summer	FRESNO			
339	TREE SWALLOW					Yearlong	FRESNO			
340	VIOLET-GREEN SWALLOW					Yearlong	FRESNO			
341	NORTHERN ROUGH-WINGED SWALLOW					Spring-Summer	FRESNO			
342	BANK SWALLOW			4		Spring and Fall	FRESNO			
343	CLIFF SWALLOW					Spring-Summer	FRESNO			
344	BARN SWALLOW					Spring-Summer	FRESNO			
346	STELLER'S JAY					Yearlong	FRESNO			
348	ISLAND/WESTERN SCRUB-JAY			6		Yearlong	FRESNO			
349	PINYON JAY					Yearlong	FRESNO			
350	CLARK'S NUTCRACKER									

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
						Yearlong	FRESNO			
352	YELLOW-BILLED MAGPIE					Yearlong	FRESNO			
353	AMERICAN CROW			9		Yearlong	FRESNO			
354	COMMON RAVEN					Yearlong	FRESNO			
356	MOUNTAIN CHICKADEE					Yearlong	FRESNO			
358	PLAIN TITMOUSE					Yearlong	FRESNO			
360	BUSH TIT					Yearlong	FRESNO			
361	RED-BREASTED NUTHATCH					Yearlong	FRESNO			
362	WHITE-BREASTED NUTHATCH					Yearlong	FRESNO			
363	PYGMY NUTHATCH					Yearlong	FRESNO			
364	BROWN CREEPER					Yearlong	FRESNO			
366	ROCK WREN					Yearlong	FRESNO			
367	CANYON WREN					Yearlong	FRESNO			
368	BEWICK'S WREN					Yearlong	FRESNO			
369	HOUSE WREN					Yearlong	FRESNO			
370	WINTER WREN					Yearlong	FRESNO			
372	MARSH WREN					Yearlong	FRESNO			
373	AMERICAN DIPPER					Yearlong	FRESNO			

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
75	GOLDEN-CROWNED KINGLET					Yearlong	FRESNO			
76	RUBY-CROWNED KINGLET					Yearlong	FRESNO			
77	BLUE-GRAY GNATCATCHER					Yearlong	FRESNO			
80	WESTERN BLUEBIRD					Yearlong	FRESNO			
81	MOUNTAIN BLUEBIRD					Yearlong	FRESNO			
82	TOWNSEND'S SOLITAIRE					Yearlong	FRESNO			
85	SWAINSON'S THRUSH					Spring-Summer	FRESNO			
86	HERMIT THRUSH					Yearlong	FRESNO			
89	AMERICAN ROBIN					Yearlong	FRESNO			
90	VARIED THRUSH					Fall-Winter	FRESNO			
91	WRENTIT					Yearlong	FRESNO			
93	NORTHERN MOCKINGBIRD					Yearlong	FRESNO			
94	SAGE THRASHER					Yearlong	FRESNO			
98	CALIFORNIA THRASHER					Yearlong	FRESNO			
00	LE CONTE'S THRASHER			6		Yearlong	FRESNO			
04	AMERICAN PIPIT					Yearlong	FRESNO			
07	CEDAR WAXWING					Fall-Winter	FRESNO			

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
408	PHAINOPEPLA					Yearlong	FRESNO			
410	LOGGERHEAD SHRIKE	1		6		Yearlong	FRESNO			
411	EUROPEAN STARLING					Yearlong	FRESNO			
415	SOLITARY VIREO					Spring-Summer	FRESNO			
417	HUTTON'S VIREO					Yearlong	FRESNO			
418	WARBLING VIREO					Spring-Summer	FRESNO			
425	ORANGE-CROWNED WARBLER					Yearlong	FRESNO			
426	NASHVILLE WARBLER					Spring-Summer	FRESNO			
427	VIRGINIA'S WARBLER			6		Summer	FRESNO			
430	YELLOW WARBLER			6		Spring-Summer	FRESNO			
435	YELLOW-RUMPED WARBLER					Yearlong	FRESNO			
436	BLACK-THROATED GRAY WARBLER					Spring-Summer	FRESNO			
438	HERMIT WARBLER					Spring-Summer	FRESNO			
460	MACGILLIVRAY'S WARBLER					Spring-Summer	FRESNO			
461	COMMON YELLOWTHROAT			6		Yearlong	FRESNO			
463	WILSON'S WARBLER					Spring-Summer	FRESNO			
467	YELLOW-BREASTED CHAT			6		Spring-Summer	FRESNO			
471	WESTERN Tanager									

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
						Spring-Summer	FRESNO			
75	BLACK-HEADED GROSBEAK					Spring-Summer	FRESNO			
76	BLUE GROSBEAK					Spring-Summer	FRESNO			
77	LAZULI BUNTING					Spring-Summer	FRESNO			
82	GREEN-TAILED TOWHEE					Spring-Summer	FRESNO			
83	SPOTTED TOWHEE			6		Yearlong	FRESNO			
84	CALIFORNIA TOWHEE		2 3			Yearlong	FRESNO			
87	RUFIOUS-CROWNED SPARROW			6		Yearlong	FRESNO			
89	CHIPPING SPARROW					Summer	FRESNO			
91	BREWER'S SPARROW					Summer	FRESNO			
93	BLACK-CHINNED SPARROW					Spring-Summer	FRESNO			
94	VESPER SPARROW					Fall-Winter	FRESNO			
95	LARK SPARROW					Yearlong	FRESNO			
96	BLACK-THROATED SPARROW					Spring-Summer	FRESNO			
97	SAGE SPARROW		2	6		Yearlong	FRESNO			
99	SAVANNAH SPARROW		3	6		Yearlong	FRESNO			
01	GRASSHOPPER SPARROW					Spring-Summer	FRESNO			
04	FOX SPARROW					Yearlong	FRESNO			

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		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
505	SONG SPARROW			6		Yearlong	FRESNO			
506	LINCOLN'S SPARROW					Yearlong	FRESNO			
509	GOLDEN-CROWNED SPARROW					Fall-Winter	FRESNO			
510	WHITE-CROWNED SPARROW					Yearlong	FRESNO			
512	DARK-EYED JUNCO			6		Yearlong	FRESNO			
519	RED-WINGED BLACKBIRD					Yearlong	FRESNO			
520	BICOLOR BLACKBIRD			6		Yearlong	FRESNO			
521	WESTERN MEADOWLARK					Yearlong	FRESNO			
522	YELLOW-HEADED BLACKBIRD					Yearlong	FRESNO			
524	BREWER'S BLACKBIRD					Yearlong	FRESNO			
528	BROWN-HEADED COWBIRD					Yearlong	FRESNO			
530	HOODED ORIOLE					Spring-Summer	FRESNO			
532	BULLOCK'S ORIOLE					Spring-Summer	FRESNO			
534	GRAY-CROWNED ROSY-FINCH					Yearlong	FRESNO			
535	PINE GROSBEAK					Yearlong	FRESNO			
536	PURPLE FINCH					Yearlong	FRESNO			
537	LA SASSIN'S FINCH					Yearlong	FRESNO			

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		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
538	HOUSE FINCH					Yearlong	FRESNO			
539	RED CROSSBILL					Yearlong	FRESNO			
542	PINE SISKIN					Yearlong	FRESNO			
543	LESSER GOLDFINCH					Yearlong	FRESNO			
544	LAWRENCE'S GOLDFINCH					Yearlong	FRESNO			
545	AMERICAN GOLDFINCH					Yearlong	FRESNO			
546	EVENING GROSBEAK					Yearlong	FRESNO			
547	HOUSE SPARROW					Yearlong	FRESNO			
001	VIRGINIA OPOSSUM				9	Yearlong	FRESNO			
002	MT. LYELL SHREW			6		Yearlong	FRESNO			
004	DUSKY SHREW					Yearlong	FRESNO			
006	ORNATE SHREW			6		Yearlong	FRESNO			
008	INYO SHREW					Yearlong	FRESNO			
010	WATER SHREW					Yearlong	FRESNO			
012	TROWBRIDGE'S SHREW					Yearlong	FRESNO			
018	BROAD-FOOTED MOLE			6		Yearlong	FRESNO			
021	LITTLE BROWN MYOTIS			6		Yearlong	FRESNO			
023	YUMA MYOTIS									

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		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
						Yearlong	FRESNO			
M025	LONG-EARED MYOTIS					Yearlong	FRESNO			
M026	FRINGED MYOTIS					Yearlong	FRESNO			
M027	LONG-LEGGED MYOTIS					Yearlong	FRESNO			
M028	CALIFORNIA MYOTIS					Yearlong	FRESNO			
M029	WESTERN SMALL-FOOTED MYOTIS					Yearlong	FRESNO			
M030	SILVER-HAIRED BAT					Yearlong	FRESNO			
M031	WESTERN PIPISTRELLE					Yearlong	FRESNO			
M032	BIG BROWN BAT					Yearlong	FRESNO			
M033	WESTERN RED BAT					Yearlong	FRESNO			
M034	HOARY BAT					Yearlong	FRESNO			
M036	SPOTTED BAT			6		Yearlong	FRESNO			
M037	TOWNSEND'S BIG-EARED BAT			6		Yearlong	FRESNO			
M038	PALLID BAT			6		Yearlong	FRESNO			
M039	BRAZILIAN FREE-TAILED BAT					Yearlong	FRESNO			
M042	WESTERN MASTIFF BAT			6		Yearlong	FRESNO			
M043	AMERICAN PIKA					Yearlong	FRESNO			
M045	BRUSH RABBIT		3		9	Yearlong	FRESNO			

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		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
047	DESERT COTTONTAIL				9	Yearlong	FRESNO			
049	SNOWSHOE HARE			6	9	Yearlong	FRESNO			
050	WHITE-TAILED HARE			6	9	Yearlong	FRESNO			
051	BLACK-TAILED HARE			6	9	Yearlong	FRESNO			
052	MOUNTAIN BEAVER	1		6		Yearlong	FRESNO			
053	ALPINE CHIPMUNK					Yearlong	FRESNO			
054	LEAST CHIPMUNK					Yearlong	FRESNO			
055	YELLOW-PINE CHIPMUNK					Yearlong	FRESNO			
057	ALLEN'S CHIPMUNK					Yearlong	FRESNO			
060	MERRIAM'S CHIPMUNK					Yearlong	FRESNO			
063	LODGEPOLE CHIPMUNK					Yearlong	FRESNO			
064	PANAMINT CHIPMUNK					Yearlong	FRESNO			
065	UINTA CHIPMUNK					Yearlong	FRESNO			
066	YELLOW-BELLIED MARMOT					Yearlong	FRESNO			
068	NELSON'S ANTELOPE SQUIRREL			4		Yearlong	FRESNO			
070	BELDING'S GROUND SQUIRREL					Yearlong	FRESNO			
072	CALIFORNIA GROUND SQUIRREL					Yearlong	FRESNO			

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		CT=4	CP=5	CS=6	P						
		FS=7	BS=8	H=9	S				R	C	F
075	GOLDEN-MANTLED GROUND SQUIRREL						Yearlong	FRESNO			
077	WESTERN GRAY SQUIRREL				9		Yearlong	FRESNO			
078	EASTERN FOX SQUIRREL				9		Yearlong	FRESNO			
079	DOUGLAS' SQUIRREL				9		Yearlong	FRESNO			
080	NORTHERN FLYING SQUIRREL						Yearlong	FRESNO			
081	BOTTA'S POCKET GOPHER						Yearlong	FRESNO			
085	MOUNTAIN POCKET GOPHER						Yearlong	FRESNO			
087	SAN JOAQUIN POCKET MOUSE			6			Yearlong	FRESNO			
088	GREAT BASIN POCKET MOUSE						Yearlong	FRESNO			
095	CALIFORNIA POCKET MOUSE			6			Yearlong	FRESNO			
101	BIG-EARED KANGAROO RAT			6			Yearlong	FRESNO			
104	HEERMANN'S KANGAROO RAT	1	3	5			Yearlong	FRESNO			
106	GIANT KANGAROO RAT	1	3				Yearlong	FRESNO			
107	PANAMINT KANGAROO RAT						Yearlong	FRESNO			
110	MERRIAM'S KANGAROO RAT			6			Yearlong	FRESNO			
111	FRESNO KANGAROO RAT	1	3	6			Yearlong	FRESNO			
117	AMERICAN BEAVER				9		Yearlong	FRESNO			
113	WESTERN HARVEST MOUSE										

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		CT=4	CP=5	CS=6	P	LOCATION				
		FS=7	BS=8	H=9	S	OR HABITAT				
						Yearlong	FRESNO			
116	CALIFORNIA MOUSE					Yearlong	FRESNO			
117	DEER MOUSE			6		Yearlong	FRESNO			
119	BRUSH MOUSE					Yearlong	FRESNO			
120	PINYON MOUSE					Yearlong	FRESNO			
122	SOUTHERN GRASSHOPPER MOUSE			6		Yearlong	FRESNO			
126	DESERT WOODRAT			6		Yearlong	FRESNO			
127	DUSKY-FOOTED WOODRAT			6		Yearlong	FRESNO			
128	BUSHY-TAILED WOODRAT					Yearlong	FRESNO			
130	HEATHER VOLE					Yearlong	FRESNO			
133	MONTANE VOLE					Yearlong	FRESNO			
134	CALIFORNIA VOLE	1	3	6		Yearlong	FRESNO			
136	LONG-TAILED VOLE					Yearlong	FRESNO			
139	COMMON MUSKRAT				9	Yearlong	FRESNO			
140	BLACK RAT					Yearlong	FRESNO			
141	NORWAY RAT					Yearlong	FRESNO			
142	HOUSE MOUSE					Yearlong	FRESNO			
143	WESTERN JUMPING MOUSE					Yearlong	FRESNO			

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		FS=7	BS=8	H=9	S					
145	COMMON PORCUPINE					Yearlong	FRESNO			
146	COYOTE				9	Yearlong	FRESNO			
147	RED FOX		4	7	9	Yearlong	FRESNO			
148	KIT FOX	1	4			Yearlong	FRESNO			
149	GRAY FOX				9	Yearlong	FRESNO			
151	BLACK BEAR				9	Yearlong	FRESNO			
152	WONGTAIL		5			Yearlong	FRESNO			
153	RACCOON				9	Yearlong	FRESNO			
154	AMERICAN MARTEN		6	7		Yearlong	FRESNO			
155	FISHER		6	7		Yearlong	FRESNO			
156	ERMINE				9	Yearlong	FRESNO			
157	LONG-TAILED WEASEL				9	Yearlong	FRESNO			
158	MINK				9	Yearlong	FRESNO			
159	WOLVERINE		4	5		Yearlong	FRESNO			
160	AMERICAN BADGER				9	Yearlong	FRESNO			
161	WESTERN SPOTTED SKUNK		6		9	Yearlong	FRESNO			
162	STRIPED SKUNK				9	Yearlong	FRESNO			

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		CT=4	CP=5	CS=6	P						
		FS=7	BS=8	H=9	S						
163	NORTHERN RIVER OTTER		6				Yearlong	FRESNO			
165	MOUNTAIN LION		5	6			Yearlong	FRESNO			
166	BOBCAT				9		Yearlong	FRESNO			
176	WILD PIG				9		Yearlong	FRESNO			
177	ELK				9		Yearlong	FRESNO			
181	MULE DEER				9		Yearlong	FRESNO			
183	MOUNTAIN SHEEP		4	5	7	8	9	Yearlong	FRESNO		
004	WESTERN POND TURTLE		5	6	7			Yearlong	FRESNO		
017	DESERT COLLARED LIZARD						Yearlong	FRESNO			
019	BLUNT-NOSED LEOPARD LIZARD	1	3	5			Yearlong	FRESNO			
020	DESERT SPINY LIZARD						Yearlong	FRESNO			
022	WESTERN FENCE LIZARD						Yearlong	FRESNO			
023	SAGEBRUSH LIZARD						Yearlong	FRESNO			
024	SIDE-BLOTCHED LIZARD						Yearlong	FRESNO			
029	COAST HORNED LIZARD		5	6			Yearlong	FRESNO			
030	DESERT HORNED LIZARD						Yearlong	FRESNO			
034	DESERT NIGHT LIZARD			6			Yearlong	FRESNO			
036	WESTERN SKINK			6							

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SPECIES DETAIL REPORT

ID	SPECIES NAME	STATUS				SEASON IN LOCATION OR HABITAT	LOCATIONS, HABITATS AND SPECIAL ELEMENTS	IMPORTANCE TO...		
		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
						Yearlong	FRESNO			
037	GILBERT'S SKINK					Yearlong	FRESNO			
039	WESTERN WHIPTAIL					Yearlong	FRESNO			
040	SOUTHERN ALLIGATOR LIZARD					Yearlong	FRESNO			
042	NORTHERN ALLIGATOR LIZARD					Yearlong	FRESNO			
043	CALIFORNIA LEGLESS LIZARD			5 6		Yearlong	FRESNO			
046	RUBBER BOA			4 5 7		Yearlong	FRESNO			
048	RINGNECK SNAKE					Yearlong	FRESNO			
049	SHARP-TAILED SNAKE					Yearlong	FRESNO			
051	RACER					Yearlong	FRESNO			
052	COACHWHIP			5 6		Yearlong	FRESNO			
053	CALIFORNIA WHIPSNAKE			4 5		Yearlong	FRESNO			
056	GLOSSY SNAKE					Yearlong	FRESNO			
057	GOPHER SNAKE			6		Yearlong	FRESNO			
058	COMMON KINGSLAKE					Yearlong	FRESNO			
059	CALIFORNIA MOUNTAIN KINGSLAKE			5 6		Yearlong	FRESNO			
060	LONG-NOSED SNAKE					Yearlong	FRESNO			
061	COMMON GARTER SNAKE			1 3 5 6		Yearlong	FRESNO			

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SPECIES DETAIL REPORT

ID	SPECIES NAME	STATUS				SEASON IN LOCATION OR HABITAT	LOCATIONS, HABITATS AND SPECIAL ELEMENTS	IMPORTANCE TO...		
		FE=1	FT=2	CE=3	C			R	C	F
		CT=4	CP=5	CS=6	P					
		FS=7	BS=8	H=9	S					
062	WESTERN TERRESTRIAL GARTER SNAKE					Yearlong	FRESNO			
063	SIERRA/GIANT/TWO-STRIPED G. SNAKE		2	4	5	Yearlong	FRESNO			
068	WESTERN BLACK-HEADED SNAKE					Yearlong	FRESNO			
071	NIGHT SNAKE					Yearlong	FRESNO			
074	SPECKLED RATTLESNAKE					Yearlong	FRESNO			
076	WESTERN RATTLESNAKE					Yearlong	FRESNO			

Total Number of Species: 405

CHAPTER 8: AIR QUALITY



8.1 INTRODUCTION

Air pollution adversely affects human health, degrades the natural and built environments, causes agricultural losses, and changes the earth's climate. Air quality is a global problem that must be addressed by all levels of government. Regional and local agencies have a particularly important role to play in addressing air quality problems.

This chapter provides background on air quality conditions and regulations in Fresno County, including:

- A description of the regulatory structure that governs air quality for Fresno County; and
- A description of the Fresno County's air quality conditions, including meteorological conditions, and the causes, effects, and amounts of the main air pollutants found in the county; air quality standards; current conditions; and recent trends.

8.2 REGULATORY STRUCTURE

The following section describes the regulatory structure governing air quality in Fresno County.

FEDERAL

The U.S. Environmental Protection Agency (EPA) is responsible for overseeing the nation's air quality. EPA's air quality policies are derived from the Federal Clean Air Act (CAA) of 1970 (amended in 1977 and 1990). The CAA directs the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards set maximum levels for the concentration of certain gases and particles in the air that are harmful to human health and other organic life.

EPA uses seven 'criteria' pollutants as indicators of air quality. The seven criteria air pollutants are: carbon monoxide (CO), ground level ozone (O₃), fine particulate matter less than 10 microns in diameter (PM₁₀), fine particulate matter less than 2.5 microns in diameter (PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and lead (Pb). The criteria for the acceptable levels of each of these pollutants are the maximum concentrations above which adverse effects on human health may occur. These threshold concentrations are the NAAQS.

For each of these pollutants there is a scale of severity thresholds (i.e. "moderate," "serious," "severe," "extreme," etc.) and a series of 'nonattainment requirements' which are measures that are required to be put into place if a locality is not "in attainment" (i.e. does not meet the applicable air quality standards). Areas of the country where air pollution levels persistently exceed the standards may be designated by the EPA as "nonattainment areas." Each nonattainment area is

declared for a specific pollutant. Nonattainment areas for different pollutants may overlap each other or share common boundaries.

The EPA has issued rules to implement the Federal Clean Air Act Amendment's (CAAA) requirements. The CAAA requires areas that do not meet the NAAQS to develop and submit State Implementation Plans (SIPs) to the EPA demonstrating how these standards will be achieved and maintained. In response, the State of California has developed its State Implementation Plan (SIP), containing strategies to meet the Federal air quality standards. As a part of the SIP, the State is required to establish a total emissions budget for air pollutants. Included in this is a motor vehicle emissions budget allocating a certain amount of air pollution emissions to motor vehicle use.

Air quality regulations are closely tied to transportation planning requirements by Federal laws and funding procedures. The Clean Air Act together with joint EPA and U.S. Department of Transportation (DOT) rules require states to adopt "transportation conformity rules." The transportation conformity requirements of the CAAA state that all transportation projects must conform to the SIP. Conformity provisions of the CAAA act as an "enforcer" to keep State and local transportation planning consistent with State and local air quality planning. Transportation conformity provisions apply to all designated non-attainment areas. In addition, conformity regulations apply to maintenance areas which are areas that have been redesignated to attainment based on progress made in achieving the NAAQS.

The CAAA requires the integration of transportation and air quality planning, and assigns responsibility to transportation plans and programs for reducing mobile source emissions. It requires transportation planning decisions not only to achieve air quality goals, but also to achieve broader environmental goals related to land-use, travel mode choice, and reductions in vehicle miles traveled (VMT).

By expanding the requirements for determining the conformity of transportation plans, programs, and projects with SIPs, and by expanding the use of highway funding sanctions to enforce those requirements, the CAAA sets up a linkage between transportation and environmental goals. While the CAAA gives transportation and air quality decision makers a mandate to better coordinate their respective planning processes, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was reauthorized and updated in June 1998 by the Transportation Equity Act for the 21st Century (TEA-21), offers the tools and funding to help carry out that mandate.

In metropolitan areas, such as Fresno County, transportation conformity is linked to the transportation planning requirements under TEA-21. The CAA requires that both the long range plan and the transportation improvement program (TIP) for regional transportation planning agencies be assessed for their consistency with the air quality plans of an area.

TEA-21 ties funding to the realization of clean air goals. Specific funding is set aside for congestion mitigation and air quality programs. While these funds are considered as enticements or 'carrots' to encourage air quality management, TEA-21 also provides 'sticks' by tying funding to Clean Air Act requirements. EPA transportation conformity regulations require that TIPs conform to air quality goals and places restrictions on non-attainment areas in terms of the kind of projects that they can fund. These regulations require evidence that adding transportation capacity in ozone and carbon monoxide nonattainment areas does not produce more air pollution as compared to the "no-build" option.

STATE

The California Clean Air Act (CCAA) of 1988, amended in 1992 and 1996, provides the regulatory framework for attainment of the California Ambient Air Quality Standards (CAAQS). The CAAQS were developed by the State under the authority of the Federal CAA. The CAA allows individual states to develop their own air pollution standards, providing they are more restrictive than Federal requirements. Thus, there are two sets of criteria to be met in California: Federal air pollution standards and State air pollution standards. The CCAA classifies "nonattainment areas" (areas that do not meet CCAA standards for pollution levels) as "moderate," "serious," "severe," and "extreme." Areas that are in violation of the CAAQS must prepare an Air Quality Attainment Plan that provides a program to achieve the standards.

The California Air Resources Board (ARB) is the agency responsible for coordination and oversight of State and local air pollution control programs, and for implementing the CCAA. The ARB monitors air quality and enforces mobile source emissions standards. The ARB sets standards for emissions from *mobile sources*, such as motor vehicles, boats, farm equipment, and heavy trucks. Under the Federal CAA, emissions from mobile sources nationwide are regulated at the Federal level. California remains the only state that has been granted the authority to continue its own mobile source emissions program (42 United States Code 7543).

The ARB also is responsible for regulating toxic air contaminants. A toxic air contaminant is defined as any air pollutant that may cause or contribute to an increase in mortality or serious illness, or that may pose a present or potential hazard to human health. Typically, these are pollutants that cause cancer and other toxic effects. Health and Safety Code Section 39656 provides the authority for the ARB and air districts to develop programs to regulate toxic air contaminants in order to enable the State to meet CAAA requirements. The ARB is responsible for identifying all toxic air contaminants. All toxics identified by the EPA must be included, but the ARB can also identify toxics not listed by the EPA. The ARB must also implement emissions standards and control measures for toxics. Those standards and measures adopted by the EPA must be adopted by the ARB, but they may adopt more stringent standards and measures when needed to protect public health.

Another state regulation for which air quality is an important part of its mandate is the California Environmental Quality Act of 1970 (CEQA). CEQA requires public agencies to consider and disclose the environmental effects of their decisions, including air quality impacts, to the public and the government. It further requires that agencies implement mitigation measures, if feasible, to mitigate adverse environmental effects.

REGIONAL

Air pollution is a problem that extends beyond local boundaries; air quality issues are generally regional in scope. Air pollution sources are classified as *mobile* (primarily motor vehicles), *stationary*, or *area* sources. In California, air districts (either multi-county Unified Air Pollution Control Districts (UAPCDs) or county Air Quality Management Districts (AQMDs)) have the primary responsibility for the control of air pollution from all sources other than emissions directly from *mobile* sources, which are the responsibility of the ARB and the EPA. Air districts adopt and enforce regulations to achieve State and Federal ambient air quality standards and enforce other applicable State and Federal laws.

The primary role of air districts is to control emissions from *stationary* and *area* sources. *Stationary* sources are those for which an air permit is required, including "any article, machine, equipment, or other contrivance that may cause the issuance of air contaminants." (Section 42300). Air districts are also responsible for *area* sources, which consist of individual sources of air pollutants that have not been inventoried as specific stationary, mobile, or biogenic sources. These individual sources treated collectively as *area* sources are typically too small, numerous, or difficult to inventory using the methods for the other classes of sources. For example, gasoline stations and dry cleaning establishments are often treated as area sources. The main reason not to treat them as *stationary* sources is that the effort required to gather data and estimate emissions for each individual facility is very great although emissions per facility are generally small. For these sources, the distinction between *stationary* and *area* is usually defined by a cutoff point typically based on annual emissions. *Area* sources do not require air permits, but taken together produce significant emissions.

As mentioned above, Health and Safety Code Section 39656 provides the authority for the ARB and air districts to develop programs to regulate toxic air contaminants.

San Joaquin Valley Unified Air Pollution Control District

The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), headquartered in Fresno, was formed in 1991. The SJVUAPCD has jurisdiction over air quality issues in the San Joaquin Valley Air Basin (SJVAB), a 27,000 square mile, eight-county area, including Fresno County and all or part of seven other counties. The SJVUAPCD is the second largest air district in the United States.

As described above, in addition to regulating stationary and area sources of pollution, the District is required by the CCAA and the Federal CAAA to adopt Transportation Control Measures (TCMs) and indirect-source control programs to reduce mobile source emissions. Thus, the district must work closely with local agencies such as counties, cities, and councils of governments. The District is involved with coordinating the implementation of regional transportation plans created by Regional Transportation Planning Agencies in the Valley in order to ensure compliance with clean air standards.

Under its authority for regulating toxic air contaminants, the District has adopted a *Risk Management Policy for Permitting New and Modified Sources* that applies to new and modified stationary sources as defined in District Rule 2201. The policy requires facilities meeting specific criteria to implement Toxic Best Available Control Measures. Health risk assessments are also required for facilities meeting other specific criteria.

The District has adopted several plans to meet State and Federal air quality standards, and has published guidelines for assessing air quality impacts. The following documents constitute the District's planning framework. The plans are implemented by rules and regulations that establish the District's regulatory framework.

- The 1991 California Clean Air Act Air Quality Attainment Plan for ozone and carbon monoxide;
- The 1991 Moderate Area Nonattainment Plan (PM₁₀);
- The 1992 State Implementation Plan for Fresno's carbon monoxide pollution;
- The 1993 Revised Rate of Progress Plan for ozone
- The 1994 Ozone Attainment Demonstration Plan;
- The 1994 Serious Area PM₁₀ Plan;

- The Revised Post 1996 Rate of Progress Plan for ozone; and
- The 1997 PM₁₀ Attainment Demonstration Plan.

Council of Fresno County Governments

The Council of Fresno County Governments (COFCG) is the State-designated Regional Transportation Planning Agency (RTPA) with the responsibility to prepare a long-range Regional Transportation Plan (RTP). COFCG's Federal designation as the Metropolitan Planning Organization (MPO) for the Fresno County area also requires the preparation of a long-range plan. As the MPO, COFCG is responsible for planning, programming, and coordinating Federal transportation funding. COFCG is also the designated Congestion Management Agency (CMA) for Fresno County, responsible for preparing a Congestion Management Plan (CMP). This program attempts to strengthen the linkage between transportation, land use, and air quality decisions.

As part of its Federal MPO responsibilities under the CAA, COFCG is required to make "conformity determinations" on regional transportation plans and program, demonstrating that transportation projects will either improve or not worsen the air quality in Fresno County. In 1992 COFCG entered into a cooperative planning agreement with the SJVUAPCD and the RTPAs of the other seven Valley counties. The intent of this agreement was to facilitate a coordinated and comprehensive regional air quality and transportation planning process. The areas coordinated by this process include:

- Air Quality Conformity Process;
- Transportation and Air Quality Modeling, and Modeling Data;
- Regional Transportation Plans;
- Regional Transportation Improvement Programs;
- Congestion Management Programs;
- Transportation Control Measures (TCMs); and
- Other transportation systems studies required to address interregional issues.

The first significant product of the agreement between the Valley RTPAs and the SJVUAPCD was the San Joaquin Valley Transportation Control Measure (TCM) Program, created in 1993. The purpose of the TCM Program is to reduce emissions of carbon monoxide and ozone precursors. This program ultimately provided a list of TCMs that were considered reasonable and could be implemented in the Valley. The program describes control measures and identifies the resultant emissions reductions on a county-by-county basis. Individual RTPAs that need to use TCMs to achieve conformity are able to pick and choose from a menu of already analyzed TCMs. The TCMs that have been chosen by COFCG for Fresno County are included as a part of the RTP.

LOCAL

Local government's responsibility for air quality has increased significantly with the passage of the CCAA and the Federal CAAA. This legislation has placed new emphasis on reducing motor vehicle trips and vehicle miles traveled at the local level. Although the SJVUAPCD is required to include TCMs and indirect source programs in its Air Quality Attainment Plan, cities and counties and their Councils of Government are responsible for most implementation measures.

Local government responsibilities for air quality are found in four major areas: (1) land use planning; (2) reviewing and mitigating the environmental impacts of development projects; (3)

developing and maintaining the transportation infrastructure; and (4) implementing local air quality programs such as commute-based trip reduction and rideshare programs.

Land Use Planning

The control of emissions from stationary point sources, such as industrial plants or factories, is under the jurisdiction of the SJVUAPCD. Performance standards (i.e. the amount of pollutant generated) and technological requirements for mitigating excessive pollution for new and existing development are set by the District. While counties and cities generally do not create more stringent pollutant standards for these stationary point sources, they are reserved this right under Health and Safety Code Section 41508. County and city development approval authority provides another source of control that can be used to reduce adverse air quality impacts. This can take the form of zoning, subdivision regulation, and other land use policies.

The linkages between land use patterns, transportation systems, and air quality are the primary means for local governments to address air quality issues. Through the use of local land use policies, counties and cities can regulate the size, type, location and timing of development. This power can be used to encourage development patterns that reduce air quality impacts. In addition, localized impacts of air pollutants can be addressed by local land use planning. For example, factories that emit pollutants can be mandated to locate certain distances from "sensitive receptors" such as schools, hospitals, and residential developments. Also, as mentioned above, local governments are allowed to create pollution standards (for all air pollution sources except mobile sources) that are more stringent than the regional or state standards. These regulations might include such actions as banning open-hearth fireplaces and leaf blowers, and creating more strict area or stationary source pollution standards.

Environmental Review

The State CEQA process requires local agencies to determine the potential environmental effects of development projects. The CEQA review process for air quality impacts checks to be certain that proposed developments meet the State's and each regional air district's standards for air pollution and pollution control technology. As a part of this process, mitigation measures to address air quality impacts of projects are required when those impacts are deemed significant. Local governments can set standards for the review of projects and for required mitigation measures, as long as these standards are at least as stringent as federal, state, regional, and other local standards.

Transportation Infrastructure

The types of transportation infrastructure that local governments develop, maintain, and encourage have marked effects on air quality. These transportation investment decisions should be guided by a process that considers the air quality and land use impacts of transportation infrastructure. In addition, local governments can require developments to provide infrastructure that is supportive of clean air goals and public transportation investments. Such requirements could include transit-supportive site plans and the provision of on-site facilities that are supportive of 'alternative' transportation modes.

Local Air Quality Programs

The major local air quality programs that local governments can institute are Transportation Control Measures. TCMs are defined in the CCAA as "any strategy to reduce vehicle trips, vehicle

use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions.” (California Health and Safety Code Section 40717(g)). These strategies overlap with other techniques discussed here, such as land use planning and transportation infrastructure provision.

The CCAA allows air districts to delegate implementation of TCMs to any local agency, providing the agency submits a plan to the district for approval, and the agency adopts measures at least as stringent as the district’s. These measures may include such things as traffic flow improvement, increased public transit, bicycling programs, and trip reduction ordinances. As discussed above, COFCG has adopted TCMs as part of the Regional Transportation Plan (RTP). For a number of these TCMs, including bicycle facility improvements and rideshare programs, Fresno County is a main implementing agency.

TCMs can be implemented by any agency or department at the city, county, or regional level. Public transit agencies implement strategies to improve transit service and to increase ridership. Public works departments for counties or cities build and maintain bicycle and pedestrian paths and facilities. Public works and roads departments install traffic flow improvements and synchronize signals. Measures to encourage ridesharing/trip reduction are often managed by the Transportation Planning Agency (TPA), although multi-county ridesharing coordinators and individual city coordinators are common as well.

TCMs must be implemented expeditiously to comply with CAAA requirements. In order to determine this, the Air District and TPAs go through a process of interagency coordination and consultation. The Air District and each San Joaquin Valley TPA has approved a memorandum of understanding to review TCMs for effectiveness and to develop new TCMs as needed to meet commitments in the State Implementation Plan (SIP). The TPAs keep track of TCMs in their counties through contact with their member city and county representatives. The TCMs are also reviewed when the TPAs make conformity findings for their plans.

Another type of local government air quality program is a fleet low-emission vehicle program. Cities and counties often operate the largest vehicle fleets in their jurisdictions. Programs to convert vehicle fleets to cleaner burning fuels have significant air quality benefits and can provide a model to private industry. The SJVUAPCD’s 1991 *Air Quality Attainment Plan* contained a fleet vehicle control program. However, this fleet vehicle program was never implemented since the State of California opted out of the federal fleet requirement by adopting more stringent vehicle emission standards. The District has pursued voluntary incentive programs available to fleet operators. It has implemented one such program to date - a heavy-duty vehicle program.

8.3 AIR QUALITY CONDITIONS

Fresno County is one of eight counties within the San Joaquin Valley Air Basin (SJVAB), which is governed by the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD). The Air Basin is home to over 3.1 million people, encompasses over 27,000 square miles, and is the fastest growing region in California.

The SJVAB is surrounded by three mountain ranges: the Sierra Nevada on the east, the Coast Range on the west, and the Tehachapi Range on the south. These ranges act as a buffer to coastal weather patterns, while simultaneously blocking the free circulation of air out of the Valley. The result is a complex pattern of stable trapped air. The stability of this air creates high-level and low-level inversions that contribute to air pollution by not allowing the polluted air to dilute and

disperse. These physical characteristics of the Air Basin, combined with rapid population growth, have created serious air pollution problems for the Air Basin and for individual counties such as Fresno. The following section describes meteorological conditions in Fresno County that affect air quality, causes and effects of air pollution, air quality standards, current air quality conditions, and air quality trends.

METEOROLOGICAL CONDITIONS IN FRESNO COUNTY

The air quality in Fresno County is a key element that helps define the quality of life for county residents. This section presents background information on meteorological and air quality conditions in Fresno County. Air quality is affected by topography and climate as well as by the types, strengths, and locations of air pollutant sources.

Topography and Climate

Fresno County is located within the San Joaquin Valley Air Basin (SJVAB) which makes up the southern half of the Central Valley. Geography plays a significant role in weather patterns throughout the Central Valley. The valley extends from south of Bakersfield to north of Redding and is bounded by the Sierra Nevada on the east, the Coast Range on the west, the Tehachapi Range on the south, and the Cascade Range on the north. These mountain ranges tend to buffer the valley from the marine weather systems that originate over the Pacific Ocean and are drawn inland by the jet stream. The only breach in this barrier is the Carquinez Straits which exposes the mid-section of the valley to the Pacific Coast marine weather conditions. The Coast and Tehachapi Ranges, located on the west and south sides of the valley, induce winter storms from the Pacific to release much of their precipitation on the western slopes of the Sierra Nevada and to produce a partial rain shadow over the valley.

In broad climatological terms, winters in the San Joaquin Valley can be characterized as mild and fairly humid, and summers as hot, dry, and nearly cloudless. This climate is the result of both the topography and the mean position of the seasonal mid-latitude storm track.

The major effect of the mountain ranges, however, is to block free circulation of air to the east. This results in stable air being trapped by the bowl-like topography for extended periods during the colder half of the year. Another effect is the fostering of local and mesoscale circulations, such as mountain-valley winds. The result of all of these influences is a set of complex flow patterns.

Temperature and Humidity

The annual temperature and humidity pattern in the San Joaquin Valley shows the effects of the mean cyclonic storm track position and of the topography. During the summer, mountain ranges to the west tend to block the maritime influence by preventing the flow of air in the shallow marine layer into the valley except through the mountain gaps. This marine air is prevented from flowing over the mountains by an inversion that acts as a "lid." The result is generally dry weather with hot afternoons and mild evenings.

Summer high temperatures often exceed 100 degrees Fahrenheit, averaging in the low 90s in the northern valley and high 90s in the south. Summer low temperatures average in the high 50s in the north and average in the upper 60s in the south. In winter, as the cyclonic storm track moves southward, the storm systems moving in from the Pacific Ocean bring a decidedly maritime influence to the San Joaquin Valley. The high mountains to the east prevent the cold, continental

air masses of the interior from influencing the valley. Winters are usually mild and humid. Temperatures below freezing are unusual. Average high temperatures in the winter are in the 50s, but highs in the 30s and 40s can occur on days with persistent fog and low cloudiness.

The cloudless, hot days of summer and fall are favorable to the formation of photochemical oxidants. Under extremely hot conditions, however, convective heating of the earth's surface lifts and mixes the pollutants so that concentrations drop to acceptable levels. This convective mixing, when combined with the afternoon winds, tends to cause pollutants to peak around noon and to decrease later in the day.

Precipitation

Precipitation in the San Joaquin Valley is strongly influenced by the position of the semipermanent subtropical high pressure belt located off the Pacific Coast (the Pacific High). In the winter, this high pressure system moves southward, allowing Pacific storms to move through the valley. These storms bring in moist, maritime air that produces considerable precipitation on the western, upslope side of the Coast Ranges. Significant precipitation also occurs on the western side of the Sierra Nevada. On the valley floor, however, there is some downslope flow from the Coast Range and the resultant evaporation of moisture from associated warming results in a minimum of precipitation. Nevertheless, the majority of precipitation falling in the valley is produced by those storms during the winter. Precipitation during the summer months is in the form of convective rain showers and is rare. It is usually associated with an influx of moisture into the valley through the San Francisco area during an anomalous flow pattern in the lower layers of the atmosphere. Although the hourly rates of precipitation from these storms may be high, their rarity keeps monthly totals low.

Precipitation on the valley floor and in the Sierra Nevada decreases from north to south. This is primarily because the Pacific storm track often passes through the northern part of the state while the southern part of the state remains protected by the Pacific High. Fresno receives about 10 inches of rain per year. Snowstorms, hailstorms, and ice storms occur infrequently in the San Joaquin Valley and severe occurrences of any of these are very rare.

The winds and unstable air conditions experienced during the passage of storms result in periods of low pollutant concentrations and excellent visibility. Between winter storms, high pressure and light winds allow cold moist air to pool on the valley floor. This creates strong low level temperature inversions and very stable air conditions. This situation leads to tule fogs and to conditions favorable to high concentrations of certain air pollutants. Ozone levels are low during these periods because of the lack of sunlight to drive the photochemical reaction.

Fog

The formation of natural fog is caused by local cooling of the atmosphere until it is saturated (dew point temperature). This type of fog, known as radiation fog, is more likely to occur inland. Cooling may also occur due to heat radiation losses or horizontal movement of a mass of air over a colder surface. This second type of fog, known as advection fog, generally occurs along the coast.

As mentioned above, when conditions are favorable for fog to form, they are also favorable for high concentrations of certain pollutants. However, the water droplets in fog can act as a sink for some of these pollutants, thereby lowering their concentrations.

Winds

The topography of the San Joaquin Valley has a dominating effect on wind flow patterns. Winds tend to blow in a northeast-southwest orientation somewhat parallel to the valley and mountain ranges. The seasonal shifting of the mid-latitude general circulation pattern also plays a role in influencing the directions. In spring and early summer, the thermal low-pressure systems develop over the interior basins east of the Sierra Nevada, and the Pacific high-pressure system moves northward. These developments and the topography produce the high incidence of relatively strong northwesterly winds in the spring and early summer.

In winter, when storm systems move through the area, the wind direction pattern shows the variability to be expected from storms. The maximum occurrence of calms (or very light winds) in winter is associated with the lulls between passage of these systems.

Superimposed on this seasonal regime is the diurnal wind cycle. In the San Joaquin Valley this cycle takes the form of a combination of sea breeze-land breeze and mountain-valley regimes. The sea breeze-land breeze regime has a sea breeze flowing into the San Joaquin Valley from the north during the day and a land breeze flowing out of the valley at night. The mountain-valley regime has an upslope (mountain) flow during the day and a downslope (valley) flow at night.

Summer wind conditions promote the transport of ozone and ozone precursors from the Bay Area through the Carquinez Strait, and through the low mountain passes such as Altamont Pass and Pacheco Pass. During summer, morning winds are usually light, but as temperatures increase during the day, the prevailing northwesterly wind becomes stronger. Afternoon winds of 10 to 20 miles per hour are common. These winds bring in the transported pollutants from other regions, but also disperse locally generated pollutants.

Tehachapi Pass, at the southeastern edge of the valley, is the site of frequent strong winds blowing into the Southeast Desert Air Basin from the valley. These winds transport pollutants from the valley into the adjacent air basin.

Another major transport path is over the Sierra Nevada, which form the eastern boundary of the basin. Upslope and up-valley winds transport pollutants into the mountains. These winds are strongest in early afternoon after the sun has heated the slopes.

Atmospheric Stability and Inversions

Atmospheric stability refers to the extent of convective overturning and atmospheric mixing. The less stable an atmosphere, the more convective turbulence will be generated resulting in more dispersion and dilution of any fog or pollution. Low-level inversions or isothermal layers within a few hundred feet of the ground may restrict dilution. Another restriction is the thickness of the mixing depth. This mixing depth, measured from the surface upward, is the atmospheric layer in which convective overturning due to the warming of air near the ground occurs.

The dispersive power of the atmospheric boundary layer (i.e., the lowest several hundred feet of the atmosphere) has been subdivided into seven intervals called stability categories. The first three categories, A, B, and C, range from extreme to slight instability; D is neutral stability; and E, F, and G represent moderate and extreme stability. Dispersive power decreases with progression through these categories.

The actual dispersive power of the atmosphere is controlled by the structure and intensity of turbulence. In the boundary layer, these quantities are controlled by temperature stratification, wind speed, wind shear, and surface roughness. Vertical temperature stratification is a useful measure of dispersive power, but it contains no information about the effects of surface roughness. On the other hand, direct measures of turbulence do contain this information and are, therefore, more useful predictors of dispersive capacity. During late fall and winter (November through February), the predominant categories are D through G because of cool surface temperatures and the frequent entrapment of cold air near the surface due to the basin-like topography of the San Joaquin Valley. March appears to be a transition month with equally occurring percentages of Category G and Category A.

During the remaining spring months of April and May as well as the summer months of June and July, Category A is predominant. August again appears to be transitional with comparable percentages of Category A and Category G, although there are slightly more category A's. The fall months of September, October, and November also have comparable percentages of Category A and Category G, although there are now more Category Gs than Category As because cooler temperatures are experienced near the surface.

In the San Joaquin Valley, surface-based inversions are present on most mornings throughout the year. Elevated inversions are much less frequent than surface inversions. As a rule, the least troublesome inversions are the shallow, surface-based morning inversions. Daytime heating of the air layers near the surface is often sufficient to break such inversions. By comparison, the deep strong inversions with elevated bases generally create the more severe stagnation problems. The greatest frequency of occurrence of inversions that are surface-based, or have a base less than 500 feet, is during the fall season, while the stronger, elevated inversions usually appear during the months of December and January. Some studies also indicate that surface-based inversions in the southern part of the valley can be more frequent and stronger than their counterparts in the north.

CAUSES AND EFFECTS OF AIR POLLUTION

According to California Health and Safety Code Section 43000(b), the control and elimination of air pollutants is of prime importance for the protection and preservation of the public health and well-being, as well as the environment's. Air pollution in Fresno County has serious consequences for public health, the natural environment, and the built environment. The need for aggressive air quality management in Fresno County is justified by these adverse effects.

Global Effects

Naturally occurring atmospheric gases such as carbon dioxide (CO₂) and nitrous oxide (N₂O) trap infrared heat that is radiating back toward space – this is known as the “greenhouse effect”. However, human activities are turning the greenhouse effect into a greenhouse problem by adding gases to the atmosphere at a faster rate than they can be absorbed. This is causing an increase in the Earth's average temperature, commonly referred to as “global warming.” As these global climate changes occur, natural systems will be destabilized, which could pose numerous risks to human health and the natural environment.

Air pollution can contribute to other global health effects. The ozone layer in the upper atmosphere guards the earth from harmful ultraviolet radiation. There is strong scientific evidence that the use of chlorofluorocarbons (CFCs), and other chlorine and bromine containing substances,

are linked with reductions in stratospheric ozone. As a result, the use of these types of substances on a global, regional, and local level is being regulated.

In addition to major global problems caused by air pollution, there are other serious effects on smaller, regional scales. The following is a description of the causes and effects of the major air pollutants that are more 'local' in nature.

Ground-Level Ozone

Ozone (O_3) is a colorless gas associated with smog or haze conditions. While O_3 in the upper atmosphere is beneficial to life by shielding the earth from harmful ultraviolet radiation from the sun, high concentrations of O_3 near ground-level (tropospheric ozone) are a major health and environmental concern. O_3 is not emitted directly into the air but is a secondary pollutant that is formed through complex chemical reactions between 'precursor' emissions of reactive organic gases (ROG, also known as volatile organic compounds (VOC)) and oxides of nitrogen (NO_x) in the presence of sunlight. Nitrogen oxides (NO_x) and reactive organic gases (ROG) are therefore known as ozone "precursors." These reactions are stimulated by sunlight and temperature so that peak O_3 levels occur typically during the warmer times of the year.

Both ROG and NO_x are emitted by transportation and industrial sources. NO_x results primarily from the combustion of fossil fuel, while ROG is emitted from sources as diverse as autos, chemical manufacturing, dry cleaners, and paint shops. Emissions from motor vehicles, gas-powered garden equipment and motor boats, gasoline and paint vapors, aerosol products, and industry all significantly contribute to the formation of ozone. Mobile sources produce about half of the ground-level ozone nationwide. According to the 1996 ARB *Estimated Average Annual Emissions*, the major source of ROG in Fresno County is on-road motor vehicle use (39%) and solvent evaporation (20%). The major source of NO_x in Fresno County is on-road motor vehicle use, accounting for 49 percent of production, followed by commercial and industrial fuel combustion (28 percent).

Ground level ozone has multiple negative impacts on the environment and public health. It damages vegetation, forests, crops, buildings, and some man-made materials and products such as rubber, paint, and plastics. The reactivity of O_3 causes health problems because it damages lung tissue, reduces lung function and sensitizes the lungs to other irritants. The adverse health impacts caused by ozone include eye irritation, coughing, chest pain, headaches, upper respiratory illnesses, asthma, and reduced pulmonary function. Individuals with chronic respiratory diseases are especially susceptible to ozone. Evidence also indicates that ambient levels of ozone not only affect people with impaired respiratory systems, but healthy adults and children as well. In addition, some compounds in ROG responsible for ozone formation are also toxic. For example, benzene is a carcinogen.

Small Particulate Matter (PM_{10} and $PM_{2.5}$)

Small particulate matter, PM_{10} and $PM_{2.5}$, is any material less than 10 microns or 2.5 microns in diameter, respectively. This matter consists of particles small enough to remain suspended in the air for long periods. Particulate matter of this size is too small to be filtered by the nose and lungs and it has the ability to reach the thoracic or lower regions of the respiratory tract. The actual composition of small particulate matter varies greatly with time and location, but it is generally composed of dust (created primarily from agricultural processes in Fresno County), sand, salt spray, pollen, mineral particles, smoke, and acid fumes. Primary sources of particulate matter

include agricultural activities, such as field plowing, road dust formed from vehicle use, wood smoke, and industrial emissions. According to the 1996 ARB *Estimated Average Annual Emissions*, the major source of PM₁₀ in Fresno County is unpaved road dust (29%), followed by farming operations (27%) and fugitive windblown dust (14%).

In 1996, the EPA proposed regulatory amendments that added PM_{2.5} to its list of regulated air pollutants, in recognition of the health effects of these smaller particles. Because they are able to penetrate further into the respiratory tract, PM_{2.5} particles are more likely than larger matter to cause adverse health effects, especially for children.

There are major human health effects caused by exposure to particulate matter. These include effects on breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular disease, alterations in the body's defense systems against foreign materials, damage to lung tissue, carcinogenesis, and premature death. Individuals with respiratory and cardiovascular diseases, children, and elderly persons are at the greatest risk. Other non-health related effects of particulate matter include the soiling and damaging of materials, and visibility impairment.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, and poisonous gas produced by the incomplete combustion of fuel. Nationwide, 77 percent of CO emissions are from transportation sources. The largest emissions contribution comes from highway motor vehicles. Cars and trucks produce up to 90 percent of carbon monoxide emissions in urban areas. Other major CO sources are wood-burning stoves, incinerators, and industrial sources. The major source of CO in Fresno County is on-road motor vehicle use, accounting for 68 percent of production, followed by other mobile sources (15%). CO levels in the county are highest in the winter, especially during air stagnation periods.

Carbon monoxide binds strongly to hemoglobin, the oxygen-carrying protein in blood, and reduces the blood's capacity for absorbing oxygen and carrying it to the heart, brain, and other parts of the body. Health threats are most serious for those who suffer from cardiovascular disease, particularly those with angina or peripheral vascular disease. Exposure to elevated CO levels can cause dizziness, nausea, blurred vision, headaches, slowed reflexes and drowsiness. At high concentrations, carbon monoxide's major health risks are chronic diseases, mental impairment, and death.

Nitrogen Dioxide

Nitrogen dioxide (NO₂) is a brownish, highly reactive gas that is present in all urban atmospheres. NO₂ forms when fuel is burned at high temperatures. The two major emissions sources are transportation and stationary fuel combustion sources such as electric utility and industrial boilers. The major source of nitrogen oxides (NO_x) in Fresno County is on-road motor vehicle use (49%), followed by commercial and industrial fuel combustion (28%), and other mobile sources (14%).

NO₂ can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. Pre-school children are especially at risk. Nitrogen oxides in general (NO_x) are an important precursor both to ozone (O₃) and acid rain, and may affect both terrestrial and aquatic ecosystems. Prolonged exposure to NO_x leads to eye and mucus membrane aggravation and

pulmonary dysfunction. Non-health related effects of NO_x include the fading of textile dyes and additives, deterioration of cotton and nylon, corrosion of metals, and the impairment of visibility.

Sulfur Dioxide

Sulfur dioxide (SO₂) is a noxious odor-causing gas that is formed primarily by the combustion of sulfur-containing fossil fuels. Ambient SO₂ results largely from stationary sources such as coal and oil combustion, steel mills, refineries, pulp and paper mills, and nonferrous smelters. Industrial and commercial fuel combustion accounts for 53 percent of sulfur oxide (SO_x) production in Fresno County, with other industrial processes accounting for 33 percent.

High concentrations of SO₂ affect breathing and may aggravate existing respiratory and cardiovascular disease. Sensitive populations include asthmatics, individuals with bronchitis or emphysema, children, and the elderly. SO₂ is also a primary contributor to acid deposition, or acid rain, which causes acidification of lakes and streams and can damage trees, crops, historic buildings, and statues. In addition, sulfur compounds in the air contribute to visibility impairment in many areas of the country. This has become an increasingly important issue in national parks.

Lead

The dramatic decline in blood lead levels from the early 1970s can be attributed to the reduction of leaded gasoline and to the removal of lead from soldered cans. Lead gasoline additives, non-ferrous smelters, and battery plants are the most significant contributors to atmospheric lead emissions. In 1993, transportation sources contributed 33 percent of the annual nationwide emissions, down substantially from 81 percent in 1985.

Lead (Pb) damages the cardiovascular, renal and nervous systems, resulting in anemia, brain damage, and kidney disease. Pre-school age children are particularly susceptible to brain damage effects. Lead also has adverse effects on animals, microorganisms, and plants. Exposure to lead can occur through multiple pathways, including inhalation of air and ingestion of lead in food, water, soil, or dust. Low doses of Pb can lead to central nervous system damage. Lead also causes lesions of the neuromuscular system, circulatory system, brain, and gastrointestinal tract. Recent studies have also shown that Pb may be a factor in high blood pressure and in subsequent heart disease in middle-aged males.

AIR QUALITY STANDARDS

Air pollution is a very complex phenomenon and each pollutant plays a different role in the overall air quality problems in non-attainment areas. In addition, weather, geography, types of industry, age of vehicle fleet, travel behaviors, and other factors all come into play in creating air pollution. To further complicate the issue, strategies to reduce emissions of one pollutant type can result in increased levels of another pollutant.

State and Federal Standards

The following is a discussion of the standards, designations and classifications of the major pollutants regulated by the CAA and the CCAA.

An area meets the hourly (1, 8, or 24 hour) average NAAQS or CAAQS if there is no more than one day per year when the highest hourly average value exceeds the threshold. If there are yearly or

quarterly values, the expected annual (or quarterly) arithmetic mean is not to exceed the standard. Attainment standards vary by pollutant. For example, to be in attainment for the Federal standards, an area must meet the ozone NAAQS for three consecutive years and the carbon monoxide standards for two consecutive years. For each pollutant there are also different severity thresholds for nonattainment. For example, there are six levels of severity for ozone and two for carbon monoxide. For each of these severity levels for each pollutant there are also separate attainment dates and levels of mandated actions required of the SIP. Table 8-1 below shows the current State and Federal ambient air quality standards.

TABLE 8-1			
CURRENT FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS			
Pollutant	Averaging Time	Federal Standard (NAAQS)	California Standard (CAAQS)
Ozone (O ₃)	1-hour	0.12 ppm	0.09 ppm
	8-hour	0.08 ppm	—
Carbon Monoxide (CO)	1-hour	35.0 ppm	20.0 ppm
	8-hour	9.0 ppm	9.0 ppm
Nitrogen Dioxide (NO ₂)	1-hour	—	0.25 ppm
	annual	0.053 ppm	—
Sulfur Dioxide (SO ₂)	1-hour	—	0.25 ppm
	24-hour	0.14 ppm	0.04 ppm
	annual	0.03 ppm	—
PM ₁₀	24-hour	150 mcg/m ³	50 mcg/m ³
	annual	50 mcg/m ³	30 mcg/m ³
PM _{2.5}	24-hour	65 mcg/m ³	—
	annual	15 mcg/m ³	—
Lead (Pb)	30-days	—	1.5 mcg/m ³
	quarterly	1.5 mcg/m ³	—
Notes: ppm = parts per million mcg/m ³ = micrograms per cubic meter			
Source: California Air Resources Board, 1998.			

Penalties for Nonattainment of Standards

There are several potential penalties that can be placed upon air districts and the State for consistently not meeting State and Federal requirements for mitigating air quality.

At the state level, the Federal Clean Air Act states that failure to submit a State Implementation Plan (SIP), detailing how the State will achieve Federal air quality standards, will result in the denial of certain types of Federal funding such as highway funds, and the denial of permits for such improvements as sewage treatment plants. In cases where a SIP is submitted, but it fails to demonstrate achievement of the standards, the EPA is directed to prepare a Federal Implementation Plan (FIP). This leads to a loss of some State control over improving its air quality. The EPA can also implement a FIP on an individual air basin in a state. For example, FIPs were implemented in the South Coast, Ventura County, and Sacramento regions several years ago. The penalties may also be applied on an air basin basis. For example, if the San Joaquin Valley failed to submit its portion of the SIP, then only San Joaquin Valley would be sanctioned.

Within the state, penalties for consistent nonattainment of ambient air quality standards usually take the form of increased regulation, stricter standards, and extensions of time for future

improvement of air quality conditions. For example, in the San Joaquin Valley Air Basin, the EPA is scheduled to review the Valley's attainment status for Federal one-hour ozone in the year 2000. It is very likely that the Valley will be reclassified from "serious" to a "severe" nonattainment area as a result. The consequence from this change in status includes the following. The definition for a major source of pollution would be lowered from the current level of 50 tons or more emissions of an ozone precursor to 25 tons per year. This change will impact up to 400 additional sources of pollution in the District, and these sources would then become subject to EPA requirements for emissions and Reasonably Available Control Technology, the technological devices used to control emissions. In addition, a new "severe area" plan for attainment of the one-hour ozone standards would be required to be submitted to the EPA. Similar measures may be taken against the District if it fails to meet other standards for other pollutants by designated times, such as the eight-hour ozone standard in the year 2003. The net result of these penalties is an increase in the amount of time provided to attain the standards, but with stricter regulations and the resultant increased costs associated with further attainment efforts.

At the State level, the CCAA requires regions that violate State standards to reduce their pollutants by five percent or more per year (California Health and Section 40914). As an alternative, the adoption of "all feasible measures" to reduce air pollution on an expeditious schedule is acceptable if a district is unable to achieve a five percent annual reduction (Section 40914(b)(2)). The definition of "all feasible measures" is determined by each air district. It is based on the technological and economic feasibility of each control measure. During the process of developing its Air Quality Attainment Plan, the District examines all known control measures for possible implementation. Technological feasibility is determined by the availability of the pollution control technology or device to the regulated industry in the time frame provided in the plan. The emission reductions claimed for the technology must have a sound basis.

Economic feasibility is determined by calculating the cost-effectiveness of the control measure in terms of dollars per ton of emissions reduced. The district sets a cost-effectiveness threshold to determine whether a measure is economically feasible. The thresholds for the SJVUAPCD are currently \$5,000 per ton of ROG and \$9,500 per ton of NO_x. The thresholds may be revisited if emissions reductions required for attainment cannot be achieved with control measures meeting the current thresholds.

If the air district is unable to demonstrate attainment through implementation of what it considers feasible control measures, the ARB and the EPA may suggest other measures that it may be more costly. Ultimately, the EPA may disapprove of the district's plan if it finds it to be inadequate. The EPA may take over the planning process and develop a FIP if the district fails to revise the plan within the schedules listed in the CCAA.

Provisions of the California Environmental Quality Act (CEQA), including those relating to air quality, particularly the project permitting process for stationary sources of pollution and Environmental Impact Report (EIR) requirements, are self executing statutes. This means the enforcement of these statutes, of which the CCAA is a part of, are enforced by the public through litigation and the threat of litigation.

CURRENT CONDITIONS

The San Joaquin Valley is classified as "serious non-attainment" for Federal ozone and PM₁₀ standards. All San Joaquin Valley urban areas have been officially redesignated as "attainment" for the federal carbon monoxide standard as of March 31, 1998. The Fresno metropolitan area was

approved for redesignation as "attainment" for the State carbon monoxide standard on September 24, 1998. This will become effective upon completion of the Office of Administrative Law review. The SJVUAPCD has requested a five year extension in order to reach attainment for PM₁₀ by the year 2006.

Ozone (O₃)

The entire SJVAB often violates State and Federal ozone standards. The area is designated "severe nonattainment" for the State standards, and "serious nonattainment" for Federal standards (as of May 1997, the most recent data available). Over the last two decades, ozone levels have remained relatively stable. The most recent full year of data certified by ARB is 1996. During that year, Fresno County exceeded the federal one-hour ozone standard on 31 days and exceeded the more stringent state one-hour standard on 96 days.

Particulate Matter (PM₁₀)

In 1997, the SJVAB was designated "nonattainment" for State standards. It was designated "serious nonattainment" for Federal fine particulate matter standards in 1993. State and Federal PM₁₀ standards are often violated in the Air Basin and in Fresno County. According to ARB summaries (for 1996), Fresno County exceeded State 24-hour standards 22 times, and Federal standards zero times. This is down from previous years; for example, in 1988 the State standards were exceeded 43 times, and Federal standards six times. ARB data shows PM₁₀ emissions at 125 tons per day in 1996, compared to 121 tons per day in 1990.

Particulate Matter (PM_{2.5})

On June 30, 1998, ARB submitted the *1998 California Particulate Matter Monitoring Network Description* to EPA for approval. Currently under review, the plan calls for nine proposed monitoring sites in the SJVAB (two in Fresno County), which, if established, will collect annual data on PM_{2.5}. Fresno County should take into account this new data that will soon be generated when developing air quality strategies and policies. The District anticipates that it will be designated as nonattainment for this pollutant.

Carbon Monoxide (CO)

In 1997, the urbanized portions of Fresno County were designated as "moderate nonattainment" for State and Federal carbon monoxide standards. The non-urban portions of the county were designated as "attainment" for both State and Federal standards. ARB summaries show CO emissions at 500 tons per day in 1996, compared to 657 tons per day in 1990. The implementation of oxygenated fuels in winter and the introduction of cleaner vehicles provided substantial reductions in CO.

The Fresno Urbanized Area, Bakersfield Metropolitan Area, Stockton Urbanized Area and Modesto Urbanized Area were redesignated "attainment" of the state CO standard effective June 1998. Fresno was redesignated "attainment" of the state CO standard by the ARB in September 1998. This will become effective upon completion of review by the Office of Administrative Law.

Reactive Organic Gases (ROG)

There are no State or Federal standards for ROG. Despite a lack of State and Federal standards, ROG emissions must be controlled at the local level because of health effects and ozone production capability. Another reason for controlling ROG is that some of the components of ROG are classified as toxic pollutants. An example of this is benzene, which is found in gasoline.

ROG emissions in Fresno County were estimated at 101 tons per day in 1996, compared to 127 tons per day in 1990.

Nitrogen Dioxide (NO₂)

Fresno County and the SJVUAPCD are designated "attainment" for both Federal and State standards for NO₂, the major component of NO_x. This pollutant is important because it is a precursor to the formation of ozone, PM₁₀, and PM_{2.5}.

Oxides of nitrogen (NO_x) were produced at a level of 101 tons per day in Fresno County in 1996. This is down from 1990, when 120 tons per day were produced.

Sulfur Dioxide (SO₂)

Kern County is the only part of the San Joaquin Valley actually designated as in attainment of the federal SO₂ standard. The rest of the Valley, including Fresno County, falls under the "unclassified" category, because the monitoring protocols necessary to prove federal attainment have not been accomplished. However, because of the relatively low levels of SO₂ emissions in the Valley, it is not considered a problem. The entire Valley is considered in "attainment" of the State SO₂ standard. Sulfur oxide (SO_x) emissions levels in Fresno County were estimated at nine tons per day in 1996.

Lead (Pb)

Fresno County is designated "attainment" for particulate lead (as of May 1997). The last major measurements of lead were conducted in 1989, when lead levels were five percent of State standards.

AIR QUALITY TRENDS

Significant factors that contribute to air quality problems in the region are the Valley's topographical and meteorological conditions, rapid population growth, and associated increases in traffic, urbanization, and industry. The following is a summary of the major factors that could affect air quality in the Valley in the future.

The California Department of Transportation (Caltrans) estimates that the state's total vehicle miles traveled (VMT) was growing at more than twice the rate of population growth until recently. This growth has been attributed to increases in vehicle ownership, greater numbers of working women, increases in miles driven per person, and greater numbers of trips per household. Primary causes of the increase in VMT are more dispersed land use patterns and changing demographics including smaller household size which increases the number of drivers and reduces population densities. Recently, VMT growth has slowed somewhat though, but is still projected to grow at a somewhat faster rate than population growth. According to the *Regional Transportation Plan Conformity*

Analysis of the Council of Fresno County Governments, the population of Fresno County is expected to increase by 114 percent between 1990 and 2018, while VMT is projected to increase by 155 percent in the same period. The San Joaquin Valley could potentially experience greater population growth related air quality problems than other areas in California, as population growth rates in the Valley are projected by the California Department of Finance to exceed growth rates for California as a whole.

Estimates of traffic volumes and service levels show increasing traffic congestion. Congestion in major urban areas is growing at even higher rates than VMT, at about 15 percent per year. This can lead to even greater emissions production for each vehicle mile traveled.

Another recently identified trend that has slowed progress in achieving air quality standards is the increasing percentages of light trucks, minivans, and sports utility vehicles in the vehicle fleet. These vehicles are subject to less stringent tailpipe standards, so they emit more pollutants per mile than regular cars. The ARB has recently adopted regulations that require vehicle manufacturers to make these vehicles as clean as other light duty cars in the next few years.

The latest transportation conformity analyses prepared by the Valley RTPAs indicate that mobile source emissions will continue to decline until at least the 2018 horizon year. The latest mobile source emission model (MVE17G) shows increases in emissions over the previous version in the early years, but substantial decreases in the later years. This is due to internal changes in the model as well as expectations that vehicles will be cleaner due to adopted fuel and tailpipe regulations.

In the San Joaquin Valley Air Basin, the *Ozone Attainment Plan* lists the 1990 and 1999 Planning Inventory for stationary sources. The Plan was intended to bring the Air District into compliance for ozone standards, but this will not be attained by 1999. Stationary source ROG is projected to decrease from 326 tons/day in 1990 to 269 tons/day in 1999. Stationary source NO_x is projected to decrease from 383 tons/day in 1990 to 204 tons/day in 1999.

PM₁₀ from "Miscellaneous Processes", including farming, construction, road dust, unplanned fires and fugitive windblown dust is projected to be 349 tons per day in 2006 compared to 379 tons per day in 1993 in the San Joaquin Valley Air Basin. PM₁₀ from residential fuel combustion is projected to increase from 5 tons/day in 1993 to 11 tons per day in 2006.

8.4 FINDINGS

- The topography and meteorology of the San Joaquin Valley Air Basin (SJVAB) tends to confine air pollutants within the valley, promoting ozone formation during the warm summer months.
- Emissions directly or indirectly related to motor vehicles account for a large proportion of total emissions of key criteria air pollutants throughout Fresno County and the SJVAB. The scale and distribution of future land use development in Fresno County and other local jurisdictions within the SJVAB will have an important influence on future motor vehicle emissions within the SJVAB.
- Although annual one-hour average maximum ozone levels within Fresno County and the SJVAB have shown a barely discernible downward trend over the last 18 years, the highest levels within Fresno County have remained at least 17 percent above the NAAQS and 56 percent above the CAAQS, and the highest levels throughout the SJVAB have remained at least 33 percent above the NAAQS and 78 percent above the CAAQS.
- Due to the above-described ozone levels, the SJVAB is designated as a “serious nonattainment area” with respect to the federal ozone standards and a “severe non-attainment area” with respect to the state ozone standard. This non-attainment status has required the SJVUAPCD to prepare plans to demonstrate the means by which these standards will be achieved in the future, and implement control measures and adopt regulations to actually achieve the needed air pollutant reductions.
- The SJVAB is also considered a serious nonattainment area with respect to the federal PM_{10} standard and a nonattainment area with respect to the state PM_{10} standard. The SJVUAPCD has placed emphasis on preparing plans aimed at attaining the federal PM_{10} standard.
- The SJVUAPCD and the counties and cities within its jurisdiction – including Fresno County – will need to respond to the new federal standards for ozone and $PM_{2.5}$. Additional air pollutant control measures may need to be adopted to attain these revised standards, particularly the ozone standard. Since motor vehicle exhaust accounts for a larger proportion of $PM_{2.5}$ than of PM_{10} , mobile-source-based air pollution control measures will likely become a more important component of attainment plans for particulate matter.

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8.7 GLOSSARY

Air Districts - Regional governmental agencies that have the primary responsibility for control of air pollution from all sources other than emissions directly from motor vehicles.

Ambient Air Quality Standards - Concentration-based standards for criteria air pollutants established at both the federal and state levels.

Attainment/Nonattainment - Terms used to indicate whether or not a particular region is considered to be in compliance with applicable federal or California ambient air quality standards.

CAAQS - California Ambient Air Quality Standards

CARB - California Air Resources Board, the governmental entity under the California Environmental Protection Agency that is responsible for coordination and oversight of State and local air pollution control programs in California and for implementing the California Clean Air Act of 1988.

CCAA - California Clean Air Act

CO - Carbon monoxide, an odorless, colorless and highly toxic gas that is formed by the incomplete combustion of fuels.

Criteria Air Pollutants - Air pollutants for which the U.S. EPA has established specific concentration-based criteria based upon protection of human health and welfare.

EPA - The United States Environmental Protection Agency, the federal agency responsible for implementing national air quality programs.

FCAA - Federal Clean Air Act

NAAQS - National Ambient Air Quality Standards

NO_x - Oxides of nitrogen, a family of gaseous nitrogen compounds that are precursors to ozone formation.

Ozone - Ozone (O₃) is a photochemical pollutant that is formed by a complex series of chemical reactions between reactive organic gases (ROG), oxides of nitrogen (NO_x) and sunlight.

PM₁₀ - Particulate matter less than 10 microns in diameter – small enough to be inhaled, pass through the respiratory system, and lodge in the lungs, with resultant health effects.

ROG - Reactive Organic Gases (also known as volatile organic compounds), photochemically reactive hydrocarbons that are important for ozone formation.

SJVAB - San Joaquin Valley Air Basin.

SJVUAPCD - San Joaquin Valley Unified Air Pollution Control District, one of several air districts within California.

CHAPTER 9: SAFETY



9.1 INTRODUCTION

In planning for development, there are a wide range of environmental hazards to be considered. Some of these hazards are human-made, and some are due to natural environmental factors. Much of the risk associated with environmental hazards often can be greatly reduced, or even eliminated, through proper siting of development. However, where development is necessary in a potentially hazardous area, mitigation of potential hazards through design and administrative controls can reduce risks to life and property. This chapter presents information regarding the following known environmental hazards in Fresno County: seismic and geological, flooding and dam failure inundation, urban and wildland fire, airports, and hazardous waste and contaminated sites. Information about these hazards was obtained from various environmental documents prepared for development projects in Fresno County, federal, state, and local government publications and agency records, and consultation with agency personnel.

9.2 SEISMIC AND GEOLOGICAL HAZARDS

REGIONAL GEOLOGY

Fresno County is close to the geographic center of California and occupies part of the San Joaquin Valley, the western slope of the Sierra Nevada, and the southern part of the Coast Range (see Figure 9-1). In eastern Fresno County, granitic rocks associated with the Sierra Nevada batholith are abundant. Small areas of serpentinite, gabbro, and metavolcanic rock are scattered throughout the foothills. Most of Fresno County (from approximately Clovis to Interstate 5) lies within the Central Valley geomorphic province, a large, elongate, northwest-trending trough consisting of several thousand feet of marine and non-marine sedimentary rocks derived from erosion of the Coast Ranges and the Sierra Nevada over the last 200 million years. The southern Coast Range, which includes Fresno County west of Interstate 5, consists of three distinct geologic terranes that reflect several hundred million years of mountain building and erosional processes. From the late Jurassic period (approximately 225 million years ago) to the present, the southern Coast Ranges have been the most tectonically active of all areas in Fresno County. Principal geologic units in Fresno County are shown in Figure 9-1.

Faults

A fault is defined as "a planar or gently curving fracture in the earth's crust across which there has been relative displacement." Movement within a fault causes an earthquake. Generally, earthquakes are associated with faults exposed at the earth's surface. However, recent evidence suggests that subsurface or "blind" faults can also result in earthquakes. Blind-thrust faults can exhibit no surface rupture.

An "active fault" is defined by the California State Department of Conservation, Division of Mines and Geology (CDMG) as one that has had surface displacement within the last 11,000 years. This does not mean, however, that faults having no evidence of surface displacement within the last 11,000 years (Holocene) are necessarily inactive. Potentially active faults are those that have shown

displacement within the last 1.6 million years (Quaternary). An "inactive fault" shows no evidence of movement in historic or recent geologic time, suggesting that these faults are dormant. Within the last few years, however, geologists have discovered that the filling of a reservoir can induce fault activity and earthquakes, such that an "inactive" fault can become active.

There are a number of active and potentially active faults within and adjacent to Fresno County. Faults within Fresno County and major active and potentially active faults in the region are described below. Their locations are shown on Figure 9-2.

Clovis Fault

The northwest-trending Clovis fault is believed to be located approximately five to six miles east of the City of Clovis, extending from an area just south of the San Joaquin River to a few miles south of Fancher Creek. The Clovis fault is considered a pre-Quaternary fault or fault without recognized Quaternary displacement. This fault is not necessarily inactive.

Hartley Springs Fault, Silver Lake Fault (Parker Lake Fault), Unnamed Faults

Holocene and Quaternary faults are present in the vicinity of Duck Lake in the northeastern part of Fresno County, a few miles south of Mammoth Lakes.

Unnamed Inferred Fault(s)

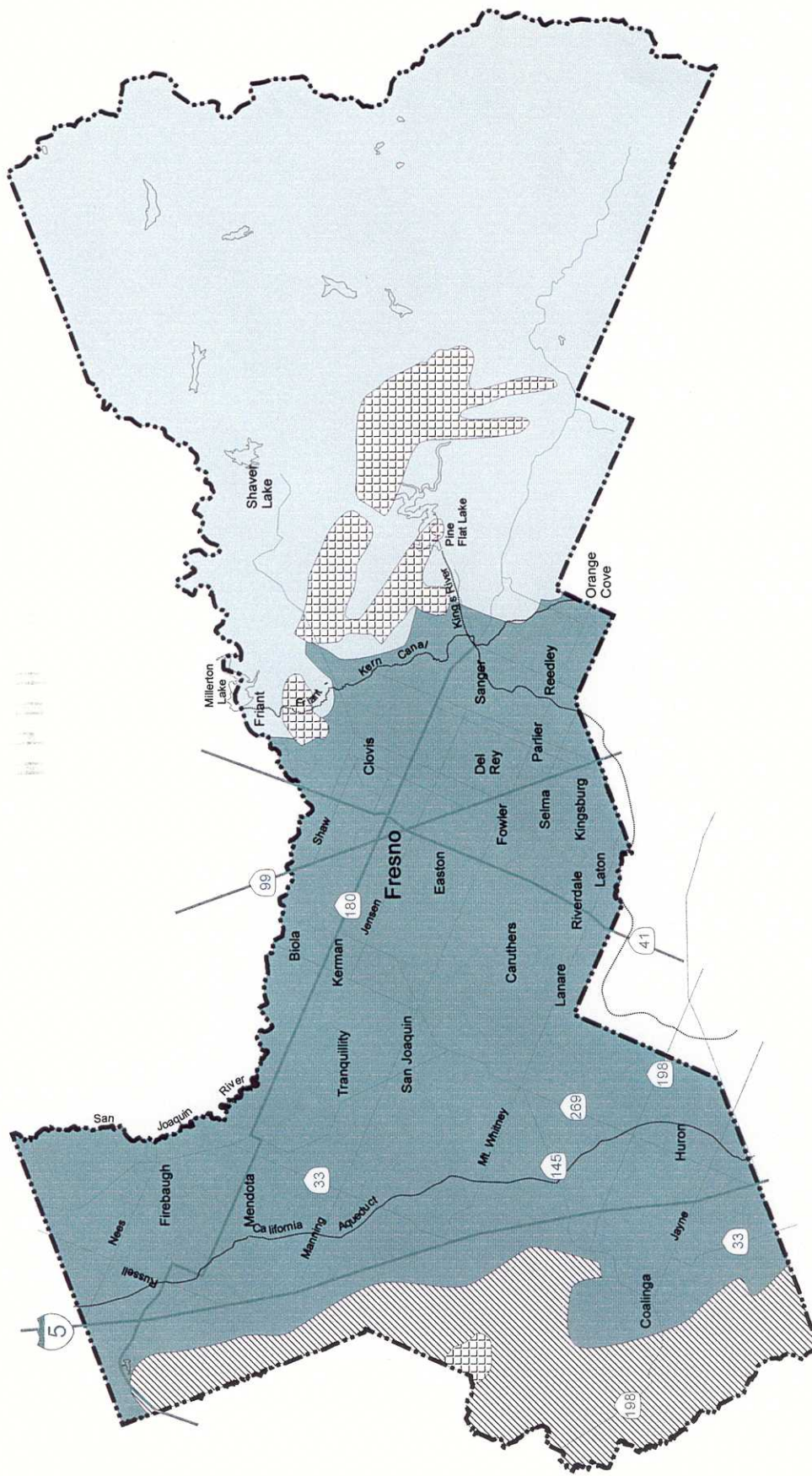
Relative or apparent upward and downward displacement interpreted as inferred faults occurs in an area located a few miles south of Helm, extending southeast to approximately Lanare (between Fresno Slough and Crescent Ditch). As with the Clovis fault, there is no apparent Quaternary displacement; however, the possibility for fault movement in this area cannot be completely eliminated.


Nunez Fault

The Nunez fault is located approximately six to seven miles northwest of Coalinga (see Figure 9-3). The Nunez fault experienced surface rupture during the 1983 Coalinga earthquake and is designated an Earthquake Hazard Zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994 (formerly known as the Alquist-Priolo Special Studies Zones Act of 1972). No structure for human occupancy may be built within an Earthquake Fault Zone until geologic investigations demonstrate that the site is free of fault traces that are likely to rupture with surface displacement. Special development standards associated with Alquist-Priolo requirements would be necessary for development in this area.

Ortigalita Fault


The Ortigalita fault zone is approximately 50 miles long, originating near Crow Creek in western Stanislaus County and extending southeast to a few miles north of Panoche in western Fresno County. Most of the fault is considered active due to displacement during Holocene time, and is designated an Earthquake Hazard Zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994. As illustrated in Figure 9-3, the southernmost extension of the fault lies in Fresno County.






NORTH


0 10
1" = 10 miles




Igneous rocks, primarily granite



Quaternary alluvial materials



Metamorphic volcanic, igneous and sedimentary rocks



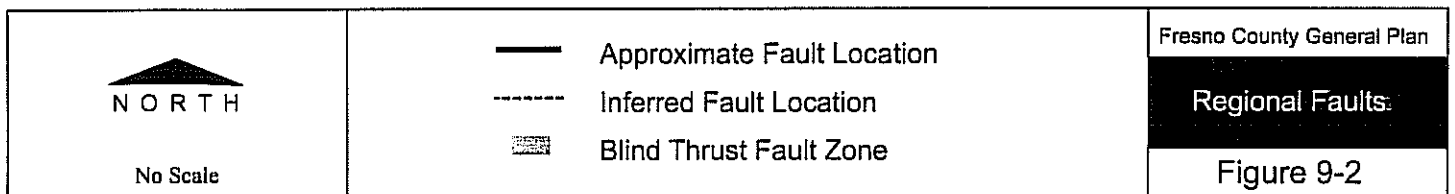
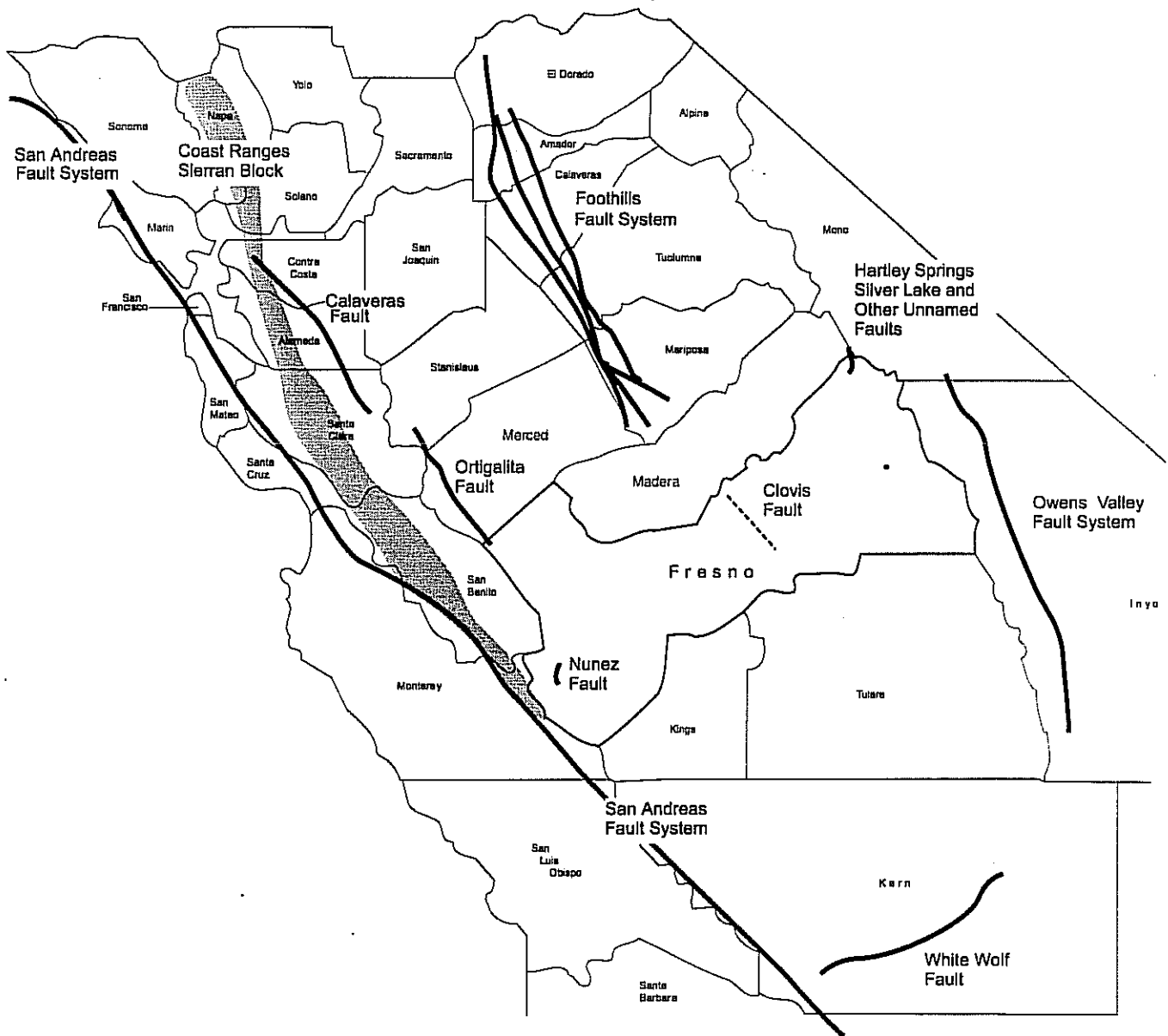
Marine sedimentary rocks

Fresno County General Plan

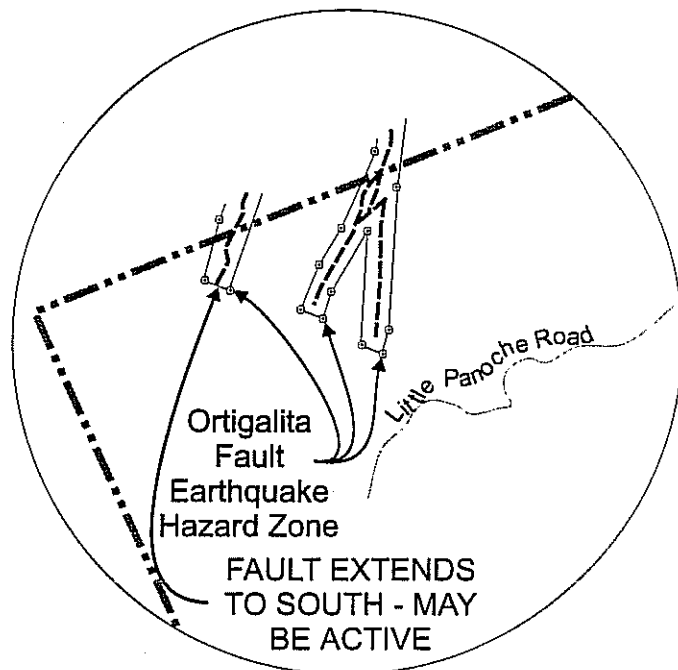
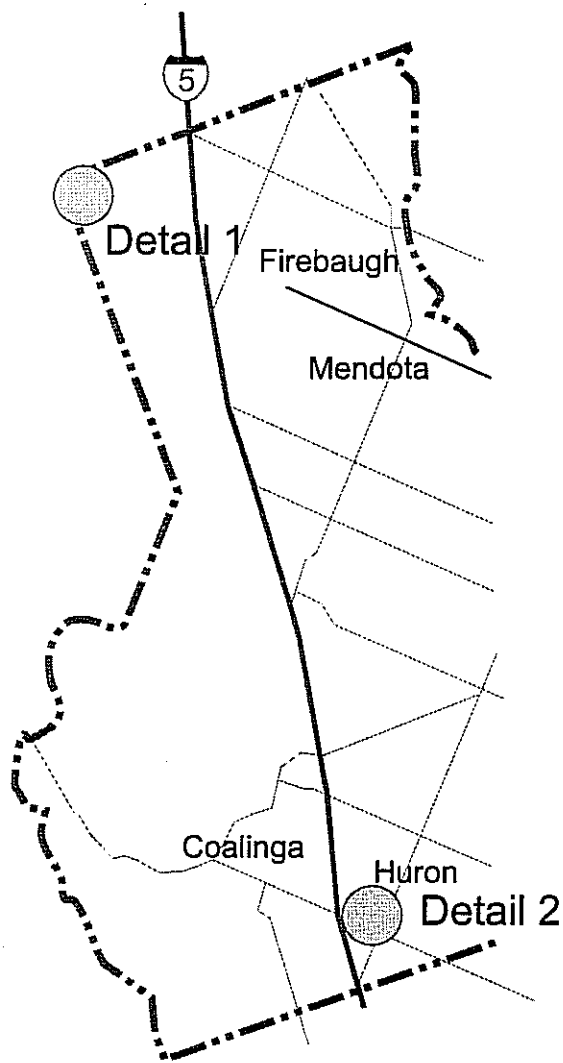
Major Geologic Units

Figure 9-1

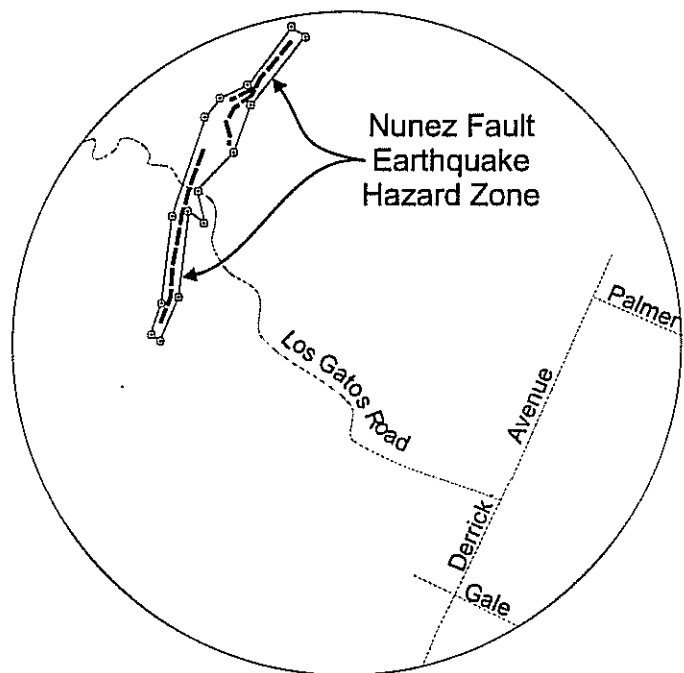
Source: California Division of Mines and Geology, Geologic Map of California, 1977; EIP Associates, May 1997.



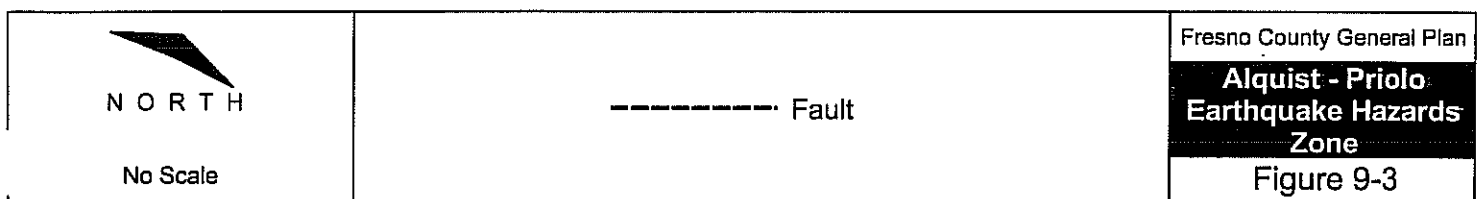
SOURCE: California Division of Mines and Geology, Fault Activity Map of California and Adjacent Areas, Scale 1:750,000 Geologic Data Map No. 6, 1994; EIP Associates, March 1997.



Detail 1



Detail 2



Source: Alquist Priolo Special Studies Zones Fresno Area Plates I and II

San Andreas Fault

The San Andreas fault lies to the west and southwest of Fresno County. In the southwestern part of the county, the fault is roughly parallel to and a few miles west of the county line. This fault is considered active and is of primary concern in evaluating seismic hazards throughout western Fresno County, although effects of earthquakes along the San Andreas fault could occur farther east as well.

Sierra Nevada Fault Zone (Owens Valley Fault Zone)

Approximately 12 miles east of the eastern Fresno County boundary lies the Owens Valley fault zone. This northwest-trending fault zone is a lengthy and complex system containing active and potentially active faults. Historically this fault has been the source of seismic activity in Madera County to the north.

Foothills Fault System

The southern part of the Foothills fault system, located approximately 70 to 80 miles north of the city of Fresno, includes the Bear Mountains fault and the Melones fault zone, as well as numerous smaller, but related faults. According to CDMG data, these faults have not shown any activity during the last 1.6 million years; however, geologic investigations of the seismic safety of the Auburn Dam site suggest these faults are potentially active. Therefore, the possibility exists that earthquakes could occur on these faults.

White Wolf Fault

The White Wolf fault is located approximately 100 miles south of western Fresno County. The fault was not considered active until 1952, when movement along it generated a series of damaging earthquakes in the Bakersfield (Kern County) area.

Coast Range-Sierran Block Boundary

Recent evidence suggests that faults along the western boundary of the Central Valley may be more active than once believed. According to the CDMG, asymmetrical folds have recently been identified on the eastern slopes of the Coast Ranges, which include western Fresno County. Such folds can hide faults which show no surface rupture. These faults and folds, which are part of a large system called the Coast Range-Sierran Block Boundary, are similar to the faults/folds identified as the cause of the 1983 Coalinga earthquake. Therefore, faults beneath the Central Valley once believed to be inactive are now believed to be active and capable of generating large magnitude earthquakes.

SEISMIC HAZARDS

The seismic potential of an active or potentially active fault is generally evaluated by estimating the magnitude (M) on the Richter scale of an earthquake that may be expected to occur along the fault. The Richter scale measures the amplitude of seismic waves recorded by a seismograph. Earthquakes are also measured on the Modified Mercalli Scale. The Modified Mercalli Scale measures the intensity of an earthquake by the way it is felt and responded to by humans, and by

the amount of damage it does to buildings and structures. The relationship between the Richter Scale and the Modified Mercalli Scale is shown on Table 9-1. The Modified Mercalli Scale is presented in Table 9-2. Another commonly used measure of a fault's ability to result in displacement is Maximum Credible Earthquake (MCE). The MCE is defined as "the largest earthquake (measured in magnitude on the Richter Scale) that appears to be reasonably capable of occurring under the presently known geologic framework."

TABLE 9-1

**APPROXIMATE RELATIONSHIPS BETWEEN EARTHQUAKE MAGNITUDE
AND INTENSITY**

Richter Scale Magnitude	Maximum Expected Intensity (MM)¹	Distance Felt (kilometers)
2.0 - 2.9	I - II	0
3.0 - 3.9	II - III	15
4.0 - 4.9	IV - V	80
5.0 - 5.9	VI - VII	150
6.0 - 6.9	VII - VIII	220
7.0 - 7.9	IX - X	400
8.0 - 8.9	XI - XII	600

Source: United States Geologic Survey, *Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093*, 1977.

¹Modified Mercalli Intensity Scale

TABLE 9-2

MODIFIED MERCALLI SCALE OF EARTHQUAKE INTENSITY

Scale	Effects
I.	Earthquake shaking not felt.
II.	Shaking felt by those at rest.
III.	Felt by most people indoors; some can estimate duration of shaking.
IV.	Felt by most people indoors. Having objects swing, windows and doors rattle, wooden walls and frames creak.
V.	Felt by everyone indoors; many estimate duration of shaking. Standing autos rock. Crockery clashes, dishes rattle, and glasses clink. Doors close, open, or swing.
VI.	Felt by everyone indoors and most people outdoors. Many now estimate not only the duration of the shaking, but also its direction and have no doubt as to its cause. Sleepers awakened. Liquids disturbed, some spilled. Small unstable objects displaced. Weak plaster and weak materials crack.
VII.	Many are frightened and run outdoors. People walk unsteadily. Pictures thrown off walls, books off shelves. Dishes or glasses broken. Weak chimneys break at roofline. Plaster, loose bricks, unbraced parapets fall. Concrete irrigation ditches damaged.
VIII.	Difficult to stand. Shaking noticed by auto drivers, waves on ponds. Small slides and cave-ins along sand or gravel banks. Stucco and some masonry walls fall. Chimneys, factory stacks, towers, elevated tanks twist or fall.
IX.	General fright. People thrown to the ground. Steering of autos affected. Branches broken from trees. General damage to foundations and frame structures. Reservoirs seriously damaged. Underground pipes broken.
X.	General panic. Conspicuous cracks in ground. Most masonry and frame structures destroyed along their foundations. Some well-built wooden structures and bridges are destroyed. Serious damage to dams, dikes and embankments. Railroads bent slightly.
XI.	General panic. Large landslides. Water thrown out of banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flatland. General destruction of buildings. Underground pipelines completely out of service. Railroads bent greatly.
XII.	General panic. Damage nearly total, the ultimate catastrophe. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.
Source: California Division of Mines and Geology, 1973.	

Five County Seismic Safety Element

The *Five County Seismic Safety Element* was prepared in 1974 for the general plans in Fresno, Kings, Madera, Mariposa, and Tulare Counties. The supporting technical report presented information regarding the distribution of seismic and related geologic hazards and their risk of occurrence. As identified in the *Five County Seismic Safety Element*, known active faults that pose a serious hazard to the five-county area included the San Andreas fault, Owens Valley fault zone, and White Wolf fault. The principal earthquake hazard was determined to be groundshaking. The five-county area was divided into ten seismic microzones, differentiated by the level of ground motion that could reasonably be anticipated from earthquakes on the principal fault systems affecting the five-county area. For each microzone, Uniform Building Code (UBC) Seismic Zone and Design Force Multiplication Factors for normal and critical facilities were identified. The design factors assumed UBC Seismic Zone 2 and 3 ratings (corresponding to 0.2g and 0.3g peak horizontal ground acceleration, respectively).

The *Five County Seismic Safety Element* has not been updated and does not include information pertaining to the 1983 Coalinga earthquake, nor does it reflect the current seismic hazard estimates as described below.

Groundshaking

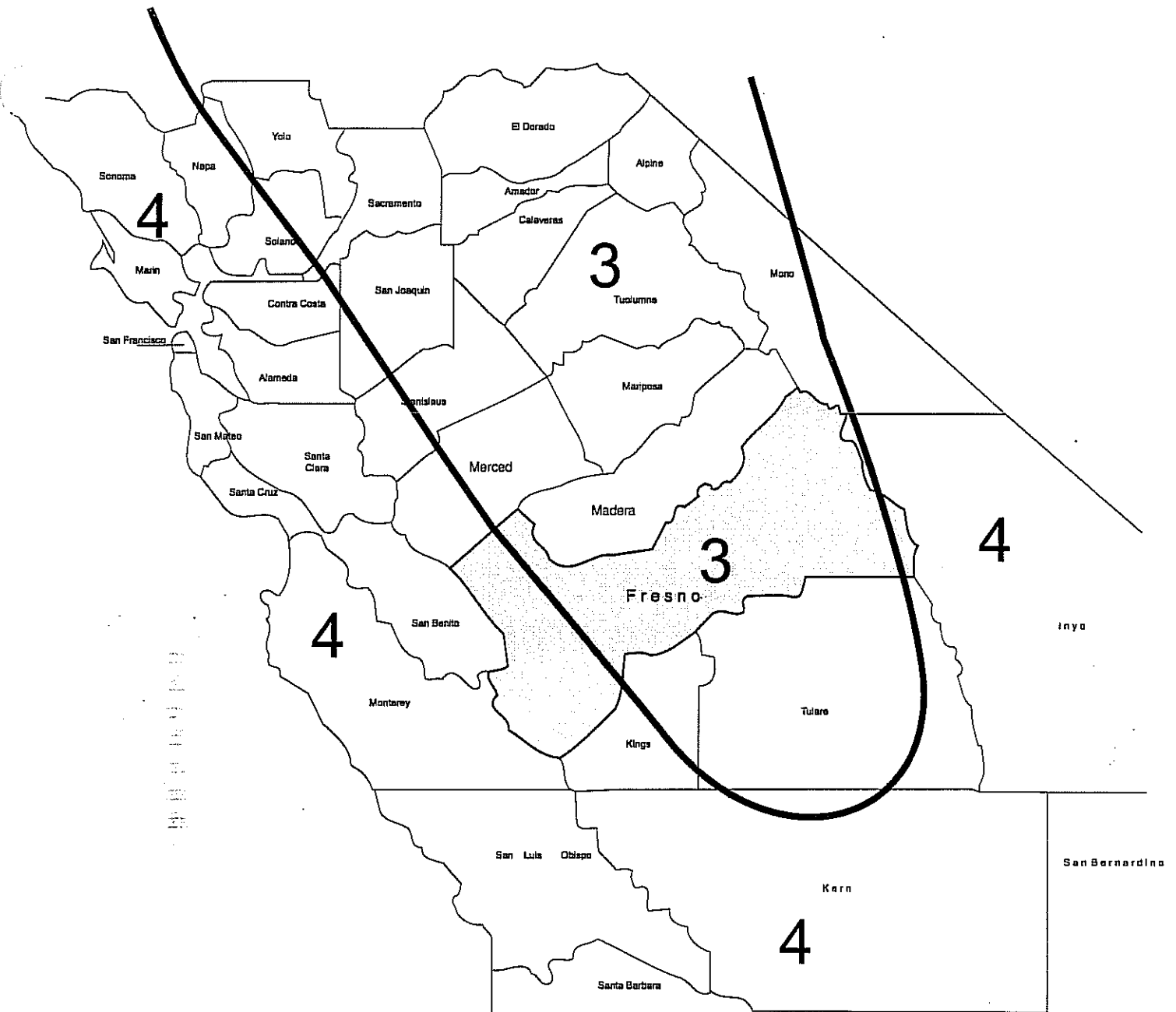
When movement occurs along a fault, the energy generated is released as waves which cause groundshaking. Groundshaking intensity varies with the magnitude of the earthquake, the distance from the epicenter, and the type of rock or sediment through which the seismic waves move. The geological characteristics of an area thus can be a greater hazard than its distance to the earthquake epicenter.



Although most of Fresno County is situated within an area of relatively low seismic activity, the faults and fault systems that lie along the eastern and western boundaries of Fresno County, as well as other regional faults, have the potential to produce high-magnitude earthquakes throughout the county. A high-magnitude earthquake on one of these faults could cause moderate intensity groundshaking in Fresno County. The valley portion of Fresno County is located on alluvial deposits, which tend to experience greater groundshaking intensities than areas located on hard rock. Therefore, structures in the valley areas would tend to suffer greater damage from groundshaking than those located in the foothill and mountain areas.

Most of Fresno County, from approximately Interstate 5 east, is located in Seismic Zone 3, as defined by the most recent California UBC. Areas in the Coast Range and foothills and a small area along the Fresno County-Inyo County boundary are located in Seismic Zone 4 (see Figure 9-4). According to the CDMG's Probabilistic Seismic Hazard Map, estimated peak horizontal ground acceleration in Fresno County ranges from 0.1g in the valley and foothills increasing outward to as high as 0.7g or greater in a small area in the southwestern part of the county (see Figure 9-5). These estimates assume a 10 percent probability of earthquake occurrence in 50 years. The CDMG has developed more detailed seismic hazard maps for the San Francisco and greater Los Angeles areas; however, as of March 1997, such maps have not been prepared for Fresno County.

Seismic Structural Safety

Older buildings constructed before building codes were established, and even newer buildings constructed before earthquake-resistance provisions were included in the codes, are the most likely to be damaged during an earthquake. Buildings one or two stories high of wood-frame construction are considered to be the most structurally resistant to earthquake damage. Older masonry buildings without seismic reinforcement (unreinforced masonry) are the most susceptible to the type of structural failure that causes injury or death. The susceptibility of a structure to damage from groundshaking is also related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions, which affect low-rise buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium can cushion low-rise buildings, but it can also accentuate the motion in tall buildings. The amplified motion resulting from softer alluvial soils can also severely damage older masonry buildings. Other potentially dangerous conditions include, but are not limited to: building architectural features that are not firmly anchored, such as parapets and cornices; roadways, including column and pile bents and abutments for bridges and overcrossings; and above-ground storage tanks and their mounting devices. Such features could be damaged or destroyed during strong or sustained groundshaking.



 <p>NORTH</p> <p>No Scale</p>	 <p>Seismic Zone Boundaries</p>	<p>Fresno County General Plan</p> <p>California Building Code Seismic Zones</p> <p>Figure 9-4</p>
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SOURCE: California Code of Regulations, Title 24, Figure 23-2, 1991; Structural Engineers Association of California, Seismology Committee, Recommended Lateral Force Requirements and Tentative Commentary, 1988, Figure 1A and p. 5-C; EIP Associates, March 1997.

As noted above, some areas of western and eastern Fresno County are located within Seismic Zone 4. *Government Code* Section 8875 specifies steps that must be taken by all cities and counties to identify all potentially hazardous buildings and to establish a program for mitigation of such buildings. No inventory of the number of such buildings or their condition has been compiled as of March 1997, so the degree of risk posed by these structures cannot be determined.

California Health and Safety Code Section 1250 defines essential facilities as those structures which are necessary for emergency operations subsequent to a natural disaster. These facilities include hospitals and other medical facilities having surgery and emergency treatment areas, fire and police stations, tanks or other structures containing water or other fire-suppression materials, emergency vehicle shelters and garages, structures and equipment in emergency-preparedness centers, standby power-generating equipment for essential facilities, and structures and equipment in government communication centers and other facilities required for emergency response. These facilities are subject to more stringent design and construction standards, as prescribed in Title 24, Chapter 23 of the *Code of California Regulations*, thus minimizing potential damage. Chapter 23 also applies to skilled nursing facilities, public schools and State-owned or State-leased essential services buildings regulated by the Office of Statewide Health Planning and Development and the Office of the State Architect, Structural Safety Section.

Liquefaction

Liquefaction is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged groundshaking. Areas most prone to liquefaction are those that are water saturated (e.g., where the water table is less than 30 feet below the surface) and consist of relatively uniform sands that are loose to medium density. In addition to necessary soil conditions, the ground acceleration and duration of the earthquake must be of sufficient energy to induce liquefaction. Scientific studies have shown that the ground acceleration must approach 0.3g before liquefaction occurs in a sandy soil with relative densities typical of the San Joaquin alluvial deposits.

Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, tilting, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation, such as that which occurred along the coastline near Seward, Alaska during the 1964 earthquake. Also of particular concern in terms of developed and newly developing areas are fill areas that have been poorly compacted.

No specific countywide assessments to identify liquefaction hazards have been performed. Areas where groundwater is less than 30 feet below the surface occur primarily in the valley. However, soil types in the area are not conducive to liquefaction because they are either too coarse or too high in clay content. Areas subject to 0.3g acceleration or greater are located in a small section of the Sierra Nevada along the Fresno-Inyo Counties boundary, or along the Coast Range foothills in western Fresno County. However, the depth to groundwater in such areas is greater than in the valley, which would minimize liquefaction potential as well. Detailed geotechnical engineering investigations would be necessary to more accurately evaluate liquefaction potential in specific areas and to identify and map the areal extent of locations subject to liquefaction.

Settlement

Settlement can occur in poorly consolidated soils during groundshaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils, or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence due to groundshaking is not available. The only urban area directly affected by settlement is the city of Coalinga. Fluctuating groundwater levels may have changed the local soil characteristics. Sufficient subsurface data is lacking to conclude that settlement would occur during a large earthquake; however, the data is sufficient to indicate that the potential exists.

OTHER GEOLOGIC HAZARDS

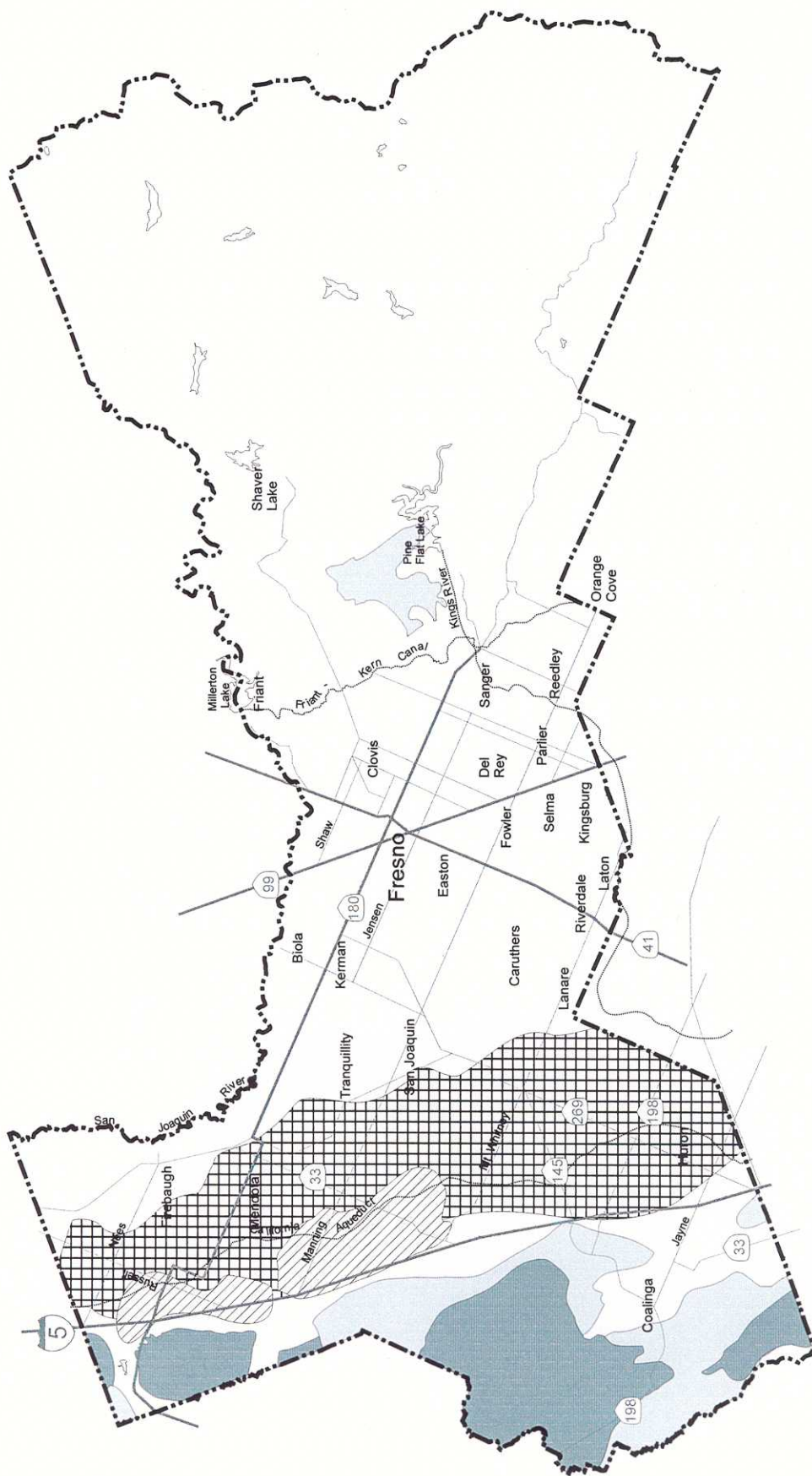
Landslides

Landslides are a primary geologic hazard and are influenced by four factors:

- strength of rock and resistance to failure, which is a function of rock type (or geologic formation);
- geologic structure or orientation of a surface along which slippage could occur;
- water (can add weight to a potentially unstable mass or influence strength of a potential failure surface); and,
- topography (amount of slope in combination with gravitation forces).

As described above, three distinct geologic environments are present in Fresno County. These dissimilarities present different landslide hazards. As of December 1996, the CDMG had not developed landslide hazard identification maps for Fresno County. However, it is reasonable to assume that certain areas in Fresno County are more prone to landsliding than others (see Figure 9-6). Such areas can be found in the foothill and mountain areas where fractured and steep slopes are present (as in the Sierra Nevada), where less consolidated or weathered soils overlie bedrock (e.g., the Coast Range), or where inadequate ground cover accelerates erosion. Erosion and slumping of soils can also occur along bluffs along the San Joaquin River.

Other areas where steep slopes are present, however, are not heavily populated and most are located in federal or state lands, although roadways such as State Route 168 in eastern Fresno County and State Route 198 in western Fresno County could be affected by landslides in the event of an earthquake or heavy rain. For example, during the 1995 storm event in California, a fairly large landslide occurred on Los Gatos Road, which is a significant local access road west of Coalinga. CDMG geologists determined that catastrophic failure was unlikely, but long-term road maintenance could be compromised due to undercutting of the slope by the creek below the road. There is no risk of large landslides in the valley area of the county due to its relatively flat topography. There is, however, the potential for small slides and slumping along the steep banks or river or creeks.



- | | | | |
|---|---------------------------|---|--------------------|
|  | Moderate Landslide Hazard |  | Shallow Subsidence |
|  | High Landslide Hazard |  | Deep Subsidence |

Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. Subsidence caused by groundwater withdrawal generally presents a more serious problem, since it can affect large areas. Oil and gas withdrawal, on the other hand, tends to affect smaller, localized areas. Some areas of the Central Valley have subsided more than 20 feet during the past 50 years.

Seiche

A seiche is a standing wave produced in a body of water such as a reservoir, lake, or harbor, by wind, atmospheric changes, or earthquakes. Seiches have the potential to damage shoreline structures, dams, and levees. Studies of true seismic seiches are limited, but the largest recorded seiche was 1.2 feet during the 1964 Alaska earthquake. Since this is less than wave heights that could be expected from wind-induced waves, earthquake-induced seiches are not considered a risk in Fresno County. In addition, the effects from a seiche would be similar to the flood hazard for a particular area, and the risk of occurrence is perceived as considerably less than the risk of flooding.

Expansive Soils and Erosion

Please see Section 7.4 (Soils) for a discussion of geotechnical considerations regarding expansive soil and erosion hazards.

Volcanic Hazards

The Mono Lake-Long Valley Area is adjacent to the north and east of northernmost areas of Fresno County and includes such features as Mono Craters and Long Valley calderas and numerous active and potential faults. The Mono Lake-Long Valley Area is considered an active volcanic region of California. Lava, tephra (ejected materials such as dust, ash, and cinder transported through air), and pyroclastic (rock fragments) flows often occur during large volcanic events. Four large earthquakes (greater than M6 on the Richter Scale) and numerous relatively shallow earthquakes occurred in the Mono Lake-Long Valley area in 1980. Since that time earthquakes and associated uplift and deformation in the Mammoth Lakes Caldera have continued. Monitoring efforts are ongoing in the Mammoth Lakes area and emergency response plans have been prepared in the event of volcanic eruption. Known volcanic hazards in Fresno County and hazards associated with the county's proximity to the Mono Lake-Long Valley Area are summarized below.

Volcanic Flows

Two mildly explosive volcanic vents of Holocene age are located three to four miles from northernmost Fresno County, northwest of Duck Lake. In the event of an eruption, flows or debris from the vents would likely flow predominantly southwest approximately parallel to the North Fork of the San Joaquin River in Madera County. At the northernmost tip of Fresno County, lava flows, steam blasts, or base surges could occur. Northern portions of the Silver Divide (including Duck Lake and Fish Creek) could be subject to tephra hazards. This particular area of Fresno

County is unpopulated, not easily developable, and is situated in the high peaks of the Sierra Nevada; therefore, potential safety hazards would be limited to individuals visiting the area.

Ash

With increased distance from a volcano, there is decreased affect from volcanic eruption. However, should a volcanic eruption occur, it is likely that a significant amount of ash (volcanic debris less than 44 millimeters in diameter) would be released into the atmosphere. Assuming a worst-case scenario, geologists estimate that the South Fork of the San Joaquin River, Mono Creek, Margaret Lakes, Duck Lake, Fish Creek, Lake Thomas A. Edison, Bear Creek, Lake Italy, and the town of Mono Hot Springs could be subject to eight inches or more of compacted ash. (For comparison, it usually takes five inches of ash to stop automobile engines.) These areas, as well as Kaiser Creek and Three Island Lake, could also be affected by hot pyroclastic flows. Up to two inches of ash could fall within a 50-mile radius of eruptions, should they occur, in the Mono Lake-Long Valley Area, potentially affecting Auberry, Prather, Meadow Lakes, Pine Ridge, Tollhouse, Dinkey Creek, Humphreys Station, Courtright Reservoir, Pine Flat Reservoir area, and numerous small lakes, creeks, and streams.

Historic wind directions and windspeeds suggest that, like smaller eruptions, most volcanic ash from large to very large eruptions would be deposited to the east of the volcano or volcanic vents. The likelihood that ash would affect development in Fresno County depends on the frequency with which winds at various heights above the volcano blow toward the area; the thickness of ash that would fall is chiefly a function of the volume erupted and windspeed. Wind direction and windspeed frequencies can be judged from past ash falls and from modern wind records. The majority of ash beds from volcanic eruptions in California lie east of their source vents. Furthermore, well-studied volcanoes such as Mount Rainier and Mount St. Helens show that more than 90 percent of the ash beds deposited from volcanic eruptions during the last 10,000 years lie east of those volcanoes. This data suggest that most ashfall from future eruptions would likewise be deposited east of the volcanic vents in California, including those at the Mono Lake-Long Valley Volcanic Area.

Floods and Mudflows Resulting from Volcanic Eruptions

An eruption on the western slope of Mammoth Mountain in the winter could cause hot mudflows to mix with melting snow and rock debris creating the possibility of severe flood conditions in the San Joaquin River drainage system. These floods and mudflows could endanger people, dams, and other property as they move downstream.

9.3 FLOOD HAZARDS

The east side of Fresno County is drained primarily by the San Joaquin and Kings Rivers. Small streams, which are usually dry except during winter and spring runoff, drain the foothills of the Coast Range.

Flooding is a natural occurrence in the Central Valley because it is a natural drainage basin for thousands of watershed acres of Sierra Nevada and Coast Range foothills and mountains. Two kinds of flooding can occur in the Central Valley: general rainfall floods occurring in the late fall

and winter in the foothills and on the valley floor; and snowmelt floods occurring in the late spring and early summer. Most floods are produced by extended periods of rainfall during the winter months. Floods can also occur when large amounts of water due to snowmelt enter storage reservoirs, causing an increase in the amount of water that is released. Fresno County has a long history of flooding, but little definitive data is available for specific floods, particularly on the smaller streams. Historical records indicate that nine significant flood events occurred in Fresno County between the 1840s and 1900.

Flooding in Fresno County occurs primarily along the Kings River in the central-eastern part of the county, Dry Creek, and some sections of the San Joaquin River. However, a variety of mechanisms are employed to reduce flood damage. Such measures include flood control reservoirs, acquisition of development rights, levee systems, and watershed treatment. In particular, construction of Pine Flat and Friant Dams has greatly reduced flooding in urbanized areas on the east side of the valley.

The Fresno Metropolitan Flood Control District (FMFCD) also owns and operates a number of flood control dams and stormwater retention/detention facilities in the county to control flows on Dry, Dog, Fancher, Redbank, and Hog Creeks. Streams draining the Coast Range foothills frequently flood much valuable agricultural land, roads, and to some extent, communities such as Coalinga, Huron, Mendota, Firebaugh, Dos Palos, and other smaller towns. A flood control reservoir constructed on Little Panoche Creek has helped to reduce flooding in that area.

100-YEAR FLOOD HAZARD

Official floodplain maps are maintained by the Federal Emergency Management Agency (FEMA). FEMA determines areas subject to flood hazards and designates these areas by relative risk of flooding on a map for each community, known as the Flood Insurance Rate Map (FIRM). A 100-year flood is considered for purposes of land use planning and protection of property and human safety. The boundaries of the 100-year floodplain are delineated by FEMA on the basis of hydrology, topography, and modeling of flow during predicted rainstorms. The analysis of predicted flooding does not account for the effects of continued land subsidence or the rise in sea level associated with the greenhouse effect. FEMA-designated 100-year flood plains in Fresno County are shown in Figure 9-7.

The 100-year flood is defined as the flood event that has a one percent chance of occurring in any given year. It is important to note that the delineation of areas within the 100-year floodplain represents a statistical probability for the long-term average occurrence of flooding. Actually, flooding can occur in a 100-year floodplain more often or less often than once in a hundred years. Smaller floods have an even greater chance of occurring in any year and pose hazards as well. Areas that are flooded less often only become inundated as a result of more uncommon and extreme precipitation/runoff events.

The river's potential flood carrying capacity has decreased as trees, vegetation, and structures (e.g., bridges, trestles, buildings) have increased within the San Joaquin River. Unsecured and uprooted material can be carried down the river, clogging channels and piling up against trestles and bridge abutments that can, in turn, give way or collapse and form further blockage. Such debris "dams" can further worsen channel constrictions, resulting in greater potential height, speed, and force of flood stage waters. Flooding can force waters out of the river channel and above its ordinary

floodplain. Confined floodplains can result in significantly higher water elevations and higher flow rates during high runoff and flood events.

Updated channel analyses have not been performed to determine the amount of obstruction posed by vegetation and development in the San Joaquin River channel. As such, FEMA maps depicting the 100-year floodplain for the San Joaquin River probably do not reflect the true extent and risk of flooding. The FMFCD has performed two site-specific studies using FEMA topography data to compare to developer-submitted models within the riverbottom. The FMFCD found the water surface elevation increase, on average, was about four feet higher than the FEMA 100-year floodplain mapping.

DAM FAILURE INUNDATION

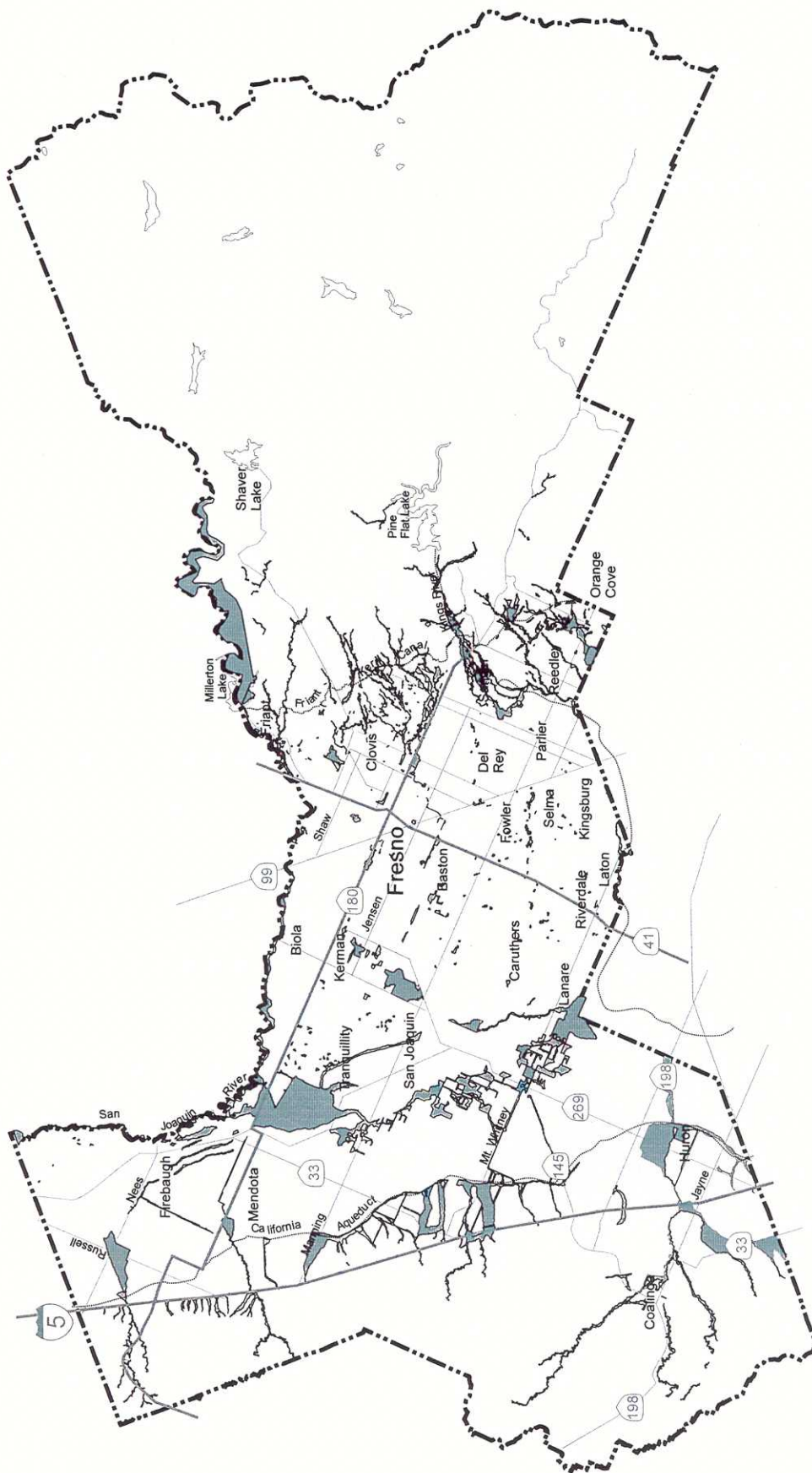
According to California Department of Water Resources records, there are 33 dams located within Fresno County. Of these, four major dams could cause substantial flooding in Fresno County in the event of a failure: Friant Dam, Big Dry Creek Dam, Redbank-Fancher Creek Project Dams, and Pine Flat Dam. Identified dam failure-flood inundation areas in Fresno County are shown in Figure 9-8. In addition, failure of upstream dams such as Shaver Lake, Lake Thomas A. Edison, Huntington, Florence, Mammoth Pool Reservoir, Wishon, and Courtright Reservoir, could contribute to flooding conditions on the San Joaquin and Kings Rivers, if downstream dam capacity of the major dams is exceeded. However, comprehensive analysis of the potential for dam failure and possible downstream effects for these upstream dams has not been undertaken. Dam failure evacuation plans are currently being prepared for 23 dams located within Fresno County.

Dam failure can result from a number of natural or human activities, such as earthquakes, erosion, improper siting, rapidly rising flood waters, and structural and design flaws. Flooding due to dam failure can cause loss of life, damage to property, and other ensuing hazards. Damage to electric-generating facilities and transmission lines associated with hydro-electric dams could also affect life support systems in communities outside the immediate hazard area.

Friant Dam

The San Joaquin River is impounded at Friant Dam in Fresno County, forming Millerton Lake. Friant Dam is operated primarily as an irrigation facility of the Central Valley Project (CVP), although it provides some flood control. Irrigation waters are stored in Millerton Lake, which is also used as a recreational facility, and released through irrigation canals to irrigation districts. In conjunction with approximately 21 upstream reservoirs, forebays and pumping facilities of the CVP, flood operation criteria was developed by the U.S. Army Corps of Engineers (Corps) after the Friant Dam project was completed. Releases are controlled to satisfy downstream riparian water rights settlement conditions. Major releases to the river may occur from March through May to maintain capacity in Millerton Lake for rainfall and snowmelt. Up to 390,000 acre-feet (ac-ft) of the lake's total 520,000 ac-ft capacity may be reserved for flood control, but the flood reserve capacity diminishes to zero by April 1 of each year. These flows are steadily reduced downstream due to the effects of pumping. In addition to providing irrigation water, flows diverted from the San Joaquin River are used for domestic water supply.

In 1992, the Bureau of Reclamation completed a safety of dams investigation and report for Friant Dam to determine the safety of the Dam for different types of adverse conditions, including



overtopping of the Dam during the Probable Maximum Flood, alkali-aggregate reactions of concrete to bind spillway gates in the up position, dam instability due to existing faults and mud seams under the Dam, high uplift pressures, seepage along the horizontal construction joints, seepage into the gallery, and the Maximum Credible Earthquake. The report concluded that the structural classification for Friant Dam is "satisfactory." Based on this report, the Bureau of Reclamation determined that some damage to the dam structure could exist as a result of different types of adverse loading conditions. It was also found that dam structural repair work would be required as part of the Friant Dam's maintenance program. The Bureau of Reclamation is developing the required repair program. The upstream dams and forebays have not been examined to date for structural integrity.

An inundation study completed in March 1997 by the Bureau of Reclamation has redefined a worst-case scenario dam break of Friant Dam to include inundation of a significant portion of the City of Fresno, and a much larger portion of Fresno County than previously described. (See *Friant Dam Inundation Study*, prepared by the Bureau of Reclamation's Technical Service Center in Denver, Colorado). Moreover, since the river has had little in the way of regular maintenance, as noted above, such restrictions in water flow and quantity of water that can be carried by the river could exacerbate dam failure effects. The areas of greatest threat of such inundation are located east of SR 41 and SR 99 overcrossings.

Big Dry Creek Dam

The Big Dry Creek Dam impounds stormwater runoff from Big Dry Creek in the Big Dry Creek Reservoir. Dry Creek Reservoir is owned and operated by the Fresno County Metropolitan Flood Control District, and is intended primarily for flood control of winter runoff from the Dry Creek and Dog Creek watersheds. The reservoir has a storage capacity of approximately 30,000 ac-ft and a surface area of approximately 3,500 acres. The reservoir was designed for a 200-year standard project flood, which is a design specification used by the Corps for reservoirs. The maximum height of the inundation pool is 432.7 feet above mean sea level.

Under wet weather conditions, the Dry Creek Reservoir captures runoff and controls releases into artificial ditches and canals, which drain into either Little Dry Creek, located north of the reservoir, or in a southerly direction into Mill Ditch. Flows from Little Dry Creek and Mill Ditch eventually drain to the San Joaquin River. Flows from the Reservoir can also be diverted into Dog Creek, which also eventually drains to the San Joaquin River. During dry weather conditions, the reservoir does not discharge water and is normally empty, with the exception of a 156 acre-foot residual pool. The top of the pool remains below the elevation of an existing discharge gate.

Pine Flat Dam

The Pine Flat Dam, which was completed in 1954, impounds the Kings River at Pine Flat Reservoir, approximately 25 miles northeast of Reedley. The Dam was constructed for flood control, irrigation, recreation, and water conservation, and is owned by the U.S. Army Corps of Engineers. The reservoir has a storage capacity of approximately 1,000,000 acre-feet.

Redbank-Fancher Creek Projects

The Redbank-Fancher Creeks Flood Control Project consists of two dams, three detention basins, and canals designed to protect developed areas in and around Fresno from a design storm of 200-year frequency. The project was constructed by the Corps and is managed by the FMFCD.

The Corps conducted a dam breach analysis of Redbank and Fancher Creek projects. The results indicate that failure of either of these two facilities would result in a broad sheet flow of approximately two feet over much of north central and central Fresno (city). Although the actual amount of time it would take to reach any specific property as well as the extent of inundation that would occur is subject to many variables; however, some estimates can be made. Initial flood water would reach the area near the intersection of Sierra and Chestnut Avenues within three hours, the California State University, Fresno, campus in four hours, and Fashion Fair in approximately six hours. Additional flooding would occur across the eastern portion of the community with flooding taking place at the Fresno Air Terminal within ten hours.

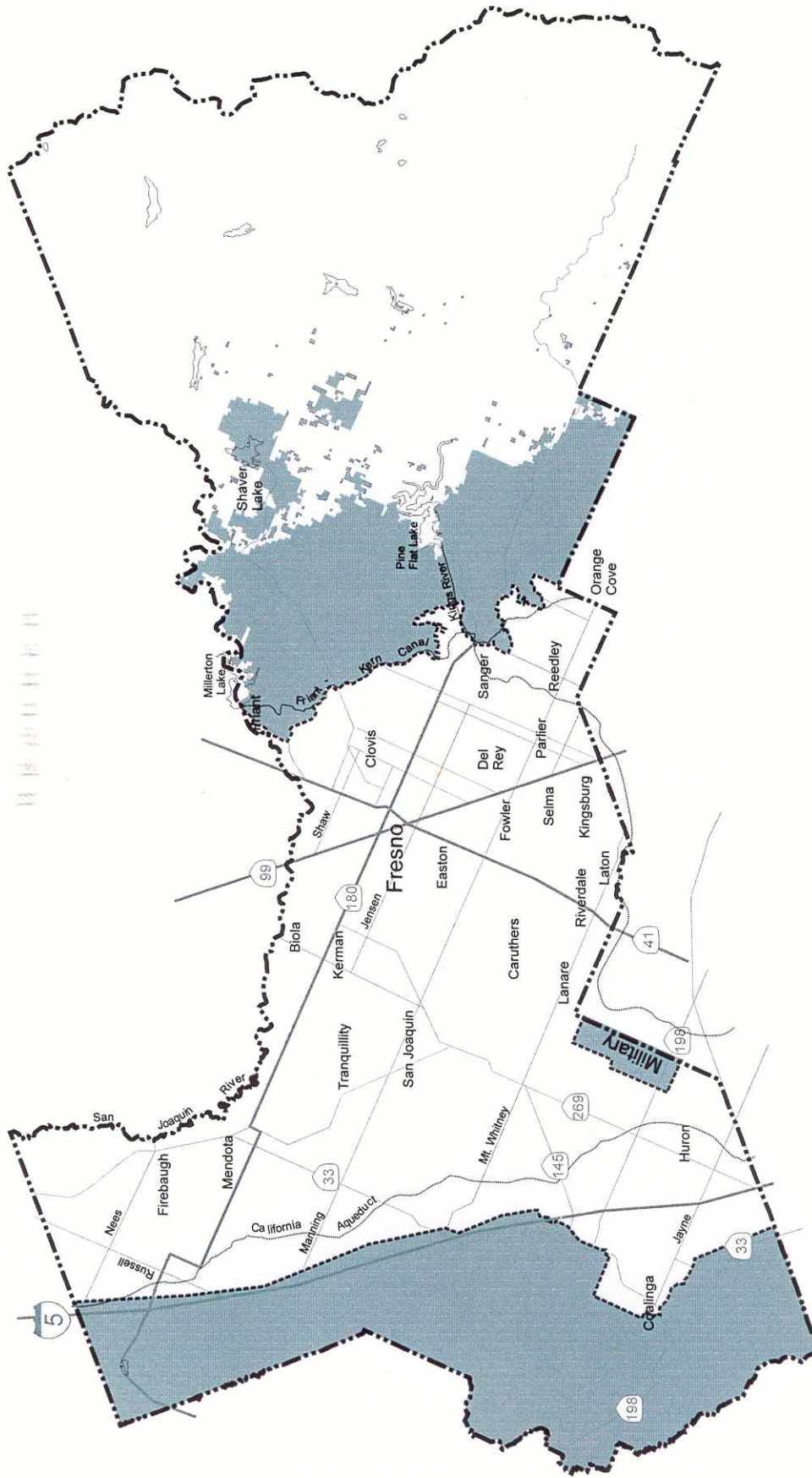
9.4 FIRE HAZARDS

Both urban and wildland fire hazards exist in Fresno County, creating the potential for injury, loss of life, and property damage. Urban fires primarily involve the uncontrolled burning of residential, commercial, or industrial structures due to human activities. Wildland fires affect grass, forest, and brushlands, as well as any structures on these lands. Such fires can result from either human-made or natural causes. The type and amount of fuels, topography, and climate are the primary factors influencing the degree of fire risk. Vegetation fires comprised the majority of fires in the California Department of Forestry and Fire Protection (CDF) Fresno-Kings Ranger Unit and Fresno County and Fig Garden Fire Protection Districts in 1996. Most of the fires were caused by human activities involving motor vehicle and equipment fires, arson, and debris burning.

FIRE PREVENTION AND SUPPRESSION

Public protection classifications are designated by the Insurance Services Office (ISO). The ISO bases its classifications on a number of factors, including fire department location, equipment, and staffing; water supply; and communications abilities. Ratings range from 1 to 10, with 1 being the best possible fire protection, and 10 being the worst. ISO ratings in Fresno County range from 5 to 8. The locations and ratings are described in more detail in Chapter 5, Public Services.

Fresno County and Fig Garden Fire Protection Districts are under contract with the CDF to provide structural and vegetative fire protection services within Fresno County. CDF is also responsible for providing fire protection to State Responsibility Areas (SRAs). Figure 9-9 shows the boundaries of SRA and CDF jurisdictions. SRAs are areas in which the State Board of Forestry has determined that the State has the financial responsibility for fire prevention and suppression in accordance with *Public Resources Code* Section 4102. In recognition of the severity of wildland fire hazard in certain areas of California, the State enacted legislation requiring local jurisdictions with State Responsibility Areas (SRAs) to adopt minimum recommended standards pertaining to road



Fresno County General Plan

Fire Protection Areas

Figure 9-9

Direct Protection Areas for Wildland Fire Protection

State Responsibility Area

Non-State Responsibility Area



NORTH

0 10
1" = 10 miles

Source: California Department of Forestry and Fire Protection, *State Responsibility Areas for Fire Protection*, 1993

standards for fire equipment access, standards for identifying streets, roads, and buildings, minimum private water supply reserves for emergency fire use, and fuel breaks and greenbelts to achieve fuel reductions. With certain exceptions, all new development and construction in SRAs after July 1, 1991 must meet the new standards. The State requirements do not supersede more stringent local regulations.

Past CDF/Fresno County Protection District fire prevention efforts have concentrated on loss-reduction programs and high-intensity public education campaigns. Combined with aggressive civil and criminal action programs, ignitions have been held to a moderate level. However, fire prevention staffing levels preclude many additional programs or projects.

Fire Construction Standards

Public Resources Code Section 4290 *et seq.* sets minimum fire safety standards for development in SRAs. Current development in Fresno County is subject to "Fire Safe" requirements (*Public Resources Code* Section 4291), which include minimum roadway width for access to parcels, turnarounds and maximum length limitations for dead-end roads, driveway width and length standards, and fuel clearance.

URBAN FIRE HAZARDS

Urban fires primarily involve the uncontrolled burning of residential, commercial, and industrial structures due to human-made causes. Factors that exacerbate urban structural fires include substandard building construction, highly flammable materials, delay in response time, and inadequate fire protection services.

WILDLAND FIRE HAZARDS

Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control measures have affected the natural cycle of the ecosystem. Suppression of natural fires allows the understory to become dense, creating the potential for larger and more intense wildland fires. Wind, steepness of terrain, and naturally volatile or hot-burning vegetation contribute to wildland fire hazard potential. Where there is human access into wildland areas, such as the Sierra Nevada and Coast Range foothills, the risk of fire increases because of a greater chance for human carelessness and historic and current fire management practices. Human activities such as smoking, debris burning, and equipment operation are the major causes of wildland fires.

Although the total number of fires in the oak savannah portions of the lower Sierra foothills may have increased with five-acre lot subdivision activity, the size and duration of fires appears to have been reduced in this area due to firebreaks created by driveways and roads, reduced fuels and "checkerboard" fuel patterns through individual safe area vegetation clearance (per PRC 4291); increased vigilance and foster reporting of fires; and early intervention (fire suppression) efforts by individuals and fire companies.

On the other hand, creation of residential parcels in this area has compounded potential property damage from fires and has vastly complicated firefighting responsibilities in the area: wildland firefighting strategies have had to become more like municipal firefighting efforts. Foothill and

mountain subdivisions have also virtually eliminated prescribed burning as a means of fire suppression.

9.5 AIRPORT SAFETY

Airport safety issues are primarily hazards posed to flight and hazards posed to those on the ground. Flight hazards can be physical (e.g., tall structures that would obstruct airspace), visual (such as glare caused by lights or reflective surfaces), or electronic (interference with aircraft instruments or communication systems). As urban areas grow, there is an increased need for airport operations. Such increased activity generates an increased risk of aircraft crash hazards.

With proper land use planning, aircraft safety risks can be reduced, primarily by avoiding incompatible land uses. The formation of airport land use commissions (ALUCs) was mandated in 1968 for all counties containing at least one public use airport (*Public Utilities Code* Section 21670 *et seq.*). The commissioners represent the county, its cities, and the public. Legislation passed in 1982 established a direct link between ALUCs comprehensive plans and land use plans and regulations prepared by cities and counties (*Public Utilities Code* Section 21676). In accordance with this legislation, ALUCs must review general and specific plans of local jurisdictions for consistency with the county's airport comprehensive land use plan (CLUP). Primary and Secondary Review Areas must be identified for each facility. Projects proposed within the geographic boundaries of the Primary Review Area are referred to the ALUC for review and evaluation. Within the Secondary Review Area, only those projects involving a structure or other object with a height that would exceed that permitted under adopted land use zoning would be referred to the ALUC for review.

Air safety zones, which are established at the end of each runway, are intended to restrict the type and intensity of activities that occur in each zone. The State Airport Land Use Planning Handbook allows jurisdictions flexibility in determining air safety zones. Restrictions correspond to the probability of an accident in each zone, based on data generated by the Federal Aviation Administration (FAA). Each zone has certain acceptable and unacceptable land uses, which are determined by safety, noise, and airspace issues relative to runways, departure patterns, and overflight (common aircraft traffic). For example, residential, commercial, industrial, institutional, and parks are considered incompatible land uses within clear zones; however, golf courses and agricultural land uses, provided there are no structures, would be considered compatible. Certain types of residential, commercial, and institutional land uses are not allowed within the approach safety zone. General land use compatibility guidelines for air safety are presented in Appendix 9A.

There are nine public and private airports within Fresno County. These airports handle a total of approximately 400,700 operations (take-offs and landings) per year. Specific land use policy plans have been developed for five airports in Fresno County: Fresno Air Terminal, Coalinga Airport, Harris Ranch Airport, Sierra Sky Park Airport, and Fresno Chandler Downtown Airport. In addition, a single land use policy plan has been prepared for four public use general aviation airports located in Firebaugh, Mendota, Reedley, and Selma. Land use and safety considerations pertaining to each of these facilities is summarized below.

FRESNO AIR TERMINAL

The Fresno Air Terminal (FAT) airport is the largest and busiest airport in the San Joaquin Valley, serving a six-county region. The airport is owned and operated by the City of Fresno and occupies approximately 2,300 acres of land located approximately five miles northeast of downtown Fresno. The principal runway (11L-29R) is 9,222 feet long and 150 feet wide. A parallel general aviation runway (11R-29L) is 7,200 feet long and 100 feet wide. Highly urbanized and mixed land uses surround the facility.

The FAT is used by air carriers, commuter passenger airlines, air cargo operators, and for general aviation purposes. The military is also a major user of the airport. The California Air National Guard facility occupies a 58-acre area adjacent to McKinley Avenue in the southeast portion of the airport. A helicopter repair and maintenance unit of the Army National Guard, a unit of the U.S. Marine Corps Reserve, and the Fresno Air Attack Base (aerial firefighting units of the U.S. Forest Service and California Department of Forestry and Fire Protection) are also present. A number of corporate aviation businesses occupy facilities north of the runways. Approximately 250 general aviation aircraft are based at the FAT. Four fixed-base operators offer services including fueling, aircraft maintenance, repair and storage, charter services, flight instruction, aircraft mechanic school, advertising, surveying, air taxi, patrol, and rentals and sales. In 1990, there were approximately 210,000 operations. Estimated annual operations for the year 2010 range from 379,000 to 400,000.

The *Fresno Air Terminal and Environs Plan*, adopted in 1992, was derived from the former *FAT Specific Plan* which was originally adopted in 1980 and substantially revised in 1987. The 1987 *Specific Plan* was based on the *FAT Land Use Policy Plan* and incorporated most of the form and substance of the *Land Use Policy Plan*. It also established new noise contours and reconciled the land uses shown on the *FAT Specific Plan* map with the 1984 *City of Fresno General Plan*. In addition to consolidating the previous documents, the purpose of the *FAT and Environs Plan* is to guide the orderly development of airport property and facilities and to ensure compatibility of land uses to prevent potential problems related to aircraft noise and safety. The *FAT Redevelopment Plan*, adopted in 1988, is a separate plan covering a 102-acre area located west of Clovis Avenue and south of Shields Avenue. The purpose of the redevelopment plan is the eventual conversion of the project area into a high-quality aviation-related business park.

The FAT has incorporated four Approach Protection Zones (APZs) into its land use plan (see Appendix 9A). APZ I is defined as that area at ground level that begins at the end of each primary surface and terminates directly below each approach surface slope. APZ II is 2,500 feet wide by 5,000 feet long to the northwest and southeast of the thresholds of the runways. APZ III extends 5,000 feet beyond APZ II, and APZ IV extends 4,000 feet beyond APZ III. The *Environs Plan* identifies specific land use compatibility criteria for each zone.

NEW COALINGA AIRPORT

The New Coalinga Airport, which has replaced the old municipal airport, is a general aviation airport with one 5,000-foot-long runway in an undeveloped area at the northwest corner of Phelps Avenue and Calaveras Avenue within the city of Coalinga Sphere of Influence. The *Coalinga Airport Land Use Plan (ALUP)*, prepared in 1994, contains goals and policies pertaining to noise, air safety zones, land use compatibility, general nuisance/aviation easements, and airspace protection.

The *Airport Master Plan* for the New Coalinga Airport was adopted by the Coalinga City Council in 1990. Existing and planned land uses are agriculture and wildlife conservation. Such uses prohibit any urban development that could conflict with airport operations. The City of Coalinga is in the approval process for its Habitat Conservation Plan (HCP) for the Sphere of Influence of the City of Coalinga. A habitat conservation bank of 490 acres has been established by the City and will be used to mitigate all development impacts of the City including those of the airport.

There are approximately 10 aircraft based at the airport with approximately 2,800 aircraft operations (takeoffs and landings) annually. By the year 2010, 50 based aircraft are expected to result in approximately 25,000 annual operations. At buildout (50 years), 100 based aircraft and 50,000 annual operations are anticipated.

Consistent with Federal Aviation Regulations (FAR) Part 77, the New Coalinga Airport has established an *Approach and Clear Zone Plan* (ACZP). Clear zones are trapezoidal areas at each runway end, where safety concerns are greatest due to the potential for crashes on takeoffs and landings. The Part 77 approach surface is an imaginary surface that extends beyond the clear zone, sloping upward from the runway at an angle determined by the mix of aircraft and airport weather capability. The approach surface is defined to give aircraft an unobstructed flight path to the runway. Although less hazardous than clear zones, approach safety zones still contain potential for accidents. The ACZP for the New Coalinga Airport is shown in Appendix 9-A. The city of Coalinga owns the clear zones and approach safety zones, except for the portion of the ultimate clear zone extending into an agricultural field. For that portion of land, an aviation easement eventually will be required from the property owner. Initial airport development assumed visual clear zones, but the 20-year buildout under the *Airport Master Plan*, including the ACZP, allows for a precision-instrument approach and the appropriate clear zone.

HARRIS RANCH AIRPORT

The Harris Ranch Airport is located in the southeast quadrant of the intersection of Interstate 5 and State Route 198 (Dorris Avenue) interchange, approximately 10 miles northeast of the city of Coalinga. The airport is a Basic Utility Stage 1 facility (accommodating aircraft less than 12,500 pounds) with a single runway 2,820 feet long and 30 feet wide. It is a visual approach facility and is not lighted. The principal use is from itinerant traffic supporting the commercial development located in the quadrant. There are no based aircraft. The *Harris Ranch Airport Land Use Policy Plan* was prepared in 1995. FAR Part 77 approach surface and clear zones have been established for the Harris Ranch Airport and are shown in Appendix 9A.

A formal Master Plan has not been developed for the airport; however, Fresno County has approved a series of conditional use permits for both commercial development within the quadrant and for existing and planned airport facilities. In addition, Caltrans Aeronautics Program approved a long-term airport layout plan in 1980.

SIERRA SKY PARK

The Sierra Sky Park public-use airport is located approximately ten miles northwest of downtown Fresno northwest of the intersection of West Herndon Avenue and North Blythe Avenue. The San Joaquin Country Club and Riverside Golf Course are nearby. The facility is privately owned and funded, and was established in conjunction with a surrounding residential and commercial

development as a "fly-in" subdivision – the first in the United States. It is classified as a Basic Utility Stage I airport. The runway is paved and has lights for night operations. There are approximately 60 based aircraft within the surrounding residences. Each one of the lots of the Sierra Sky Park subdivision has easements to park two aircraft each. The airport has no fixed base operation services. Operations in 1980 were reported to be approximately 100,000. Current data is not available, but operations are estimated to be somewhat less due to the decline of general aviation activity and the absence of a fixed base operator.

The Sierra Sky Park Land Use Policy Plan was prepared in 1983 and revised in 1990 and 1995. The operation of Sierra Sky Park was the subject of litigation between the airport owners and surrounding property owners regarding easement rights. The issue was resolved with an agreement that provides for continued day and night use of the airport by the public. FAR Part 77 approach and clear zones have been established for the facility and are shown in Appendix 9A.

FRESNO-CHANDLER DOWNTOWN AIRPORT

The Fresno-Chandler Downtown Airport is owned and operated by the city of Fresno. Acting as a reliever airport for the FAT, Fresno-Chandler serves small- and medium-size private and corporate aircraft. The facility occupies an area of 200 acres approximately one and one-half miles west of downtown Fresno and is within the Edison Community Plan Area. Major land uses in the vicinity of the airport are agriculture, residential, and public and industrial.

Fresno-Chandler is classified as a Basic Utility State II Airport and is capable of accommodating 95 percent of propeller-driven aircraft weighing less than 12,500 pounds. There are two runways: 12L-30R is 3,475 feet long and 75 feet wide, and 12R-30L is 3,441 feet long and 75 feet wide. It is configured to handle approximately 200 based aircraft, and there are two fixed base operators.

An *Enviroins Specific Plan* was adopted in 1982. Preparation of a master plan is currently (1997) underway to identify future physical and operational improvements. The Plan will also evaluate land use compatibility, economic impacts, potential noise exposure, and airspace usage. FAR Part 77 approach and clear zones have been established for the facility and are shown in Appendix 9A.

FRESNO COUNTY AIRPORTS

Firebaugh Municipal Airport

The Firebaugh Municipal Airport, which is owned and operated by the City of Firebaugh, is located on the north side of Nees Avenue, west of the Main Canal. Surrounding unincorporated land is designated for agricultural, industrial, and open space reserve uses. The Firebaugh Airport consists of one runway 3,100 feet long and 60 feet wide. There are about 1,200 annual operations. Crop dusters comprise a little over half the operations. FAR Part 77 approach and clear zones have been established for the facility and are shown in Appendix 9A.

Mendota Municipal Airport

The Mendota Municipal Airport is located east of SR 33, between the end of 9th Street and the San Joaquin River. Developed land uses are present to the west. Areas north, east, and south are primarily undeveloped. The Mendota Municipal Airport has one 2,500-foot runway. FAR Part 77 approach and clear zone have been established for the facility and are shown in Appendix 9A.

Reedley Municipal Airport

The Reedley Municipal Airport is located on a 138-acre site approximately five miles north of Reedley, on the west side of Frankwood Avenue between American and Central Avenues. The airport is a Basic Utility Stage 1 visual approach facility with a single runway 3,300 feet long and 50 feet wide and has medium-intensity runway lights. In 1991, there were 59 based aircraft and 10,000 operations. For the year 2000, 105 based aircraft with approximately 16,000 annual operations are anticipated. Aircraft types are predominantly single-engine with some light jets and twin-engine aircraft.

Agriculture, primarily orchards and vineyards, comprises most of the land use in the airport environs. The surrounding area is primarily zoned by Fresno County for exclusive agricultural uses with 20-acre minimum parcel size. Numerous residences are scattered throughout the areas. During the public hearings on the proposed airport acquisition and development in 1972, the airport's proximity to an elementary school was a major land use compatibility concern due to safety reasons. However, runway alignment approximately 2,400 feet from the school and establishment of a flight pattern away from the school provided adequate mitigation.

The Reedley Municipal Airport Master Plan is a component of the city of Reedley General Plan 2012. FAR Part 77 approach and clear zones are defined in the Master Plan as well as in the *Fresno County Airports Land Use Policy Plan* and are shown in Appendix 9A. Criteria for airport/land use compatibility is provided in the *Airports Land Use Policy Plan*.

The city of Reedley is currently proceeding with plans for future development of Reedley Municipal Airport. Installation of Visual Approach Slope Indicator (VASI) and runway extensions to bring the airport to Basic Utility Stage II standards are among the planned projects. No commercial air carrier service is anticipated.

Selma Aerodrome

The Selma Aerodrome is located west of State Route 99 between Huntsman and Floral Avenues and is within the proposed Sphere of Influence for the city of Selma. Existing and proposed land use designations in the vicinity of the airport include open space, commercial, light industrial, and business park uses. Airport land use/safety compatibility criteria has been specified in the *Land Use Element of the City of Selma General Plan Update* (1997), as well as in the *Fresno County Airports Land Use Policy Plan*. FAR Part 77 approach and clear zones have been established for the facility and are shown in Appendix 9A.

LEMOORE NAVAL AIR STATION

Portions of Lemoore Naval Air Station occupy approximately 19 square miles in south-central Fresno County, approximately 20 miles northeast of Coalinga. Most of the facility is located in Kings County. The main runways are oriented northwest-southeast across the county line; one runway extends approximately 2,500 feet into Fresno County, the other approximately 4,000 feet. The facility is formally considered to be located in Kings County. The following information is provided to generally describe general land use and safety considerations that may be relevant for Fresno County planning purposes.

According to Kings County land use mapping, the facility is surrounded by land designated for agricultural uses to ensure the preservation of large and sparsely developed parcels in the area for safety purposes. Lemoore Naval Air Station discourages, and Kings County severely limits, development of any sort within three miles of the air station, in part to limit the effect of jet aircraft noise on nearby land uses and for airspace/safety purposes. Kings County implements this limitation by zoning the area for exclusive agricultural use at a minimum parcel size of 40 acres.

Lemoore Naval Air Station has identified Air Installation Compatible Use Zones, which are recognized in the 1994 *Kings County Airport Land Use Compatibility Plan*. FAR Part 77 approach and clear zones have been established for the facility and are shown in Appendix 9A.

9.6 HAZARDOUS WASTE

As defined by the *California Health and Safety Code*, hazardous waste is "a waste or combination of wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may either: (a) cause, or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating irreversible, illness, or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed." This section describes how hazardous waste is managed in Fresno County, including generation, transportation, disposal, treatment, storage, and disposal facilities, and contaminated sites.

FRESNO COUNTY HAZARDOUS WASTE MANAGEMENT PLAN

Fresno County has prepared a *Hazardous Waste Management Plan (HWMP)* in accordance with *California Health and Safety Code Section 24135 et seq.* The Fresno County HWMP, which was developed in 1988, identifies hazardous waste generators within the county, amounts and types of waste produced, and projected waste generation. In addition, the Plan identifies the need for any potential future locations of treatment, storage, and disposal (TSD) facilities and includes policies and potential impacts for the management of hazardous waste within the county. The major goal of the HWMP is to reduce the need for new hazardous waste facilities by reducing waste at its source through recycling, reduced use of hazardous materials, and public education. The HWMP was, for the second time, submitted to the State in 1992 and was not approved.

HAZARDOUS WASTE PRODUCTION AND DISPOSAL

Hazardous waste generators in Fresno County include industries, businesses, public and private institutions, and households. In 1995, there were approximately 400 small-quantity (between 100

and 1,000 kilograms per month) hazardous waste generators, and approximately 300 large-quantity (more than 1,000 kilograms per month) hazardous waste generators. Appendix 9B contains a list of large-quantity generators, based on data maintained by the U.S. Environmental Protection Agency (EPA). According to the 1988 HWMP, waste oil comprised the largest percentage (34 percent) of industrial hazardous waste generated in Fresno County. Nonhalogenated solvents, pesticides, polychlorinated biphenyls (PCBs) and dioxins, and nonhalogenated organic sludges and solids accounted for slightly less (31 percent). The majority of these businesses are located in the Fresno-Clovis metropolitan area.

The total of industrial wastes generated in 1986 was approximately 28,276 tons. Of this amount, approximately 14,176 tons was generated by small-quantity generators. In 1986 Fresno County hazardous waste generators shipped approximately 18,500 to 18,700 tons of manifested hazardous waste off-site. Wastes imported into Fresno County accounted for approximately 18,630 tons in 1986, of which 89 percent were recovered at Safety Kleen's recovery facility in Reedley (see below).

EXISTING TREATMENT, STORAGE, AND DISPOSAL FACILITIES

There are two operating and one inactive permitted treatment, storage, and disposal facilities in Fresno County.

Safety Kleen Corporation

Safety Kleen Corporation operates two TSD facilities in Fresno County, one treatment facility in Reedley and one collection center in Fresno. Parts cleaning solvents (mineral spirits and immersion cleaner) are recycled at the Reedley facility.

The Safety Kleen Fresno facility collects nonhalogenated solvents (mineral spirits), halogenated solvents (immersion cleaner and waste perchloroethylene from dry cleaning establishments), and waste paint and lacquer thinner from Fresno County as well as from other counties. Safety Kleen stores the waste mineral spirits temporarily before shipping them to treatment facilities. The paint waste and lacquer thinners are shipped to an outside recycler in the Los Angeles area. Perchloroethylene is shipped out-of-state for treatment at Safety Kleen's halogenated solvent treatment facility in Texas. Waste paint and perchloroethylene have been collected at the Fresno facility since 1987; the facility has collected other wastes for a longer period. Safety Kleen's Fresno facility collects approximately 355,000 gallons of nonhalogenated solvents annually. Fresno County generates 40 percent of this volume, and the remaining 60 percent originates in other counties.

Parts cleaning solvents (mineral spirits and immersion cleaner) are recycled at the Reedley facility. In 1986 Safety Kleen had the capacity to recover over 29,000 tons per year of solvents at the facility. Safety Kleen plans a five to ten percent annual expansion of the Reedley facility capacity to recycle parts cleaning solvents. Because the other wastes are not treated by Safety Kleen facilities within Fresno County, plans for expansion of treatment capacities for paints and halogenated solvents (dry cleaning wastes) are not known.

Blue Hills Disposal Site

Fresno County owns and operates a permitted Class I disposal facility, the Blue Hills Disposal site. Through Fall 1982, the Blue Hills facility was open for disposal of empty agricultural chemical containers for two periods of two weeks each during Spring and Fall. Since Spring 1983, disposal has been limited to nonhazardous, triple-rinsed containers. The existing site has been closed in accordance with State hazardous waste facility closure regulations (*California Code of Regulations*, Title 22).

POTENTIAL TREATMENT, STORAGE, AND DISPOSAL FACILITIES

California Health and Safety Code Section 25135.1 requires that a HWMP must include, at a minimum, an identification of general areas for siting new hazardous waste management facilities. Activities at such facilities could include transfer and storage, aqueous treatment, organics recycling, solidification and stabilization, incinerators, or residuals repositories. In Fresno County, transfer stations and oil recycling facilities are particularly needed to accommodate projected hazardous waste generation and disposal needs.

Siting criteria adapted from California Department of Health Services criteria was used to delineate land considered unsuitable for siting TSD facilities. Such criteria included seismic hazards, flooding and dam inundation, biological resources, soil conditions, mineral resources, aquifer characteristics, distance from residences and sensitive populations, air quality, location of major transportation routes, agricultural land use, proximity to developed public utilities and services, special zoning or other land uses (e.g., tribal lands), and cultural and visual resources. An overlay system based on available siting criteria was used to locate areas where the fewest constraints were found. These areas included undeveloped areas to the east of the Fresno-Clovis metropolitan area in the Sierra Nevada foothills, scattered locations in the valley, and along Interstate 5 and State Route 198. During the public comment process on the County's *Hazardous Waste Management Plan*, Sierra Nevada foothill areas were acknowledged to be unsuited for hazardous waste disposal due to limited road access, fire hazard areas, and the fractured rock aquifers which could not be effectively cleaned up or monitored if a spill occurred. Additional comprehensive evaluation would be necessary to select specific site(s).

TRANSPORTATION ROUTES

Hazardous wastes are transported through Fresno County by two modes: truck and rail. Two major north-south roadways are located in Fresno County. State Route 99 is a freeway that runs through the central part of the county. Major rail lines in the vicinity of State Route 99 include Union Pacific and the Burlington Northern Santa Fe Railroads. To the west, Interstate 5 traverses the county at the base of the Coast Range foothills. State Routes 33, 41, 43, 63, 145, 168, 180, and 198 provide local service to urban and rural areas in the county. County roads and city streets may be used to transport hazardous wastes from their sources to disposal facilities to the regional and state roadways.

Stringent federal and state regulations pertaining to container packaging and labeling, vehicle placarding, and manifesting have been established to protect the public and environment during the transportation of hazardous wastes. Federal requirements are specified by the U.S. Department of Transportation (DOT) in Title 49 of the Code of Federal Regulations. California regulations

include those established by the Department of Toxic Substances Control (Title 22 of the *California Code of Regulations*) and California Highway Patrol (Title 13 of the *California Code of Regulations*). Transporters carrying hazardous wastes must also adhere to certain routing requirements enforced by the California Highway Patrol under Section 31303 of the *California Vehicle Code*.

DOT has established nine hazardous materials classifications: explosives, compressed gases, flammable/combustible liquids, flammable solids, oxidizers, poisons, corrosive, radioactive, and miscellaneous. Hazardous waste transporters must adhere to certain routing requirements enforced by the California Highway Patrol. Transportation of hazardous wastes from the point of origin to the appropriate waste facility must be by the most direct route, utilizing State or interstate highways whenever possible, and only highways of sufficient width and load-bearing capacity for the vehicle or combination of vehicles used. All nine DOT classes of hazardous materials, which includes hazardous wastes, may be through-transported on Interstate 5. Materials that are poisonous by inhalation, explosives, or high-level radioactive may also be through-transported on certain State Routes, including SR 33, 41, 63, 99, 180, and 198, subject to certain restrictions.

CONTAMINATED SITES

Pesticide manufacturing/processing, storage, applicator facilities, industrial manufacturing and processing, and old dumps comprise most of the sites where soil or groundwater contamination has occurred. Twenty sites in Fresno County were identified in the 1988 HWMP as "major contaminated sites." Five sites were included on the federal National Priorities List (NPL). Since 1988, three sites have been certified (i.e. remediation has been completed) by the California Department of Toxic Substances Control. According to the Fresno County Environmental Health Department, no new major contaminated sites have been identified. In addition to the major sites, approximately 400 smaller sites have been included in the 1998 California Department of Substances Control Hazardous Waste and Substances Site List compiled pursuant to *Government Code* Section 65962.5 ("Cortese List"). The majority of the sites are in the Fresno and Clovis metropolitan area and are related to leaking Underground Storage Tanks (USTs). A list of sites included in the Cortese List is included in Appendix 9C.

Leaking Underground Storage Tanks

The majority of underground storage tanks contain gasoline and other petroleum products such as diesel and waste oil. A variety of other hazardous materials and wastes, such as solvents, are also stored in underground storage tanks. Leaking underground storage tanks, particularly those containing petroleum products, represent a significant portion of sources of soil and groundwater contamination. According to the Central Valley Regional Water Quality Control Board (CVRWQCB) Underground Tank Tracking System Database, over 600 underground tank locations in Fresno County, primarily in the Fresno-Clovis metropolitan area, have been identified as contaminated from leaking underground storage tanks. Soil or groundwater contamination due to leaking underground tanks at automobile service stations comprised almost all of the cases. Of the 600, approximately one-third have been closed (i.e., remediated or no further action is required) by Fresno County or the CVRWQCB.

9.7 HAZARDOUS MATERIALS EMERGENCY RESPONSE

Fresno County's Health Services Division coordinates an Emergency Response Program that provides technical oversight and assistance for all emergency situations, including hazardous materials incidents that occur in Fresno County. The program began operation in 1981, and a *Hazardous Materials Emergency Plan* has been developed. The Plan is being revised to better reflect how service is actually provided and to incorporate Incident Command System standards. The revised plan is anticipated to be approved in late 1997.

The majority of hazardous materials incidents in Fresno County are fuel-spill related. If a hazardous materials incident occurs, an Emergency Response Van is dispatched by the Sheriff's office. When Environmental Health Services personnel reach the site, they assist other emergency response personnel in (1) assessing the situation, (2) determining cleanup strategies, (3) overseeing evacuation, if necessary, and (4) certifying that cleanup is complete.

9.8 FINDINGS

- Several active and potentially active faults have been identified in Fresno County. Two of the active faults in western Fresno County have been designated Alquist-Priolo Earthquake Hazard Zones. No structure for human occupancy may be built within an Earthquake Hazard Zone (EHZ) until geologic investigations demonstrate that the site is free of fault traces that are likely to rupture with surface displacement. Special development standards associated with Alquist-Priolo requirements would be necessary for development in those areas.
- Groundshaking is the primary seismic hazard in Fresno County, because of the county's seismic setting and record of historical activity.
- Areas of fracturing and steep slopes with inadequate groundcover in the foothill and mountain areas are prone to landsliding. There is a potential for small slides and slumping along steep banks of rivers and creeks in the valley area.
- The Mono Lake-Long Valley Area is adjacent to the north and east of northernmost areas of Fresno County and is considered an active volcanic region of California. Northern portions of the Silver Divide (including Duck Lake and Fish Creek) could be subject to tephra hazards. However, due to the area's remote location, potential safety hazards would be limited to individuals visiting the area. Assuming a worst-case scenario, geologists estimate that areas including the South Fork of the San Joaquin River, Mono Creek, Margaret Lakes, Duck Lake, Fish Creek, Lake Thomas A. Edison, Bear Creek, Lake Italy, and the town of Mono Hot Springs could be subject to eight inches or more of compacted ash. Up to two inches of ash could fall within a 50-mile radius of eruptions, should they occur, in the Mono Lake-Long Valley Area, potentially affecting Auberry, Prather, Meadow Lakes, Pine Ridge, Toolhouse, Dinkey Creek, Humphreys Station, Courtright Reservoir, Pine Flat Reservoir area, and numerous small lakes, creeks, and streams. However, historic wind directions and windspeeds suggest that most volcanic ash from large to very large eruptions would be deposited to the east of the volcano or volcanic vents, which would minimize potential ashfall effects in Fresno County.
- Principal flooding problems lie along the San Joaquin and Kings Rivers, smaller perennial streams in the Sierra Nevada foothills and to areas in western Fresno County. This area includes the cities of Huron and Mendota which become flooded from streams flowing east from the Coast Range. Friant and Pine Flat Dams, upstream reservoirs, and stormwater detention/retention facilities operated by the Fresno-Clovis Metropolitan Flood Control District have minimized flooding problems in highly urbanized areas in the valley. However, FEMA maps depicting the 100-year floodplain for the San Joaquin River probably do not reflect the true extent and risk of flooding due to obstruction by vegetation and development in the river channel.
- Urban and wildland fire hazards exist in Fresno County, creating the potential for injury, loss of life, and property damage. Urban fires primarily involve the uncontrolled burning of residential, commercial, or industrial structures due to human activities. Wildland fires affect grass, forest, and brushlands, as well as any structures on these lands. Wildland fire hazards are related to wind, steepness of terrain, and naturally volatile or hot-burning vegetation. Creation of residential parcels in the lower Sierra foothills has compounded property damage from fires and has complicated firefighting responsibilities in the area. Foothill and mountain

subdivisions have substantially reduced prescribed burning as a means of fire prevention. However, increased vigilance, faster reporting of fires and early intervention, combined with firebreaks created by driveways and roads, reduced fuels, and individual safe area vegetation clearance, has reduced the size and duration of fires.

- ISO ratings in Fresno County range from 5 to 8. Vegetation fires comprised the majority of fires in the California Department of Forestry and Fire Protection (CDF) Fresno-Kings Ranger Unit and Fresno County and Fig Garden Fire Protection Districts in 1996. Most of the fires were caused by human activities involving motor vehicle and equipment fires, arson, and debris burning. Past CDF/Fresno County Fire Protection District fire prevention efforts have kept fires to a moderate level. However, fire prevention staffing levels preclude many additional programs or projects.
- Air safety zones have been established for each airport in the county to restrict the type and intensity of activities that may occur in each zone. Restrictions correspond to the probability of an accident in each zone, based on data generated by the Federal Aviation Administration (FAA).
- Hazardous waste generators in Fresno County include industries, businesses, public and private institutions, and households. Waste oil comprises approximately one-third of industrial hazardous waste generated in Fresno County. Nonhalogenated solvents, pesticides, polychlorinated biphenyls (PCBs) and dioxins, and nonhalogenated organic sludges and solids accounted for slightly less. The majority of hazardous waste-generating businesses are located in the Fresno-Clovis Metropolitan Area.
- There are two operating and one inactive permitted hazardous materials treatment, storage, and disposal (TSD) facilities in Fresno County. General geographic areas where other TSD facilities could be located include undeveloped areas to the east of the Fresno-Clovis Metropolitan Area in the Sierra Nevada foothills, scattered locations in the valley, and along Interstate 5 and State Route 198. Additional comprehensive evaluation would be necessary to select specific site(s).
- Several sites in Fresno County are under agency oversight for soil or groundwater contamination. Five sites have been included on the federal National Priorities List (NPL). Contamination at contaminated sites is related primarily to industrial operations such as mining, chemical manufacturing, processing, or recycling, wood treatment, agricultural chemicals application, and aircraft servicing. Most of the sites are located in the Fresno-Clovis Metropolitan Area. Approximately 600 leaking underground fuel storage tank sites have also been identified throughout the county. Nearly all of the leaking tanks contain gasoline or diesel products. Approximately one-third of the sites have been remediated or no further action is required.

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Richards, Bill, California Department of Forestry and Fire Protection

Stickney, Dale, California Division of Mines and Geology

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9.11 GLOSSARY

Active Fault - As defined by the California Division of Mines and Geology, a fault that has shown displace within Holocene time (last 11,000 years). For planning purposes, such faults can be expected to move within the next hundred years.

Alluvial - Pertaining to or composed of alluvium, or deposited by a stream or running water.

Alluvium - A general term for clay, silt, sand, gravel or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sort or semi-sorted sediment in the bed of the stream or on its flood plain or delta, or as a cone or fan at the base of the mountain.

Approach Zone - The air space at each end of a runway that defines the glide path or approach path of an aircraft and that should be free from obstruction.

Aquifer - A water-bearing bed of stratum of permeable rock, sand, or gravel capable of yielding considerable amount of water to wells or springs.

Clear Zone - The section of an airport approach zone where the geometric plane defining the glide path is 50 feet or less above the center-line of the runway. The clear zone ends where the height of the glide path above ground level is 50 feet. Land use under the clear zone is restricted.

Compaction - Reduction in bulk volume or thickness of, or the pore space within, a body of fine-grained sediments in response to the increasing weight of overlying material that is continually being deposited, or to the pressure resulting from the earth movements within the crust. It is expressed as a decrease in porosity brought about by a thicker packing of the sediment particles.

Consolidated Material - Soil or rocks that have become firm as a result of compaction.

Earthquake - Perceptible trembling to violent shanking of the ground, produced by sudden displacement of rock below and at the earth's surface.

Epicenter - An area of the surface of the earth directly above the focus (true center of an earthquake, within which the strain energy is first converted to elastic wave energy of an earthquake.

Erosion - Movement of material (such as soil) from one place to another on the earth's surface. Agents of movement include water, ice, wind, and gravity.

Expansion (Shrink-Swell) Potential - The relative volume change in a soil with a gain in moisture. Expansive soils are those that greatly increase in volume when they absorb water and shrink when they dry out.

Fault - A fracture in the earth's crust accompanied by a displacement of one side with respect to the other and in a direction parallel to the fracture.

Fault System - Two or more interconnecting fault sets.

Fault Trace - The intersection of a fault with the earth's surface.

Fault Zone - A zone in which surface disruption or rock fracture has occurred due to movement along a fault. A fault zone may be expressed as an area with numerous small fractures, breccia (essentially, fractured rock) as a fault gouge. A fault zone may be anywhere from a few meters or yards) to two or more kilometers (1 mile or more) wide.

Fire Hazard Zone - An area where, due to slope, fuel, weather, or other fire-related conditions, the potential loss of life and property from a fire necessitates special fire protection measures and planning before development occurs.

Floodplain - As defined by the Federal Emergency Management Agency, any land area susceptible to being inundated by water from any source. The 100-year flood (base flood) has a one percent chance of being equaled or exceeded in any given year.

Ground Failure - Mudslide, landslide, liquefaction, of the seismic compaction of soils.

Groundshaking - When movement occurs along a fault, the energy generated is released as waves, which cause groundshaking. Groundshaking intensity varies with the magnitude of the earthquake, the distance from the epicenter, and the type of rock or sediment through which the seismic waves move. The strongest ground motion, or groundshaking, typically occurs near the epicenter of the earthquake and attenuates (diminishes) as the seismic waves move away from the epicenter. In general, loose or soft saturated sediments amplify groundshaking more than dense or stiff soils or bedrock materials.

Hazardous Material - As defined by the California Health and Safety Code, a material that, because of its quantity, concentration, or physical, chemical characteristics poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment

Hazardous Waste - As defined by the California Health and Safety Code, a waste or combination of wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may either: (a) cause, or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating irreversible, illness, or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

Holocene - a period of geologic time since the last ice age in North America, approximately 11,000 years.

Inactive Fault - A fault which shows no evidence of movement in recent geologic time and no potential for movement in the relatively near future.

Inferred Fault - A fault whose location is based largely on qualitative knowledge of the geologic characteristics of the location and for which no known surface displacement has been observed or quantified.

Intensity (of an earthquake) - A measure of the effects of earthquake waves on people, structures, and earth's surface at a particular place. The intensity at a specific point depends not only upon the strength of the earthquake, or the earthquake magnitude, but also upon the distance from the point to the epicenter and the local geology. Intensity may be contrasted with magnitude, which is a measure of the total energy released by an earthquake.

Landslide - A general term for relatively rapid mass movement, such as slump, rock slide, debris slide, mudflow, and earthflow.

Lateral Spreading - The movement of loose soils over horizontal or low-angle slopes into open areas, caused by ground motion during an earthquake.

Liquefaction - A process whereby soil is temporarily transformed to a fluid form during intense and prolonged groundshaking or because of a sudden shock or strain.

Magnitude (earthquake) - A measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic observations and mathematical calculations.

Maximum Credible Earthquake (MCE) - As defined by the California Division of Mines and Geology, the largest earthquake (measured in magnitude on the Richter Scale) that appears to be reasonably capable of occurring under the presently known geologic framework.

Potentially Active Fault - As defined by the California Division of Mines and Geology, a fault that has shown displacement during Quaternary time (last 1.6 million years).

Quaternary - a period of geologic time from 1.6 million years to the present.

Seiche - A standing wave (periodic oscillation) produced in a body of water such as a reservoir, lake, or harbor, by wind, atmospheric changes, or earthquakes.

Seismic - Pertaining to earthquake or earth vibration, including those that are artificially induced.

Settlement - Physical rearrangement of soil materials caused by a reduction in void space between the particles, resulting in a less stable alignment of individual minerals.

State Responsibility Area (SRA) - Areas in which the California State Board of Forestry has determined that the State has financial responsibility for fire prevention and suppression.

Subsidence - Gradual settling or sinking of the earth's surface with little or no horizontal motion, usually as the result of the withdrawal of oil, natural gas, or groundwater, or hydrocompaction.

Surface Rupture - An observable break in the ground surface and associated deformation resulting from movement along a fault.

Water Table - The upper surface of saturated earth material below which all materials are saturated.

Wildland - A non-urban, natural area that contains uncultivated land, timber, range, watershed, brush, or grasslands.

APPENDIX 9A

APPROACH PROTECTION ZONES

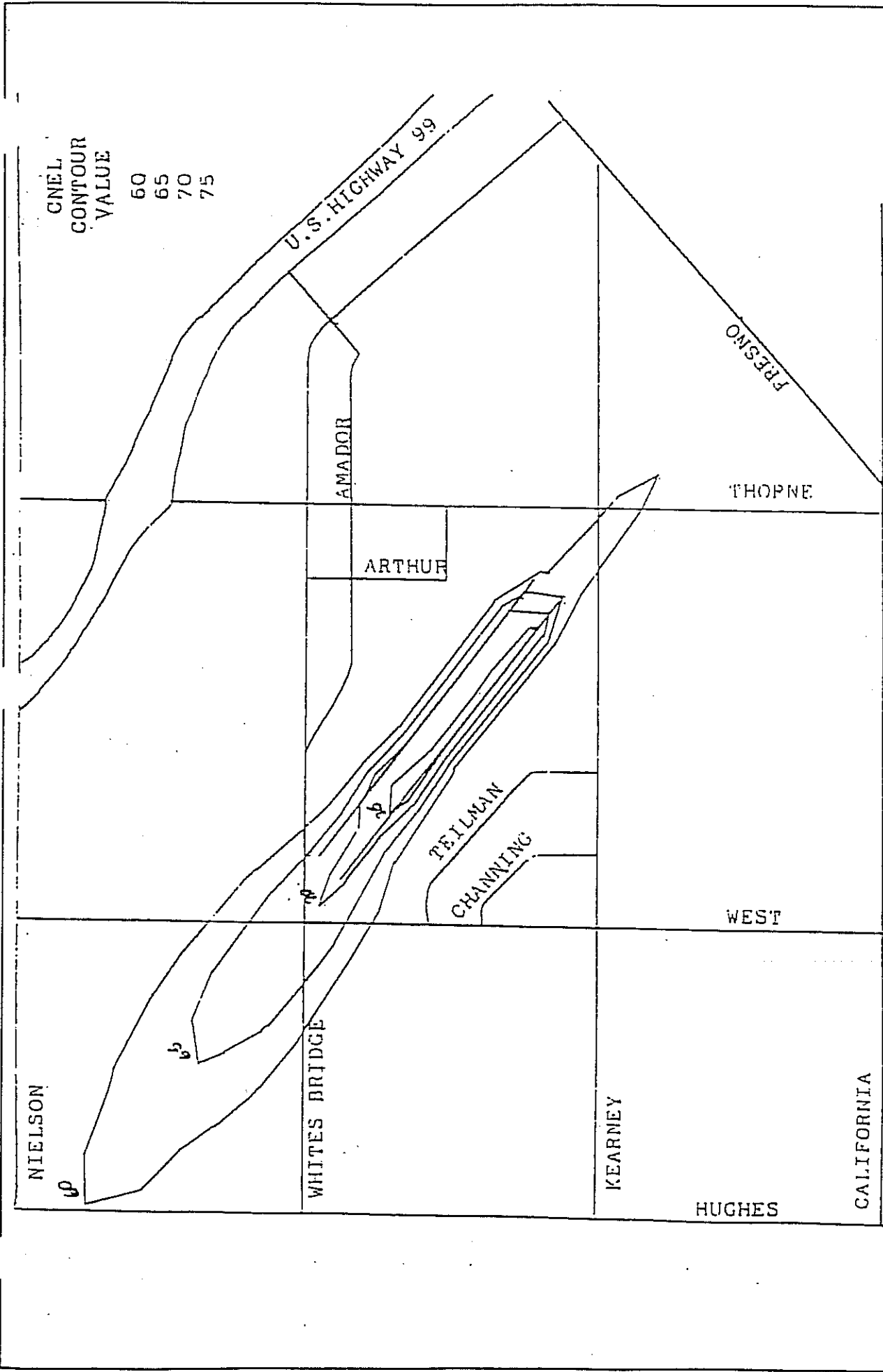


FIGURE 10-1
Fresno-Chandler Downtown
Airport Noise Impact (Year 2000)

Aircraft Noise
 Contours, CNEL

SOURCE:

0 200 400 600 800
 Feet
 Scale in Feet

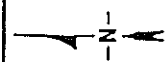
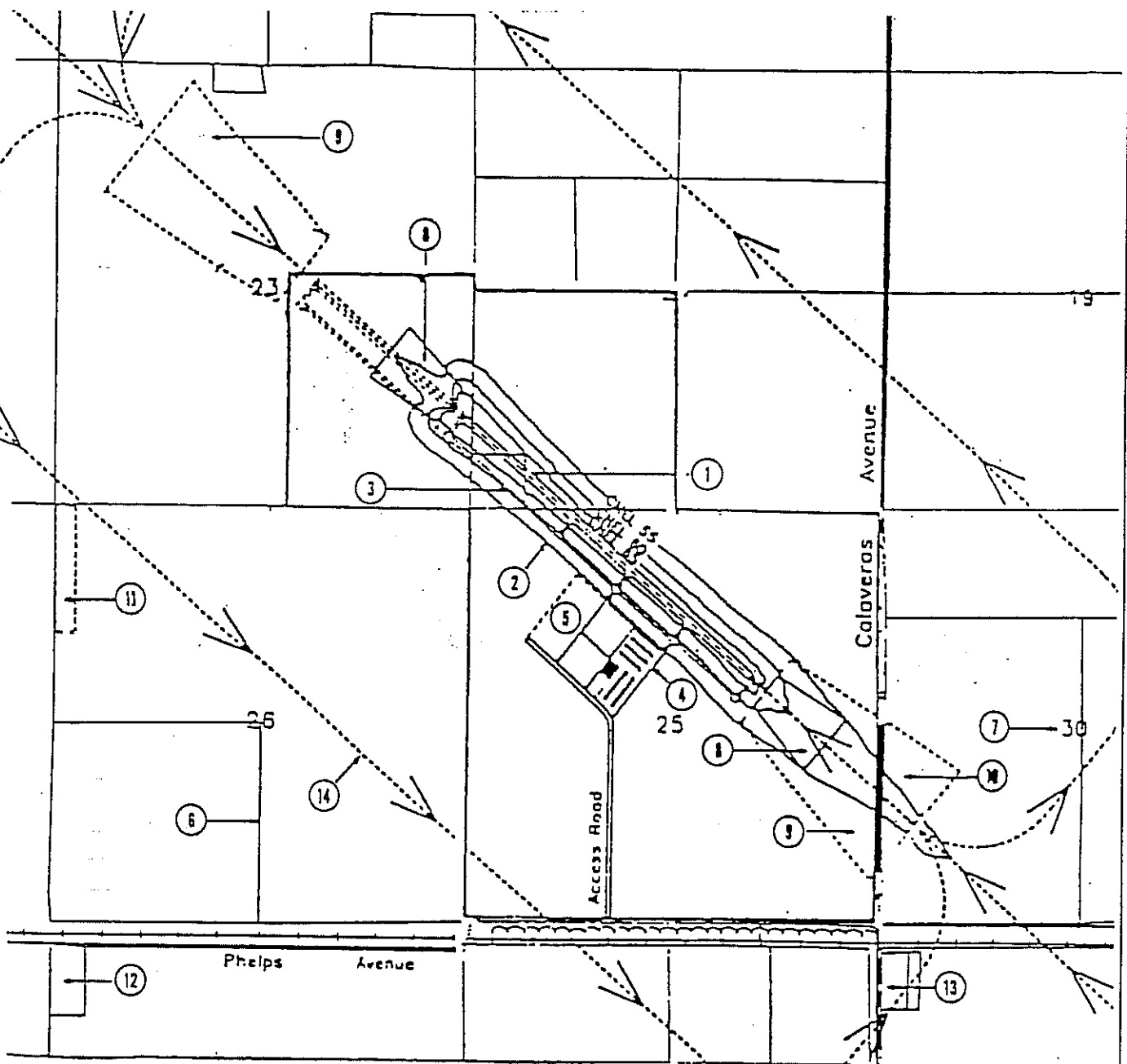




FIGURE 10-2 : Fresno Air Terminal Environs Plan Map

SOURCE: EIP Associates.
March 1997.

Scale in Feet



LEGEND AND GENERAL NOTES

1. = 5,000 x 100' RUNWAY (7,500' x 100' ULTIMATE)
2. = NOISE CONTOURS (55,60, AND 65 CNEL)
3. = PARALLEL TAXIWAY
4. = FBO/BASING AREA (INITIAL)
5. = FBO/BASING AREA (ULTIMATE)
6. = PRIVATE PROPERTY LINES (TYPICAL)
7. = SECTION NUMBER (TYPICAL)
8. = INITIAL CLEAR ZONE
9. = ULTIMATE CLEAR ZONE
10. = AVIGATION EASEMENT
11. = RESIDENCES/FARM BUILDINGS
12. = RESIDENCE
13. = CEMETERY
14. = TRAFFIC PATTERN

- LAND ACQUISITION
- - - FLIGHT TRACK
- - - ABANDONED RR
- ~ ~ ~ TREES

No Scale

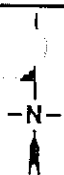


FIGURE 10-3

Coalinga Airport Noise Impact Map

SOURCE: Noise Contours by Brown-Buntin Associates.

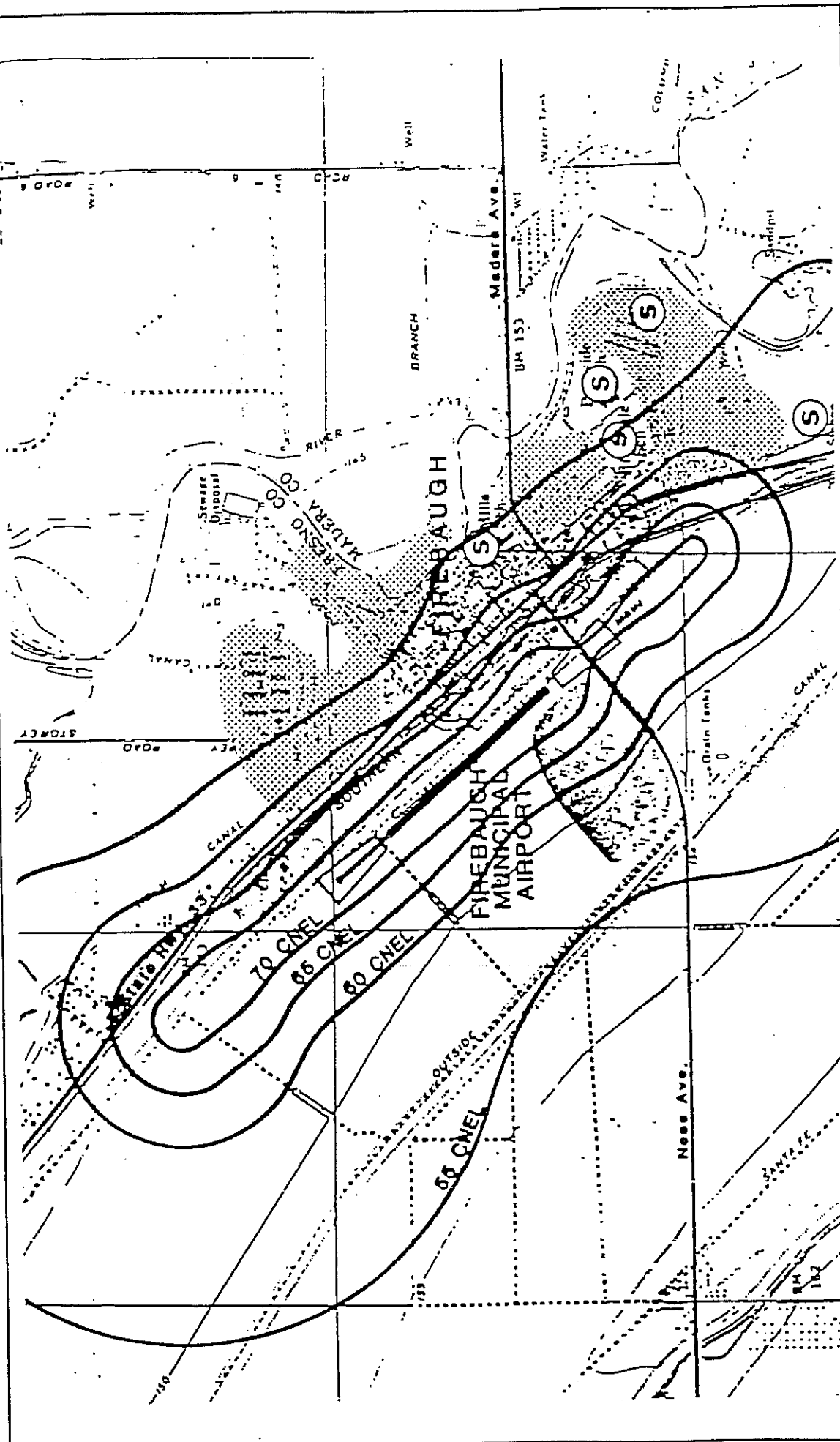


FIGURE 10-4
Firebaugh Municipal Airport
Noise Impact (Year 2000)

Aircraft Noise Contours, CNEl
 Commercial/Industrial
 Residential
 School

SOURCE: Noise
 Contours by Wyle, 1982.

0 500 1,000 1,500 2,000
 Scale in Feet

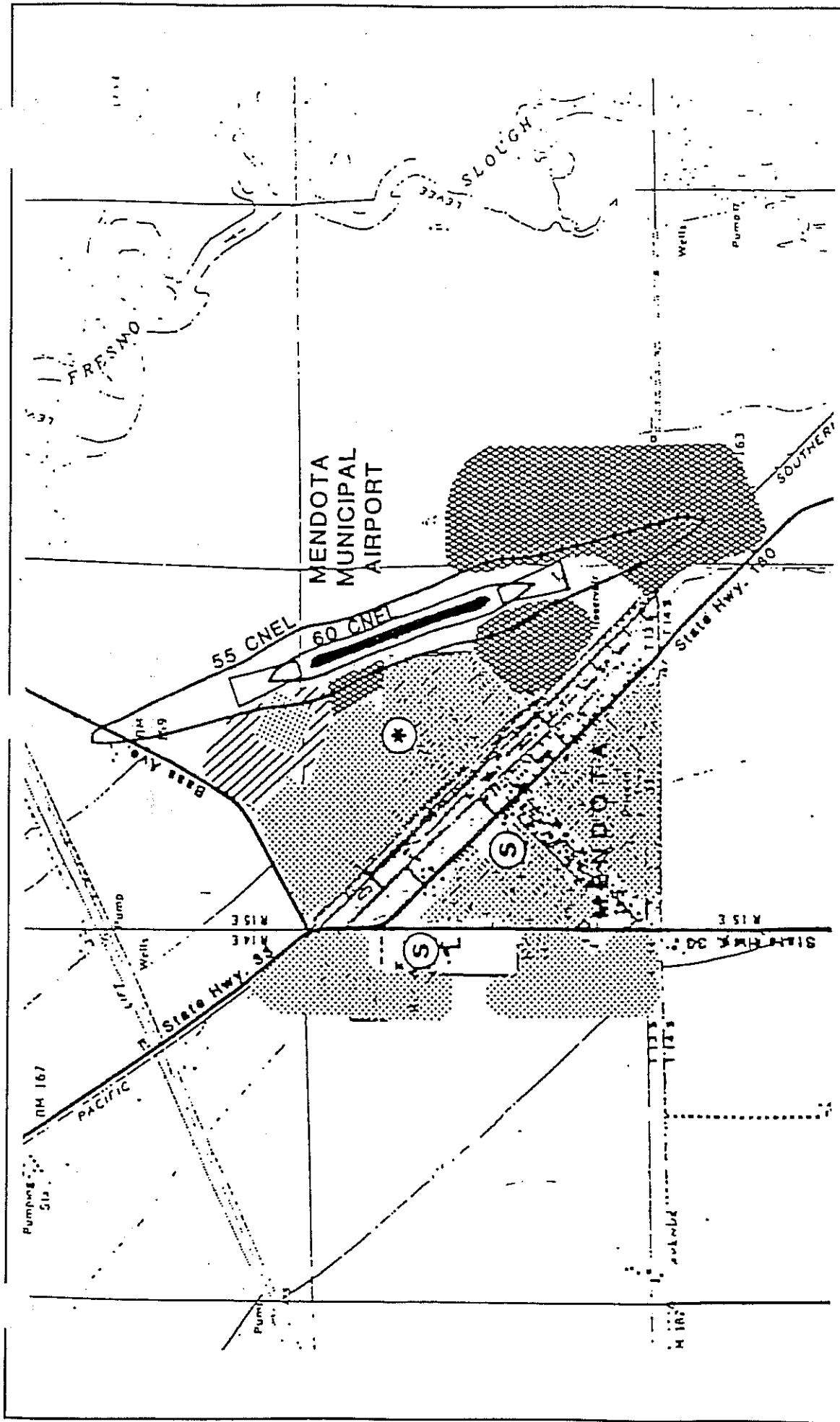
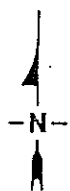
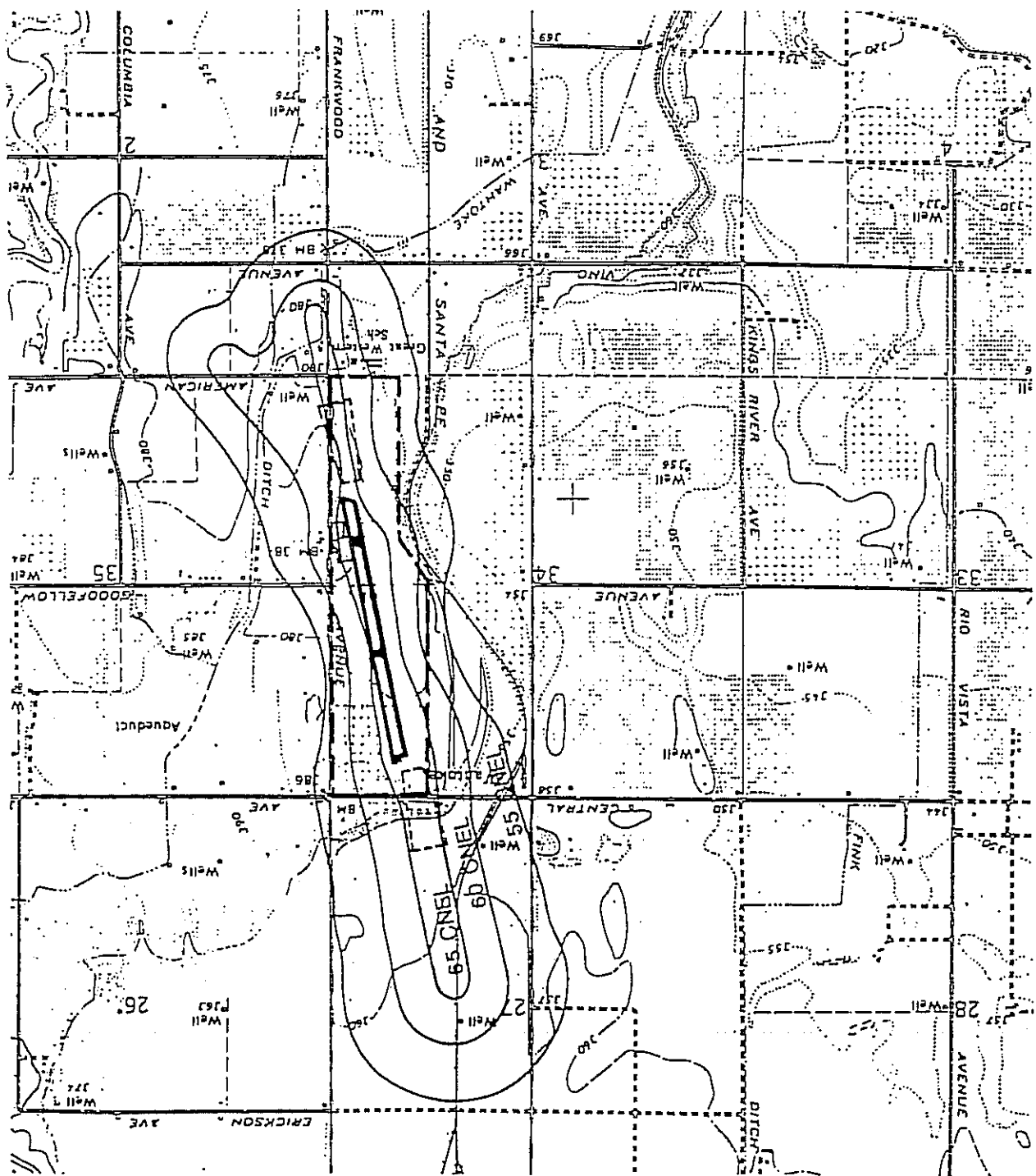


FIGURE 10-5

Mendota Municipal Airport

Noise Impact (Year 2000)



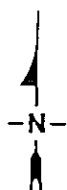
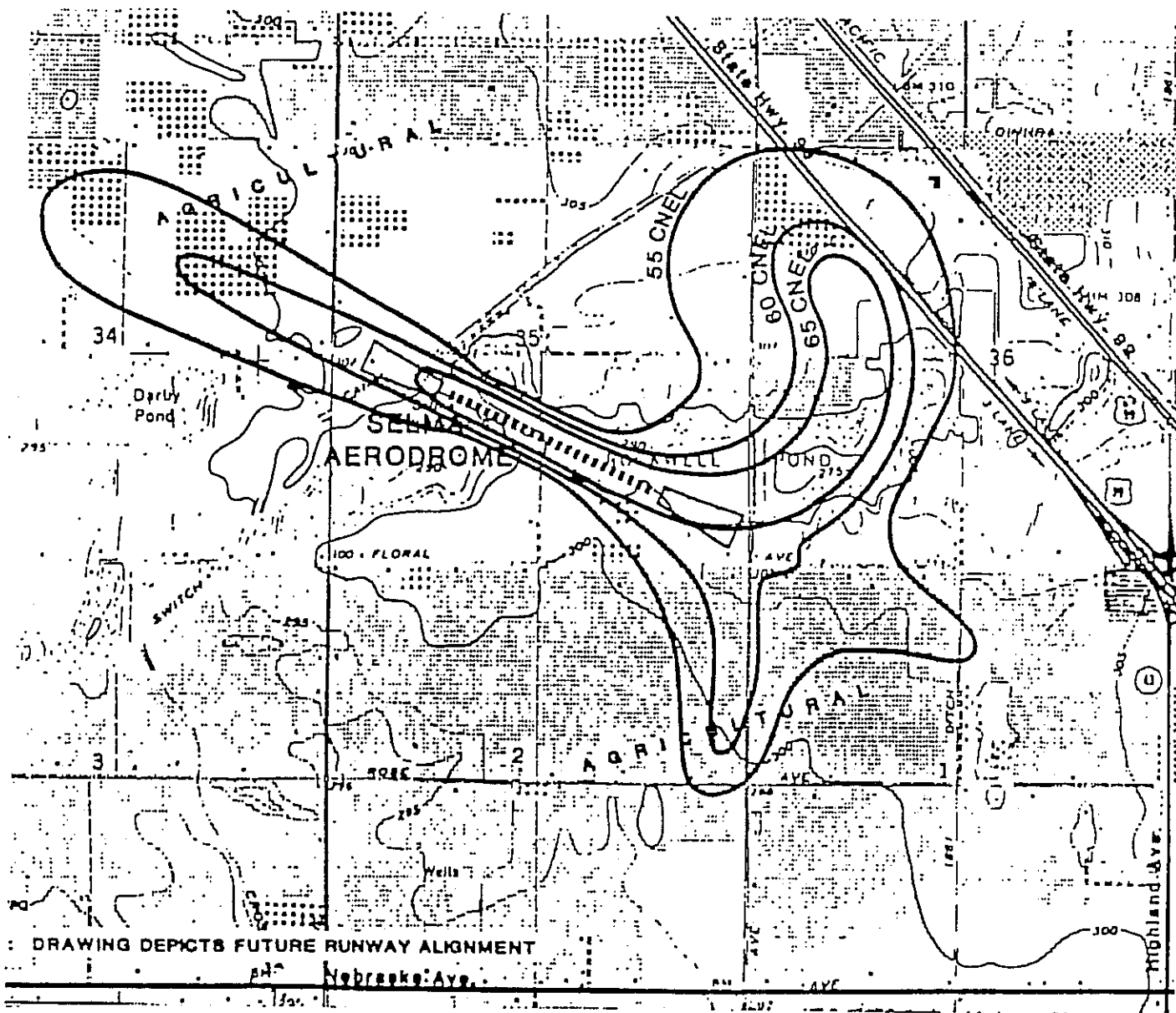
No Scale

— Aircraft Noise
Contours, CNEL

SOURCE: Noise Contours by Wyle, 1982.

FIGURE 10-6

Reedley Municipal Airport Noise Contour Map



No Scale

Aircraft Noise
Contours, CNEI

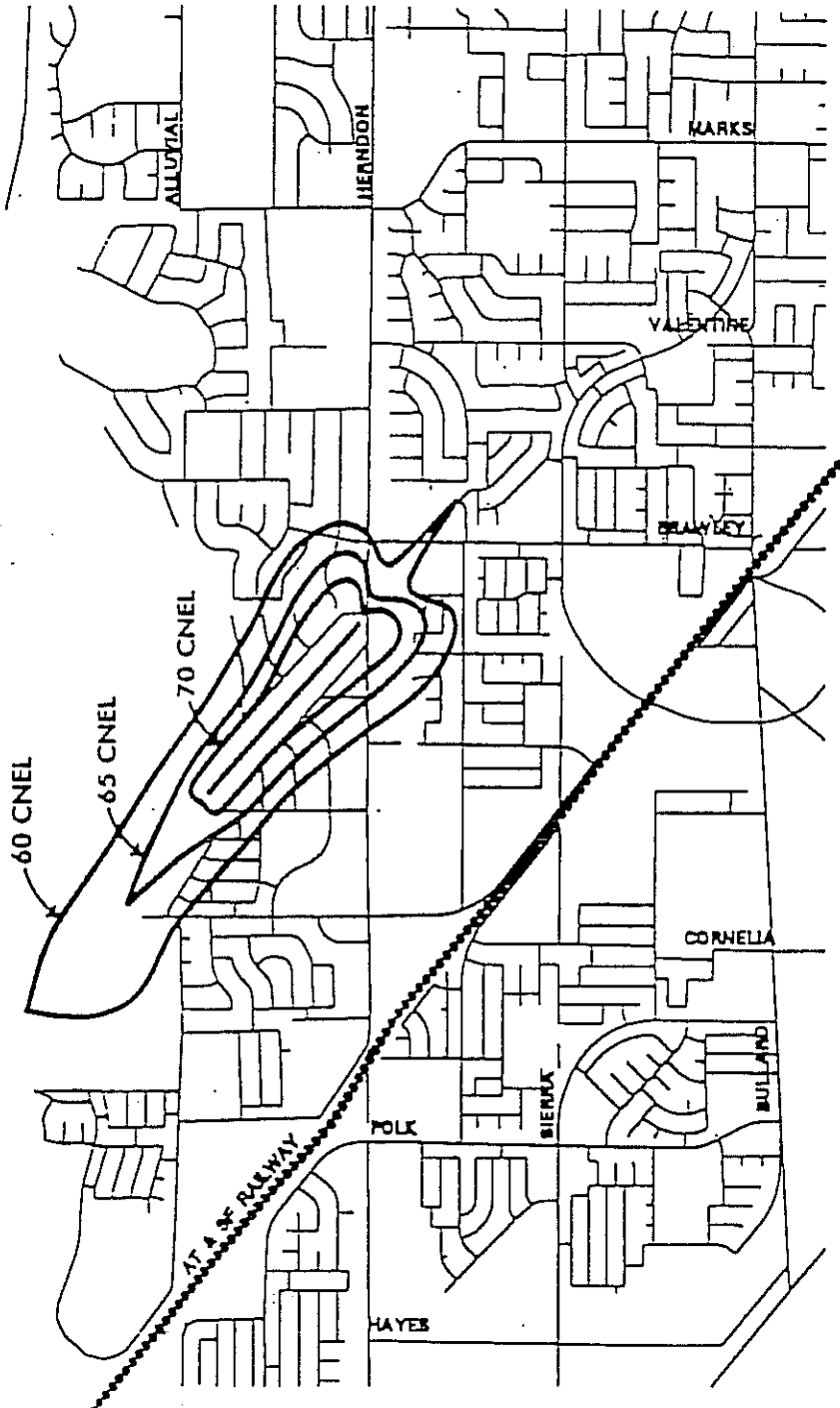
FIGURE 10-7

Selma Aerodome
Noise Impact (Year 2000)

MADERA COUNTY

JOAQUIN RIVER

SAN



SOURCE: Noise Contours by
Brown-Bunlin Associates, 1994.

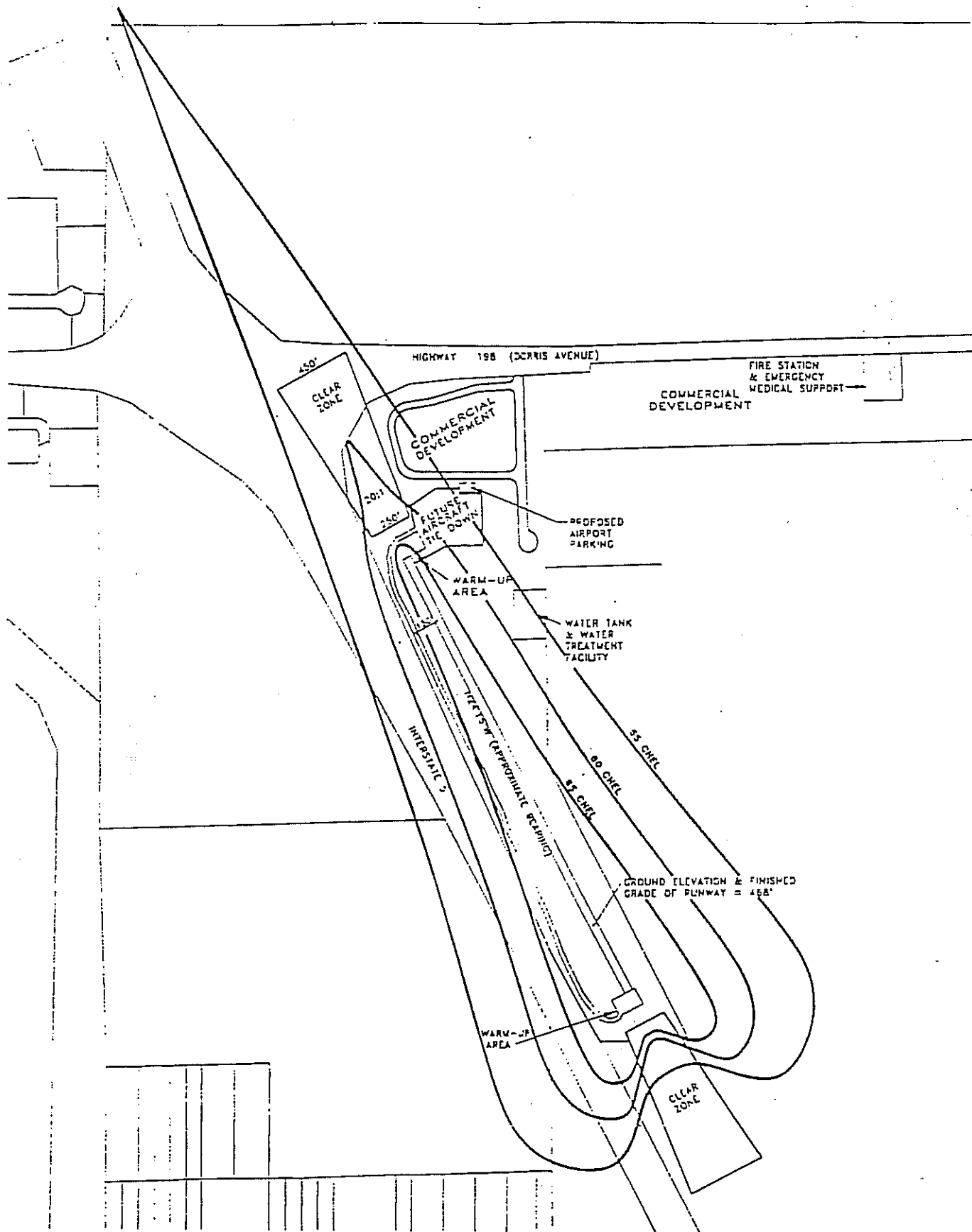


Scale In Feet

FIGURE 10-8

Sierra Sky Park Airport Noise Impact

Aircraft Noise
Contours, CNEL



0 200 400 600 800

Scale In Feet

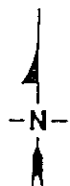
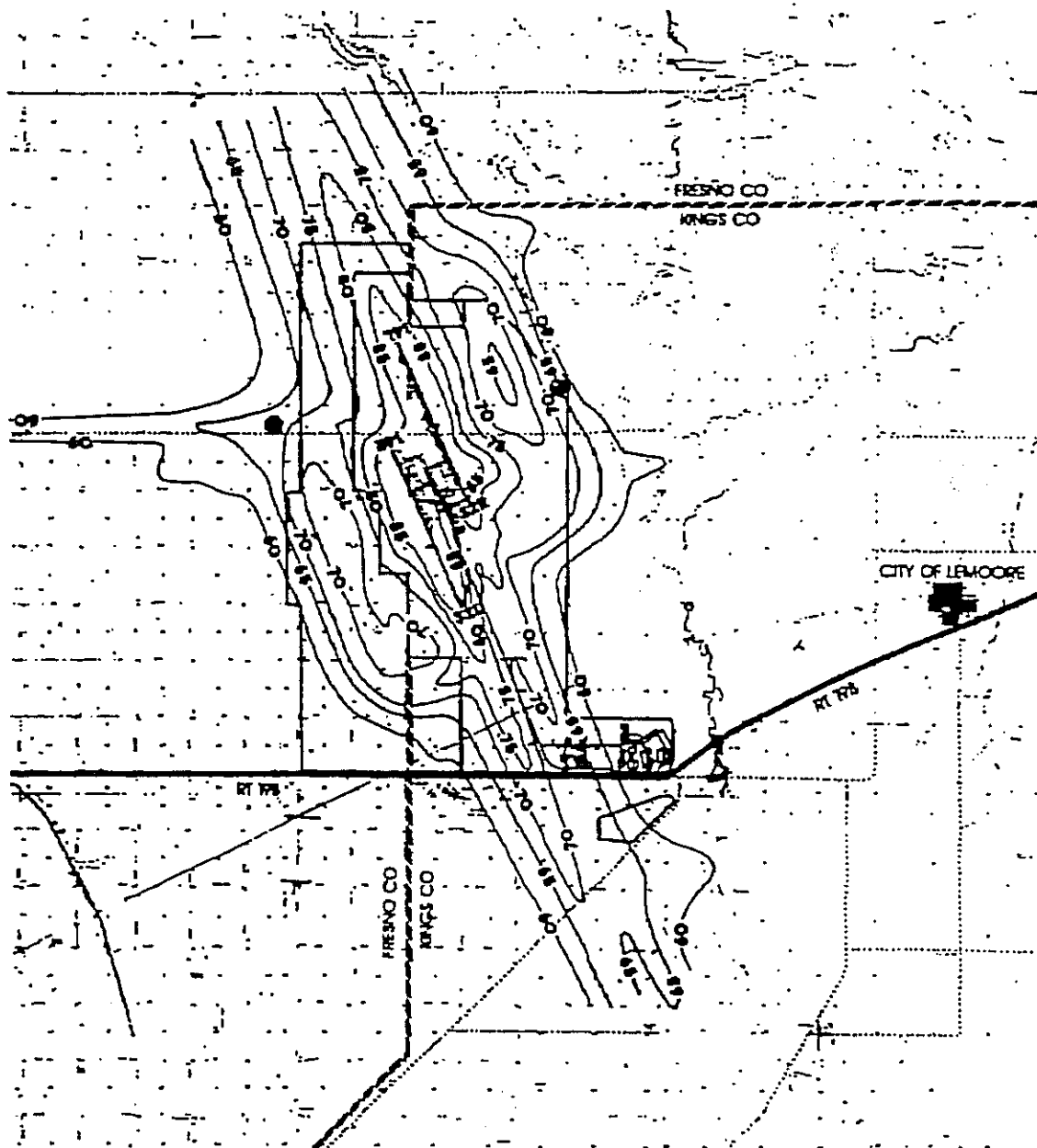
Aircraft Noise Contours, CNEL

NOTE: These noise contours represent an assumption that the number of operations will double, from 10,000 to 20,000, over the next 20 years (1995-2015).

SOURCE: Noise Contours by Brown-Buntin Associates, 1995.

FIGURE 10-9

Harris Ranch Airport Noise Impact Map



No Scale

— Aircraft Noise
Contours, CNEL

FIGURE 10-10

NAS Lemoore
Noise Contours (1981)

APPENDIX 9B

RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM LARGE QUANTITY GENERATORS

APPENDIX 9B

**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
2882 E. Annadale Avenue Fresno, CA 93706-5406	2882 E. Annadale Avenue Fresno, CA 93706-5406
Southern Pacific Transportation Co.	3135 N. Weber Avenue Fresno, CA 93705-3655
Tesoro Gasoline Digas San Joaquin	3384 North 1 st Street Fresno, CA 93726-6802
Chevron USA Inc. Sta 4	Sec 36 T19S R15E MDBM Coalinga, CA 93210
Stauffer Chemical Company	9737 Hills Valley Road Orange Cove, CA 93646
FMC Corp Agri Chem Group	2501 S. Sunland Avenue Fresno, CA 93725-1330
Puregro Company Unit 146	16275 9 th Street Huron, CA 93234
Texaco Inc. Coalinga Pump Station	SEC6 T20S R16E M B D and M Fresno, CA 93210
Shell Oil Company Fresno Plant	4155 S. Maple Avenue Fresno, CA 93725-9357
United Agri Products	3173 S. Chestnut Avenue Fresno, CA 93725-2605
Chem Waste Management	4344 W. Gale Avenue Coalinga, CA 93210
Twinning Laboratories Inc.	2527 Fresno Street Fresno, CA 93721-1804
Duncan Enterprises	5673 E. Shields Avenue Fresno, CA 93727-7819
The Agriculture & Nutrition Co., Inc.	7183 McKinley Avenue Fresno, CA 93727
PB Loader Manufacturing Co #	3275 E. Central Avenue Fresno, CA 93725-2506
Simplot JR Co DBA (Helm)	12688 S. Colorado Avenue Helm, CA 93627

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LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
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FACILITY	ADDRESS
Amstar Corp Spreckels Sugar Div F-4	29400 W. Whitesbridge Road Mendota, CA 93640-9702
Hunt Mfg Lit-Ning Prod Co. Div.	2496 S. Cherry Avenue Fresno, CA 93706-5004
Britz Inc.	21817 S. Fresno-Coalinga Road Five Points, CA 93624
Builders Concrete, Inc.	3664 W. Aslan Avenue Fresno, CA 93722-4439
Arney Rutter Inc.	2684 Cherry Avenue Fresno, CA 93706-5420
Sanders Decal & Display Inc.	2525 E. Hammond Avenue Fresno, CA 93703-3909
Commercial Electro Plating Co.	1937 S. Cherry Avenue Fresno, CA 93721-3305
Container Corp. Of America	2525 S. Sunland Avenue Fresno, CA 93725-1330
Sanger Boat Mfg.	3316 E. Annadale Avenue Fresno, Ca 93725-1904
Dow Chemical Co.	4787 E. Date Avenue Fresno, CA 93725-2102
Sun-Maid Raisin Growers of CA	13525 S. Bethel Avenue Kingsburg, CA 93631-9212
Valent USA Corporation	5910 N. Monroe Avenue Fresno, CA 93722-9309
Overhead Door Corp TODCO Div.	4771 E. Date Avenue Fresno, CA 93725-2102
Meyers Marvin AAG Chemical #1	43180 W. Nees Avenue Firebaugh, CA 93622-9541
Autco Inc.	255 Divisadero Street Fresno, CA 93706-1603
Oxychem Kings River	6385 E. North Avenue Fresno, Ca 93725-9309

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
Moyer Chemical Co.	3490 S. Maple Avenue Fresno, CA 93725-2414
Paramount Pest Control SV FRSN	2143 E. McKinley Avenue Fresno, CA 93703-3002
Valley Exchange Parts Co.	1921 S. Cherry Avenue Fresno, CA 93721-3305
Wilbur-Ellis Co.	2903 S. Cedar Avenue Fresno, CA 93725-2324
Wilbur Ellis Co.	W. Colorado Avenue at S. El Dorado San Joaquin, CA 93660
Fresno Screen Print DBA Screen Print Inc.	1379 N. Rabe Avenue Fresno, CA 93727-2249
Sperry New Holland	7595 E. Manning Avenue Fowler, A 93625-9710
Van Waters & Rogers Fresno	4729 E. Commerce Avenue Fresno, CA 93725-2205
PPG Industries Inc. Works #15	3333 S. Peach Avenue Fresno, CA 93725-9220
Western Chrome, Ltd.	2306 E. McKinley Avenue Fresno, CA 93703-3007
Lehman AG Chem Inc.	1495 N. Monroe Avenue Fresno, CA 93722-9622
Britz Inc.	7409 S. Mendocino Avenue Parlier, CA 93648-9767
Industrial Plating Co.	733 G Street Fresno, CA 93706-3427
Hicks Signs	3236 W. Belmont Avenue Fresno, CA 93722-5905
Amoco Foam Products Co.	5370 E. Home Avenue Fresno, CA 93727-2104
Coalinga Hospital Dist.	Washington Street at Sunset Street Coalinga, CA 93210

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LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
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FACILITY	ADDRESS
The Vendo Company	7209 N. Ingram Avenue Pinedale, CA 93650-1017
Panoche Chem & Supply Inc.	40109 W. Bullard Avenue Firebaugh, CA 93622-9511
Clovis USD	1450 Herndon Avenue Clovis, CA 93611-0567
Helena Chem Co.	1075 S. Vineland Avenue Kerman, CA 93630-9246
Fresno Chrome Plating, Inc.	4627 N. Bendel Avenue Fresno, CA 93722-3905
Vingro AG Enterprises, Inc.	12616 W. Belmont Avenue Kerman, CA 93630-9653
Anderson J Inc.	295 N. Fruit Avenue Fresno, CA 93706-1419
Custom Chemicides Inc.	1495 Railroad Avenue Clovis, CA 93612-2708
Chet & Sons Truck Wash	4025 S. Hwy. 99 Fresno, CA 93725
Keiser Sports - Health Equipment	411 S. West Avenue Fresno, CA 93706-1320
Helm Fertilizers Inc.	12550 S. Colorado Helm, CA 93627
Sierra Ag Chemical Co.	1941 N. Academy Avenue Sanger, CA 93657-9379
Manlift Inc. Div Kidde Inc.	8510 S. Golden State Blvd. Fowler, CA 93625
Wilco Sales & Service	431 E. Forest Avenue Coalinga, CA 93210-2110
University California Kearney Agr. Center	9240 S. Riverbend Avenue Parlier, CA 93648-9757
Foster Commodities	1010 18 th Avenue Kingsburg, CA 93631-9110

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
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FACILITY	ADDRESS
Union Oil Co., Coalinga Pump Station	1 Mi S/of Coalinga on Hwy. 33 Coalinga, CA 93210
Finer Filter Products	2349 Monterey Street Fresno, CA 93721-3001
California Military Department	5592 Air Terminal Drive Fresno, CA 93727-1201
Champion Parts Rebuilders Inc.	2788 S. Maple Avenue Fresno, CA 93725-2109
CA Department Justice Bureau of Narcotics	2550 Mariposa Mall Fresno, CA 93721-2219
Star Warehouse Company, Inc.	2860 S. East Avenue Fresno, CA 93725-1909
Refineries Serv Inc.	1724 W. McKinley Avenue Fresno, CA 93728-1203
Pacific Bell	2048 N. Fine Avenue Fresno, CA 93727-1511
Fresno Gas Load Center	211 N. Horn Fresno, CA 93706
Selma Service Center	2139 Sylvia Street Selma, CA 93662-3434
American Avenue Disposal Site	18950 W. American Avenue Kerman, CA 93630-9184
Coalinga Disposal Site	30825 Lost Hills Road Coalinga, CA 93210
Southeast Regional Disposal Site	12716 E. Dinuba Avenue Selma, CA 93662-9796
World Oil Co.	1635 2 nd Street Selma, CA 93662-3623
Miracle Auto Painting	3825 E. Ventura Avenue Fresno, CA 93702-3405
US Post Office	1900 E Street Fresno, CA 93706-2028

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
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FACILITY	ADDRESS
D Turner Chrome	4388 S. Willow Avenue Fresno, CA 93725-9352
PG&E Balch Hydro Plant	Trimmer Springs Road 63 Miles East of Fresno, CA 93700
PG&E Fresno Service Center	3530 E. California Avenue Fresno, CA 93702-4211
PG&E Hass Hydroelectric Plant	Trimmer Springs Road 80 Miles East of Fresno, CA 93700
PG&E Kings River Hydroelectric Plant	Trimmer Springs Road 45 Miles East of Fresno, CA 93700
PG&E Balch Camp Hydroelectric Center	Trimmer Springs Road 65 Miles East of Fresno, CA 93700
California State University Fresno	E. Shaw Avenue at N. Cedar Avenue Fresno, CA 93710
DOHS-Fresno Co.	Fresno, Co. Fresno Co., CA
Insulation Contracting & Supply	2706 S. Railroad Avenue Fresno, CA 93725-2021
Saint Anges Medical Center	1303 E. Herndon Avenue Fresno, CA 93720-3309
Schramm A#1 Exploratory Oil Well	Section 4- 16S- 17E Fresno Co. San Joaquin Area, CA
Balakian Drain Oil	14287 E. Manning Avenue Parlier, CA 93648-9744
Fresno Co. Public Works & Dev.	4499 E. Kings Canyon Road Fresno, CA 93702-3604
Yosemite Middle School	1279 N. 9 th Street Fresno, CA 93703-4228
Ft. Miller Middle School	1302 E. Dakota Avenue Fresno, CA 93704-4441
Sequoia Freshman School	4050 E. Hamilton Avenue Fresno, CA 93702-4456

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
Easterby Elementary School	5211 E. Tulare Avenue Fresno, CA 93727-4048
Fresno USD Cooper MS	2277 W. Bellaire Way Fresno, CA 93705-1736
Dewey Pest Control	2743 E. McKinley Avenue Fresno, CA 93703-3012
Herwaldt Olds GMC Truck	5499 N. Blackstone Avenue Fresno, CA 93710-5015
Shell Pipeline	9 Mls N. Coalinga 5 Mls. W.I.5 Coalinga, CA 93210
Valley Detroit Diesel	2935 S. Orange Avenue Fresno, CA 93725-1923
Michael Cadillac Inc.	5737 N. Blackstone Avenue Fresno, CA 93710-5005
Martens Chevrolet & Oldsmobile	1760 11 th Street Reedley, CA 93654-2904
Hallowell Chevrolet Co., Inc.	961 W. Shaw Avenue Clovis, CA 93612-3203
Valley Truck Wrecking Inc.	10764 S. Alta Avenue Dinuba, CA 93618-9216
Reedley Ford Tractor Sales	1230 G Street Reedley, CA 93654-3034
Lovegren Motors	730 O Street Sanger, CA 93657-3136
Dealer Service	2533 N. Blackstone Avenue Fresno, CA 93703-1701
Pepsi Cola San Joaquin	1150 E. North Avenue Fresno, CA 93725-1929
Valley Industrial Service	1050 W. Whitesbridge Road Fresno, CA 93706-1328
Spain Air, Inc.	15723 Folsom Avenue Dos Palos, CA 93620-9453

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
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FACILITY	ADDRESS
Coalinga Dist. Coalinga	39405 S. Derrick Avenue Coalinga, CA 93210-9736
Clovis Drum Co., Inc.	4536 E. Herndon Avenue Clovis, CA 93612
Caltrans Fresno West Avenue Special Crews	1283 N. West Avenue Fresno, CA 93728-1216
Caltrans Fresno Area Maintenance Station	2796 S. Railroad Avenue Fresno, CA 93725-2021
Atchison Topeka Santa Fe RR Co.	3901 E. Vine Avenue Fresno, CA 93725-2025
PG&E San Joaquin Regional Office	1401 Fulton Street Fresno, CA 93721-1609
Coca-Cola Bottling Co.	905 R Street Fresno, CA 93721-1311
Shell S/S 204-2886-2104	1778 E. Shaw Avenue Fresno, CA 93728-3432
Shell S/S 204-2886-2302	1140 N. Van Ness Avenue Fresno, CA 93728-3432
Shell S/S 204-2886-1106	1190 N. Chestnut Avenue Fresno, CA 93702-1709
Shell S/S 204-2886-7202	5405 N. Blackstone Avenue Fresno, CA 93710-5015
Shell S/S 204-2886-6501	2595 S. East Avenue Fresno, CA 93706-5118
Shell S/S 204-1656-0306	640 Shaw Avenue Clovis, CA 93612-3809
Shell S/S 204-2886-6907	4245 N. Cedar Avenue Fresno, CA 93726-3706
Shell S/S 204-8860-0900	5325 W. Shaw Avenue Fresno, CA 93722-5033
Shell S/S 204-2886-2104	1778 E. Shaw Avenue Fresno, CA 93710-8104

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
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FACILITY	ADDRESS
Vincent Ganduglia Trucking	4737 E. Florence Avenue Fresno, CA 93725-1148
J M S Enterprises DBA Mastercraft	1320 W. Shields Avenue Fresno, CA 93705-3340
Fresno USD Dewolf High School	2021 N. Clark Street Fresno, CA 93703-2124
National College	390 W. Westland Avenue Clovis, CA 93612
Fresno USD Duncan Polytech High	4330 E. Garland Avenue Fresno, CA 93726-6102
Fresno USD Powers Elementary School	110 E. Swift Avenue Fresno, CA 93704-3511
Dales Auto & Diesel Inc.	9860 Zumwalt Avenue Reedley, CA 93654-9300
Fresno USD Sunset Elementary School	1755 Crystal Avenue Fresno, CA 93706-2721
Fresno USD Wilson Elementary School	2131 W. Ashlan Avenue Fresno, CA 93705-1701
Fresno USD Jefferson Elementary School	202 N. Mariposa Street Fresno, CA 93701-2425
Fresno USD Ginburg Elementary School	67 E. Ashlan Avenue Fresno, CA 93704-3518
Fresno USD Wichell Elementary School	3722 E. Lowe Avenue Fresno, CA 93702-3432
Fresno USD Hamilton Adult School	102 E. Clinton Avenue Fresno, CA 93704-5315
Fresno USD Wishon Elementary School	3857 E. Harvard Avenue Fresno, CA 93703-1919
Fresno USD Heaton Elementary School	1533 N. San Pablo Avenue Fresno, CA 93728-2040
Fresno USD Wolters Elementary School	5174 N. 1 st Street Fresno, CA 93710-7811

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
Fresno USD Lincoln Elementary School	651 B Street Fresno, CA 93706-3827
Fresno USD McCardle Elementary School	577 E. Sierra Avenue Fresno, CA 93710-3824
PG&E Auberry Hydro Center	33755 Old Mill Road Auberry, CA 93602-9655
General Telephone of CA	19919 E. Dinuba Avenue Reedley, CA 93654-9324
JMS Enterprises DBA Mastercraft	1731 W. Bullard Avenue Fresno, CA 93711-2369
The Manny Moe and Jack Pep Boys	5615 E. Kings Canyon Road Fresno, CA 93727-4641
Scelzi Enterprises	1530 N. Thesta Street Fresno, CA 93703-3704
Electric Laboratories	1740 Van Ness Avenue Fresno, CA 93721-1131
Shell Oil Co./WCD Pipelines	Kern Co. Pipelines Fresno, CA 90700
Dydratech	1331 S. West Avenue Fresno, CA 93706-2530
Circle K Store #3615	4602 E. Church Avenue Fresno, CA 93725-1620
Circle K Store #3609	481 S. Madera Avenue Kerman, CA 93630-1537
Circle K Store #1315	2585 Jensen Avenue Sanger, CA 93657-2251
Circle K Store #3608	21998 Colorado Avenue San Joaquin, CA 93660
Weber Motors Inc.	255 N. Abby Street Fresno, CA 93701-1904
San Sierra Service Inc.	3260 E. Annadale Avenue Fresno, CA 93725-1903

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**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
Sanger Ford Mercury	1703 Academy Avenue Sanger, CA 93657-3703
Big Creek Regional Warehouse	55481 Poplar Big Creek, CA 93605
American Truck Salvage	3599 S. Golden State Blvd. Fresno, CA 93725-2408
ATI Machinery Inc.	21436 S. Lassen Avenue Five Points, CA 93624
Beef Packers Inc.	3115 S. Fig Avenue Fresno, CA 93706-5647
Century Trailer & Equipment	2695 S. 4 th Street Fresno, CA 93725-1932
Westside Ford Lincoln Mercury	1503 8 th Street Firebaugh, CA 93622-2107
Valley Detroit Allison	2935 S. Orange Avenue Fresno, CA 93725-1923
Fresno Pacific	2297 E. Shepherd Avenue Clovis, CA 93611-9154
Santa Fe Energy Co. Coalinga	1405 E. Elm Avenue Coalinga, CA 93210-13ND
Commercial Waste Transport Inc.	2619 S. Peach Avenue Fresno, CA 93725-1825
One Hour Martinizing	777 E. Barstow Avenue, Suite C Fresno, CA 93710-6238
One Hour Martinizing	4041 N. Blackstone Avenue Fresno, CA 93726-3806
One Hour Martinizing	3041 W. Bullard Avenue Fresno, CA 93711-1609
Schenley Distilleries	3475 E. Church Avenue Fresno, CA 93725-1340
Zacky Farms	190 N. Thorne Avenue Fresno, CA 93706-1440

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**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
City of Fresno Fleet Division	2175 G Street #F Fresno, CA 93706-1620
Fresno Transit	2223 G Street Fresno, CA 93706-1631
Big Creek Plant 8	Edison PH8 Auberry, CA 93602
Fresno USD/IMC	3132 E. Fairmont Avenue Fresno, CA 93726-0606
Harris Feeding Co.	Fresno Coalinga Road at I-5 Coalinga, CA 93210
Lightning Track & Auto Painting	1506 H Street Fresno, CA 93721-1616
Wosaxton Trucking	6632 E. Parlier Fowler, CA 93625
Coalinga Huron Mosquito Abatement Dist.	Calavares & Phelps Avenue Coalinga, CA 93210
Slavich Bros., Inc.	Stanislaus Street at M Street Fresno, CA 93721
Bullard Village Drug	766 Bullard Avenue Fresno, CA 93704-1610
Interstate Water Treatment Inc.	1433 W. Pine Avenue Fresno, CA 93728-1208
Viking Freight System Inc.	4477 S. Chestnut Avenue Fresno, CA 93725-9393
Econo Lube n Tune #70	3944 N. Blackstone Avenue Fresno, CA 93726-3803
Bratton's Auto Body	1349 N. Blackstone Avenue Fresno, CA 93703-3607
City of Kingsburg Public Works	1200 Kern Street Kingsburg, CA 93631-2413
Averys Airless Repair	4592 E. Pine Avenue Fresno, CA 93703-4433

APPENDIX 9B**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
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US ENVIRONMENTAL PROTECTION AGENCY****FRESNO COUNTY
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FACILITY	ADDRESS
American Fluid Power	3045 N. Sunnyside Avenue Fresno, CA 93727-1300
Pop's Engine Distributing	1960 H Street Fresno, CA 93721-1024
Mendota Biomass Power	400 Guillen Parkway Mendota, CA 93640
Seven Up RC Bottling Company	2012 S. Pearl Street Fresno, CA 93721-3312
Advance Diesel System	3138 S. Elm Avenue Fresno, CA 93706-5619
Marlins Automotive & Truck	4587A E. Floradora Avenue Fresno, Ca 93703-4419
Selma Mower Center	10015 E. Manning Avenue Selma, CA 93662-9761
Buchmin Industries	1485 E. Curtis Avenue Reedley, CA 93654-9317
Beef Packers Inc.	3115 S. Fig Avenue Fresno, CA 93706-5647
Pricketts	123 M Street Fresno, CA 93721-3116
Commercial Manufacturing	2432 S. Railroad Avenue Fresno, CA 93706-5108
Valley Well & Pump	3072 W. Jensen Avenue Fresno, CA 93706-4648
Holiday Cleaners	5128 N. Palm Avenue Fresno, CA 93704-2203
Prudential Overall Supply	1260 E. North Avenue Fresno, CA 93725-1930
Reed Manufacturing & Supply	1560 Marion Street Kingsburg, CA 93631-1806
Towt Industries Int.	1307 Simpson Street Kingsburg, CA 93631-2225

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LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
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FACILITY	ADDRESS
B & F Auto Service	1496 N. Van Ness Avenue Fresno, CA 93728-1939
Michael Bradley Corporation	625 S. Zediker Avenue Parlier, CA 93648-2033
Suburban Propane	3363 S. Golden State Blvd. Fresno, CA 93725-2406
Liquid Carbonic Corporation	2771 S. Maple Avenue Fresno, CA 93725-2117
Phillips Road Property	SW of NE Sec 25 Los Banos, CA 93779
Herndon Substation	7430 N. Weber Avenue Fresno, CA 93722-9734
Fresno Toyota Isuzu	105 E. Auto Center Drive Fresno, CA 93710-5100
Holchem Fresno	4672 E. Drummon Street Fresno, CA 93725
City of Fresno Fleet Management	2175 G Street, Bldg. F Fresno, CA 93706
Quiring Corporation	6167 N. Fresno Street Fresno, CA 93710-5207
Harris Ranch Beef Co.	16277 S. McCall Avenue Selma, CA 93662-9458
Universal Coatings	5449 E. Lamona Avenue Fresno, CA 93727-2225
Ametek, Inc. Microfoam Division	2510 S. East Avenue Fresno, CA 93706-5103
Paul Munroe Hydraulics	4169 N. Motel Drive 104 Fresno, CA 93722
Regional Aircraft Services	1446 N. Villa Avenue Fresno, CA 93727-2115
Central California Conference Assoc. of S.D.A.	2820 Willow Avenue Clovis, CA 93612-4646

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**FRESNO COUNTY
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FACILITY	ADDRESS
Good Samaritan Medical Clinic	3636 N. 1 st Street, Suite 162 Fresno, CA 93726-6818
Creative Marketing and Research	3594 E. Wawong Fresno, CA 93725
Pacific Farm Co.	W. Nees Avenue at N. Russell Avenue Firebaugh, CA 93622
Quickie Designs	2842 N. Business Park Avenue Fresno, CA 93727-1328
BP Oil Co. Eqpt. So. Pac. Pipeline	4149 S. Maple Avenue Fresno, CA 93725-9357
Triple D Farms	24953 Jayne Avenue Coalinga, CA 93210-9617
Michael Giffen Ranch Inc.	36906 W. Shaw Avenue Firebaugh, CA 93622-9508
Interagency Treatment Center	Adams Avenue and the San Luis Mendota, CA 93640
Century Ford	195 E. Auto Center Drive Fresno, CA 93710-5100
Roadway Mazada	165 E. Auto Center Drive Fresno, CA 93710-5100
Big Creek 1 Hydro Division Off.	54205 Mountain Poplar Drive Big Creek, CA 93605
United Health Centers Mendota	121 Barboza Street Mendota, CA 93640-1901
Atapco OPG Fresno Division	2686 S. Maple Avenue Fresno, CA 93725-2108
ORO Financial of CA Inc.	6939 E. Kings Canyon Road Fresno, CA 93727-3606
Eastwood Power Station	45795 Tollhouse Road Shaver Lake, CA 93605
Big Creek 2 2A	53615 Upper Chawanakee Road Auberry, CA 93602

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US ENVIRONMENTAL PROTECTION AGENCY**

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FACILITY	ADDRESS
Auto Parts Wholesale	2324 S. Barton Avenue Fresno, CA 93725-1101
Western Farm Service Central Valley Division	Lassen Road Five Points, CA 93624
Texaco Inc. Beacon-Coalinga Tank Farm	Caliola PS-Sec 6-20/16 Coalinga, CA 93210
Chevron USA Inc. Fresno CA Term	4073 S. Maple Avenue Fresno, CA 93725-9357
Chevron USA Inc. Fresno Air Term	5175 E. Clinton Way Fresno, CA 93727-2046
FMC Corp. Agri. Chem. Group	14451 W. Whitesbridge Avenue Kerman, CA 93630-9216
FMC Corp. Agri. Chem. Group	13688 E. Manning Avenue Parlier, CA 93648-9743
Sherwin-Williams Co.	5459 E. Lamona Avenue Fresno, CA 93727-2225
Sherwin-Williams Co.	1440 Stanislaus Street Fresno, CA 93706-1623
Britz Inc.	25600 Jayne Avenue Coalinga, CA 93210-9617
Environmental Dspl. Service	SEC 36 T19 RTE 14 E Coalinga, CA 93210
Professional Agricultural Service	2578 S. Lyon Avenue Mendota, CA 93640-9738
Red Star Industrial Service	3333 N. Sabre Drive Fresno, CA 93727-7816
Southern Pacific Pipelines LP	4149 S. Maple Avenue Fresno, CA 93725-9357
PG&E Helms Pumped Storage PR	77 Beale Street, Attn: H.M. Howe Near Shaver Lake, CA 93745
PG&E Kerckhoff 2 Power House	Under Construction Near Auberry, CA 93602

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LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY****FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
Kemmer Agricultural Co., Inc.	88 N. Hughes Avenue Fresno, CA 93706-1233
Agrichemical Sales & Service	8715 S. Elm Avenue Fresno, CA 93706-9218
Browning-Ferris Ind. Of CA Inc.	5501 Motel Drive Fresno, CA 93705
L-B Truck Wash	3767 S. Highway 99 Fresno, CA 93725
Pacific Bell	980 P Street Firebaugh, CA 93622-2227
Pacific Bell	1658 7 th Street Mendota, CA 93640-2347
Pacific Bell	525 Shaw Avenue Clovis, CA 93612-3848
Pacific Bell	1445 Van Ness Avenue Fresno, CA 93721-1210
Pacific Bell	4781 E. Tulare Avenue Fresno, CA 93702-2629
Pacific Bell	1250 East Ashland Avenue Fresno, CA 93704
Pacific Bell	American & Peach Avenue Fresno, CA 93727
Pacific Bell	Yuba & Butte Avenue Kerman, CA 93630
Pacific Bell	420 W. Sierra Avenue Fresno, CA 93704-1123
Pacific Bell	Cornelia & Manning Raisin City, CA 93652
Pacific Bell	East Yale Avenue Fresno, CA 93704
Pacific Bell	1788 H. Helm Avenue Fresno, CA 93727-1628

APPENDIX 9B

**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
Pacific Bell	4828 N. 1 st Street Fresno, CA 93726-0528
Pacific Bell	666 W. Shaw Avenue Fresno, CA 93704-2424
Pacific Bell	4969 E. Clinton Avenue Fresno, CA 93727-1549
Pacific Bell	Between Hyde & Ellena Burrel, CA 93607
Pacific Bell	13320 S. Henderson Avenue Caruthers, CA 93609-9463
Pacific Bell	198 E. Durian Avenue Coalinga, CA 93210-2839
Pacific Bell	Sequoia 045 Radio Station Park Ridge, CA 93633
Pacific Bell	1925 E. Dakota Avenue Fresno, CA 93726-4821
Pacific Bell	4734 E. Carmen Avenue Fresno, CA 93703-4501
Pacific Bell	1649 Van Ness Avenue Fresno, CA 93721-1128
Pacific Bell	2515 S. Orange Avenue Fresno, CA 93725-1329
Pacific Bell	1401 Fulton Street Fresno, CA 93721-1609
Pacific Bell	700 W. Herndon Avenue Fresno, CA 93650-1011
Pacific Bell	2502 Merced Street Fresno, CA 937221-1812
Pacific Bell	1407 Van Ness Avenue Fresno, CA 93721-1210
Pacific Bell	1621 Fulton Street Fresno, CA 93721-1627

APPENDIX 9B

**RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY**

**FRESNO COUNTY
MAY 1, 1995**

FACILITY	ADDRESS
Pacific Bell	1420 Tuolumne Street Fresno, CA 93706-1624
Pacific Bell	1665 E. Street Fresno, CA 93706-2025
Pacific Bell	3636 N. 1 st Street Fresno, CA 93726-6818
Pacific Bell	1320 E. Shaw Avenue Fresno, CA 93710-7905
Pacific Bell	1245 Van Ness Avenue Fresno, CA 93721-1711
Pacific Bell	2345 49 South Orange Avenue Fresno, CA 93725
Pacific Bell	206 7 th Fowler, CA 93625
Pacific Bell	770 E. Shaw Avenue Fresno, CA 93710-7708
Pacific Bell	1907 N. Gateway Blvd. Fresno, CA 93727-1605
Pacific Bell	1617 E. Saginaw Way Fresno, CA 93704-4458
Pacific Bell	S/S Lincoln Del Rey, CA 93616
Pacific Bell	Selma at Indianola & RR Selma, CA 93662
Pacific Bell	Bear Mountain Sec 5 T14S Orange Cove, CA 93646
Pacific Bell	1700 Todd Street Selma, CA 93662-3637
Pacific Bell	2410 McCall Avenue Selma, CA 93662-3145
Pacific Bell	9 th and L Street Huron, CA 93234

APPENDIX 9B

RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
LARGE QUANTITY GENERATORS
US ENVIRONMENTAL PROTECTION AGENCY

FRESNO COUNTY
MAY 1, 1995

FACILITY	ADDRESS
Pacific Bell	1431 Marion Street Kingsburg, CA 93631-1928
Pacific Bell	20834 South Del Rio Street Laton, CA 93242
Pacific Bell	Center Street at Park Orange Cove, CA 93646
Pacific Bell	Tulare Street at J Street Parlier, CA 93648
Pacific Bell	3562 Henson Avenue Riverdale, CA 93656
Pacific Bell	2021 Orange Avenue Selma, CA 93662-3713
Pacific Bell	21068 Fresno-Coalinga Road Five Points, CA 93624
Pacific Bell	5554 South Wildwood Avenue Del Rey, CA 93616
Producers Cotton Oil Co.	2365 E. North Avenue Fresno, CA 93725-2615
Coalinga Cogeneration Co.	32812 W. Gale Avenue Coalinga, CA 93210-9735
USANG CA	5425 E. McKinley Avenue Fresno, CA 93727-2108
Fresno Aucrad	5168 E. Dakota Avenue Fresno, CA 93727-7404
USTD IRS	5045 Butler Avenue Fresno, CA 93727-5136

APPENDIX 9C

CORTESE LIST SITES

April 1998

TO: All Interested Persons

Inclosed is a copy of the Hazardous Waste and Substances Sites List consolidated by the Department of Toxic Substances Control, pursuant to *Government Code Section 65962.5*.

The data for the list were received from the following:

1. CALSITES Department of Toxic Substances Control;
Contaminated or potentially contaminated hazardous waste sites listed in the
Calsites database (formerly known as ASPIS)
(916) 323-3400
2. LTANK California State Water Resources Control Board;
Leaking Underground Storage Tanks
(916) 227-4400
3. WB-LF California Integrated Waste Management Board;
Sanitary Landfills which have evidence of groundwater contamination
(916) 255-2460

The reporting state agencies have stated that the location of a site, as printed in the list, may not necessarily lie within the incorporated boundaries of a city. To provide the most unequivocal listing, we have sorted the data by street name and number. While the city and county are also printed, the data are not aggregated by either city or county. City and county listings are available, although their accuracy depends upon the correct city and county identification by the primary data source. If you require one of these listings, please contact Ms. Beckie Mora at (916) 445-6532. If you need any additional information regarding a listed site or if you believe the information is inaccurate, please contact the appropriate reporting state agency as listed above.

Government Code Section 65962.5

**List of Hazardous Waste and Substance Sites;
Submission to California Environmental Protection Agency
Department of Toxic Substances Control
Office of Environmental Information Management**

- (A) The Department of Toxic Substances Control shall compile and update as appropriate, but at least annually, and shall submit to the California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control, Office of Environmental Information Management a list of all of the following:
- (1) All hazardous waste facilities subject to corrective action pursuant to Section 25187.5 of the Health and Safety Code.
 - (2) All land designated as hazardous waste property or border zone property pursuant to Article 11 (commencing with Section 25220) of Chapter 6.5 of Division 20 of the Health and Safety Code.
 - (3) All information received by the Department of Toxic Substances Control pursuant to Section 25242 of the Health and Safety Code on hazardous waste disposals on public land.
 - (4) All sites listed pursuant to Section 25356 of the Health and Safety Code.
 - (5) All sites included in the Abandoned Site Assessment Program.
 - (6) A list of all public drinking water wells which contain detectable levels of organic contaminants and which are subject to water analysis pursuant to Section 4026.2 or 4026.3 of the Health and Safety Code.
- (B) The State Water Resources Control Board shall compile and update as appropriate, but at least annually, and shall submit to the California Environmental Protection Agency, a list of all of the following:
- (1) All underground storage tanks for which an unauthorized release report is filed pursuant to Section 25295 of the Health and Safety Code.
 - (2) All solid waste disposal facilities from which there is a migration of hazardous waste and for which California Regional Water Quality Control Board has notified the State Department of Toxic Substances Control pursuant to subdivision (e) of Section 13273 of the Water Code.
 - (3) All cease and desist orders issued after January 1, 1986, pursuant to Section 13301 of the Water Code, which concern the discharge of wastes which are hazardous materials.
- (C) The local enforcement agency, as designated pursuant to Section 18051 of Title 14 of the California Administrative Code, shall compile as appropriate, but at least annually, and shall submit to the California Integrated Waste Management Board, a list of all solid waste disposal facilities from which there is a known migration of hazardous waste. The California Integrated Waste Management Board shall compile the local lists into a statewide list which shall be submitted to the California Environmental Protection Agency and shall be available to any person who requests the information.
- (D) The California Environmental Protection Agency shall consolidate the information submitted pursuant to this section and distribute it in a timely fashion to each city and county in which sites on the lists are located.
- (E) Before a local agency accepts as complete an application for any development project which will be used by any person, the applicant shall consult the lists sent to the appropriate city or county and shall submit a signed statement to the local agency indicating whether the project is located on a site which is included on any of the lists compiled pursuant to this section. If the site is included on a list, the list shall be specified on the statement.
- (F) This section shall become operative on July 1, 1987.

DISC
FACILITY INVENTORY DATA BASE
HAZARDOUS WASTE AND SUBSTANCES SITES LIST

County Code 10 = Fresno County

STREET NBR	STREET NAME	CITY	ZIP	FACILITY NAME	CO	REG BY - REG ID
4412 (NO STREET NBR)	PLEASANT VALLEY	PLACERVILLE	95667	PLEASANT VALLEY STORE	9	LTNKA 090039
6529 (NO STREET NBR)	PLEASANT VALLEY RD/HWY 49	EL DORADO	95623	GEORGES PIT STOP	9	LTNKA 090067
3025 (NO STREET NBR)	PONY EXPRESS TRAIL	POLLOCK PINES	95726	CRYSTAL VIEW SS	9	LTNKA 090060
1111 (NO STREET NBR)	RESERVOIR RD	GEORGETOWN	95634	GROWLERSBURG CONSERVATION	9	LTNKA 090075
900 (NO STREET NBR)	SACRAMENTO	PLACERVILLE	95667	CEFALU PROPERTY	9	LTNKA 090078
1021 (NO STREET NBR)	SADDLE AND KELLER ROADS	SOUTH LAKE TAHOE	95735	BASE OF WORLD CUP IN PRKG	9	LTNKA 6TO121A
1021 (NO STREET NBR)	SIERRAATTAHOE	TWIN BRIDGES	95705	SIERRA-AT-TAHOE AKA: SKI	9	LTNKA 090057
1021 (NO STREET NBR)	SKI RUN	SOUTH LAKE TAHOE		SKI RUN MARINA	9	LTNKA 6TO163A
1021 (NO STREET NBR)	SKI RUN SKI RUN BLVD	SOUTH LAKE TAHOE		AL'S SKI RUN CHEVRON	9	LTNKA 6TO076A
1021 (NO STREET NBR)	TAHOE BLVD	SOUTH LAKE TAHOE		MIDDLE SCHOOL BUS DEPOT	9	LTNKA 6TO114A
1021 (NO STREET NBR)	TAHOE BLVD	SOUTH LAKE TAHOE		LAKE TAHOE USD - BUS DEPO	9	LTNKA 6TO192A
1810 (NO STREET NBR)	WEISLOVATT RD	EL DORADO HILLS	95630	WEISLOVATT LUMBER	9	LTNKA 090093
2015 (NO STREET NBR)	ACADEMY	SANGER	93657	SUMA FRUIT INTERNATIONAL	10	LTNKA 5T10000161
801 (NO STREET NBR)	ACADEMY	SANGER	93657	COUNTRY HOME VIDEO	10	LTNKA 5T10000328
25722 (NO STREET NBR)	ADAMS	SANGER	93657	BEACON STATION #504	10	LTNKA 5T10000397
32560 (NO STREET NBR)	ADAMS	ORANGE COVE	93646	MAURILIO VALERO PROPERTY	10	LTNKA 5T10000352
901 (NO STREET NBR)	AIRPORT	TRANQUILITY	93668	WESTLANDS WATER DISTRICT	10	LTNKA 5T10000573
10014 (NO STREET NBR)	ALTA	MENDOTA		MENDOTA AIRPORT	10	LTNKA 5T10000210
10764 (NO STREET NBR)	ALTA	DINUBA	93618	AMIGO MINI MART	10	LTNKA 5T10000299
4988 (NO STREET NBR)	ANDERSON	DINUBA	93618	VALLEY TRUCK WRECKING CO.	10	LTNKA 5T10000255
4996 (NO STREET NBR)	ANDERSON	FRESNO	93727	EXECUTIVE WINGS, INC	10	LTNKA 5T10000438
5004 (NO STREET NBR)	ANDERSON	FRESNO	93727	WESTERN PIPER SALES	10	LTNKA 5T10000506
5045 (NO STREET NBR)	ANDERSON	FRESNO	93727	BESCHCRAFT WEST	10	LTNKA 5T10000481
2724 (NO STREET NBR)	ANNADALE	FRESNO	93727	WOFFORD FLYING SERVICE	10	LTNKA 5T10000587
3141 (NO STREET NBR)	ARGYLE	FRESNO	937060000	SHANE INDUSTRIES INC.	10	LTNKA 5T10000501
4011 (NO STREET NBR)	ASHLAN	FRESNO	93727	BALLARD TILE	10	LTNKA 5T10000236
2401 (NO STREET NBR)	ASHLEY	FRESNO	93711	PRIVATE GARAGE	10	LTNKA 5T10000280
29478 (NO STREET NBR)	AUBERRY	FRESNO	93727	FRESNO AIR TERMINAL	10	LTNKA 5T10000127
1762 (NO STREET NBR)	B	PRATHER	93651	CANYON FORK PROPERTIES	10	LTNKA 5T10000609
53830 (NO STREET NBR)	BADGER	PINEHURST	93711	JAMES REPAIR SHOP	10	LTNKA 5T10000160
811 (NO STREET NBR)	BARSTOW	CLOVIS	93612	PINEHURST TRADING POST	10	LTNKA 5T10000026
2324 (NO STREET NBR)	BARTON	FRESNO	937250000	BISHOPS STORE HOUSE	10	LTNKA 5T10000063
2158 (NO STREET NBR)	BASS	FRESNO	93640	CARDIS CORPORATION	10	LTNKA 5T10000450
104 (NO STREET NBR)	BELMONT	MENDOTA	937280000	SILVER CREEK PACKING	10	LTNKA 5T10000105
1155 (NO STREET NBR)	BELMONT	FRESNO	93702	LA TAPATIA	10	LTNKA 5T10000535
1536 (NO STREET NBR)	BELMONT	FRESNO	93701	ARCO #274	10	LTNKA 5T10000154
3440 (NO STREET NBR)	BELMONT	FRESNO	937020000	PENNYWISE SELF SERVICE	10	LTNKA 5T10000327
3709 (NO STREET NBR)	BELMONT	FRESNO	93702	WEBSTER PROPERTY	10	LTNKA 5T10000526
5191 (NO STREET NBR)	BELMONT	FRESNO	93747	THOMPSON MOTOR SALES	10	LTNKA 5T10000351
890 (NO STREET NBR)	BELMONT	FRESNO	937010000	HAROLD'S AUTOMOTIVE	10	LTNKA 5T10000206
14900 (NO STREET NBR)	BELMONT AVE & J ST	FRESNO	93701	ROEDING PARK	10	LTNKA 5T10000601
4627 (NO STREET NBR)	BELMONT	FRESNO	93630	TRI FARMS	10	LTNKA 5T10000265
1486 (NO STREET NBR)	BLACKSTONE	KERMAN	937110000	KERMAN CO-OP & WAREHOUSE	10	LTNKA 5T10000252
2211 (NO STREET NBR)	BLACKSTONE	FRESNO		FRESNO CHROME PLATING, IN	10	CALSI 10340008
4540 (NO STREET NBR)	BLACKSTONE	BIG CREEK	93703	BIG CREEK RANGER STATION	10	LTNKA 5T10000125
4591 (NO STREET NBR)	BLACKSTONE	FRESNO	93703	LEO'S EXXON	10	LTNKA 5T10000221
4621 (NO STREET NBR)	BLACKSTONE	FRESNO	900400000	BLACKSTONE MINI MART	10	LTNKA 5T10000522
4819 (NO STREET NBR)	BLACKSTONE	FRESNO	92726	KUYUMJIAN PROPERTY	10	LTNKA 5T10000503
5405 (NO STREET NBR)	BLACKSTONE	FRESNO	93726	THRIFTY OIL COMPANY #162	10	LTNKA 5T10000318
5405 (NO STREET NBR)	BLACKSTONE	FRESNO		7-ELEVEN (BLACKSTONE)	10	LTNKA 5T10000392
5499 (NO STREET NBR)	BLACKSTONE	FRESNO		SHELL S/S	10	LTNKA 5T10000046
		FRESNO		SHELL. NORTHGATE 1	10	LTNKA 5T10000276
		FRESNO		SHELL. NORTHGATE 2	10	LTNKA 5T10000503
		FRESNO	93710	HERWALDT OLDSMOBILE	10	LTNKA 5T10000295

FACILITY INVENTORY DATA BASE
HAZARDOUS WASTE AND SUBSTANCES SITES LIST

STREET NBR	STREET NAME	CITY	ZIP	FACILITY NAME	CO	REG BY	REG ID
6277	BLACKSTONE	FRESNO	93710	TIRE COUNTY U.S.A., INC.	10	LTNKA	5T10000349
7259	BLACKSTONE	PINEDALE	936500000	GEORGE'S EXXON	10	LTNKA	5T10000487
3486	BLANCHARD	LATON	93242	ESP & PARICHAN FARMS	10	LTNKA	5T10000475
(NO STREET NBR)	BLACK N. SHERMAN SYLVIA Y	SELMA	93662	PG&E MANUFACTURED GAS PLA	10	CALSI	10490093
5050	BLTYHE	FRESNO	93706	CALOTE RESIDENCE	10	LTNKA	5T10000616
4141	BRAWLEY	FRESNO	93711	MODERN WELDING	10	LTNKA	5T10000237
4150	BRAWLEY	FRESNO	937220000	HYDRO CONDUIT CORPORATION	10	LTNKA	5T10000532
441	BRAWLEY	FRESNO	93706	FRESNO POULTRY	10	LTNKA	5T10000365
4536	BRAWLEY	FRESNO	93711	F.U.S.D. WAREHOUSE YARD	10	LTNKA	5T10000205
1033	BROADWAY	FRESNO		GREYHOUND BUS DEPOT	10	LTNKA	5T10000457
110	BROADWAY	FRESNO		ARMORED TRANSPORT INC	10	LTNKA	5T10000496
330	BROADWAY	FRESNO		ANGELICA HEALTH CARE	10	LTNKA	5T10000479
565	BROADWAY	FRESNO	93701	ACE S/S	10	LTNKA	5T10000031
1709	BULLARD	FRESNO	93721	NORTH CENTRAL FIRE	10	LTNKA	5T10000428
3000	BUTLER	FRESNO	937080000	CALIFORNIA PRODUCTS COMPA	10	LTNKA	5T10000539
3603	BUTLER	FRESNO	93702	SHELL'S TINO SERVICE	10	LTNKA	5T10000150
15449	CALIFORNIA	KERMAN	93630	VACANT BUILDING	10	LTNKA	5T10000307
2421	CALIFORNIA	FRESNO	93710	TRUSCO TANK, INC.	10	LTNKA	5T10000306
3530	CALIFORNIA	FRESNO	937000000	PG & E FRESNO SERVICE CEN	10	LTNKA	5T10000578
3720	CALIFORNIA	FRESNO	93706	SAM'S VILLAGE MARKET	10	LTNKA	5T10000460
437	CALIFORNIA	FRESNO	93706	VACANT LOT (ABD S/S)	10	LTNKA	5T10000121
5305	CALIFORNIA	FRESNO	93706	KOLLER DAIRY	10	LTNKA	5T10000254
1605	CEDAR	FRESNO		UNOCAL	10	LTNKA	5T10000188
4190	CEDAR	FRESNO	93727	ARCO #2061	10	LTNKA	5T10000164
8665	CEDAR	FRESNO	93725	FOWLER PACKING	10	LTNKA	5T10000421
3257	CENTRAL	FRESNO	93725	SNOWDEN ENTERPRISES, INC.	10	LTNKA	5T10000418
12825	CHESTNUT	FRESNO	937250000	THRIFTY BEST (AKA CHESTNU	10	WB-LF	10-AA-0025
1917	CHESTNUT	FRESNO	93702	SENIOR CITIZENS VILLAGE	10	LTNKA	5T10000270
2397	CHESTNUT	FRESNO	937250000	7-11 #16970	10	LTNKA	5T10000432
4355	CHESTNUT	FRESNO	93725	G.I. TRUCKING	10	LTNKA	5T10000559
2440	CHURCH	FRESNO	937060000	ROADWAY EXPRESS, INC	10	LTNKA	5T10000449
3223	CHURCH	FRESNO	93725	GUILD WINERY	10	LTNKA	5T10000229
3767	CHURCH	FRESNO	93725	QUAL-T-TRUCK	10	LTNKA	5T10000320
4142	CHURCH	FRESNO	93725	GILBERT'S EXXON	10	LTNKA	5T10000326
5069	CLAYTON	FRESNO	937060000	A & R CUNHA FARMS	10	LTNKA	5T10000444
1254	CLINTON	FRESNO	937050000	BUZ'S SUPER SERVICE	10	LTNKA	5T10000628
1919	CLINTON	FRESNO	93705	FAST GAS, FORMER	10	LTNKA	5T10000009
5075	CLINTON	FRESNO	93726	BUDGET RENT-A-CAR	10	LTNKA	5T10000471
5175	CLINTON	FRESNO	93727	HERTZ RENT-A-CAR	10	LTNKA	5T10000368
1110	CLOVIS	CLOVIS	93612	RAY STANLEY CHEVRON	10	LTNKA	5T10000184
21817	COALINGA	FIVE POINTS	93624	BRITZ FERTILIZERS, INC -	10	CALSI	10280077
22055	COLORADO	SAN JOAQUIN	93660	SUBURBAN PROPANE	10	LTNKA	5T10000207
22125	COLORADO	SAN JOAQUIN	93660	SUBURBAN PROPANE	10	LTNKA	5T10000238
(NO STREET NBR)	COLORADO & MAIN	KERMAN	93660	UNION 76	10	LTNKA	5T10000071
14655	D	KERMAN	93630	KERMAN UNIFIED SCHOOL DIS	10	LTNKA	5T10000620
4919	DAKOTA	FRESNO	93727	SUNNYSIDE POOLS, INC	10	LTNKA	5T10000515
4961	DAKOTA	FRESNO	93727	HOLIDAY POOLS	10	LTNKA	5T10000238
5545	DAKOTA	FRESNO	93727	JURA FARMS, INC.	10	LTNKA	5T10000531
6116	DANIEL	TRANQUILLITY	93668	TRANQUILLITY ELEMENTARY	10	LTNKA	5T10000384
5404	DEL REY	DEL REY	93616	H S MANN METAL WASTE COMP	10	CALSI	10330038
17909	DERRICK	CONTISA CREEK	93608	HALFWAY STORE	10	LTNKA	5T10000425
37300	DICKENSON	COALINGA	93210	TEXACO	10	LTNKA	5T10000030
2045	DICKENSON	FRESNO		CENTRAL HIGH SCHOOL	10	LTNKA	5T10000159
1271	DINUBA	SELMA	936620000	FRESNO COUNTY SOUTHEAST R	10	WB-LF	10-A 111

FACILITY INVENTORY DATA BASE
HAZARDOUS WASTE AND SUBSTANCES SITES LIST

SORT BY CNTY, ST NAME, ST NBR

STREET NBR	STREET NAME	CITY	ZIP	FACILITY NAME	CO	REG BY	REG ID
545	DINUBA	REEDLEY	93654	ALTA SELF SERVE	10	LTNKA	5T10000500
1735	DOCKERY & ADJOINING	SELMA	93662	SELMA TREATING COMPANY	10	CALSI	102400051
24505	DORRIS	COALINGA	93210	HARRIS RANCH SHELL	10	LTNKA	5T10000135
15032	DOS PALOS	DOS PALOS	93620	FARMERS RICE COOPERATIVE	10	LTNKA	5T10000430
9421	DOS PALOS	FIREBAUGH	93622	DAVIS DRIER & ELEVATOR	10	LTNKA	5T10000554
1157	DRAVER	KINGSBURG	936310000	COLORADO'S AUTO CARE	10	LTNKA	5T10000610
3596	DUDLEY	FRESNO	93722	VERN INGRAM	10	LTNKA	5T10000245
46034	DUNLOP	MIRAMONTE	93641	MIRAMONTE GENERAL STORE	10	LTNKA	5T10000058
1060	E	FRESNO	937060000	FRANKS EXXON	10	LTNKA	5T10000466
2365	E	FRESNO	93725	PRODUCERS COTTON OIL CO	10	LTNKA	5T10000333
1895	ELM	COALINGA	93210	WESTSIDE TRUCKING	10	LTNKA	5T10000593
2632	ELM	FRESNO		MYRTLE HARPER	10	LTNKA	5T10000191
301	ELM	COALINGA	93210	BUFORD OIL-TEXACO MINI-MA	10	LTNKA	5T10000129
3087	ELM	FRESNO	93706	GLEIM-CROWN PUMPS	10	LTNKA	5T10000354
475	ELM	COALINGA	93210	RON LEE'S UNION 76	10	LTNKA	5T10000364
625	ELM	COALINGA	93210	KELLER MOTORS INC.	10	LTNKA	5T10000039
702	ELM	COALINGA	93210	JIFFY FOOD E-Z SERVE	10	LTNKA	5T10000387
780	ELM	COALINGA	93210	CAL TRANS YARD	10	LTNKA	5T10000107
19191	EXCELSIOR	COALINGA	93210	CAL TRANS COALINGA MAINT	10	LTNKA	5T10000025
1410	F	FIVE POINTS		WESTSIDE ELEMENTARY SCHOO	10	LTNKA	5T10000027
620	F	FRESNO	93771	DUNAVANT & W.B. CO.	10	LTNKA	5T10000453
804	F	FRESNO	93711	BLUES AUTO	10	LTNKA	5T10000537
(NO STREET NBR)	FAIRFAX & PANDOCHE	MENDOTA	93706	FELIX AUTO MECHANIC	10	LTNKA	5T10000248
2425	FLORAL	SELMA	93640	C CHASE CO	10	LTNKA	5T10000066
3000	FLORAL	SELMA		CONSOLIDATED MOSQUITO ABA	10	LTNKA	5T10000357
540	FOREST	COALINGA	93210	NINDE KHERA'S SELMA TRUCK	10	LTNKA	5T10000635
16025	FOWLER	SELMA	93662	JIMS EQUIPMENT	10	LTNKA	5T10000149
1060	FRESNO	FRESNO	93775	WILDFLOWER SUPERETTE	10	LTNKA	5T10000632
1101	FRESNO	FRESNO	93775	UNOCAL #4987	10	LTNKA	5T10000308
1101	FRESNO	FRESNO	93775	LOOK SELF SERVE	10	LTNKA	5T10000183
1160	FRESNO	FRESNO	93775	LOOK SELF SERVICE	10	LTNKA	5T10000330
2330	FRESNO	FRESNO	937030000	CHEVRON #9-4374	10	LTNKA	5T10000117
2409	FRESNO	FRESNO	93703	M & S TEXACO	10	LTNKA	5T10000581
2527	FRESNO	FRESNO	93716	FRESNO CLINTON B.P.	10	LTNKA	5T10000494
4192	FRESNO	FRESNO	93727	TWINNING LABORATORIES	10	LTNKA	5T10000070
450	FRESNO	FRESNO	93648	ARGO #610	10	LTNKA	5T10000110
457	FRESNO	PARLIER	93721	HAGA AUTOMOTIVE	10	LTNKA	5T10000546
5544	FRESNO	FRESNO	93721	FRESNO TIRE WHOLESALE	10	LTNKA	5T10000517
7775	FRIANT	FRESNO	93710	WRENWOOD POLICE DRESSING	10	LTNKA	5T10000600
180	FRUIT	FRESNO	93710	WOODWARD PARK	10	LTNKA	5T10000589
2407	FRUIT	FRESNO	93706	HARRELL COMPANY	10	LTNKA	5T10000400
742	FULTON	FRESNO	937050000	B & B AUTO REPAIR	10	LTNKA	5T10000538
1111	G	FRESNO	93721	ARCHIVES RECORD STORAGE B	10	LTNKA	5T10000394
1307	G	FRESNO	93706	JENSEN AND PILEGARD	10	LTNKA	5T10000069
2101	G	REEDLEY	93706	PG&E G STREET SUBSTATION	10	CALSI	10490101
2150	G	FRESNO	93654	ENNS PONTIAC, BUICK, & GM	10	LTNKA	5T10000049
655	G	FRESNO	937060000	CITY OF FRESNO-FLEET MGMT	10	LTNKA	5T10000536
30933	GALE	FRESNO	93721	UNION PACIFIC RAILROAD	10	LTNKA	5T10000633
1843	GETTYSBURG	COALINGA	93721	ABANDONED S/S	10	LTNKA	5T10000124
396	GETTYSBURG	FRESNO	93726	CALTRANS MAINTENANCE STAT	10	LTNKA	5T10000484
798	GETTYSBURG	CLOVIS	93612	AAMCO TRANSMISSIONS	10	LTNKA	5T10000375
2989	GOLDEN STATE	CLOVIS	93612	7-11 #16999	10	LTNKA	5T10000427
		CALWA	93725	BEACON STATION #537	10	LTNKA	5T10000313
				SANTA FE INTERMODAL YARD	10	LTNKA	5T10000451

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STREET NBR	STREET NAME	CITY	ZIP	FACILITY NAME	CO	REG BY	REG ID
3363	GOLDEN STATE	FRESNO	93778	SUBURBAN PROPANE	10	LTNKA	5T10000189
3741	GOLDEN STATE	FRESNO	937250000	BENNY'S AUTO SALES	10	LTNKA	5T10000604
2989	GOLDEN STATE BLVD	FRESNO	93725	AT & SP-CALWA RAIL YARD	10	LTNKA	5T10000112
16456	GOODFELLOW	SANGER	93657	RODRIGUEZ MARKET	10	LTNKA	5T10000233
3095	GREENWOOD	SANGER	93657	FAIRMONT SCHOOLS	10	LTNKA	5T10000219
401	H	FRESNO	93721	KALASHIAN PACKING CO.	10	LTNKA	5T10000401
476	H	FRESNO	93721	S & J MINI MART	10	LTNKA	5T10000489
7082	HARRISON	PINEDALE	93650	GOLDEN STATE ENTERPRISES	10	LTNKA	5T10000504
7140	HARRISON	FRESNO	936500000	INDUSTRIAL WASTE PROCESSI	10	CALSI	103300040
4639	HARVEY	FRESNO	93702	FRESNO ROOFING COMPANY	10	LTNKA	5T10000370
4685	HEDGES	FRESNO	93702	MAULDIN-DORFMEIER CONST,	10	LTNKA	5T10000341
1490	HERNDON	CLOVIS	936120000	MAINTENANCE YARD	10	LTNKA	5T10000619
53	HERNDON	CLOVIS		FRESNO CO-OP TRUCKING	10	LTNKA	5T10000579
6423	HILLS VALLEY	CLOVIS		HILLS VALLEY RANCH	10	LTNKA	5T10000426
1919	HOLLAND	FRESNO		HERBERT SCHWARTZ & SON, I	10	LTNKA	5T10000443
3805	HUGHES	FRESNO		7-11 #21303	10	LTNKA	5T10000446
511	HUGHES	FRESNO	937060000	KEMMER RESIDENCE	10	LTNKA	5T10000441
55083	HUNTINGTON LAKE	FRESNO	937220000	BIG CREEK GENERAL STORE	10	LTNKA	5T10000491
7225	HUNTSMAN	SELMA	93605	THE SELMA AIRPORT	10	LTNKA	5T10000379
(NO STREET NBR)	HWY 168	SHAWER LAKE	93664	SHAWER MAINTENANCE STATIO	10	LTNKA	5T10000013
(NO STREET NBR)	HWY 99 THORNE	FRESNO	93728	UNKNOWN	10	LTNKA	5T10000408
(NO STREET NBR)	HWY 99 THORNE	FRESNO	93728	UNKNOWN	10	LTNKA	5T10000413
701	I	REEDLEY	936540000	KWIK KORNER	10	LTNKA	5T10000584
7209	INGRAM	FRESNO	93650	VENDO COMPANY, THE	10	CALSI	105900001
510	J	PARLIER	93648	BANK OF THE WEST	10	LTNKA	5T10000492
930	J	SANGER	93657	MAR-Y-TIERRA	10	LTNKA	5T10000240
1373	JACKSON	FRESNO	93703	SMILANICK AIR CONDITIONIN	10	LTNKA	5T10000399
(NO STREET NBR)	JACOBS AVE S.	ORANGE COVE	93646	ORANGE COVE RANCH #34	10	LTNKA	5T10000629
5638	JAMES	TRANQUILLITY	93668	WESTSIDE DISTRIBUTING.	10	LTNKA	5T10000319
2720	JENSEN	SANGER	936570000	SANGER NURSEY	10	LTNKA	5T10000455
3230	JENSEN	FRESNO	93725	JENSEN AUTO PARTS	10	LTNKA	5T10000076
(NO STREET NBR)	JENSEN AND W. AVE	FRESNO		CITY OF FRESNO LANDFILL	10	WB-LF	10-AA-0005
7672	JOSEPHINE	FRESNO	93722	RIVERSIDE GOLF COURSE	10	LTNKA	5T10000158
6052	JUANACHE TRIO	TRANQUILLITY	93668	TRANQUILLITY HIGH SCHOOL	10	LTNKA	5T10000057
15850	KARNEY	KERMAN	93639	NORTH CENTRAL FIRE DIST	10	LTNKA	5T10000636
13015	KINGS CNVN	SANGER	93657	ARCO #613	10	LTNKA	5T10000001
13015	KINGS CNVN	SANGER	93657	BEACON/ARCO #613	10	LTNKA	5T10000448
17125	KINGS CNVN	SANGER	93657	SANGER ROCK & SAND	10	LTNKA	5T10000259
24611	KINGS CNVN	REEDLEY	93654	KACTUS KORNER	10	LTNKA	5T10000454
35860	KINGS CNVN	DUNLOP	936210000	HUME LAKE RANGER STATION	10	LTNKA	5T10000612
5605	KINGS CNVN	FRESNO	907490000	SHELL SERVICE STATION	10	LTNKA	5T10000641
5698	KINGS CNVN	FRESNO	93727	USA PETROLEUM	10	LTNKA	5T10000022
160	L	FRESNO		RAINBO BAKERIES	10	LTNKA	5T10000452
325	L	SANGER	93657	BALLENTINE PACKING	10	LTNKA	5T10000239
850	L	FRESNO	937210000	PETERSON INVESTMENTS	10	LTNKA	5T10000431
2636	LARKIN	FRESNO	93727	SIERRA BUILDING MATERIAL	10	LTNKA	5T10000246
13880	LASSEN	HELM	93656	DYE BUILDING	10	LTNKA	5T10000588
13900	LASSEN	HELM	936270000	HELM STORE	10	LTNKA	5T10000445
21047	LASSEN	FIVE POINTS		BEACON STATION (ABANDONED	10	LTNKA	5T10000373
21047	LASSEN	FIVE POINTS		BEACON S/S	10	LTNKA	5T10000002
36270	LASSEN	HURON	900000000	FUEL DEPOT (FORMERLY SHEL	10	LTNKA	5T10000590
36509	LASSEN	HURON	932340000	TEXACO	10	LTNKA	5T10000502
36560	LASSEN	HURON	93234	C & T SERVICE STATION	10	LTNKA	5T10000570
5013	LINCOLN	FRESNO	93706	MUNDZ MARKET	10	LTNKA	5T10000435

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33326	LODGE	TOLHOUSE	936670000	SIERRA JOINT UNION HIGH S	10	LTNKA	5T10000519
3355	LORENA	FRESNO	93717	PACIFIC FOREST PRODUCTS	10	LTNKA	5T10000392
1473	LYON	MENDOTA	93640	BUHLER COUNTRY STORE	10	LTNKA	5T10000473
1155	M	FRESNO	93721	FRESNO COUNTY JAIL	10	LTNKA	5T10000263
1161	M	REEDLEY	93654	BATHAUSER PROPERTY	10	LTNKA	5T10000346
1440	M	FIREBAUGH	94553	CAL PINE CONTAINER CORP	10	LTNKA	5T10000053
450	M	FRESNO	93706	FIRE DEPT HEADQUARTERS	10	LTNKA	5T10000123
756	MADERA	KERMAN	93630	RON GARCIA AUTO	10	LTNKA	5T10000286
10098	MANNING	RAISIN CITY	93652	PRIVATE FARM	10	LTNKA	5T10000015
13495	MANNING	PARLIER	93648	T & J ARCO & MINI MART	10	LTNKA	5T10000639
1384	MANNING	REEDLEY	93654	REEDLEY GENRAL FOOD STORE	10	LTNKA	5T10000120
21945	MANNING	REEDLEY	93654	KIMURA TRUCKING	10	LTNKA	5T10000287
22012	MANNING	REEDLEY	93654	EL MONTE GAS	10	LTNKA	5T10000007
23487	MANNING	REEDLEY	93654	KIMURA BROS & CO	10	LTNKA	5T10000006
735	MANNING	PARLIER	93648	SUN WEST PACKING	10	LTNKA	5T10000145
833	MANNING	REEDLEY	93654	ALTA SELF SERVE	10	LTNKA	5T10000352
9739	MANNING	SELMA	93662	L & H MANUFACTURING	10	LTNKA	5T10000312
3265	MAPLE	MALAGA	93726	PURITY OIL SALES, INC	10	CALSI	10500005
3561	MAPLE	FRESNO	93725	SAFETY KLEEN	10	LTNKA	5T10000378
3672	MAPLE	FRESNO	93725	VENTURE OUT	10	LTNKA	5T10000249
4412	MAPLE	FRESNO	93725	MALAGA FOOD CENTER	10	LTNKA	5T10000412
2323	MARIPOSA	FRESNO	93725	FRESNO CITY POLICE DEPT.	10	LTNKA	5T10000595
2550	MARIPOSA MALL	FRESNO	93721	DEPT GENL SERVICE FLEET A	10	LTNKA	5T10000012
16800	MARKS	CARUTHERS	93721	CONSOLIDATED MOSQUITO ABA	10	LTNKA	5T10000358
1042	MCCALL	SANGER	93612	GUILD WINERY	10	LTNKA	5T10000196
5367	MCCALL	CLOVIS	93728	DON BRICKER	10	LTNKA	5T10000342
1724	MCKINLEY	FRESNO	93728	LARSON BROS. AUTO REPAIR	10	LTNKA	5T10000174
2308	MCKINLEY	FRESNO	93703	PRETZER ROOFING CO.	10	LTNKA	5T10000598
2441	MCKINLEY	FRESNO	93722	CHEVRON #9-1116	10	LTNKA	5T10000282
3256	MCKINLEY	FRESNO	93722	M. V. MARKET & DELIVERY	10	LTNKA	5T10000269
3728	MCKINLEY	FRESNO	93722	CAL'S EXXON GARAGE	10	LTNKA	5T10000278
7183	MCKINLEY	FRESNO	93727	T H AGRICULTURE & NUTRITI	10	CALSI	10280334
9337	MCKINLEY	FRESNO	93727	PRIVATE RESIDENCE	10	LTNKA	5T10000241
(NO STREET NBR)	MCKINLEY AND CLOVIS AVENUE	FRESNO	93727	FRESNO AIR TERMINAL/OLD H	10	CALSI	10450005
2211	MERGED	FRESNO	93721	FRESNO CO. CREDIT UNION	10	LTNKA	5T10000323
(NO STREET NBR)	MITCHELL & S. PAC R/R	SELMA	93662	VACANT LOT	10	LTNKA	5T10000268
5046	MONO	FRESNO	93727	VICTOR MUSSO RESIDENCE	10	LTNKA	5T10000274
1921	MOTIL	FRESNO	93705	FUELS 4-U	10	LTNKA	5T10000109
11010	MOUNTAIN VIEW	SELMA	93662	DARLING OIL & TIRE	10	LTNKA	5T10000086
3150	MT WHITNEY	RIVERDALE	93656	TANK CLEANUP @ RIVERDALE	10	LTNKA	5T10000294
3410	MT WHITNEY	RIVERDALE	93656	D & D CHEVRON	10	LTNKA	5T10000594
3415	MT WHITNEY	RIVERSIDE	93656	MCLEOD FORD	10	LTNKA	5T10000615
3610	MT WHITNEY	RIVERDALE	93656	TEXACO STAR MART #8	10	LTNKA	5T10000567
5350	MT WHITNEY	RIVERDALE	93656	MAGGINI HAY CO.	10	LTNKA	5T10000597
568	MUSCAT	FRESNO	93727	DOLE DRIED FRUIT & NUT	10	WB-LF	10-AA-0002
(NO STREET NBR)	MUSCAT AND W. LAWN	FRESNO	945960000	BROWNING-FERRIS INDUSTRIE	10	LTNKA	5T10000134
1185	N	FIREBAUGH	93622	UNOCAL #371	10	LTNKA	5T10000528
1307	N	FIREBAUGH	93622	CLIFF'S EXXON	10	LTNKA	5T10000566
1366	N	FIREBAUGH	93622	J.A. QUINN TRUST	10	LTNKA	5T10000563
1606	N	FIREBAUGH	93622	LAZZ'S CAR WASH	10	LTNKA	5T10000334
3996	N	FRESNO	93705	CHEVRON - PARKWAY	10	LTNKA	5T10000623
635	N	SANGER	93657	GTE/CONTEL	10	LTNKA	5T10000634
6639	N	FRESNO	93722	GRANTLAND SHELL FOODMART	10	LTNKA	5T10000385
737	N	SANGER	93657	SEQUOIA CHEVROLET (FORMER	10	LTNKA	5T10000385

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785	N	FIREBAUGH	93622	ITALO'S MINI MART	10	LTNKA	5T10000403
1283	N.	FRESNO	93728	DEPT OF TRANSPORTATION	10	LTNKA	5T10000017
1385	N.	FRESNO	93728	CAL TRANS MAINTENANCE YAR	10	LTNKA	5T10000170
325	NAPLES	MENDOTA	93640	CHEVRON CARD-LOCK	10	LTNKA	5T10000304
1445	NEBRASKA	SELMA	936620000	INTERNATIONAL RAISINS INC	10	LTNKA	5T10000476
41012	NEES	FIREBAUGH	93622	VOLK RANCH	10	LTNKA	5T10000103
48060	NEES	FIREBAUGH		PACIFIC FARMS	10	LTNKA	5T10000429
3075	NIELSEN	FRESNO		FRESNO IRRIGATION DISTRICT	10	LTNKA	5T10000637
1190	O	FIREBAUGH	93622	FINANCE & THRIFT	10	LTNKA	5T10000082
220	O	FRESNO	93721	FRESNO BEVERAGE COMPANY	10	LTNKA	5T10000309
(NO STREET NBR)	OIL CITY RD	COALINGA	93210	COALINGA HEATER FACILITY	10	LTNKA	5T10000085
1278	OILER	MENDOTA	93640	GONZALES MINI MART	10	LTNKA	5T10000372
467	OILER	MENDOTA		JIFFY BEST	10	LTNKA	5T10000190
1703	OLIVE	FRESNO	937280000	EXXON	10	LTNKA	5T10000530
3645	OLIVE	FRESNO	93706	7-11 #13917	10	LTNKA	5T10000376
5210	OLIVE	FRESNO	937050000	7-11 #17943	10	LTNKA	5T10000605
5610	OLIVE	FRESNO	93727	E&J GALLO WINERY	10	LTNKA	5T10000088
1267	OLLER	MENDOTA	932300000	BEACON S/S #3-363	10	LTNKA	5T10000011
613	OLLER	MENDOTA	93640	CHEVRON #7651	10	LTNKA	5T10000010
812	OLLER	MENDOTA	93640	VACANT BUILDING	10	LTNKA	5T10000212
918	OLLER	MENDOTA	93640	CIRCLE K #1098 (CLOSED)	10	LTNKA	5T10000415
12490	ORANGE	FRESNO	93625	FOWLER PACKING	10	LTNKA	5T10000420
1606	ORANGE	FRESNO	93702	HARRY'S AUTOMOTIVE SERVICE	10	LTNKA	5T10000186
2803	ORANGE	FRESNO	93725	ACE SPRINKLER CO	10	LTNKA	5T10000260
3280	ORANGE	FRESNO	937250000	ORANGE AVE DISPOSAL SITE	10	LTNKA	5T10000456
3280	ORANGE	FRESNO	937250000	ORANGE AVENUE LANDFILL	10	WB-LF	10-AA-0013
1120	PAIGE	TULARE	93274	C. ROCHE OIL COMPANY	10	LTNKA	5T54000354
5783	PALM	FRESNO	93711	BRENTS EXXON	10	LTNKA	5T10000098
(NO STREET NBR)	PALMER AVE	COALINGA	93210	COLIOLA TANK FARM	10	LTNKA	5T10000073
46370	PANOCHE	FIREBAUGH	93622	SHELL S/S, D & L	10	LTNKA	5T10000047
46370	PANOCHE	FIREBAUGH	93622	D & L SHELL	10	LTNKA	5T10000550
1130	PARK	ORANGE COVE	93646	ORANGE COVE IRRIGATION DI	10	LTNKA	5T10000033
2077	PAIK	SELMA	93662	OLD MARKET	10	LTNKA	5T10000141
714	PARK	ORANGE COVE	93646	PARK BLVD GAS	10	LTNKA	5T10000606
940	PARK	ORANGE COVE	93626	GONZALES AUTO SERVICE	10	LTNKA	5T10000614
1030	PARLIER	PARLIER	936480000	FRESNO HOUSING AUTHORITY	10	LTNKA	5T10000474
13910	PARLIER	PARLIER		KASH INC	10	LTNKA	5T10000477
3333	PEACH	FRESNO	93725	P.P.G. INDUSTRIES	10	LTNKA	5T10000055
2012	PEARL	FRESNO	93721	7-UP BOTTLING CO	10	LTNKA	5T10000008
6773	PEDERSEN	REEDLEY	93654	D'ARRIGO BROTHERS	10	LTNKA	5T10000064
4557	PINE	FRESNO	93703	ALLEN RESIDENCE	10	LTNKA	5T10000059
4557	PINE	FRESNO	93703	ALAN ALLEN	10	LTNKA	5T10000369
26274	PINE FLAT STATION	PIEDRA	93649	PIEDRA GAS STATION	10	LTNKA	5T10000156
(NO STREET NBR)	PIEDDALE/N. FRESNO AREA	FRESNO	93650	PIEDDALE AREA GROUNDWATER	10	CALSI	10990001
298	POIK	COALINGA	93210	RON LEE SALES	10	LTNKA	5T10000067
2396	RAILROAD	FRESNO	937210000	ANDERSON CLAYTON	10	LTNKA	5T10000018
2494	RAILROAD	FRESNO	937060000	PEABODY FLOWAY	10	LTNKA	5T10000298
2768	RAILROAD	FRESNO	93725	TRUCK CITY	10	LTNKA	5T10000582
2796	RAILROAD	FRESNO	937250000	CAL TRANS FRESNO	10	LTNKA	5T10000016
2916	REID	SANGER	93657	BEVERAGE SOURCE, INC., THE	10	LTNKA	5T10000389
936	REID	REEDLEY	93654	KINGS RIVER COMMUNITY COL	10	LTNKA	5T10000034
4962	RIVERBEND	SANGER	936100000	RIVER RANCH	10	LTNKA	5T10000508
101	ROOSEVELT	FRESNO	934010000	UNOCAL BULK PLANT #221	10	LTNKA	5T10000596
10759	RUSSELL	FIREBAUGH	93622	FRANCOS MINI MART	10	LTNKA	5T10000232

STREET NBR	STREET NAME	CITY	ZIP	FACILITY NAME	CO	REG BY	REG ID
3187	S	FRESNO	93711	TED SMITH (TSE BRAKES)	10	LTNKA	5T10000362
11595	S.	CARUTHERS	93608	SINGH PROPERTY	10	LTNKA	5T10000345
2360	S.	FRESNO	93721	FRESNO WIRE ROPE & RIGGIN	10	LTNKA	5T10000244
2595	S.	FRESNO	93706	SHELL SERVICE STATION	10	LTNKA	5T10000277
2737	S.	FRESNO	93725	CONSOLIDATED FREIGHTWAYS	10	LTNKA	5T10000388
3333	SABRE	FRESNO	937270000	ARATEX SERVICES, INC.	10	LTNKA	5T10000382
135	SACRAMENTO	COALINGA	93210	MAINTANANCE YARD	10	LTNKA	5T10000084
1459	SAIPAN	FIREBAUGH	936220000	PG & E FIREBAUGH SUBSTATI	10	LTNKA	5T10000565
5018	SANTA FE GRADE	FIREBAUGH	93266	WESTERN FARM SERVICES	10	LTNKA	5T10000048
1234	SHAW	FRESNO	93710	CAL DEPT OF FORESTRY	10	LTNKA	5T10000133
12475	SHAW	BIOLA	93606	ALVARADO SERVICE	10	LTNKA	5T10000331
1785	SHAW	FRESNO	93711	ARCO STATION #0466	10	LTNKA	5T10000548
2019	SHAW	FRESNO	93711	CHEVRON #9-4285	10	LTNKA	5T10000020
2171	SHAW	FRESNO	93705	UNOCAL	10	LTNKA	5T10000180
388	SHAW	FRESNO	93710	MAX'S ONE STOP	10	LTNKA	5T10000631
443	SHAW	FRESNO	936120000	BUBBLE CLEAN	10	LTNKA	5T10000640
5316	SHAW	CLOVIS	93711	TEXACO SERVICE STATION	10	LTNKA	5T10000344
6150	SHAW	FRESNO	93711	DI REDO DRY YARD	10	LTNKA	5T10000347
794	SHAW	CLOVIS	93612	UNOCAL	10	LTNKA	5T10000199
895	SHAW	CLOVIS	936120000	BINGHAM TOYOTA	10	LTNKA	5T10000627
29010	SHELL	COALINGA	93210	SHELL OIL PIPELINE, COALIN	10	LTNKA	5T10000052
21053	SHERRILL	RIVERDALE	93656	BROWN FEED & SEED, INC.	10	LTNKA	5T10000044
4194	SHIELDS	FRESNO	93703	SHELL GAS STATION	10	LTNKA	5T10000275
4194	SHIELDS	FRESNO	93703	D & L SHELL S/S #2	10	LTNKA	5T10000518
518	SHIELDS	FRESNO	93705	E-2 GO MINI MART	10	LTNKA	5T10000533
5300	SHIELDS	FRESNO	93727	FORMERLY HAMMERFIELD	10	LTNKA	5T10000264
5575	SHIELDS	FRESNO	937270000	CALIFORNIA NATIONAL GUARD	10	LTNKA	5T10000618
7612	SHIELDS	FRESNO	93727	CLOVIS MADERA PAVING	10	LTNKA	5T10000339
1796	SIERRA	KINGSBURG	93631	VILLAGE UNION STATION	10	LTNKA	5T10000557
207	SIERRA	FRESNO	937100000	ELLIS PROPERTY	10	LTNKA	5T10000541
501	SIERRA	KINGSBURG	93631	TEXACO	10	LTNKA	5T10000296
800	SIERRA	KINGSBURG	93631	CHEVRON #9-5283	10	LTNKA	5T10000574
825	SIERRA	KINGSBURG	93631	UNOCAL SS #5663	10	LTNKA	5T10000527
825	SIERRA	KINGSBURG	93631	UNOCAL #5663	10	LTNKA	5T10000198
1785	SIMPSON	KINGSBURG	93631	FREDS TRUCK FUELS	10	LTNKA	5T10000458
20033	SOMMERSVILLE	COALINGA	93210	ARCO #5722	10	LTNKA	5T10000374
1407	ST/14TH	FIREBAUGH	93622	CHEVRON #2544	10	LTNKA	5T10000021
2201	STANISLAUS	FRESNO	93721	A PLACE FOR YOU FOUNDATIO	10	LTNKA	5T10000498
24348	SUNNER	REEDLEY	936540000	ANTOKU RESIDENCE	10	LTNKA	5T10000463
2501	SUNLAND	FRESNO	936370000	FMC CORP	10	LTNKA	5T10000386
2501	SUNLAND	FRESNO	93612	FMC CORPORATION - FRESNO	10	CALSI	10280013
141	SUNNYSIDE	CLOVIS	93612	FRESNO CUSTOM DRYWALL	10	LTNKA	5T10000317
304	SUNNYSIDE	CLOVIS	93612	SUPER EXXON	10	LTNKA	5T10000534
(NO STREET NBR)	SW CORNER OF JENSEN & W.	FRESNO	93706	FRESNO SANITARY LANDFILL	10	CALSI	10490097
2307	TAHOE	CARUTHERS	936090000	SQUARE ONE FUEL DEPOT	10	LTNKA	5T10000638
915	TENTH	FIREBAUGH	93622	TRI-AIR, INCORPORATED	10	CALSI	10070021
1473	THESTA	FRESNO	93667	SUSAN SIMONS	10	LTNKA	5T10000301
34900	TOLLHOUSE	TOLLHOUSE	93602	MT. REST WORK STATION	10	LTNKA	5T10000126
36088	TOLLHOUSE	AUBERRY	93612	CRESSMAN'S	10	LTNKA	5T10000130
7020	TOLLHOUSE	CLOVIS	93611	F&K ROCK & SAND INC.	10	LTNKA	5T10000556
9036	TOLLHOUSE	CLOVIS	93657	HARLAN RANCH COMPANY	10	LTNKA	5T10000521
19716	TRIMMER SPRINGS	SANGER	93657	JAMAT RANCH	10	LTNKA	5T10000042
21011	TRIMMER SPRINGS	PIEDRA	93657	HARRIS FARMS	10	LTNKA	5T10000042
2650	TULARE	FRESNO	93721	SANTA FE, RAILWAY MOTOR CA	10	LTNKA	5T10000568

STREET NBR	STREET NAME	CITY	ZIP	FACILITY NAME	CO	REG BY	REG ID
780	TULARE	PARLIER	93648	CITY OF PARLIER - SHOP	10	LINKA	5T10000525
606	TULE	MENDOTA	936400000	CAR WASH	10	LINKA	5T10000279
1101	UNIVERSITY	FRESNO	937410000	BUILDING UTILITIES	10	LINKA	5T10000621
1910	UNIVERSITY	FRESNO		CITY OF FRESNO WATER YARD	10	LINKA	5T10000577
1159	UPPER BRIDGE	REEDLEY		PRODUCE TRUCKING	10	LINKA	5T10000551
41711	VALARIA	DOS PALOS	936540000	AUSTIN GROCERY	10	LINKA	5T10000310
265	VALENTINE	FRESNO	93706	CURB SERVICES INC	10	LINKA	5T10000316
3010	VALENTINE	FRESNO	93706	POE	10	LINKA	5T10000094
6944	VAN BUREN	FRESNO	93722	CURTIS TOWING	10	LINKA	5T10000340
1402	VAN NESS	FRESNO	93728	ADAM'S AUTOMOTIVE	10	LINKA	5T10000262
2045	VAN NESS	FRESNO	93721	HOPPER STEEL & INDUSTRIAL	10	LINKA	5T10000271
750	VAN NESS	FRESNO	93721	PARKING LOT	10	LINKA	5T10000544
2222	VENTURA	FRESNO	93702	HARON MOTOR SALES	10	LINKA	5T10000335
3464	VENTURA	FRESNO	93702	REGAL S/S 611	10	LINKA	5T10000079
3464	VENTURA	FRESNO	93702	TEXACO FOOD MART	10	LINKA	5T10000142
3839	VENTURA	FRESNO	93702	SEIBERT OIL CO.	10	LINKA	5T10000004
3857	VENTURA	FRESNO	93701	LAMOUR'S CLEANERS	10	LINKA	5T10000163
4161	VENTURA	FRESNO	93702	CHEVRON #9-6181	10	LINKA	5T10000137
1575	VJAU	SANGER	93657	PIEDRA RANCH	10	LINKA	5T10000509
39936	W.	MENDOTA	93640	CALIFORNIA GINNING CO., I	10	LINKA	5T10000344
43106	W	FIREBAUGH	93622	SILVER CREEK RANCH	10	LINKA	5T10000436
16789	WALNUT	CARUTHERS	93609	N.. ROBERT NIELSEN, INC.	10	LINKA	5T10000404
10	WASHINGTON	COALINGA	932100000	(FRMR)COALINGA DSTRCT HOS	10	LINKA	5T10000493
2021	WEBER	FRESNO	93705	AUTO PARTS DISTRIBUTOR	10	LINKA	5T10000302
2655	WEBER	FRESNO	93705	RELIANCE STEELE	10	LINKA	5T10000072
3135	WEBER	FRESNO	93770	SOUTHERN PACIFIC, FRESNO	10	LINKA	5T10000099
15000	WHITES BRIDGE	KERMAN	93630	ARCO (BEACON) #618	10	LINKA	5T10000028
2082	WHITESBRIDGE	FRESNO	93706	ART'S MERCANTILE	10	LINKA	5T10000148
3740	WHITESBRIDGE	FRESNO	93706	MIRANDA TRUCKING	10	LINKA	5T10000414
4010	WHITESBRIDGE	FRESNO	93706	MARY'S PLACE	10	LINKA	5T10000261
9191	WHITESBRIDGE	FRESNO	93706	ROLINDO AUTO PARTS	10	LINKA	5T10000179
1806	WHITSON	SELMA	93662	HAYLEY SELF SERVICE EXXON	10	LINKA	5T10000023
34620	WILSON	FRESNO	93602	NEW AUBERRY GROCERY	10	LINKA	5T10000023
5756	1ST	FRESNO	93710	CHEVRON - 1ST ST #9-8131	10	LINKA	5T10000118
1760	11TH	REEDLEY	93654	MARTEN'S CHEVROLET	10	LINKA	5T10000346
41359	12TH & O ST	FIREBAUGH	93622	FIREBAUGH, CITY OF	10	LINKA	5T10000175
808	168	SHAWER LAKE	93664	MILE HI PRODUCE STAND	10	LINKA	5T10000643
(NO STREET NBR)	2ND	ORANGE COVE	93646	ORANGE COVE PUBLIC WORKS	10	LINKA	5T10000230
(NO STREET NBR)	2ND & YOUNG	SELMA	93662	WORLD OIL S/S	10	LINKA	5T10000074
(NO STREET NBR)	20 MI NW OF COALINGALOS G	COALINGA	93210	ATLAS ASBESTOS MINE	10	CALSI	10320044
2712	4TH	FRESNO	937250000	KENWORTH TRUCKS	10	LINKA	5T10000562
1599	5TH	MENDOTA		WASHINGTON SCHOOL	10	LINKA	5T10000115
717	7TH	FRESNO	93702	F.U.S.D. MAINTENANCE YARD	10	LINKA	5T10000217
502	8TH	FOWLER	93625	FOWLER TRUCK SERVICES	10	LINKA	5T10000353
1435	9TH	FIREBAUGH	93622	RAMIREZ PROPERTY	10	LINKA	5T10000611
16589	9TH	HURON	93234	BRUCE CHURCH YARDS	10	LINKA	5T10000524
3767	99	FRESNO		BEACON TRUCKSTOP #51-3	10	LINKA	5T10000542
311	BUTTE	WILLOWS	95988	I.G. ZUMWALT COMPANY	11	LINKA	110006
(NO STREET NBR)	CO RD 27/15	ORLAND	95963	Z&M TRUCK STOP	11	LINKA	110036
6412	CO 27	ORLAND	95963	R & M TRUCK STOP	11	LINKA	11

CHAPTER 10: NOISE



10.1 INTRODUCTION

This chapter presents background information on noise issues and noise-related constraints to be considered in the Fresno County General Plan update process. The analysis includes: noise fundamentals; a summary of noise-related policies and regulations at the federal, state, and local level; an introduction to Fresno County's major existing man-made noise sources and the noise levels that are generated in the developed environment; and a presentation of community noise levels resulting from a survey.

10.2 NOISE FUNDAMENTALS

Noise is subjectively defined as unwanted sound. Sound is technically described in terms of amplitude (loudness) and frequency (pitch). The standard unit of sound amplitude measurement is the decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) provides this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Several rating scales have been developed to analyze the adverse effects of community noise on people. Development of these scales has considered that the potential effects of noise upon people is largely dependent upon the total acoustical energy content of the noise, as well as the time of day when the noise occurs.

L_{eq}

The equivalent energy noise level, is the average acoustic energy content of noise during the time it lasts. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure, no matter what time of the day or night they occur.

L_{dn}

The day-night average noise level, is a 24-hour average L_{eq} with a 10 dBA "penalty" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for the greater nocturnal noise sensitivity of people.

CNEL

The community noise equivalent level, is very similar to L_{dn} but in addition to the 10 dBA nighttime penalty, a 5 dBA penalty is added to noise during the evening hours: 7:00 p.m. to 10:00 p.m.

Other noise measures give information on the range of instantaneous noise levels experienced over time. Examples include:

L_{\max}

Is the maximum instantaneous noise level experienced during a given period of time.

 L_{\min}

Is the minimum instantaneous noise level experienced during a given period of time.

 L_n

Values indicate noise levels that were exceeded "n" percent of the time. For instance, L_{50} is the noise level that was exceeded 50 percent of the time during a measurement period (e.g., 30 minutes in an hour).

For statistics whose values may be evaluated over variable lengths of time -- such as L_{eq} and the L_n statistics -- the time period over which the statistic is evaluated for a particular application is sometimes appended to the name of this statistic. For instance $L_{eq}(h)$ represents a one-hour (typically peak traffic hour) L_{eq} whereas $L_{eq}(24)$ represents a 24-hour L_{eq} .

10.3 REGULATIONS AND POLICIES

FEDERAL RESPONSIBILITIES

General Noise Exposure

One of the most active periods in federal development of noise guidelines, policies, and regulations occurred in the 1970's, largely under the auspices of the U.S. Environmental Protection Agency's (EPA) Office of Noise Abatement and Control (ONAC), U.S. Department of Transportation (U.S. DOT) and U.S. Department of Housing and Urban Development (HUD). After passage of the Noise Control Act of 1972, the ONAC developed a *Levels Document* that included noise exposure goals adapted here as Table 10-1.

TABLE 10-1

**ANNUAL AVERAGE NOISE LEVELS THAT PROTECT PUBLIC HEALTH AND
WELFARE WITH A MARGIN OF SAFETY
(EPA)**

Effect	Level (dBA)	Area
Hearing	$L_{eq}(24) \leq 70$	All areas (at the ear)
Outdoor activity interference and annoyance	$L_{dn} \leq 55$	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq}(24) \leq 55$	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{dn} \leq 45$	Indoor residential areas
	$L_{eq}(24) \leq 45$	Other indoor areas with human activities such as schools, etc.

Source: *Protective Noise Levels (Condensed Version of EPA Levels Document)*, U.S. EPA Office of Noise Abatement and Control, November 1978

Note: The ONAC emphasized that the goals shown above "...are *not* regulatory goals; they are levels defined by a negotiated scientific consensus. These levels were developed without concern for economic and technological feasibility, are intentionally conservative to protect the most sensitive portion of the American population, and include an additional margin of safety."

Subsequently, following discontinuation of the Office of Noise Abatement and Control, development of noise programs and policies at the federal level is left to various agencies and the Federal Interagency Committee on Urban Noise (FICUN). Table 10-2 excerpts and summarizes guidelines from FICUN's *Guidelines for Considering Noise in Land Use Planning and Control*.

TABLE 10-2

FICUN'S SUGGESTED LAND USE COMPATIBILITY GUIDELINES

Land Use		Compatibility/Noise Reduction Requirements for Various L_{dn} Ranges (dBA)						
General	Specific	0-55	55-65	65-70	70-75	75-80	80-85	85+
Residential	All except mobile homes and transient lodging	Y	Y ¹	25	30	N	N	N
	Mobile homes	Y	Y ¹	N	N	N	N	N
	Transient lodging	Y	Y	25	30	35	N	N
Trade	All but building materials, hardware, and farm equipment retailers	Y	Y	Y	25	30	N	N
Services	All but hospitals and educational facilities	Y	Y	Y	25	30	N	N
	Hospitals and educational facilities	Y	Y	25 ¹	30 ¹	N	N	N
Cultural, entertainment and recreational	Churches, auditoriums, and concert halls	Y	Y ¹	25 ¹	30 ¹	N	N	N
	Outdoor music shells, amphitheaters	Y	Y ¹	N	N	N	N	N
	Other	Y	Y ¹	Y ¹	Variable		N	

Source: *Guidelines for Considering Noise In Land Use Planning and Control.*

Key:

Y Land use compatible without restrictions

N Land use not compatible and should be prohibited

25,30,... Land use and related structures generally compatible; measures to achieve the specified noise level reductions for interior spaces must be incorporated into design and construction of structure.

¹ The designation of these uses as "compatible in this zone reflects individual federal agencies' consideration of cost and feasibility factors as well as program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

After including cost and feasibility into their analysis, FICUN considered L_{dn} s in the 55-65 dBA range (above the corresponding goal presented in the EPA's *Levels Document*) compatible for residential structures subject to local community goals and concerns. Other noise exposure guidelines have been adjusted similarly relative to the *Levels Document* goals. More recently, this interagency committee has focused on aviation noise issues and has been renamed FICAN (Federal Interagency Committee on Aviation Noise).

Transportation-Source Noise

Noise Levels From Individual Transportation Vehicles

The federal government has established noise level standards for individual transportation vehicles. Within California, state motor vehicle emissions standards replace the corresponding federal standards. Code of Federal Regulations Title 40 (40 CFR) Part 201 specifies noise limits for various railroad vehicles and activities. 14 CFR Part 36 establishes noise limits for aircraft and defines "Stage 2" and "Stage 3" noise limits, the latter being more stringent. The Airport Noise Capacity Act of 1990 requires that all airplanes in operation in the year 2000 conform with Stage 3 noise limits, and sets interim targets for Stage 3 aircraft implementation as shown in Table 10-3.

TABLE 10-3 AIRPORT NOISE AND CAPACITY ACT STAGE 3 IMPLEMENTATION COMPLIANCE TARGETS FOR AIRLINES	
Date	Minimum Proportion of Fleet Converted to Stage 3¹
December 31, 1994	55%
December 31, 1996	65%
December 31, 1998	75%
December 31, 1999	100%
Source: FAA, August 1995, October 1996 ¹ For the interim target dates, airlines may also satisfy implementation requirements by retiring specified proportions of their Stage 2 fleet.	

The Federal Aviation Administration (FAA) indicates that, nationwide, implementation of quieter, Stage 3 - compliant aircraft is proceeding ahead of schedule.

Overall Exposure

The U.S. DOT's Federal Highway Traffic Administration (FHWA) must respond to federal laws regarding highway noise abatement and has developed highway traffic noise evaluation techniques and abatement procedures. The FHWA has promulgated noise abatement guidelines for federal highway projects as shown in Table 10-4:

TABLE 10-4

FHW A NOISE ABATEMENT CRITERIA

Activity Category	Hourly A-Weighted Sound Level (dBA, $L_{eq}(h)$)	Description of Activity Categories
A	57 exterior	Lands where serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 exterior	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 exterior	Developed lands, properties, or activities not included in Categories A or B, above
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: *Project Development Procedures Manual*, Caltrans, May 1995

The U.S. DOT Federal Transit Administration (FTA) has recently developed noise exposure criteria of its own. These are based upon the land use categories and noise metrics shown in Table 10-5:

TABLE 10-5

LAND USE CATEGORIES AND METRICS FOR TRANSPORTATION NOISE IMPACT CRITERIA

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)$ ¹	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)$ ¹	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios and concert halls fall into this category. Places for meditation or study associated with cemeteries, monuments, museums. Certain historical sites, parks and recreational facilities are also included.

Source: *Transit Noise and Vibration Impact Assessment*, April 1995

¹ L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.

The FICUN guidelines address the compatibility of proposed new land uses with existing noise environments. The FHWA criteria, like the FICUN guidelines, are based on a single, fixed noise level target or threshold for each land use category, though unlike the FICUN guidelines they are used primarily in the context of evaluating proposed roadway project impacts on existing land uses. In contrast, the FTA developed a continuous relationship between base noise levels and the corresponding allowable project-generated noise level increase – the higher the existing noise level, the smaller the allowable increase in noise in overall levels. This relationship is shown for FTA land use categories 1 and 2 in Chart 10-2.

14 CFR Part 150 establishes federal guidelines for airport noise compatibility planning and includes a noise/land use compatibility matrix similar to the summary matrix presented in Table 10-2. However, unlike the recommendations shown in Table 10-2, Part 150 compatibility guidelines show L_{dn} 's above 65 dBA as being generally incompatible with all residential land uses as well as educational uses.

STATE OF CALIFORNIA RESPONSIBILITIES

General Noise Sources

The Department of Health Service's Office of Noise Control (ONC) is the state entity corresponding to the U.S. EPA's Office of Noise Abatement and Control. The ONC serves as a clearinghouse for noise-related regulatory and policy information and developed planning and regulatory tools such as the "*Land Use Compatibility for Community Noise Environments*" guidelines, reproduced here as Chart 10-1, and the *Model Community Noise Control Ordinance*.

Noise Exposure Guidelines

The land use compatibility guidelines shown in Chart 10-1 correlate ranges of noise levels for each of several land use categories with various degrees of acceptability. While exterior noise levels are presented for planning purposes, the guidelines' interpretation of these noise level ranges tends to focus on their implications for interior noise exposure. For permanent residential and transient lodging land uses, these guidelines indicate that noise levels as high as 60-65 dBA L_{dn} /CNEL may be "normally acceptable", meaning that conventional construction practices should provide adequate noise protection for interior spaces.

However, these guidelines incorporate some flexibility or uncertainty by presenting overlapping acceptability ranges, and consider noise levels as low as 55-60 dBA L_{dn} /CNEL to be the low end of the "conditionally acceptable" category for the above-described land uses. (For the "conditionally acceptable" category, the guidelines recommend a study of noise reduction requirements before new development proceeds.) These guidelines have been incorporated into the California State Office of Planning and Research's *General Plan Guidelines* and have served as an important component of many of the city and county *noise elements* that have subsequently been prepared or updated.

The *Model Community Noise Control Ordinance* establishes baseline noise limits to evaluate intrusive noise (the baseline limits and associated intrusive noise standards are summarized in Table 10-6a through 10-7b). The recommended intrusive noise standards constrain the duration of higher noise levels to a greater extent than they constrain the duration of lower noise levels. For instance, when

the baseline exterior noise limit for a particular land use category 55 dBA, a nearby source of intrusive noise could cause total noise levels at the receiving land use to exceed this level for up to 30 minutes in a given hour without violating the recommended standards, as long as levels did not rise more than a few decibels above that standard for most of those thirty minutes. However, this noise source could not cause noise levels at the receiving land use to exceed the baseline limit plus 10 dBA – or 65 dBA total – for more than five minutes per hour without violating the recommended standards, and it would also violate the standards if it caused levels at the receiving land use to exceed the baseline limit plus 20 dBA – or 75 dBA total – for *any* period of time. These standards are designed to respond to the time-varying noise levels that often characterize the sorts of intrusive noises that noise ordinances are typically designed to control.

TABLE 10-6a				
ONC MODEL COMMUNITY NOISE CONTROL ORDINANCE: BASELINE EXTERIOR NOISE LIMITS				
Receiving Land Use Category	Time Period	Noise Level (dBA) by Noise Zone Classification		
		Rural Suburban	Suburban	Urban
One & Two Family Residential	10 p.m.-7 a.m. 7 a.m.-10 p.m.	40 50	45 55	50 60
Multiple Dwelling Residential/ Public Space	10 p.m.-7 a.m. 7 a.m.-10 p.m.	45 50	50 55	55 60
Limited Commercial; Some Multiple Dwellings	10 p.m.-7 a.m. 7 a.m.-10 p.m.	55 60		
Commercial	10 p.m.-7 a.m. 7 a.m.-10 p.m.	60 65		
Light Industrial Heavy Industrial	10 p.m.-7 a.m. 7 a.m.-10 p.m.	70 75		

Source: ONC, April 1977

¹ The classification of different areas of the community in terms of environmental noise zones shall be determined by the Noise Control Office(r), based upon assessment of community noise survey data. Additional area classifications should be used as appropriate to reflect both lower and higher existing ambient levels than those shown. Industrial noise limitations are intended primarily for use at the boundary of industrial zones rather than for noise reduction within the zone.

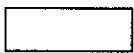
Chart 10-1
Land Use Compatibility
For Community Noise Environments

Land Use Category	Community Noise Exposure Ldn or CNEL, dB							
	50	55	60	65	70	75	80	85
Residential: Low-Density Single Family, Duplex, Mobile Homes								
Residential: Multiple Family								
Transient Lodging: Motels, Hotels								
Schools, Libraries, Churches, Hospitals, Nursing Homes								
Auditoriums, Concert Halls, Amphitheaters								
Sports Arena, Outdoor Spectator Sports								
Playgrounds, Neighborhood Parks								
Golf Courses, Riding Stables, Water Recreation, Cemeteries								
Office Buildings, Business Commercial and Professional								
Industrial, Manufacturing, Utilities, Agriculture								



**NORMALLY
ACCEPTABLE**

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.



**CONDITIONALLY
ACCEPTABLE**

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirement is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.



**GENERALLY
UNACCEPTABLE**

New construction or developments should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction Requirements must be made and needed noise insulation features included in the design.



**LAND USE
DISCOURAGED**

New construction or development should generally not be undertaken.

TABLE 10-6b	
MAXIMUM ALLOWABLE INTRUSIVE NOISE ABOVE BASELINE EXTERIOR NOISE LIMITS	
Cumulative Duration of the Intrusive Sound	Maximum Amount By Which Intrusive Noise May Exceed Baseline Standards Indicated Above (dBA)
Cumulative period of 30 minutes per hour	0
Cumulative period of 15 minutes per hour	+5
Cumulative period of 5 minutes per hour	+10
Cumulative period of 1 minutes per hour	+15
Level not to be exceeded for any time per hour	+20
Source: ONC, April 1977	

TABLE 10-7a			
ONC MODEL COMMUNITY NOISE CONTROL ORDINANCE: BASELINE INTERIOR NOISE LIMITS			
Noise Zone	Type of Land Use	Time Interval	Allowable Interior Noise Level (dBA)
All	Multifamily Residential	10 p.m.-7 a.m.	35
		7 a.m.-10 p.m.	45

Source: ONC, April 1977

TABLE 10-7b	
MAXIMUM ALLOWABLE INTRUSIVE NOISE ABOVE BASELINE INTERIOR NOISE LIMITS¹	
Cumulative Duration of the Intrusive Sound	Maximum Amount By Which Intrusive Noise May Exceed Baseline Standards Indicated Above (dBA)
Cumulative period of 5 minutes per hour	0
Cumulative period of 1 minutes per hour	+5
Level not to be exceeded for any time per hour	+10
Source: ONC, April 1977	
¹ These guidelines relate to intrusive noise originating from an adjoining dwelling unit.	

Noise Insulation Standards

The California State Building Code (Title 24, California Code of Regulations, or CCR) includes various noise insulation requirements for new multi-unit residential dwellings. It states that noise

levels within such dwellings attributable to exterior sources shall not exceed 45 dBA L_{dn} /CNEL in any habitable room.

Transportation-Source Noise

Noise Levels From Individual Transportation Vehicles

Maximum noise limits for operation of individual motor vehicles are established in Section 23130 of the California Vehicle Code and summarized here in Tables 10-8a and 10-8b:

TABLE 10-8a		
MOTOR VEHICLE NOISE LEVEL LIMITS: ALL OPERATING CONDITIONS		
Vehicle Category	Noise Limits (dBA) By Speed Limit Category	
	35 mph or Less	More Than 35 mph
Any motor vehicle with a manufacturer's gross vehicle weight rating of more than 10,000 lb and any combination of vehicles towed by such a motor vehicle	86	90
	45 mph or Less	More Than 45 mph
Any motorcycle other than a motor-driven cycle	82	86
Any other motor vehicle and any combination of vehicles towed by such a motor vehicle	76	82
Source: Motor Vehicle Noise Laws, ONC		

TABLE 10-8b	
MOTOR VEHICLE NOISE LEVEL LIMITS: SPEED LIMIT OF 35 MPH OR LESS, STREET GRADE ONE PERCENT OR LESS	
Vehicle Category	Noise Limits (dBA)
Any motor vehicle with a manufacturer's gross vehicle weight rating of more than 6,000 lb and any combination of vehicles towed by such a motor vehicle	82
Any motorcycle other than a motor-driven cycle	77
Any other motor vehicle and any combination of vehicles towed by such a motor vehicle	74
Source: Motor Vehicle Noise Laws, ONC	

Overall Exposure

For state highway projects, the California Department of Transportation (Caltrans) must respond to state laws regarding highway noise abatement and has developed a series of noise abatement guidelines relating to average noise levels generated by total highway traffic volumes. Caltrans has adopted the FHWA noise abatement criteria shown in Table 10-4, and has established significant guidelines for noise level increases along state highways shown in Chart 10-3. While the appearance of this graph is different from that shown for the FTA significant increase guidelines in Chart 10-2, both of these guidelines reduce the size of the allowable noise increase as the baseline noise level becomes higher.

In CCR Title 21, the State establishes 65 dBA CNEL as the maximum level that is compatible with residences, schools, hospitals and places of worship. It also establishes the responsibilities of regional Airport Land Use Commissions (ALUCs). In Fresno County, the Fresno County Planning and Resource Management Department also serves as the staff for the ALUC for the area. ALUCs prepare land use compatibility plans, or CLUPs, which include an evaluation of noise as a major component.

LOCAL RESPONSIBILITIES

Current Fresno County Noise Element

The *Fresno County General Plan Noise Element*, adopted in December of 1975, establishes maximum acceptable noise levels for various land use categories (see Table 10-9).

TABLE 10-9				
EXISTING NOISE ELEMENT: MAXIMUM ACCEPTABLE NOISE LEVELS				
Land Use	L ₅₀		L _{dn}	
	Daytime	Nighttime	Exterior	Interior
Rural Residential	50	45	55	45
Urban Residential & Noise Sensitive Receivers ¹	55	50	60	45
Urban Commercial	65	60		
Urban Industrial	70	70		
Source: EIP Associates				
¹ Schools, parks, hospitals and rest homes				

The *Noise Element* recommends development of a noise ordinance based upon the standards presented above, establishes areas subject to L_{dn}s above 60 dBA as "noise impact zones," requires County review of noise impacts on proposed projects within these zones and calls for incorporation of measures to protect all new (noise-sensitive) development from existing noise sources. It specifies that stationary source should not have an "adverse effect" on adjoining property in "non-intensive development" areas and that all proposed developments should minimize such effects

on surrounding land uses. It calls for sensitivity to noise impacts in land use and transportation planning and recommends that proposed transportation facilities incorporate measures to mitigate increased noise levels that would result from their implementation. The *Noise Element* presents a series of additional recommendations for controlling transportation-source noise, including designating truck routes and limiting vehicle speeds where appropriate, discouraging commercial aircraft flights between the hours of 11:00 p.m. and 6:30 a.m. and developing a program to reduce railroad noise in residential and other noise sensitive areas.

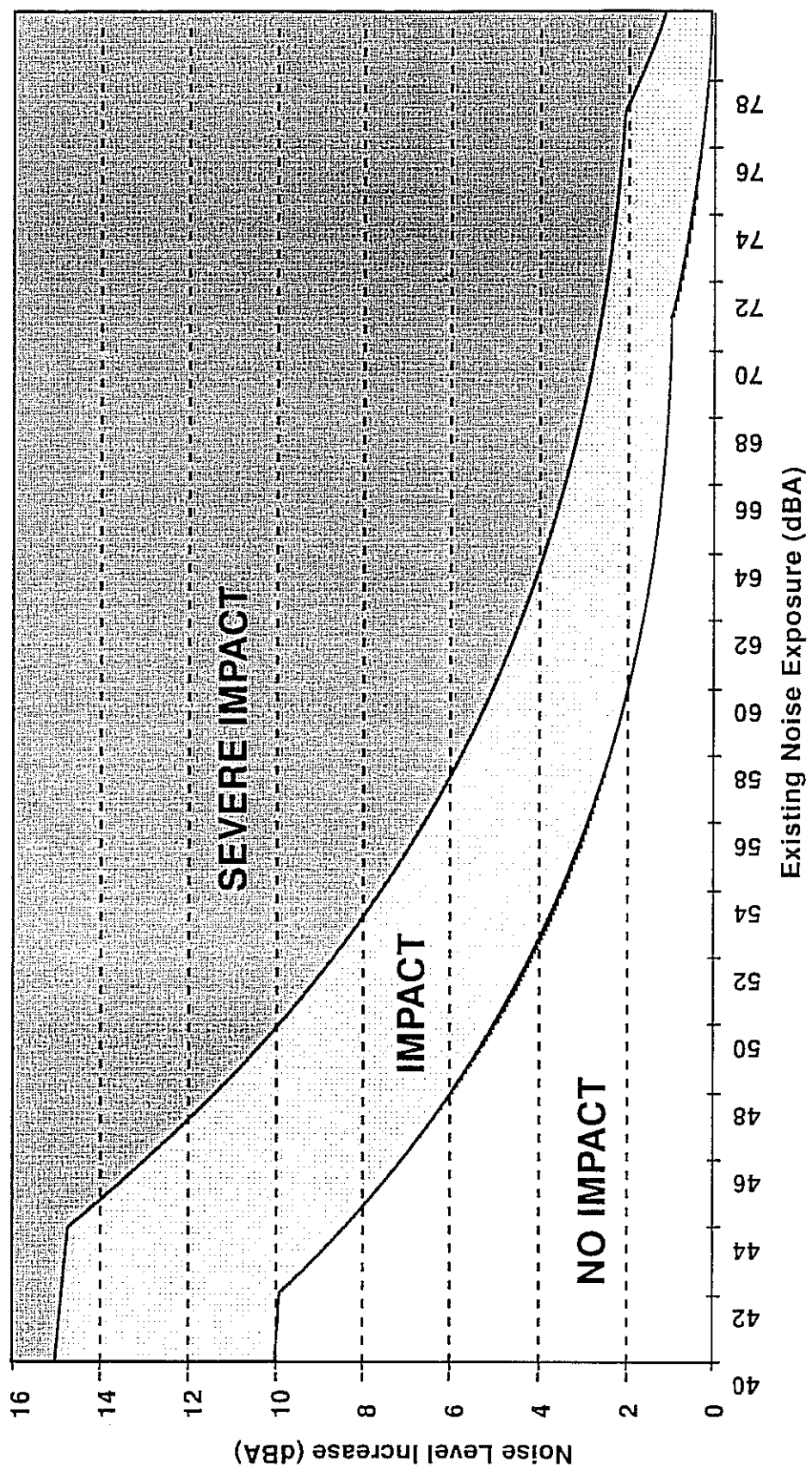
The *Noise Element* recommends development of noise contours for major roads classified in the *Fresno County General Plan's Circulation Element* and stationary facilities in unincorporated areas that emit noise levels greater than 60 dBA L_{dn} (presumably as measured outside of the facilities' property lines). The noise contours actually developed for the General Plan were based upon the L_{10} statistic (presumably under peak hour conditions per the FHWA's original noise abatement criteria) for transportation-source noise and upon L_{dn} for rail noise and apparently for aircraft noise as well.

Fresno County Noise Ordinance

The standards of the *Fresno County Noise Ordinance* incorporate a structure similar to that presented in the ONC's *Model Noise Ordinance* (Tables 10-6 and 10-7) and include baseline exterior noise standards that are consistent with the General Plan's L_{50} guidelines (Table 10-9) for rural residential areas. County standards apply specifically to noise exposure at residences, schools, hospitals, churches, and libraries; these standards are shown in Tables 10-10a and 10-10b:

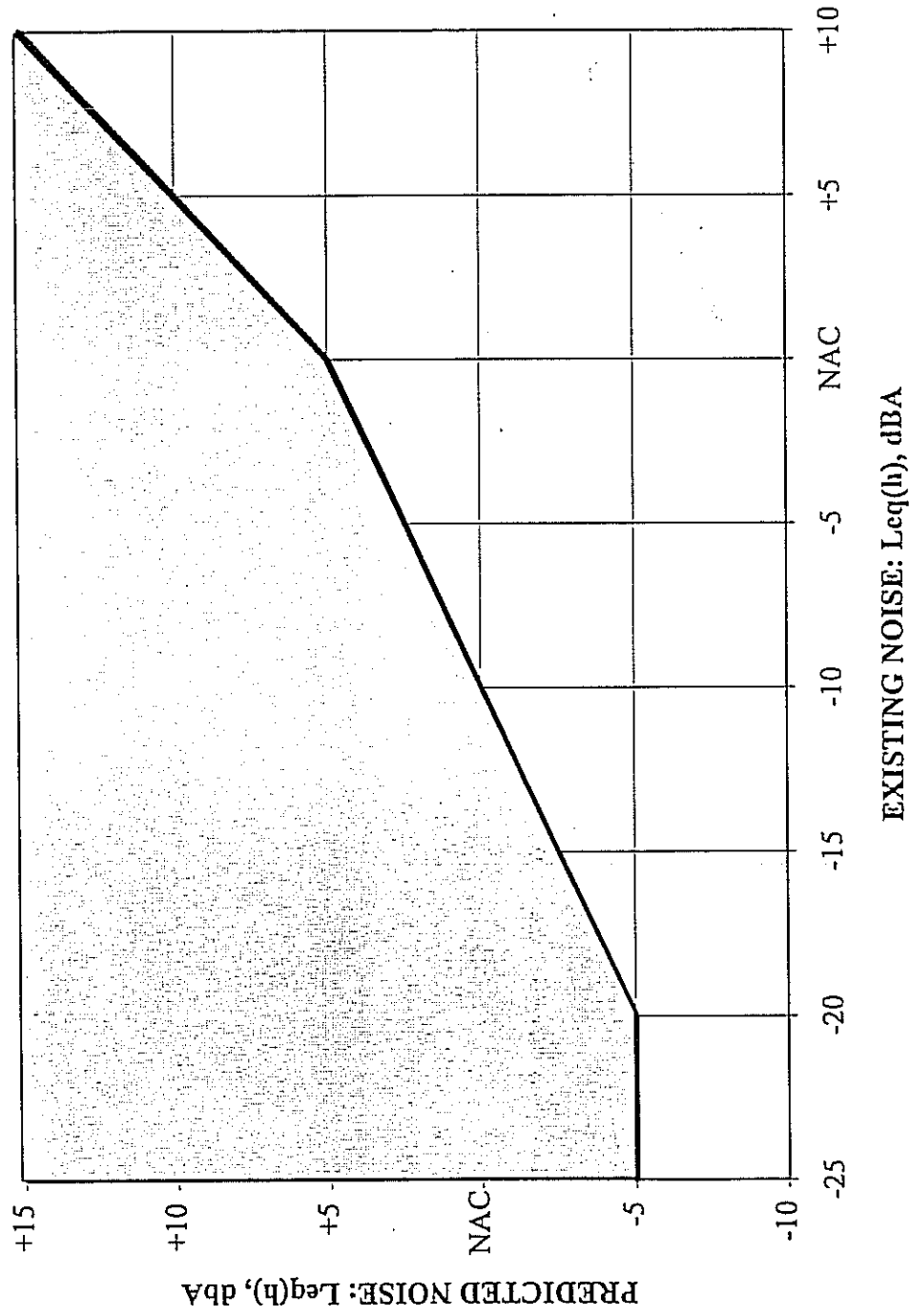
TABLE 10-10a			
FRESNO COUNTY NOISE CONTROL ORDINANCE: EXTERIOR NOISE STANDARDS			
Category	Cumulative Number of Minutes in any One-Hour Time Period	Noise Level Standards (dBA)	
		Daytime (7 a.m.-10 p.m.)	Nighttime (10 p.m.-7 a.m.)
1	30	50	45
2	15	55	50
3	5	60	55
4	1	65	60
5	0	70	65
Source: Fresno County Noise Control Ordinance, July 1978			

Chart 10-2 : FTA Noise Impact Criteria (Land Use Categories 1 and 2)



Note: Noise Exposure is in terms of $L_{eq}(h)$ for Category 1 land uses, L_{dn} for Category 2 land uses.

Chart 10-3



NOTE: The above graph is referenced to the Noise Abatement Criteria, and therefore applies to all land use categories. The shaded area above the heavy line is a substantial increase in noise.

<p>TABLE 10-10b</p> <p>FRESNO COUNTY NOISE CONTROL ORDINANCE: INTERIOR NOISE STANDARDS</p>			
Category	Cumulative Number of Minutes in any One-Hour Time Period	Noise Level Standards (dBA)	
		Daytime (7 a.m.-10 p.m.)	Nighttime (10 p.m.-7 a.m.)
1	5	45	35
2	1	50	40
3	0	55	45
Source: <i>Fresno County Noise Control Ordinance</i> , July 1978			

10.4 NOISE SOURCES

Figures 10-1 and 10-2 show the locations of major existing transportation-related and stationary-sources within Fresno County.

ROADWAYS

Roadway traffic is one of the most pervasive sources of noise within the county. The extent of traffic noise impacts along a roadway depends upon the rate of total traffic flow along the roadway. It also depends on the speed at which this traffic is traveling and on the mix of vehicles that compose this traffic flow – the passage of a single medium-duty truck past an observer generates as much noise at the observer's position as about four to eight automobile passbys (depending on speed), while a single heavy-duty truck generates noise equivalent to about ten to 60 auto passbys. In addition, the noise metric most frequently used by local jurisdictions to assess traffic noise impacts – L_{dn} – incorporates added sensitivity to nighttime noise, and so is responsive to the proportion of total daily traffic flow (ADT) that occurs during nighttime hours.

Chapter 4, Transportation and Circulation, presents the following functional classifications for roadways

- Freeways
- Expressways
- Super Arterials
- Arterials
- Collectors
- Local Roads

Distances to existing 70, 65, and 60 dBA L_{dn} noise contours were estimated for numerous segments of roadways in the first four categories. These estimates were developed based on multiple daily and hourly traffic counts collected for each segment by the COFCG, as well as truck counts obtained from Caltrans and from the Fresno County Public Works Department. Cross-sectional views of contour distances for selected major roadways are shown in Charts 10-4 through 10-8.

The locations of roadway segments corresponding to noise contours illustrated in the charts are shown in Figure 10-1

Freeways

Two freeways pass through the county in a roughly north-south orientation – Interstate 5 (I-5) in the western portion of the county and State Route 99 (SR 99) in the central portion of the county. These are the two primary north-south intrastate routes in California. (I-5 also serves interstate traffic directly.) SR 99 connects the major urban areas within the San Joaquin Valley and serves much more regional and local traffic than does I-5. Within Fresno County, the COFCG indicates that two-way average daily traffic volumes (ADTs) along SR 99 range from about 37,500 to about 92,000, while those along I-5 range from about 18,700 to about 22,200. Both support high speed traffic flow (posted speed limits of 65-70 mph) and a substantial proportion of trucks (according to Caltrans, 29 to 33 percent of total traffic along I-5, 19 to 24 percent of total traffic along SR 99). In addition, data collected by the COFCG indicates that these freeways support a relatively high proportion of nighttime traffic flow, ranging from about 17 to 18 percent along I-5 and about 13 to 14 percent along SR 99. The high speeds and large proportions of trucks and of night time traffic result in substantial traffic noise impacts along these freeways, as represented by the large modeling contour distances shown in Charts 10-4 and 10-5.

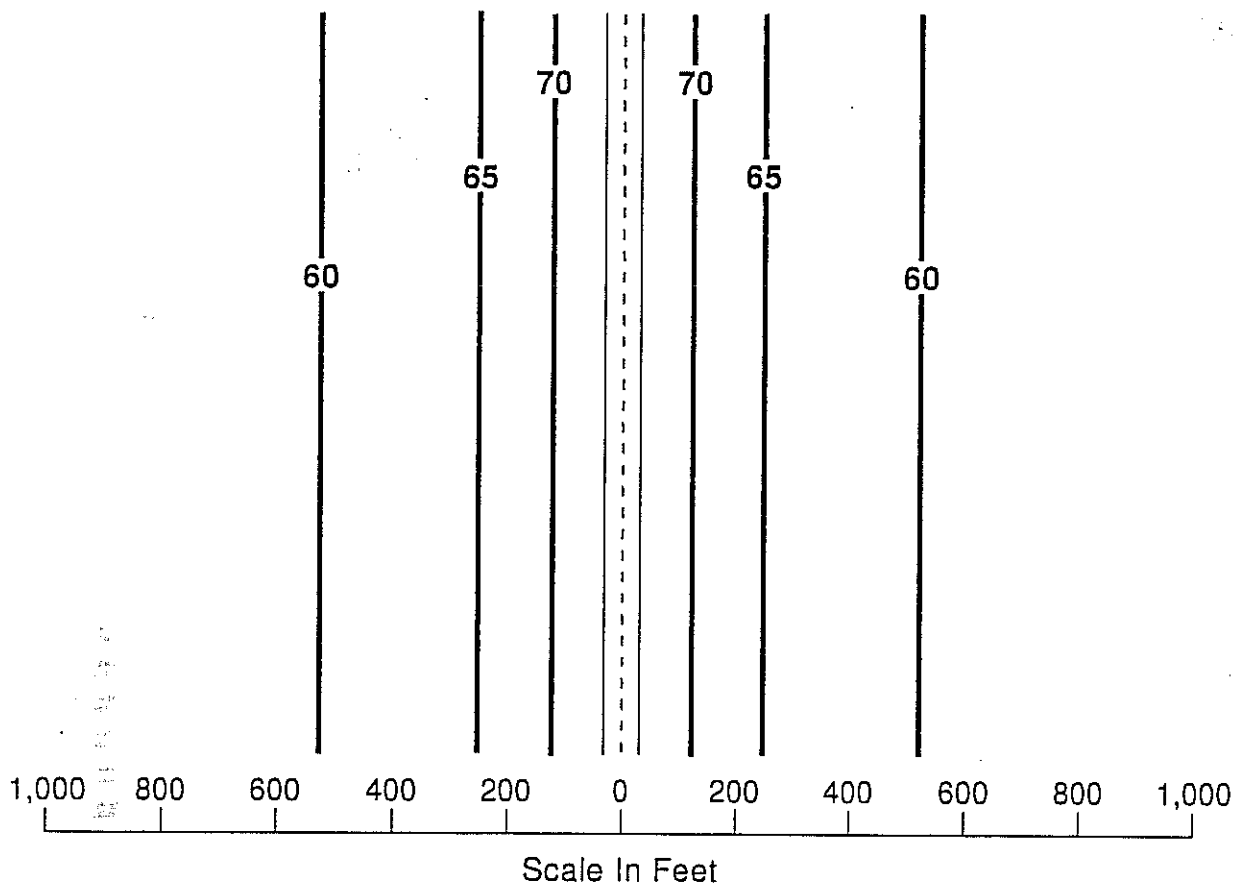
Expressways and Arterials

While I-5 and SR 99 are the county's most potent individual traffic noise sources, many other major roadways within the county have important local influences on traffic noise levels. Most arterials within the unincorporated portions of the county do not support traffic volumes nearly as high as the most heavily traveled arterials and expressways within the Fresno-Clovis Metropolitan Area (FCMA). However, many of the county's rural arterials support a large proportion of trucks and high travel speeds. Table 4-1 of this report summarizes the *Congestion Management Plan's* (CMP) designated system of principal highways and arterials, which, in addition to I-5 and SR 99, includes sections of State Routes 33, 41, 43, 63, 145, 168, 180, 198, and 269 (as well as Herndon, Shaw and Clovis Avenues within Fresno and Clovis city limits). Among the portions of these roadway segments that lie within Fresno County, traffic flow characteristics would produce the greatest noise impacts along SR 41, which supports moderately high truck percentages (eight to 15 percent), and SR 33, 43, 145, and 198, which support only low to moderate ADTs (1,550 to 12,500) but very high truck percentages (seven to 31 percent). Charts 10-6 through 10-8 present noise contour distances for selected segments along three of these roadways.

Other expressways and arterials within the unincorporated county that have a substantial local influence on noise levels include Golden State Boulevard and Jensen Avenue (which serve industrial and agricultural traffic). In addition, portions of urban arterials such as Ashlan, Shaw, Barstow, Bullard, Sierra, and Herndon pass through isolated patches of unincorporated areas surrounded by the cities of Fresno and Clovis.

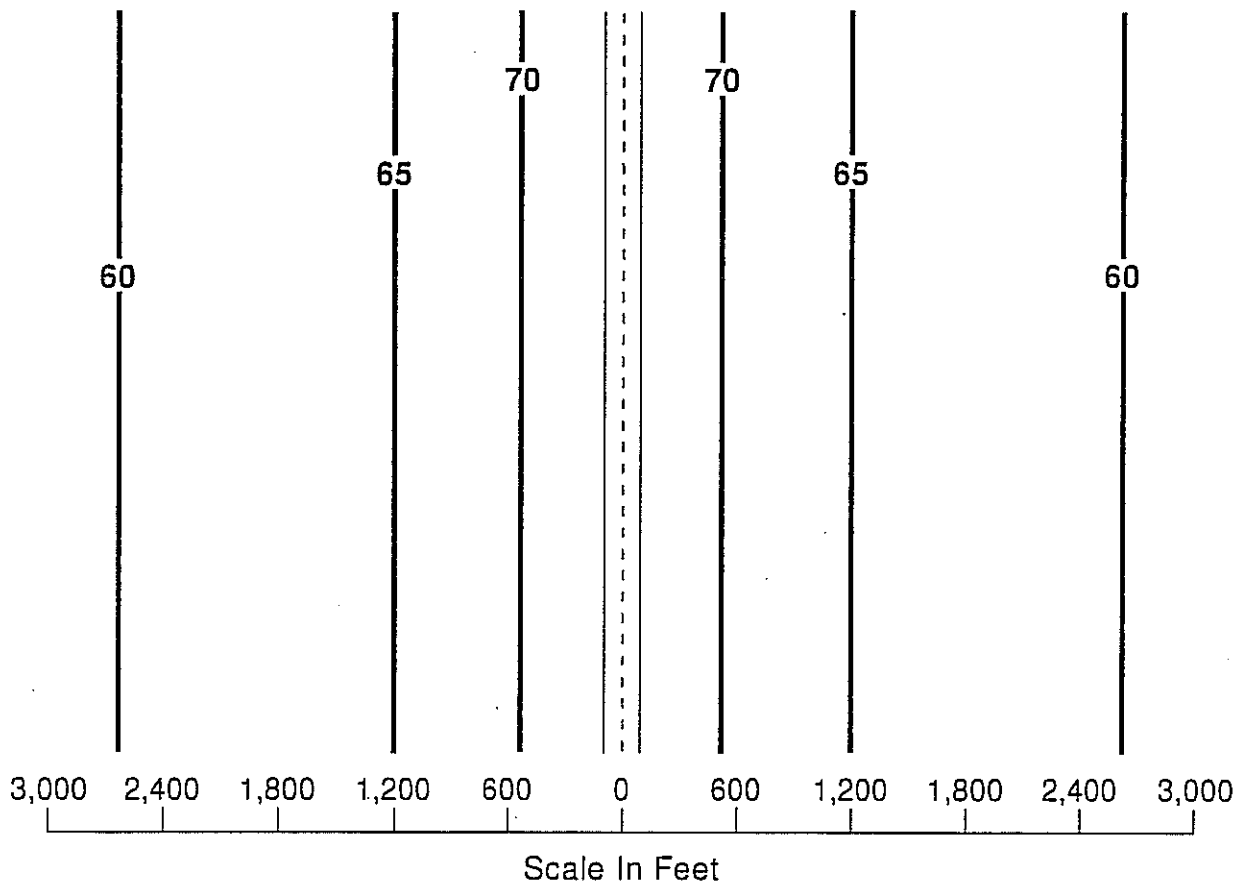
RAILROADS

Two major rail lines operated by interstate rail carriers pass through the county. The Burlington Northern & Santa Fe mainline runs roughly parallel to and about two miles east of SR 99 through the northern county, passing through the city of Fresno and then veering southward under SR 99



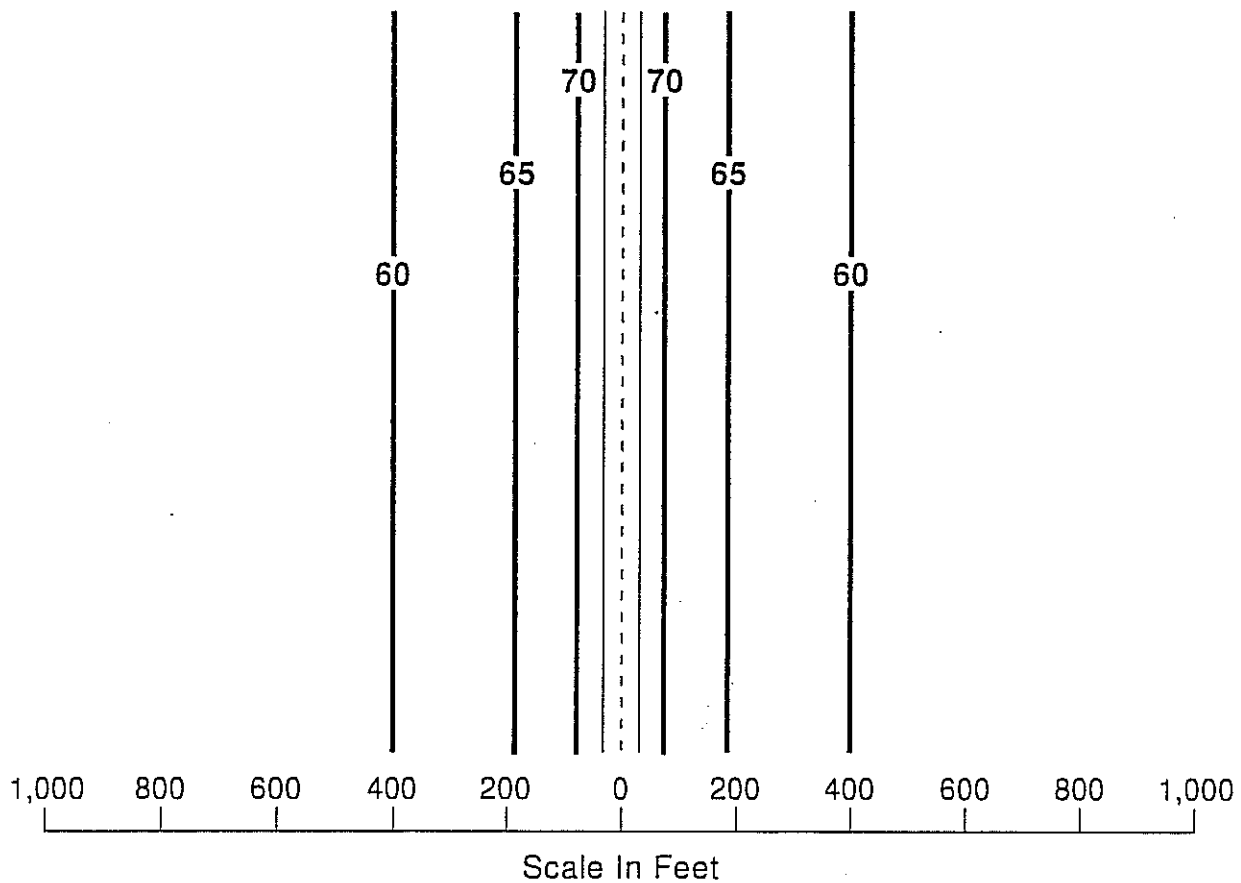
—60— Ldn Noise Contours (dBA)

Chart 10-4
Worst-Case Roadway
Noise Contour Distances:
I-5 From Panoche Road Interchange
To Nees Avenue



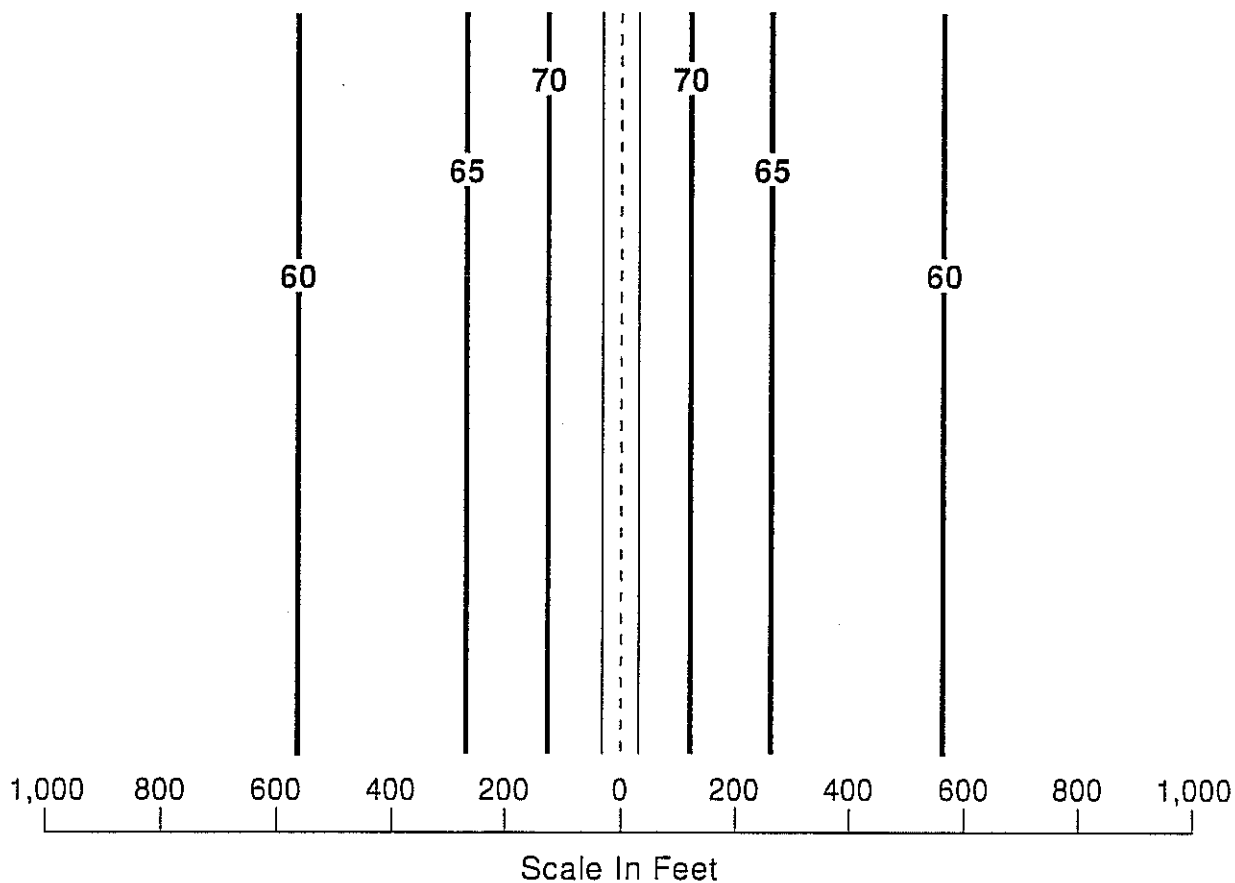
—60— Ldn Noise Contours (dBA)

**Chart 10-5
Worst-Case Roadway
Noise Contour Distances:
SR 99 From Adams
To Clovis**



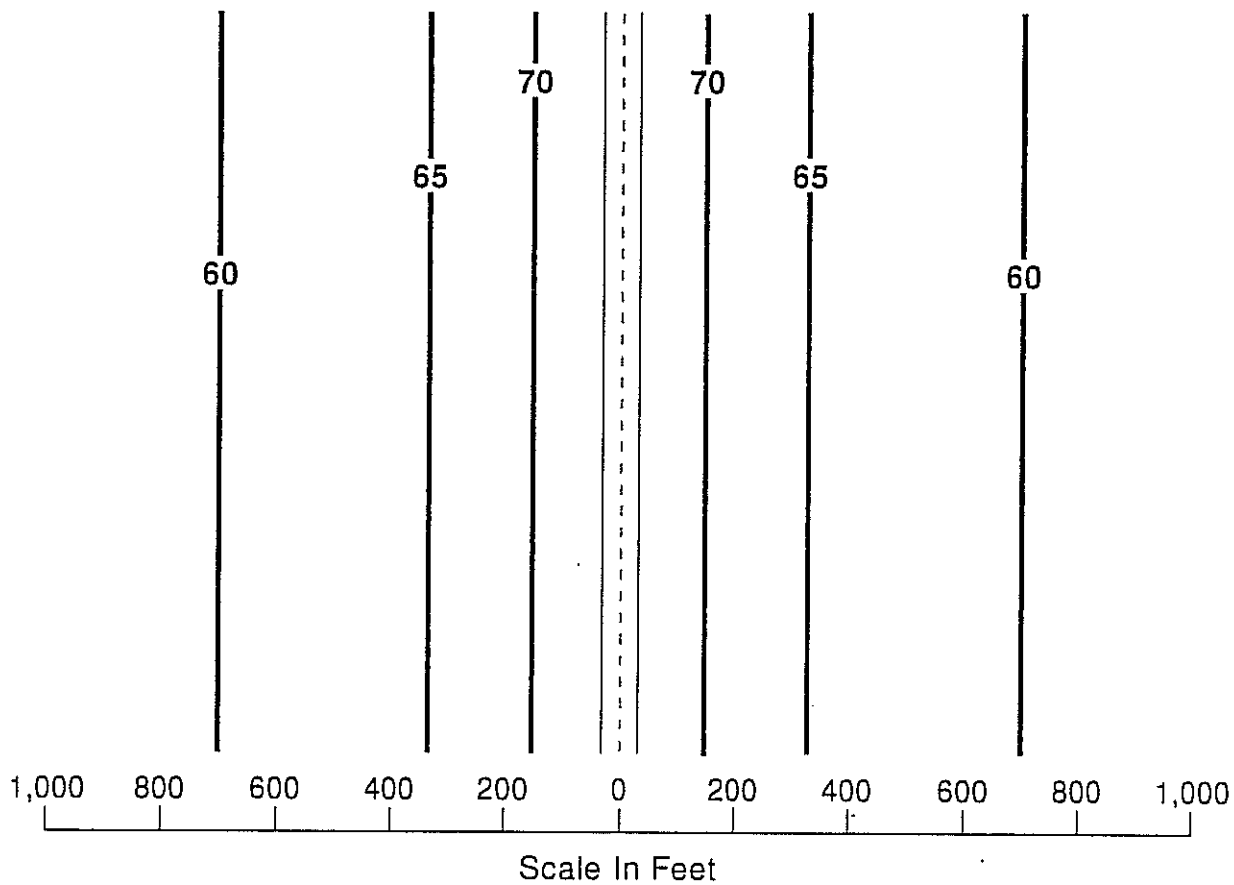
—60— Ldn Noise Contours (dBA)

Chart 10-6
Worst-Case Roadway
Noise Contour Distances:
SR 33 North Of Harlan
To North Of Manning



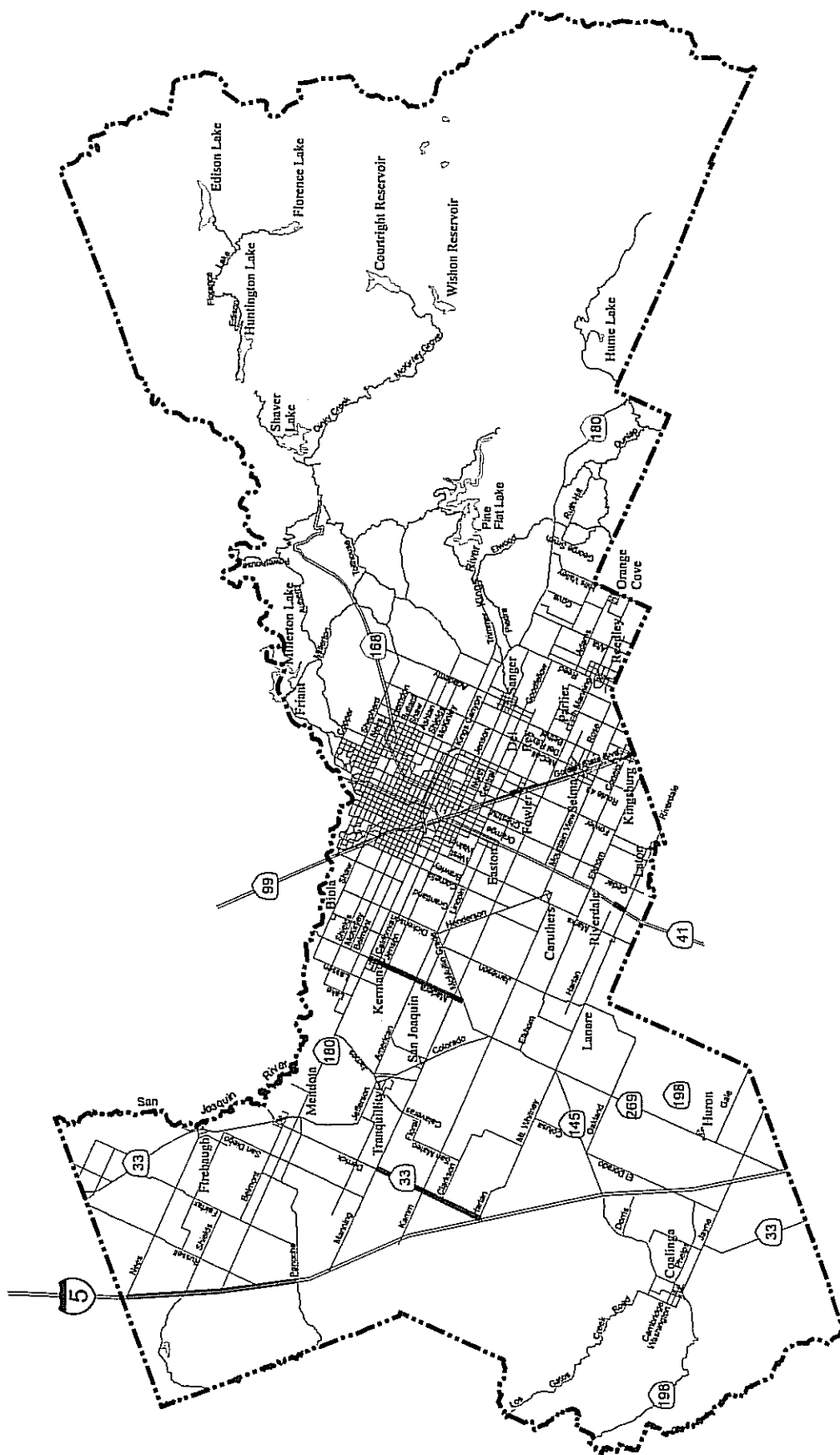
—60— Ldn Noise Contours (dBA)

**Chart 10-7
Worst-Case Roadway
Noise Contour Distances:
SR 41 North Of
Mt. Whitney**



—60— Ldn Noise Contours (dBA)

Chart 10-8
Worst-Case Roadway
Noise Contour Distances:
SR 145 South of SR 180



Fresno County General Plan

Roadway Segment Corresponding to Noise Contours Shown in Charts 10-4 through 10-8

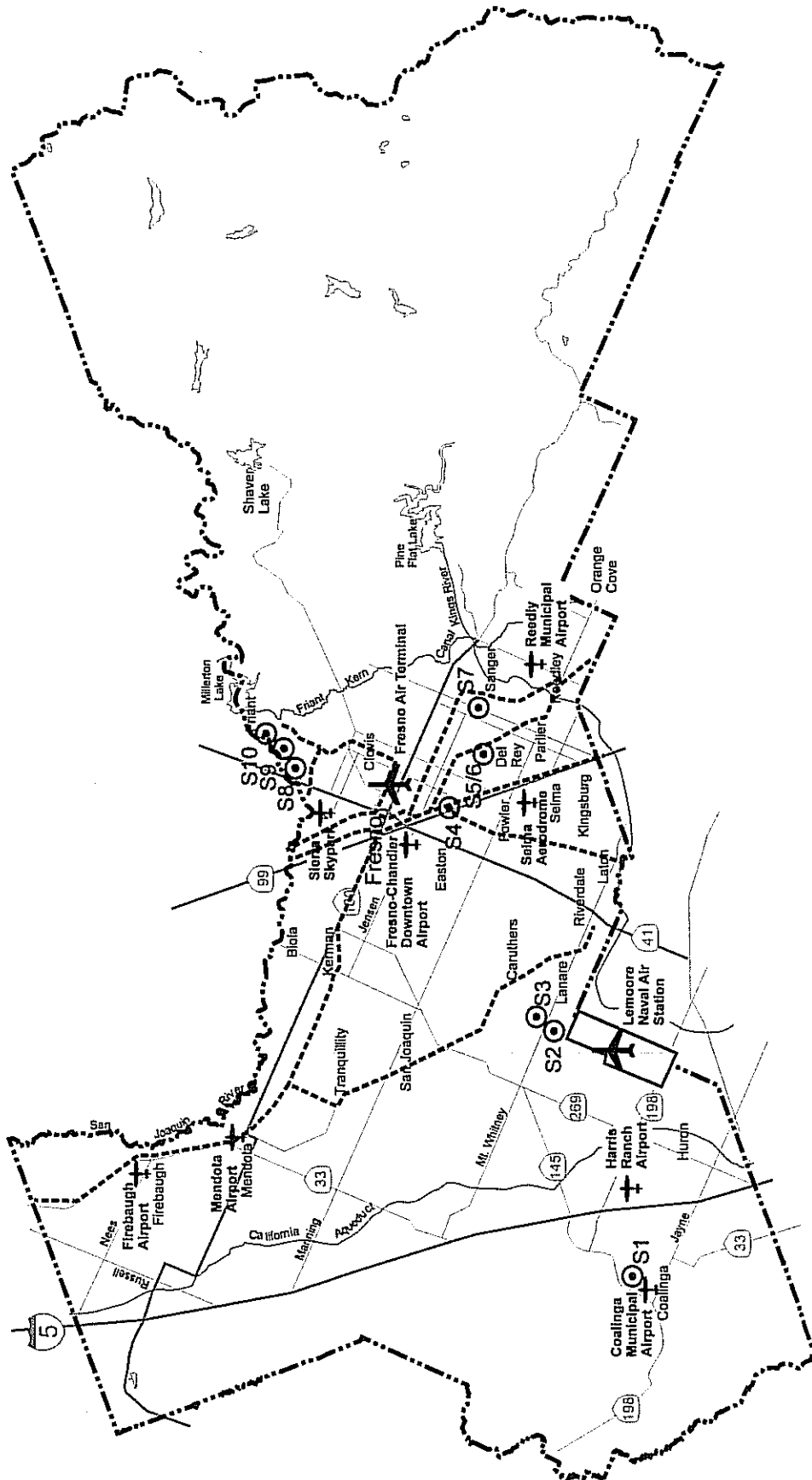
Figure 10-1

Roadway Segment Corresponding to Noise Contours Shown in Charts 10-4 through 10-8



NORTH

0 10
1" = 10 miles



NORTH

0 10
1" = 10 miles

Fresno County General Plan

Fixed Noise Sources

Figure 10-2

Stationary Sources

Rail Road Line

S1	S7	Central Valley Ready Mix
S2	S8	Al's Mini Mix
S3	S9	CalMat
S4	S10	RMC Lonestar Plant #214
S5/6		

Granite Construction Coalinga Plant

Anderson-Clayton Burrell Gln

Foster Farms Feed Plant (Burrell)

Pittsburg, Plate and Glass Fresno Plant

Mel West/Del Rey Packing Company

and between State Routes 41 and 43. The Union Pacific (formerly Southern Pacific) mainline runs parallel to and just east of SR 99 from the north to the south end of the county. The COFCG's *Fresno County Rail Corridor Preservation/Acquisition and Transportation Alternatives Study* indicates that the Santa Fe mainline supports about 18 freight and eight passenger trains per day at a maximum speed of 79 mph, while the Union Pacific mainline supports about 12 freight trains per day at a maximum speed of 60 mph. The noise contour distances for these rail operations are shown in Charts 10-9 through 10-10.

In addition to Santa Fe and Union Pacific mainline operations, the San Joaquin Valley Railroad (SJVR) operates about two freight trains per day at low speeds along a Union-Pacific-owned rail line traveling eastward from the city of Fresno through Sanger, then southeastward through Reedley. SJVR also operates about two freight trains per day along a Union-Pacific-owned line leading westward from Hanford in Kings County to Huron. Port Railroads Inc., part of SJVR, operates about one to two freight trains per day on track leading westward from the city of Fresno to a junction north of Tranquility, with one branch continuing northwestward through Firebaugh and the other branch passing southeastward through Tranquility, San Joaquin, Burrel, and Riverdale. According to the above-mentioned COFCG document, maximum speeds along these rail lines are 10 to 25 mph.

Environmental review would be required of new rapid rail or light-rail networks should they be developed in the county. Noise sensitive land uses would be affected by transit noise within approximately 750 feet of any new commuter rail mainline and within approximately 300 feet of intermediate-capacity transit lines.

AIRPORT NOISE

Operational data for Fresno County's general aviation facilities are summarized in Table 4-11 of this report. In addition to these airports, a major military aircraft facility, Lemoore Naval Air Station (NAS Lemoore), straddles the Fresno/Kings County lines. Figures in Appendix 10A depict the noise generated by the operations of the general aviation airports and NAS Lemoore in terms of CNEL contours.

Among the general aviation facilities, the Fresno Yosemite International Airport (FYT) supports the highest level of aircraft operations and generates the most extensive noise. The FYT is located within Fresno's city limit, and according to noise contours generated for the *Fresno Air Terminal Airport and Environs Plan*, most of the FYT's noise influence is confined within the city. However, small patches of unincorporated area just west of the FYT runways experience aircraft noise exposure as high as, or greater than, 70 dBA CNEL. The airport's 60 dBA CNEL aircraft noise contour extends parallel to the runways southeastward (along the primary aircraft approach path) into an unincorporated county area. Most of the existing residential development within this unincorporated area is located outside of the 60 dBA CNEL contour, but still experiences substantial elevated noise levels during large aircraft approaches. Additional unincorporated residential neighborhoods are located just beyond the northwestern extent of the airport's 60 dBA CNEL contour, and just northeast of the portion of that contour that flank the FYT's runways. Occasional military aircraft operation at FYI may cause contours to be underestimated.

The 60 dBA CNEL contours estimated for the Fresno-Chandler Downtown Airport and Coalinga Airports do not extend into the unincorporated county. Firebaugh, Mendota, and Sierra Skypark

Airports are located within the cities of Firebaugh, Mendota, and Fresno, respectively, but their 60 dBA CNEL contours extend slightly into unincorporated areas. Reedley Municipal and Harris Ranch Airports and the Selma Aerodome are located outside city limits and primarily impact unincorporated areas. However, they represent less important noise sources than the FYI because their scale of operations is much smaller than the FYI's, two of them (Harris Ranch Airport and Selma Aerodome) are located near major transportation noise sources (I-5 and SR 99/Union Pacific mainline) that have a more extensive influence on noise levels in the vicinity than the airports do, and there are fewer noise-sensitive land uses surrounding these smaller airports.

Noise contours for NAS Lemoore, last calculated in 1981 and reproduced in the NAS's 1983 *Air Installation Compatibility Use Zones (AICUZ)* study, indicate that the facility's noise effects extend substantially into Fresno County, perhaps as far as the westside communities, Five Points and Wheatville.

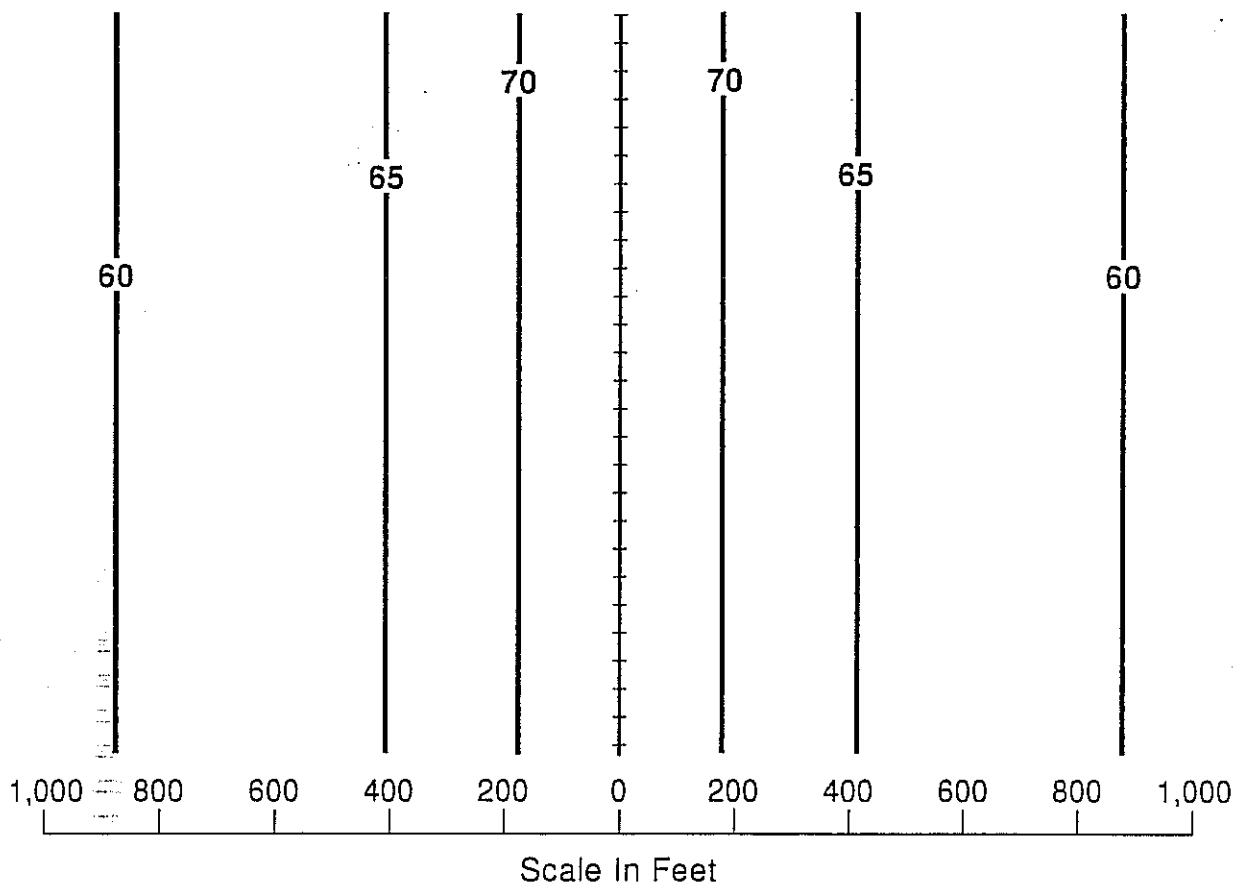
FIXED NOISE SOURCES

While much of the agricultural produce grown in Fresno County is processed elsewhere, a great deal of agricultural processing occurs within the county and represent a major stationary noise source category in the county. Other types of stationary noise sources in the county include mining and building/landscaping materials processing (e.g., cement batch plants), as well as other manufacturing and processing operations. Figure 10-2 demonstrates the stationary noise sources throughout Fresno County.

The fixed noise source discussion will focus on the L_{50} and L_{dn} statistics. These are the two noise statistics that form the basis of the current *Noise Element's* quantitative standards, and L_{dn} is the most commonly used statistic for expressing environmental noise exposure from non-aircraft noise sources. In addition, L_{50} is one of the L_n statistics that can be used to assess a noise source's conformance with the county's *Noise Control Ordinance*. Most of the activities and machinery assessed below generate relatively stable noise levels rather than a series of discrete peak events. Therefore, they are more likely to generate sustained noise levels that exceed the *Noise Ordinance's* lower L_{50} standard than they are to generate peak levels that exceed the *Noise Ordinance's* higher L_{max} threshold (see Figure 10-2).

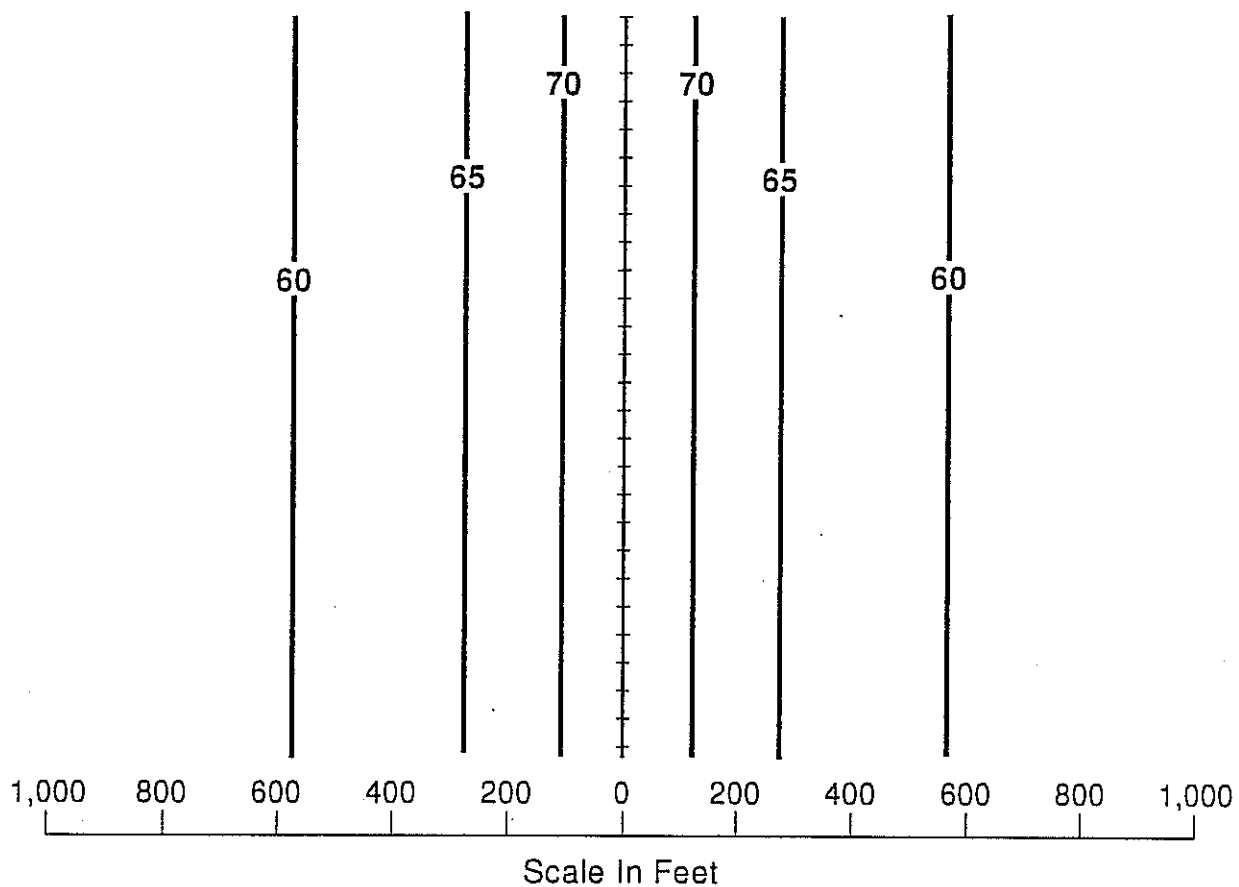
Methodology

Most of the noise data recorded specifically for this analysis was obtained using a Larson-Davis 820 Type I integrating sound level meter (SLM), calibrated with a Larson Davis CA250 calibrator. In general, two SLMs were operated at different locations simultaneously. The second SLM in these cases was either a Quest M-28 or Larson Davis 720 Type II instrument. All major monitored noise sources generated relatively stable noise levels during the observation periods, allowing for relatively short (generally one-minute) sampling intervals. These shorter intervals minimized the opportunity for unrelated noise sources (e.g., motor vehicle passbys, aircraft overflights) to interfere with measurement of the primary noise source of concern. Where appropriate, the following discussion references noise measurement and modeling data from previous environmental analyses as well.



—60— Ldn Noise Contours (dBA)

**Chart 10-9
Worst-Case Railroad Noise
Contour Distances (No Whistle):
Burlington Northern and
Santa Fe Railroad**



—60— Ldn Noise Contours (dBA)

Chart 10-10
Worst-Case Railroad Noise
Contour Distances (No Whistle):
Union Pacific Railroad

General Manufacturing and Processing

Numerous general manufacturing and processing plants are located within Fresno County. Relative to the specific categories of mining and agricultural processing facilities, a larger proportion of general manufacturing and processing plants tends to be located within the limits of cities, such as Sanger. However, many of these plants are sited within the unincorporated county. The largest concentration of such facilities is in the Malaga area south of the city of Fresno. This area contains several industrial land uses, including metal fabricators and a chemical plant as well as food processing. The largest industrial operator in this area is Pittsburgh Plate and Glass (PPG), whose Fresno plant is located at the east end of Malaga's main cluster of industrial facilities.

Pittsburgh Plate and Glass Fresno Plant

The Pittsburgh Plate and Glass (PPG) Fresno Plant (location S4 in Figure 10-2) is a large-scale sheet glass manufacturing facility located south of Jensen Avenue and west of Peach Avenue near the community of Malaga just south of Fresno's city limits. The plant is typically in full operation during the week, with reduced plant activity typically continuing through the weekend. The plant typically operates 24 hours per day and management anticipates no substantial changes to plant operations.

Measured Noise Levels

Plant-generated noise levels were monitored in the employee parking lot approximately 300 feet east of the facility's glass tempering furnace (the most prominent individual noise source). Over a period of nearly an hour, L_{eq} measured during successive one-minute intervals ranged from about 60 to 64 dBA, while L_{50} s ranged from about 60 to 63 dBA. During this monitoring period, measurements were simultaneously recorded at four off-site locations, the first three of which were adjacent to homes along the east side of Peach (generally east of the plant) and the fourth of which was located along Willow Avenue west of the plant. At the first three off-site locations, measured L_{eq} s and L_{50} s ranged from 47 to 55 dBA. (By comparison, the *County Noise Control Ordinance's* baseline noise level standards – not to be exceeded with the addition of the offending noise source for more than 30 minutes per hour – are 50 dBA during the daytime and 45 dBA at night.) One of these three locations was nearer to the plant's air compressor building than to the tempering furnace, and based on auditory observations appeared to be influenced nearly equally by noise generated by the compressors and the furnace.

The L_{eq} and L_{50} measured along Willow Avenue was 53 dBA. Compared with the noise levels measured at the parking lot "reference" location during the same interval, this level is somewhat higher than what would have been anticipated based purely upon the attenuation of noise over distance. This difference probably reflects less interference with noise propagation from the west side of the tempering furnace enclosure relative to the east side. However, the only land uses observed west of the plant were industrial and therefore insensitive to noise impacts.

Based on the short-term L_{eq} measurements and the 24-hour operating schedule of the plant, L_{dn} s at the three measurement locations east of the plant are estimated to range from about 53 dBA, below the current *Noise Element's* urban and rural L_{dn} standards, to about 62 dBA, two decibels above the current *Noise Element's* urban L_{dn} standard and two decibels above the corresponding

rural standard. (The residential density east of the plant is more rural than urban in character, but the area is located on the fringe of urban development.)

Mining/Building Materials

Numerous mining operations and rock, asphalt and concrete plants are located along the San Joaquin and Kings rivers north and east of the Fresno-Clovis Metropolitan Area. Some of the largest of these operations are discussed below, along with a major aggregate operation west of Coalinga.

Al's Mini Mix

Al's Mini Mix is a concrete batch plant operation located in Fresno County at the north end of Lanes Road west of Friant Road (location S8 in Figure 10-2). The batch plant operates on weekdays from 4:00 a.m. to 6:00 p.m., May through October, and 5:30 a.m. to 6:00 p.m., November through April, and on Saturdays from 6:00 a.m. to 1:00 p.m. The portable sand processing plant is permitted to operate on weekdays between 7:00 a.m. and about 4:00 p.m., but is typically operated only about three days per week.

Measured Noise Levels

During preparation of the *Acoustical Analysis: Al's Mini Mix, Fresno County, California* in 1988, Brown-Buntin Associates (BBA) performed noise measurements 100 feet south and west of the batch plant and at the nearest residential receptor south of the plant (approximately 1200 feet away). At the 100-foot-distance reference locations, L_{eq} s ranged from 68 to 71 dBA and L_{50} s ranged from 66 to 71 dBA. At the above-described receptor, measured noise levels ranged from 45 to 48 dBA, but were influenced by a variety of sources in addition to Al's Mini Mix.

BBA modeled the combined noise levels from the batch and processing plant (the latter not yet in existence at the time of their analysis) at the above-described receptor to the south of the facility, as well as a receptor west of the facility with unobstructed exposure to noise from the batch plant. The facility's modeled contributions to noise levels at the south receptor were negligible. With the processing plant at its "primary" location, the modeled L_{50} at the west receptor was 50 dBA, equal to the *County Noise Control Ordinance's* daytime noise level standard not to be exceeded for over thirty minutes per hour (see Table 10-9). Since the batch plant operates only about 25 percent of the time, the noise it generated had no influence on the L_{50} analysis. In addition, the processing plant, which did influence the L_{50} analysis, operates only during daytime hours, so the ordinance's more stringent nighttime standards do not apply. The modeled L_{dn} at the west receptor under this scenario was 51 dBA, below the current *Noise Element's* 55 dBA exterior L_{dn} standard for rural residential areas as shown in Table 10-10.

CalMat

The CalMat facility is located just north of Al's Mini Mix along the southeastern bank of the San Joaquin River northwest of the intersection of Friant Expressway and Millbrook Avenue (location S9 in Figure 10-2). CalMat conducts mining activities and operates batch and aggregate plants at this site. According to the *Draft EIR for CalMat of Central California Master Permit*, mining activities

and batch plant operations usually start about 5:00-6:00 a.m., while the aggregate plants usually begin operating at about 7:00 a.m. Almost all CalMat activities cease by late afternoon.

Measured Noise Levels

During preparation of the above-mentioned EIR, BBA performed short term noise measurements at seven nearby residences during the early morning hours of two consecutive days in November 1991. Several short measurement intervals were recorded at each of these locations, with pauses between intervals necessitated by interference from extraneous noise sources. The average of the L_{50} 's recorded during the multiple measurement intervals at each residence ranged from 40 to 58, with levels at six of the seven residences exceeding the *County Noise Control Ordinance's* 45 dBA nighttime L_{50} standard and levels at four of the residences exceeding the *County Noise Control Ordinance's* 50 dBA daytime L_{50} standard.

BBA also modeled worst-case future noise levels at these seven receptors and at three additional locations under two different wind direction scenarios and three different combinations of specific mining locations. Depending upon the wind direction and mining location scenarios, two to four of these receptors were projected to experience noise exposure exceeding the Noise Ordinance's 50 dBA daytime L_{50} standard, and three to six of them were projected to experience noise levels exceeding the *Noise Ordinance's* 45 dBA nighttime L_{50} standard. Severe noise exposures (worst-case L_{50} s of 74-80 dBA) were projected at two receptors.

With implementation of a "pilot channel" measure designed to reduce line-of-site noise exposure of residences to the nearby excavation activities, worst-case noise levels at the most severely-impacted residences were projected to be substantially reduced. The mitigation analysis also assumed that excavation activities would be limited to daytime hours, when noise sensitivity is lower. Nevertheless, the total numbers of receptors that would experience L_{50} s exceeding the *Noise Ordinance's* 50 dBA daytime standard under the mitigated scenarios was projected to be nearly the same as under the pre-mitigation scenarios. Furthermore, even if excavation activities were prohibited before 7:00 a.m., operation of batch and processing plants before 7:00 a.m. was projected to cause L_{50} s exceeding the *Noise Ordinance's* 45 dBA nighttime standard at four of the ten analyzed residences.

The Final EIR for the CalMat Master Permit added mitigation measures prohibiting aggregate and asphalt plant operations before 7:00 a.m. pending noise control modifications to these plants and recommended less stringent time limitations for operation of the concrete batch plant and acceptance of bulk cement deliveries. Subsequent to EIR publication, CalMat completed modifications to their aggregate processing and asphalt plants intended to reduce the noise levels they generate. A *Supplemental Environmental Noise Analysis* was prepared to assess the effectiveness of this modifications, in particular whether the reduced noise impacts at the nearest residences to levels considered acceptable under the *Noise Ordinance*. This analysis concluded that noise levels generated by the asphalt plant were substantially reduced, while no reduction in the levels generated by the aggregate plant were observed. While noise measurements and modeling results suggested that reductions in CalMat-generated noise levels had occurred at nearby receptors, the analysis concluded that *Noise Ordinance* standards would continue to be exceeded at some of these receptors under certain conditions.

Central Valley Ready Mix

Central Valley Ready Mix (location S7 in Figure 10-2) is a mining operation that provides rock and sand products. It is located along Riverbend Avenue south of Annadale Avenue, on the east bank of the Kings River east of Sanger.

Measured Noise Levels

The primary noise source observed was the rock plant on the south side of the facility. At a distance of about 100 feet east of the portion of the plant that appeared to be generating the most noise, an L_{eq} of about 77 dBA and an L_{50} of about 76 dBA. Based on these reference noise levels and a noise fall-off rate of six dBA per doubling of distance, the *Noise Ordinance's* 50 dBA daytime L_{50} standard could be exceeded at any residences within about 2000 feet of the plant. The reference measurement location appeared to be oriented relative to the plant to experience maximum noise exposure. Therefore, the extent of noise impacts at different orientations relative to the plant is likely to be reduced. Nevertheless, the plant-generated L_{50} s may exceed the *Noise Ordinance's* daytime L_{50} standards at the nearest residence, several hundred feet from the plant.

Granite Construction Coalinga Plant

Granite Construction operates a rock quarry just west of Coalinga's city limits (location S1 in Figure 10-2). Plant machinery typically operates from about 7:00 a.m. to 4:00 p.m., Monday through Friday, primarily during the construction season. Crookshanks Ready Mix operates on the property as a tenant to Granite Construction.

Measured Noise Levels

Numerous noise-generating activities – including operation of stationary machinery, mobile equipment and heavy trucks – occur on the plant site simultaneously. However, the single most potent noise source on the property is the machinery associated with the rock plant. One-minute noise measurement samples were recorded at various distances from this source at locations and during periods when other noise sources within the facility had a negligible effect on noise levels. Orientations relative to the plant machinery were selected that tended to maximize exposure to plant-generated noise. At a distance of 300 feet, both measured L_{eq} 's and L_{50} 's were about 75 dBA.

RMC Lonestar Plant #124

RMC Lonestar Plant #124 (location S10 in Figure 10-2) performs open-pit mining of rock, sand and gravel and operates a rock plant on a site along the southeast bank of the San Joaquin River near the intersection of Willow and Friant Avenues, north of Al's Mini Mix and CalMat. Typically, the rock plant operates from about 7:00 a.m. to 5:30 p.m., while the facility is open to customer truck traffic from about 6:00 a.m. to 3:30 p.m. in the summertime and about 7:00 a.m. to 3:30 p.m. in the wintertime.

Measured Noise Levels

At a distance of about 500 feet east of the rock plant, an L_{eq} of about 62 dBA and an L_{50} of about 61 dBA was recorded. Based on these reference noise levels and a noise fall-off rate of six dBA per

doubling of distance, exceeding the *Noise Ordinance's* 50 dBA daytime L_{50} standard could occur within about 1800 feet of the plant. However, the plant is located at least 2000 feet from Friant Road and the off-site properties to the east of it. Traffic on the roadway also tends to mask plant noise for any receptors substantially nearer to the roadway than to the plant. Furthermore, numerous aggregate piles within the site property partially screen noise emitted by the plant for low-elevation receptors.

Agricultural Processing

In addition to farm equipment used for agricultural harvesting and trucks used to transport harvested products, one of the main sources of agriculture-related noise emissions are facilities which process these products. In Fresno County, such processing facilities include numerous almond hulling operations and cotton gins. While most of these activities are limited to specific periods during the summer and fall months, some of them continue at least intermittently during other times of the year. The following facilities represent only a few examples of the many agricultural processing facilities within the county.

Anderson-Clayton Burrel Gin

Anderson-Clayton operates a "ten-stand", small-medium-sized pima (long-staple) cotton gin in Burrel (location S2 in Figure 10-2). Such gins perform the following functions: pre-cleaning, lint cleaning, and storage of final product, seeds and organic waste that has been removed during processing. It was operating during the site survey in early February, apparently processing cotton whose harvesting was delayed by inclement weather earlier in the year. Generally, the gin operates seven days per week, 22 hours per day during a six- to twelve-week period in the fall.

Measured Noise Levels

The loudest noise source within the Burrel gin and others of its kind are the seed blowers that produce a continuous high-pitched sound. However, the blowers and most other processing machinery are contained within a nearly-complete building enclosure. In addition, the blowers are fitted with baffles to reduce noise propagation nearer to the source. Noise sources outside the building included occasional forklift and shipping truck activity. A short-term measurement was recorded about 300 feet south of the gin building's loading dock opening during a period when activity outside of the building was negligible. The measured L_{eq} and L_{50} were both 61 dBA. Based on this reference L_{50} value, L_{50} s above the *Noise Ordinance's* 50 dBA daytime standard could be experienced as far as about 1100 feet south of the plant, and the *Ordinance's* nighttime 45 dBA L_{50} standard could be exceeded as far as about 2000 feet south of the plant. However, no existing noise-sensitive land uses were observed within this distance and generally south of the plant (where noise exposure through the loading dock opening would be greatest).

Met West

The Met West Agribusiness juice concentrator plant is located east of Del Rey Avenue in the community of Del Rey (location S5 in Figure 10-2). During the peak processing season from late summer through fall, it typically operates 24 hours per day, seven days per week.

Measured Noise Levels

In 1993, BBA prepared a report, *Acoustical Analysis: Met West Agribusiness Juice Concentrator Plant: Del Rey, Fresno County, California*, to assess whether plant-generated noise levels exceeded Noise Ordinance standards at the residence. The nearest identified residence was about 700 feet northwest of the facility. Short-term nighttime monitoring was performed at this residence in 1992 and 1993. Measured L_{50} s exceeded the *Noise Ordinance's* 45 dBA nighttime L_{50} by three to four dBA. After the plant's cooling tower was surrounded by wooden fruit bins stacked about 16 feet high, measured noise levels at the nearest residence no longer exceeded the *Noise Ordinance's* nighttime L_{50} standards. Subsequent to modifications to the cooling tower intended to reduce noise levels emanating from it, a follow-up analysis was performed to determine whether the above-described barrier was still required to ensure that noise levels at the nearest residence remained below the applicable *Noise Ordinance* standard. The analysis determined that the barrier was indeed still necessary.

Del Rey Packing Co.

The Del Rey Enterprises dehydration plant is located west of Del Rey Avenue, across from the Met West plant, in the community of Del Rey (location S6 in Figure 10-2). According to the *Acoustical Analysis: Del Rey Enterprises Dehydration Plant: Del Rey, Fresno County, California*, the plants operating schedule straddles both daytime and nighttime hours.

Measured Noise Levels

For the above-described acoustical analysis, BBA performed long-term unattended measurements at two nearby residences. At one of these homes, plant-generated noise levels remained below applicable *Noise Ordinance* standards, partly because of stacked fruit bins that intervened between the plant and the residence. Short-term attended measurements were performed at the other home to assure that the impact from Del Rey's operations could be isolated from other sources. Measured nighttime plant-generated L_{50} s at that residence ranged from six to ten dBA above the *Noise Ordinance's* 45 dBA nighttime L_{50} standard. The study recommended that fruit bins also be stacked in the path of noise propagation from the plant to this second residence. A post-mitigation analysis found that, after fruit bins had been stacked about 14 to 15 feet high along the facility's northern boundary, plant-generated L_{50} s at the second residence were below the 45 dBA nighttime L_{50} standard.

Foster Farms Feed Plant (Burrell)

Foster Farms operates a major poultry feed plant in Burrell (location S3 in Figure 10-2). The plant typically operates between about 6:00 a.m. to 10 p.m. Monday through Friday year-round.

Measured Noise Levels

The L_{eq} and L_{50} measured at about 450 feet from the plant were both about 65 dBA. Projecting from this reference distance, the maximum distance at which the plant-generated L_{50} might exceed the *Noise Ordinance's* 50 dBA daytime standard is about 2200 feet. The 45 dBA nighttime L_{50} standard could be exceeded at a distance of nearly 4000 feet under worst-case propagation conditions. However, the noise-drop off observed between the reference location and more distant sites at

which simultaneous measurements were recorded suggests that L_{50s} exceeding *Noise Ordinance* standards are generally limited to lesser distances, at least at most angles relative to the plant.

10.5 COMMUNITY NOISE SURVEY

For the General Plan Update, in 1997, EIP conducted a survey throughout unincorporated Fresno County to observe noise environments and measure noise levels at representative community locations, to observe and where appropriate measure noise levels at previously-identified stationary noise sources, and to identify additional stationary noise sources within the unincorporated county. Ambient Noise Measurement locations in Fresno County can be seen in Figure 10-3.

GENERAL COMMUNITY NOISE LEVELS

Community noise environments were observed and community noise levels were sampled at 12 locations. For the purposes of this analysis, the measurement locations were separated into three regions: western county, central county and eastern county. The western county has been defined as the area generally west and south of a line passing along the western sides of Kerman, Raisin City, and Riverdale/Lanare. Outside of specific small communities, local traffic flow in this area is primarily served only by widely spread rural arterials. The central county region begins at the previously described boundary and extends eastward to the base of the Sierra foothills east of Orange Cove, Sanger, and Clovis. Much of the land in this region is contained within the limits of incorporated cities such as Fresno and Clovis. Unincorporated areas range from communities on the scale of those observed in unincorporated portions of the western county to industrialized areas on the fringe and even patches of relatively dense residential development that are fully enclosed by land within the city of Fresno. The eastern county region extends eastward from this boundary, and is generally characterized by small resort-style communities accessed by SR 180 to the south, SR 168 and Friant Road to the north and several smaller roads.

Western County

The western county region is primarily agricultural in nature, although there are other prominent land uses in the area such as fossil-fuel related facilities that are located north and west of Coalinga. Traffic noise sources in the area include I-5 as well as other state highways and county roads. Within this portion of the county, community noise measurements were recorded at Coalinga Mineral Springs, Tranquillity, and the westside communities. The first of these sites represents the rugged mountainous and virtually undeveloped areas near the western edge of the county, while the remaining sites represent the small agricultural communities east of Interstate 5. Average noise levels (L_{eqs}) during these daytime measurements ranged from the low 40's dBA at Coalinga Mineral Springs (where the most prominent noise source was a flowing stream) to the low-to-mid-50's dBA in the westside community and Tranquillity (where human activities represented the most important influence on noise levels).

While measured noise levels at Coalinga Mineral Springs were virtually constant due to the steady nature of the primary noise source observed at this location, peak noise levels in the high 60's to 70 dBA were measured in the agricultural communities. However, the highest measured levels typically resulted from raised voices, dog barks or individual vehicle passbys and were typically sustained only briefly. Noise levels in the 40's dBA predominated at all three sites, as indicated by

the range between the measured L_{min} and L_{50} values. Agricultural activities could have a more important influence on the noise environment in these communities during the summer months.

Central County

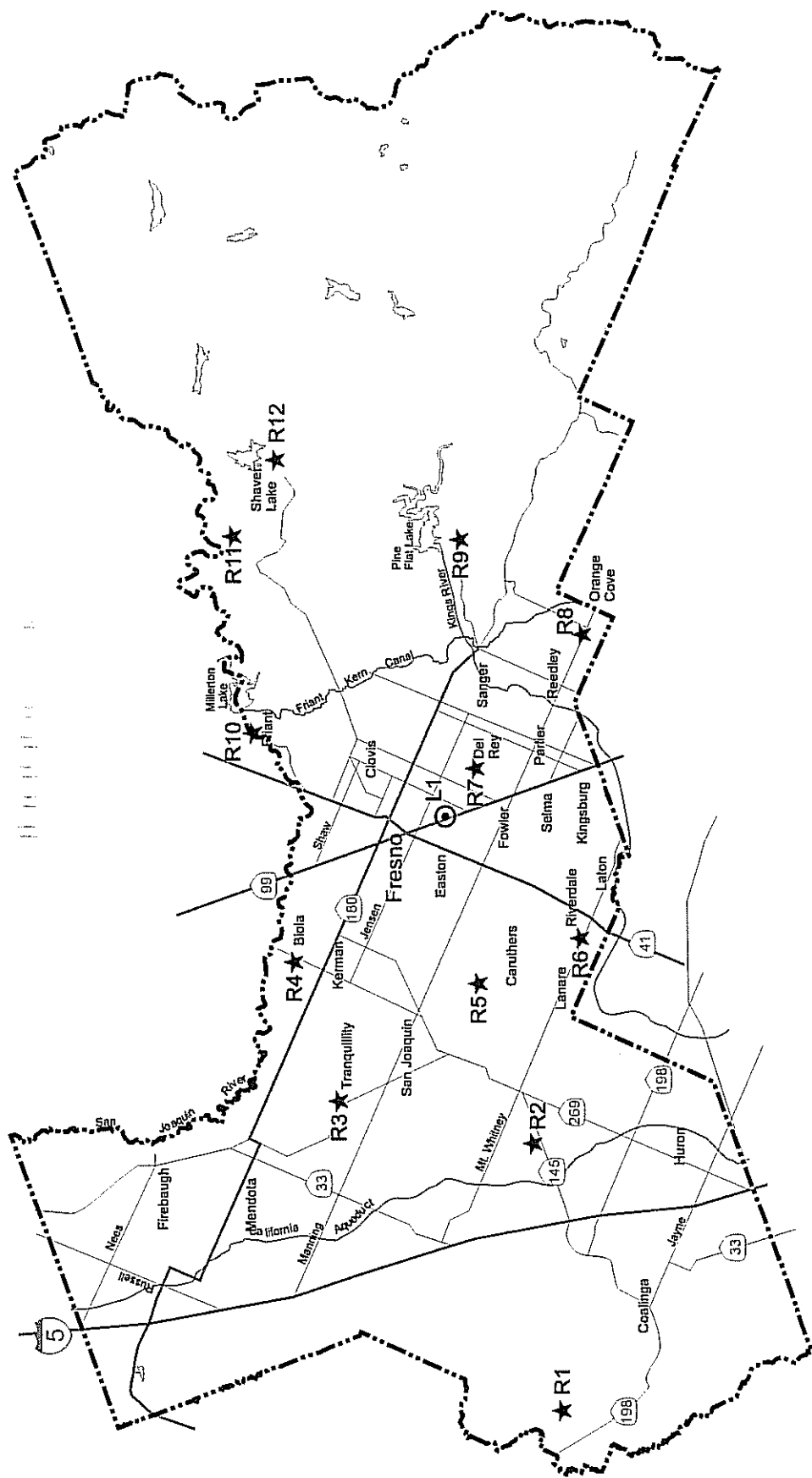
The unincorporated central county area is also predominantly agricultural but includes some major non-agricultural industrial land uses as well as portions of the Fresno-Clovis metropolitan area. While much of the area is still composed of discrete small communities, these communities are more numerous and closely spaced than those of the western county. The primary traffic noise sources in this area include SR 99 and SR 41, as well as other state highways and county arterials. Localized noise impacts are also generated by numerous rail lines and several airports and industrial facilities.

Within this portion of the county, short-term daytime community noise measurements were recorded at Biola, Raisin City, Riverdale, Del Rey and the area northwest of Orange Cove. In addition, a nighttime measurement was also recorded in Raisin City, and a long-term measurement was recorded at Malaga. Measured daytime L_{eq} s in these areas were generally in the high 40's to low 50's dBA, although the L_{eq} measured outside of Orange Cove (the one measurement location in the central county area that was located outside of a developed community) was in the low 40's dBA. The measured nighttime L_{eq} in Raisin City was 40 dBA, 10 dBA below the measured daytime level. At the Malaga site, measured hourly L_{eq} 's were in the 50's dBA and the measured L_{dn} was 61 dBA.

Measured maximum levels for the daytime short-term measurements were in the 60's dBA, except for the location near Orange Cove, where the maximum measured level was in the high 50's dBA. The L_{max} during the nighttime measurement in Raisin City was 55 dBA. At the Malaga monitoring location, hourly maximum levels ranged from the high 50's to the high 70's dBA, with the highest levels resulting from the numerous train operations that occur in this area. Measured minimum levels were very low at the short-term measurement locations, ranging from the high 20's to the high 30's dBA. In Malaga, hourly minimum levels were somewhat higher (from the mid-40's to the low 50's dBA, only a few decibels below the corresponding L_{eq} 's) probably due to the nearly constant low-level industrial noise background in this area.

Eastern County

Some of the lowest average noise levels observed during the survey were recorded in the eastern county area. Daytime monitoring locations within this region included Wonder Valley, Friant, Meadow Lakes, and Shaver Lake. In Friant, a nighttime measurement was also recorded. At three of these four locations, measured daytime and nighttime L_{eq} 's ranged from the high 30's to the low 40's dBA. The higher L_{eq} (54 dBA) recorded at the fourth location (Wonder Valley) resulted primarily from unusually loud peak events. Measured minimum levels ranged from the mid-20's to the low 30's dBA, while L_{50} 's (not influenced by peak noise events) were in the 30's dBA. Aside from the L_{eq} recorded in Wonder Valley, these levels are substantially lower than most of those recorded in the central and western county regions. Aside from L_{max} values, nighttime noise levels measured in Friant were very similar to those measured in the daytime at the same location. This reflects the fact that outdoor community activity in the area was negligible even during daytime hours, and that a greater influence from natural sounds (frogs, insects) at night partly compensated for the even lower neighborhood activity levels at that time.



<p>Fresno County General Plan</p>	<p>Ambient Noise Measurement Locations</p>
<p>★ Short-Term Measurement Locations</p> <p>⊙ Long-Term Measurement Location</p>	<p>Figure 10-3</p>



These noise measurements were performed in February. Greater recreation-related activity during the summer months would generally result in higher ambient noise levels in these areas. Figure 10-3 shows the Ambient Noise Measurement locations.

10.6 FINDINGS

- Noise guidelines and regulations developed since the currently adopted *Fresno County General Plan Noise Element* were prepared in the mid-1970's should be used to form future policies and regulations. Especially relevant are the ONC's "Land Use Compatibility for Community Noise Environments" guidelines (reproduced here as Chart 10-1).
- The most potent traffic noise sources passing through unincorporated Fresno County are I-5 and SR 99. Other traffic noise sources of importance include the other state highways within the county, major truck-bearing roadways such as Golden State Boulevard and Jensen Avenue, and urban arterials that pass through isolated patches of unincorporated land within the Fresno-Clovis Metropolitan Area.
- The two major rail lines that pass through the county are the Burlington Northern & Santa Fe Company and Union Pacific mainlines.
- The aircraft facilities that generate the most wide-spread impacts within the unincorporated county are the Fresno Yosemite International Airport (FYI) and NAS Lemoore. Existing noise exposure near the FYI is of much greater concern because of a much higher concentration of noise-sensitive land uses near that facility. Several other, smaller general aviation facilities generate noise impacts within relatively small portions of adjacent unincorporated land.
- Several fixed noise sources were identified substantially influencing noise levels in surrounding unincorporated areas. Basic source categories included manufacturing, mining/building products and agricultural processing. Noise-sensitive land use categories should not be placed within the range at which L_{50} may exceed applicable noise ordinance standards.
- The community noise survey revealed some variability in noise levels but also some basic patterns in noise exposure characterizing the western, central and eastern counties. Most of the communities within the unincorporated county are very small and are relatively quiet. Measurements were performed during winter months when agricultural activities in the western and central county and recreational activities in the eastern county tend to be reduced; however, these basic conclusions are expected to hold even under summer conditions.

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Schafer, Steve, Trainmaster, Burlington Northern and Santa Fe Company

Scroggins, Rebecca, Quality Control, Granite Construction Company Hanford Branch

White, Steve, Corporate Engineer, Anderson-Clayton Fresno Office

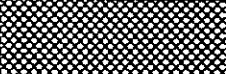

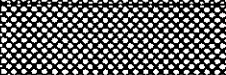
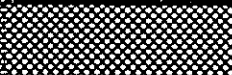
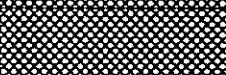
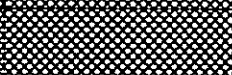
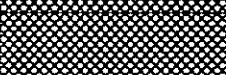
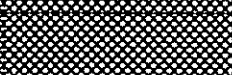




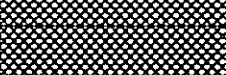

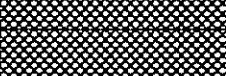



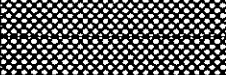
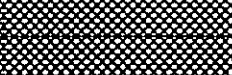
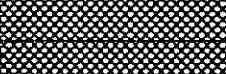





10.9 GLOSSARY

ADT -	Average daily traffic
AICUZ -	Air Installation Compatibility Use Zones
ALUC -	Airport Land Use Commission
Caltrans -	California Department of Transportation
CCR -	Code of California Regulations
CFR -	Code of Federal Regulations
CNEL -	The community noise equivalent level, is very similar to L_{dn} , but in addition to the 10 dBA nighttime penalty, a 5 dBA penalty is added to noise during the evening hours: 7:00 p.m. to 10:00 p.m.
COFCG -	Council of Fresno County Governments
CVC -	California Vehicle Code
dBA -	The A-weighted decibel scale, which discriminates against frequencies in a manner approximating the sensitivity of the human ear
decibel (dB) -	The standard unit of sound amplitude measurement
DOT -	United States Department of Transportation
EPA -	United States Environmental Protection Agency
FAA -	Federal Aviation Administration
FAT -	Fresno Air Terminal
FHWA -	Federal Highway Administration
FICAN -	Federal Interagency on Aircraft Noise
FICUN -	Federal Interagency Committee on Urban Noise
FTA -	Federal Transit Administration
HUD -	United States Department of Housing and Urban Development

- L_{dn}** - The day-night average noise level, is a 24-hour average L_{eq} with a 10 dBA "penalty" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for the greater nocturnal noise sensitivity of people.
- L_{eq}** - The equivalent energy noise level, is the average acoustic energy content of noise during the time it lasts. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure, no matter what time of the day or night they occur.
- L_{eq}(h)** - A one-hour (typically peak traffic hour) L_{eq}
- L_{eq}(24)** - A 24-hour L_{eq}
- L_{max}** - The maximum instantaneous noise level experienced during a given period of time.
- L_{min}** - The minimum instantaneous noise level experienced during a given period of time.
- L_n** - Indicates noise levels that were exceeded "n" percent of the time. For instance, L₅₀ is the noise level that was exceeded 50 percent of the time during a measurement period (e.g., 30 minutes in an hour).
- NAS** - Naval Air Station
- ONAC** - U.S. EPA's Office of Noise Abatement and Control; no longer exists
- ONC** - Office of Noise Control (California Department of Health Services); no longer exists
- OPR** - California Office of Planning and Research
- SLM** - Sound level meter
- Stage 2 Aircraft** - Aircraft that meet Stage 2 noise emission standards established in 14 CFR Part 36. Commercial airliners are required to phase out these aircraft or retrofit them to achieve enhanced noise control by the year 2000.
- Stage 3 Aircraft** - Aircraft that meet Stage 3 noise emission standards established in 14 CFR Part 36.

APPENDIX 10A

AIRPORT PLANS

Land Use Categories		Air Safety Zone	
Category	Use	Clear Zones	Approach Safety Zone
Residential	Single-Family		
	Multi-Family		
Commercial	Hotel / Motel Transient Lodging		
	Restaurant / Bar		
	Office / Retail		
	Service Station		
Industrial	Manufacturing		
	Business Park		
Institutional	Schools		
	Auditoriums		
Open Space	Parks		
	Golf Course		
Agriculture	Agriculture		



NORMALLY COMPATIBLE
Specified land use is satisfactory.



COMPATIBLE WITH RESTRICTIONS
Density limited to 3 du per acre or floor area ratio of 0.25.
No flammables, uses which attract birds, overhead power lines,
electrical interference, smoke, high intensity lighting, or concentration of people.



COMPATIBLE USE
No structures.



INCOMPATIBLE USE

Source: Caltrans, CBA Inc. Adapted from
Airport Land Use Planning Handbook.

Land Use Compatibility Guidelines for Air Safety

FIGURE 1 AIRPORT LAYOUT PLAN

- 1 = Main Runway
- 2 = AWOS
- 3 = Parallel Taxiway
- 4 = Taxiways
- 5 = Hangars
- 6 = FBO Sites
- 7 = Alternative Additional Taxiway Apron
- 8 = Future Apron
- 9 = Future FBO Site
- 10 = Future Hangars
- 11 = Terminal / Airport Manager's Office
- 12 = Aviation Reserve
- 13 = CDF Fire Station
- 14 = Initial Runway Protection Zone
- 15 = Future Runway Protection Zone
- 16 = Airport Property Line
- 17 = Aviation Easement
- 18 = Crosswind Runway
- 19 = Culverts
- 20 = Environmental Mitigation Area
- 21 = Segmented Circle / Wind Sock
- 22 = Section Number (typ)
- 23 = Fuel Island
- 24 = Washrack / Owner Maintenance Area
- 25 = Glide Slope
- 26 = Localizer
- 27 = TVOR / DME
- 28 = PAPI
- 29 = Rotating Beacon
- 30 = MIFL
- 31 = RGLS
- 32 = Underground Water Line
- 33 = MTL
- 34 = Proposed Additional Land Acquisition
- 35 = Helipad

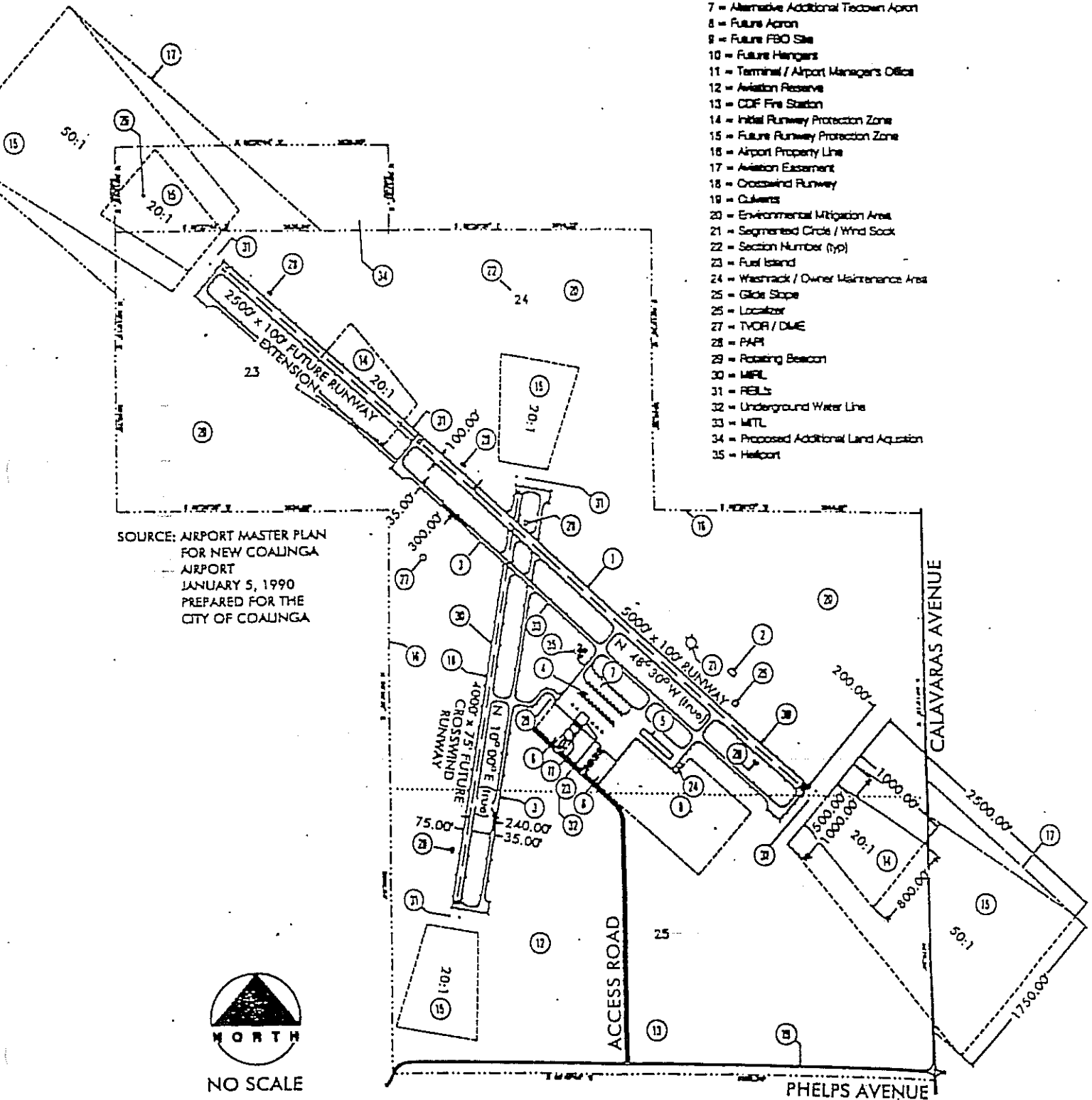
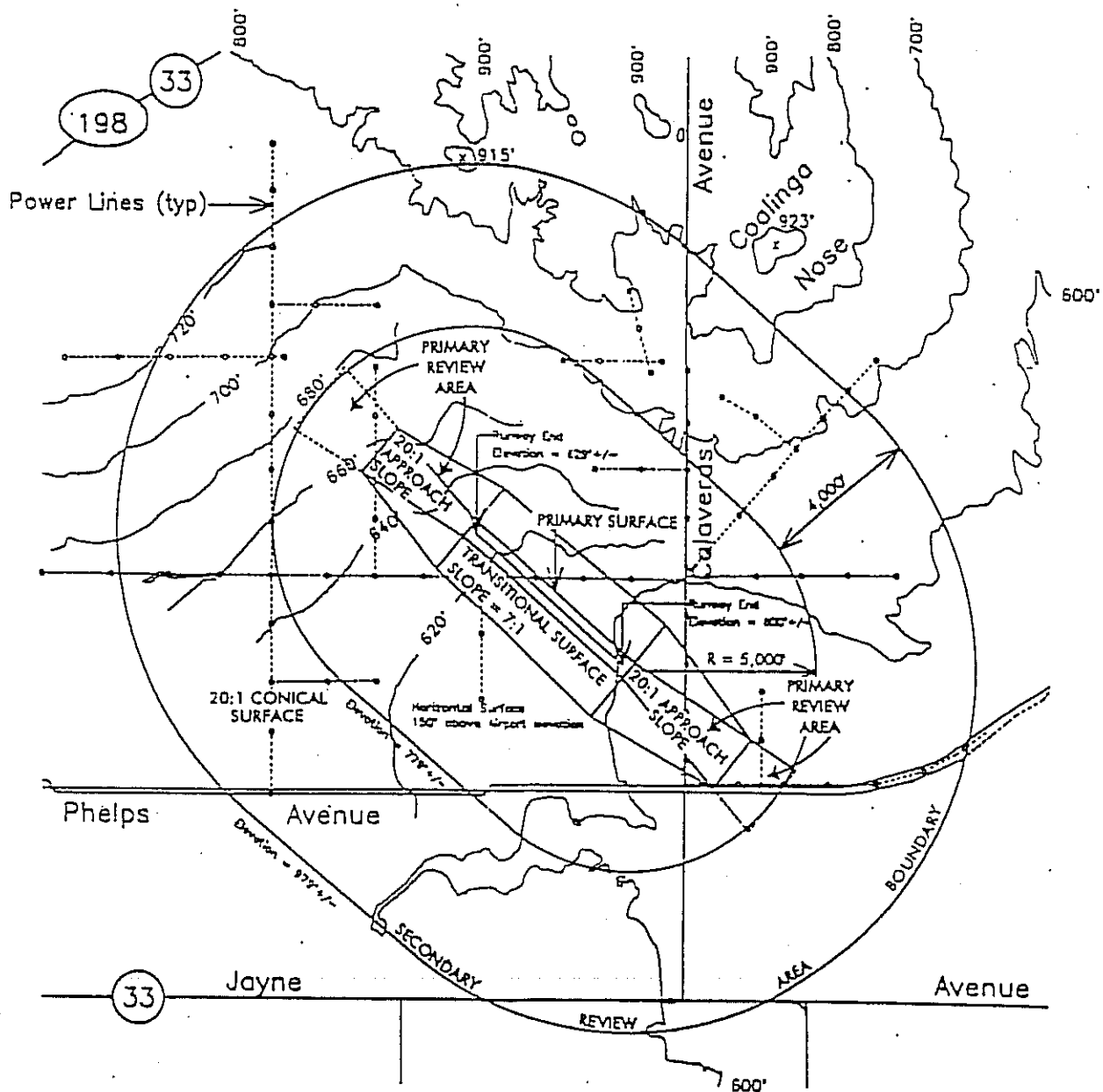
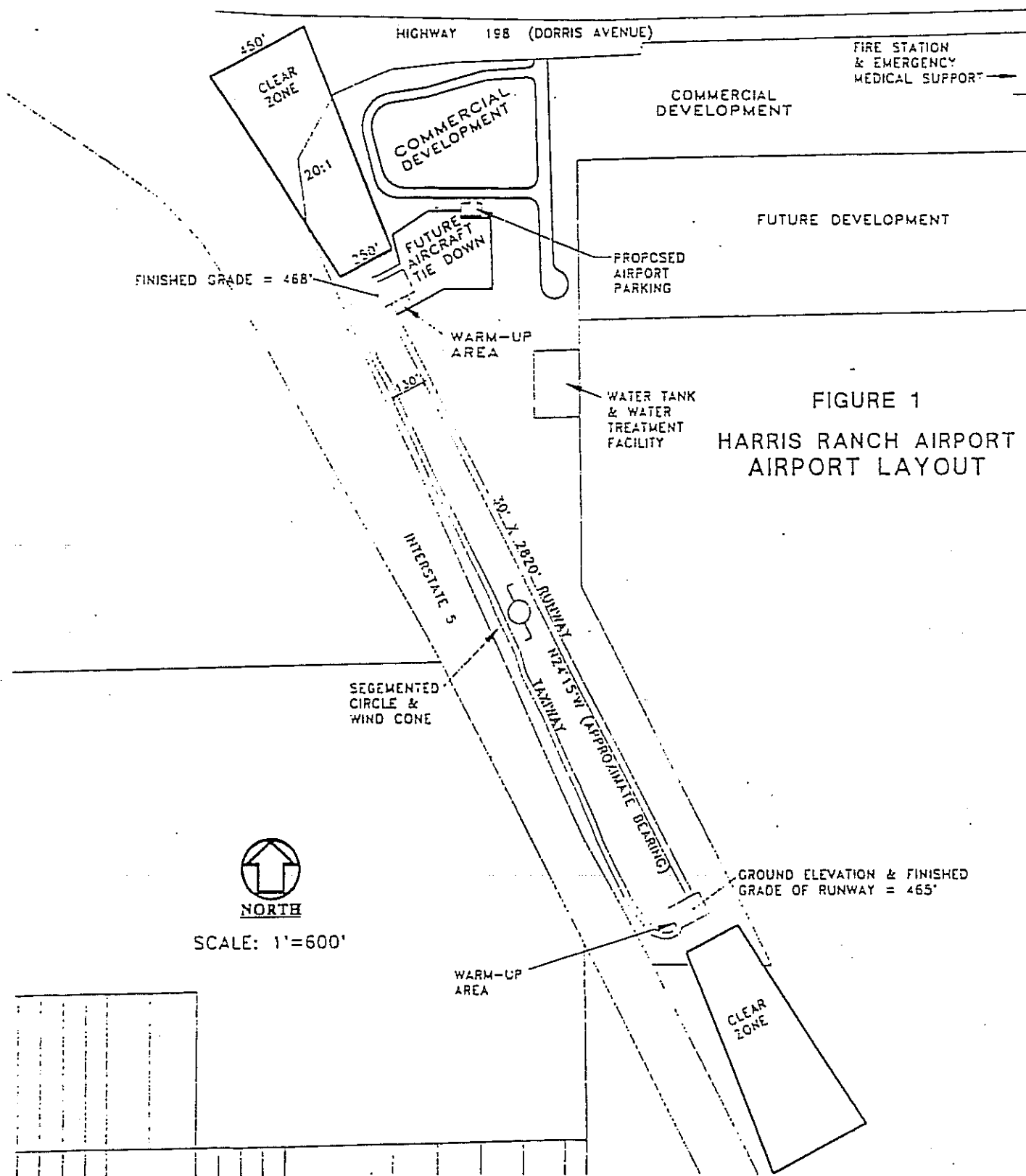


FIGURE 4
 APPROACH AND CLEAR ZONE PLAN
 FAR PART 77 IMAGINARY SURFACES



NOTE: SEE FIGURE 1 FOR PRIMARY SURFACE, CLEAR ZONE
 AND APPROACH SURFACE DIMENSIONS AND
 THE AIRPORT PROPERTY AND EASEMENT BOUNDARIES.





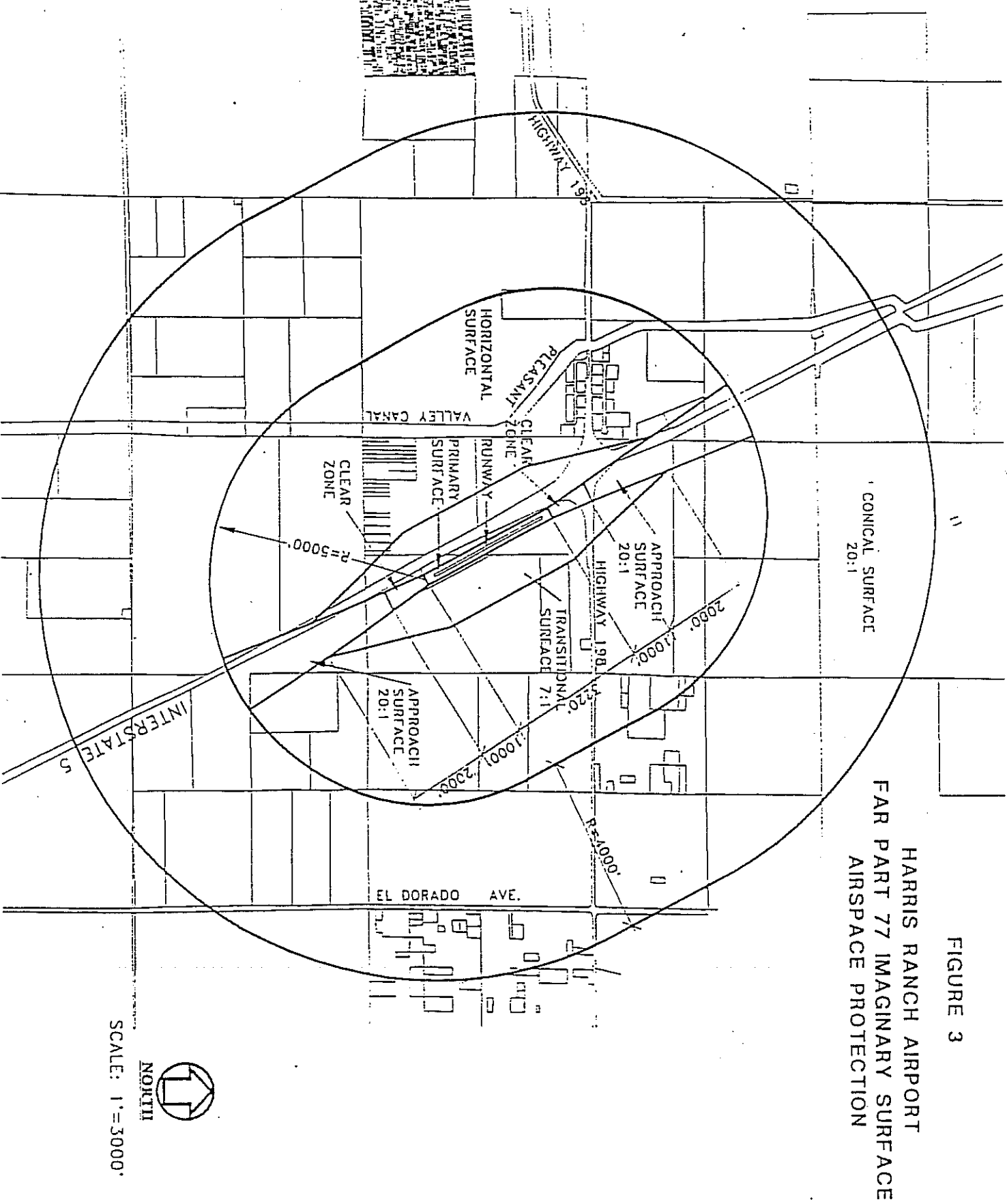


FIGURE 3

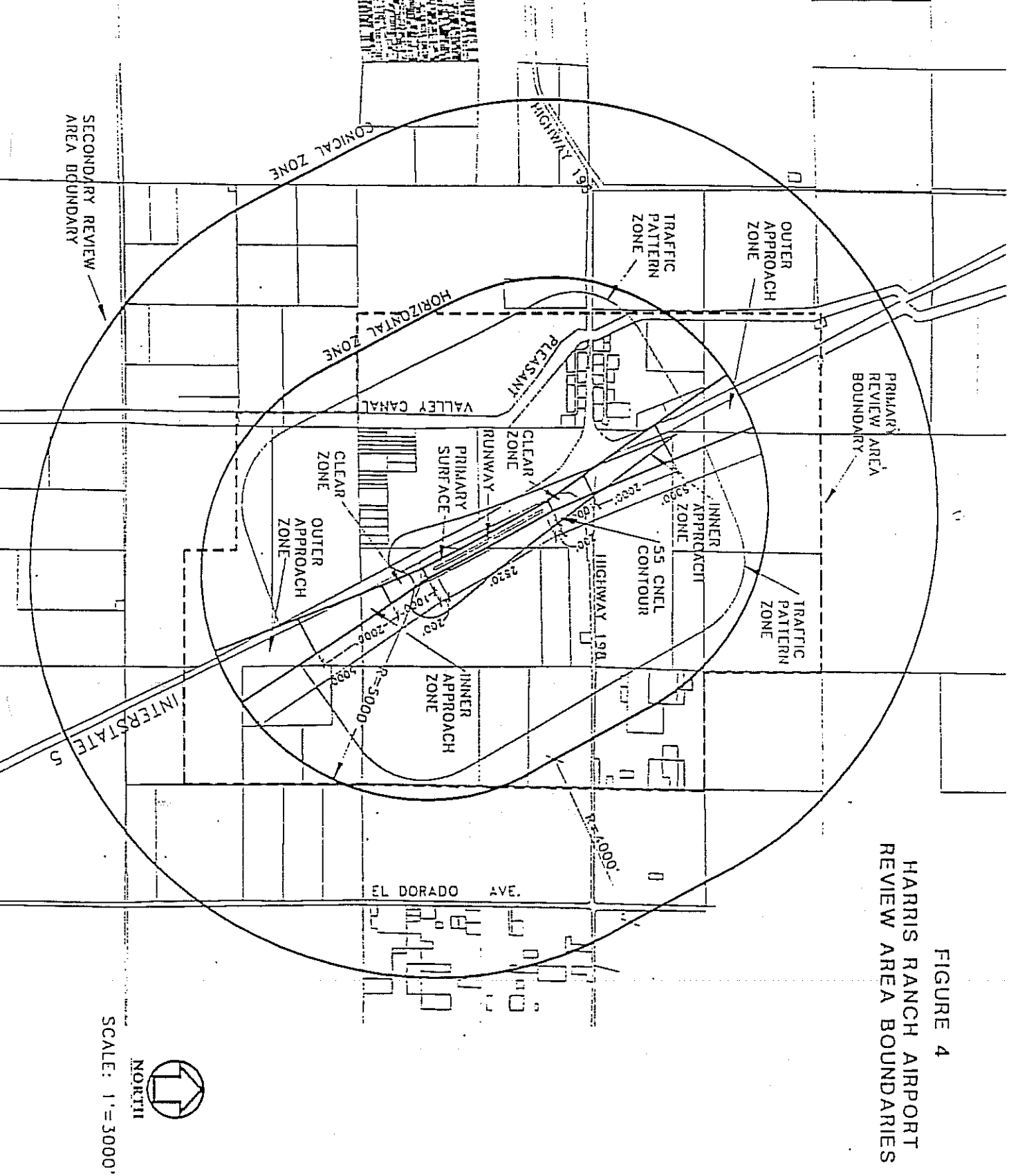
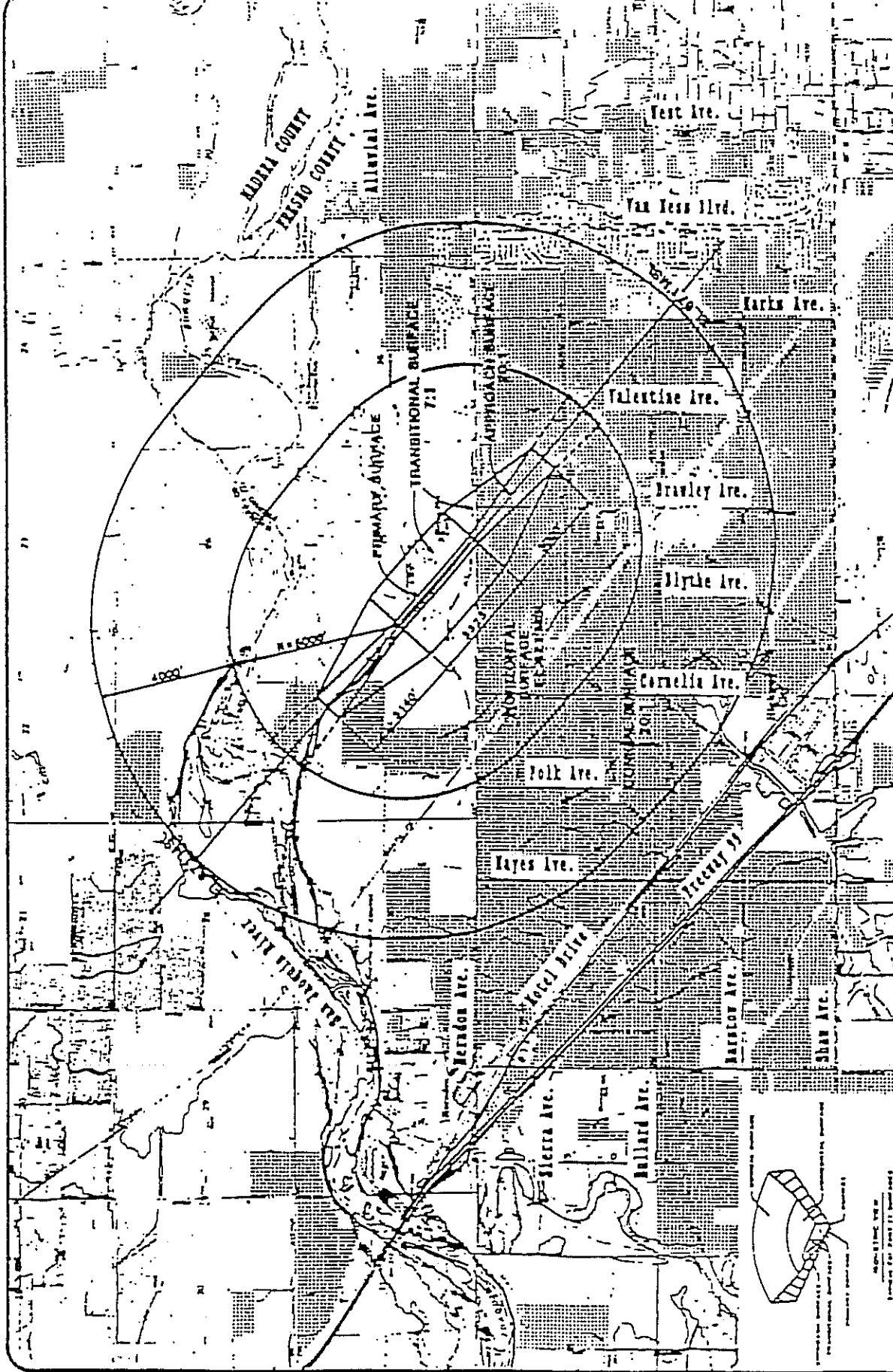


FIGURE 4

HARRIS RANCH AIRPORT
REVIEW AREA BOUNDARIES



SIERRA SKY PARK AIRPORT
FAR PART 77 AIRSPACE PLAN

FIGURE 2

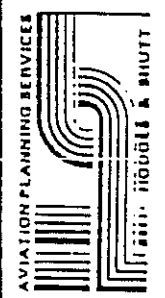
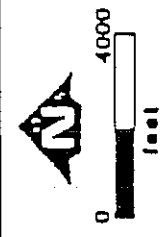
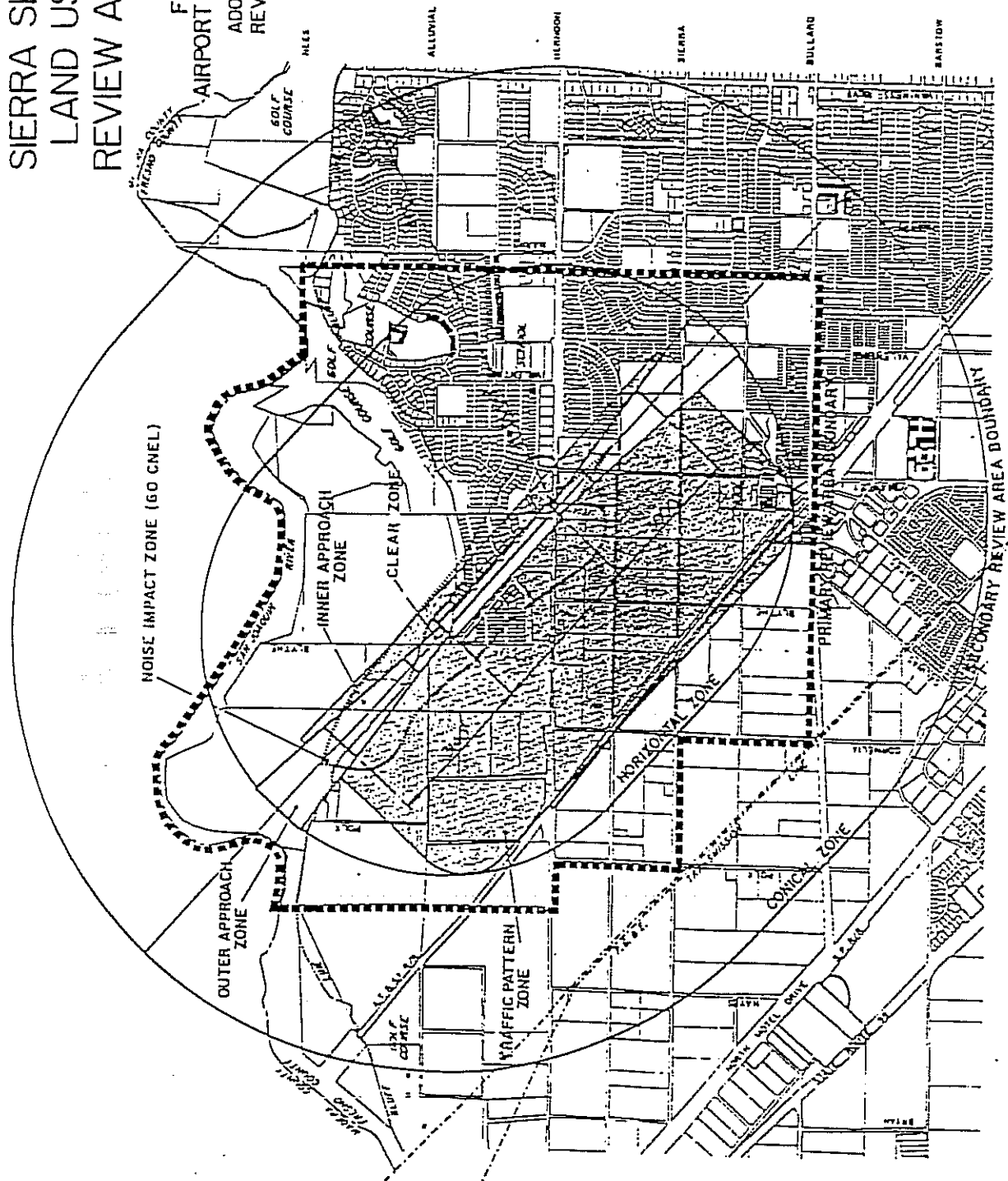


FIGURE 3

SIERRA SKY PARK AIRPORT LAND USE POLICY PLAN REVIEW AREA BOUNDARY

FRESNO COUNTY
AIRPORT LAND USE COMMISSION
ADOPTED: APRIL 11, 1983
REVISED: OCT. 16, 1995

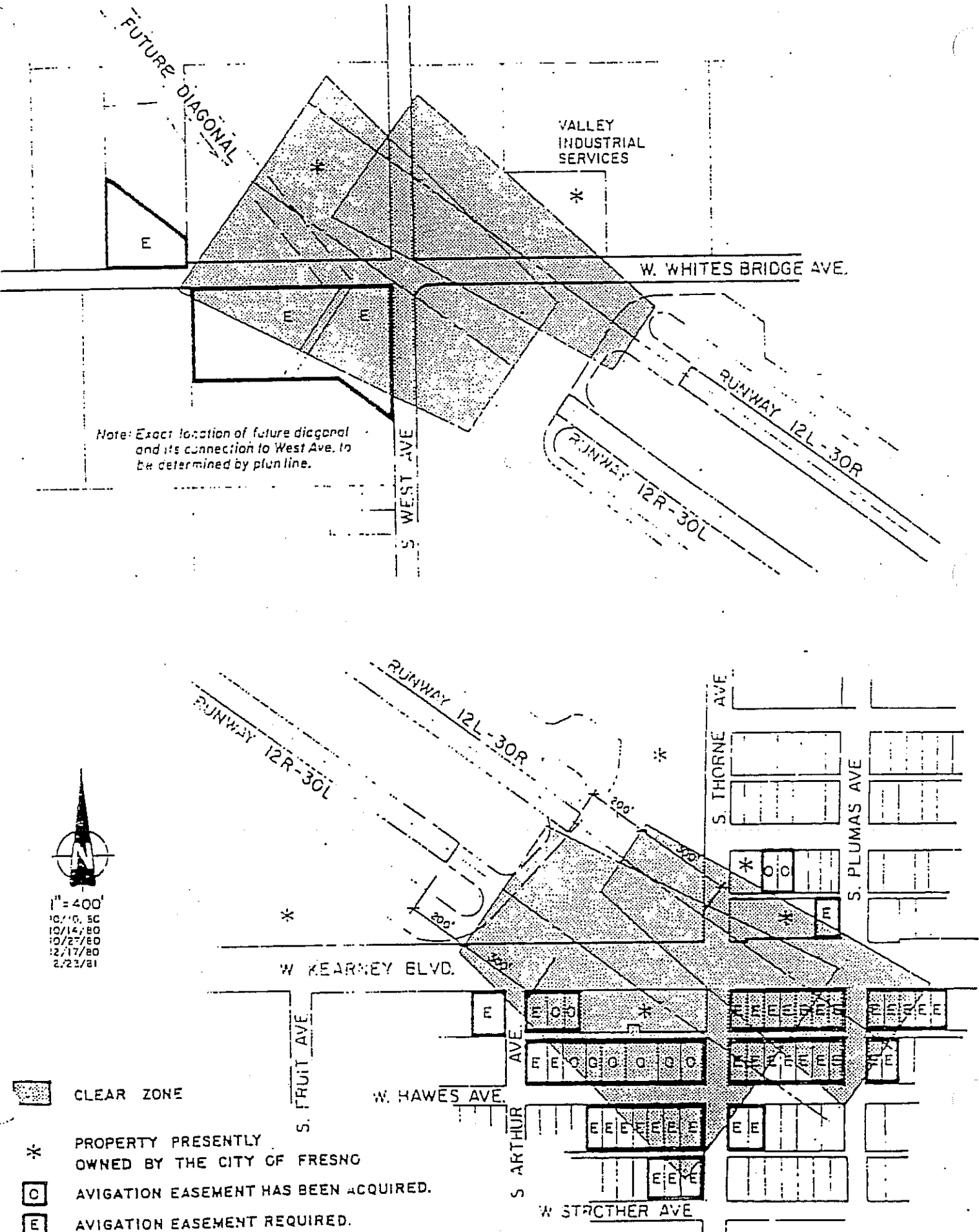


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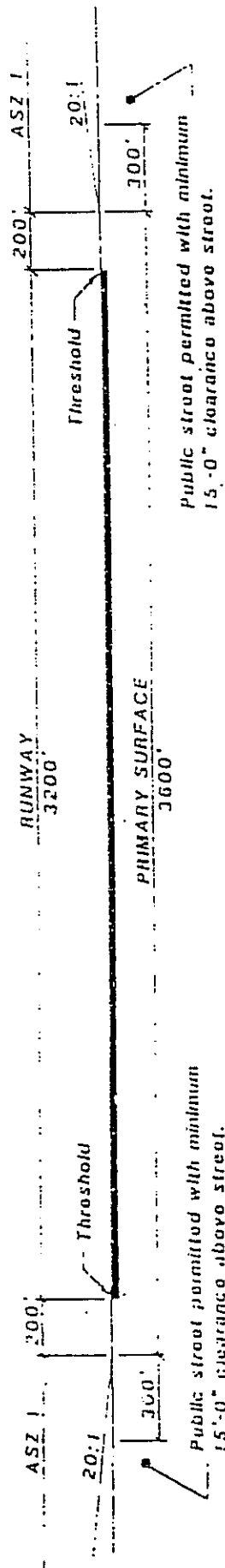
FIGURE 3

FRESNO-CHANDLER DOWNTOWN AIRPORT ENVIRONS AREA SPECIFIC PLAN AIRPORT LAYOUT: CLEAR ZONE ELEMENT

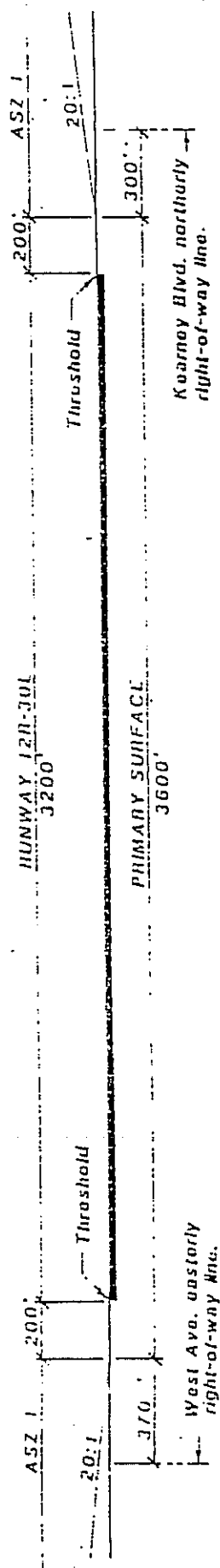
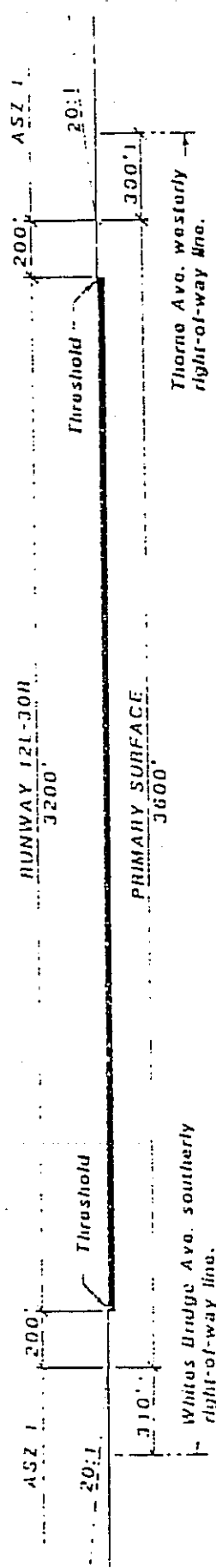


FRESNO-CHANDLER DOWNTOWN AIRPORT ENVIRONMENTAL AREA SPECIFIC PLAN: AIRPORT LAYOUT ELEMENT

FAA PROFILE OF MINIMUM REQUIREMENTS FOR BASIC UTILITY STAGE II AIRPORT IN FRESNO, CA.

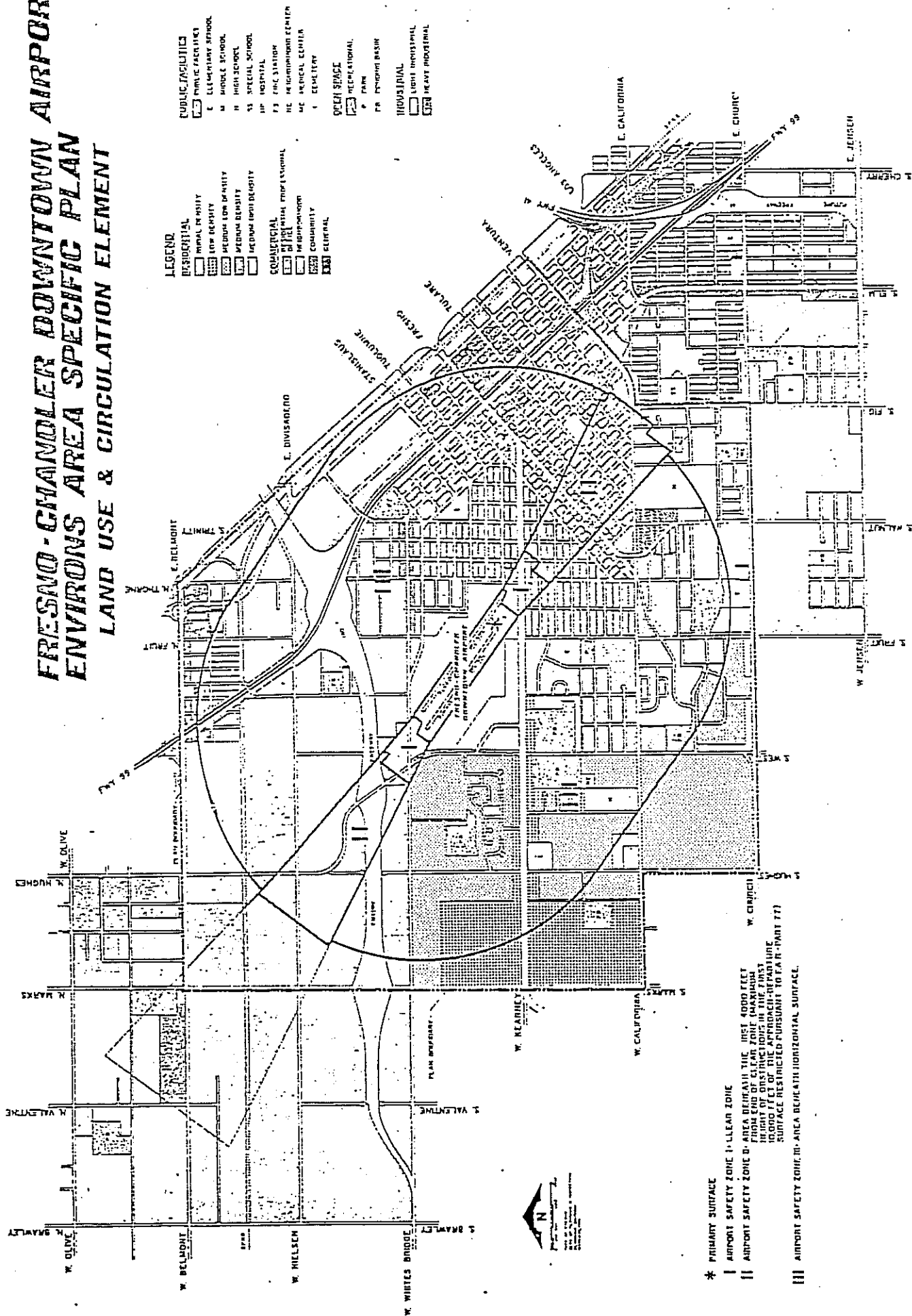


PROFILE OF RUNWAYS FOR FRESNO-CHANDLER DOWNTOWN AIRPORT



A-1: Airport Safety Zone 1 (Clear Zone)

FRESNO-CHANDLER DOWNTOWN AIRPORT ENVIRONS AREA SPECIFIC PLAN LAND USE & CIRCULATION ELEMENT



* PRIMARY SURFACE

I AIRPORT SAFETY ZONE 1-1/2 MILE ZONE

II AIRPORT SAFETY ZONE 5-1/2 MILE ZONE
FROM END OF CLEAR ZONE (MAXIMUM 1000 FEET OF THE APPROACH-DEPARTURE SURFACE RESTRICTED PURSUANT TO FAR PART 77)

III AIRPORT SAFETY ZONE 10-1/2 MILE ZONE BENEATH HORIZONTAL SURFACE.

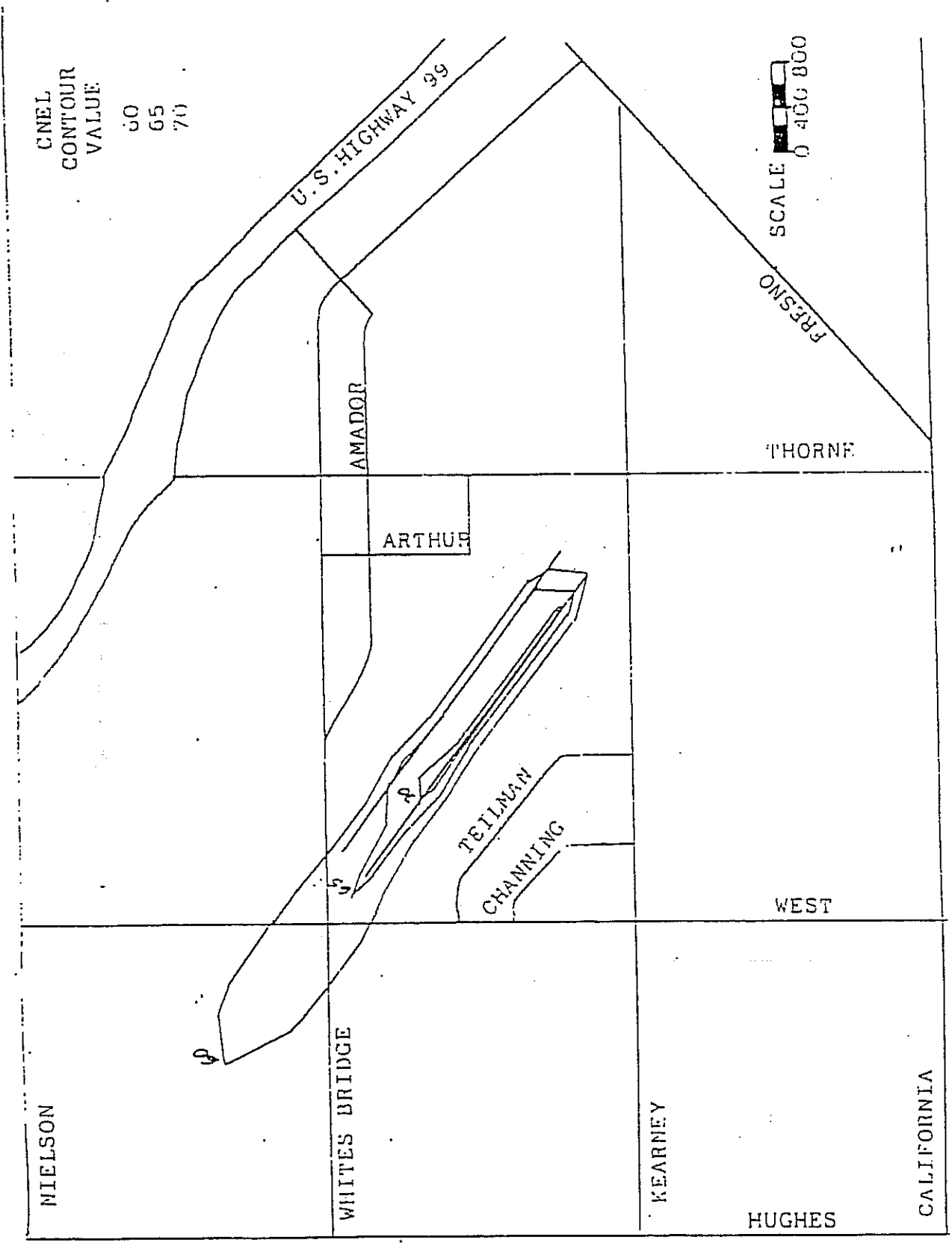


FIGURE 2 - FRESNO-CHANDLER DOWNTOWN AIRPORT
1980

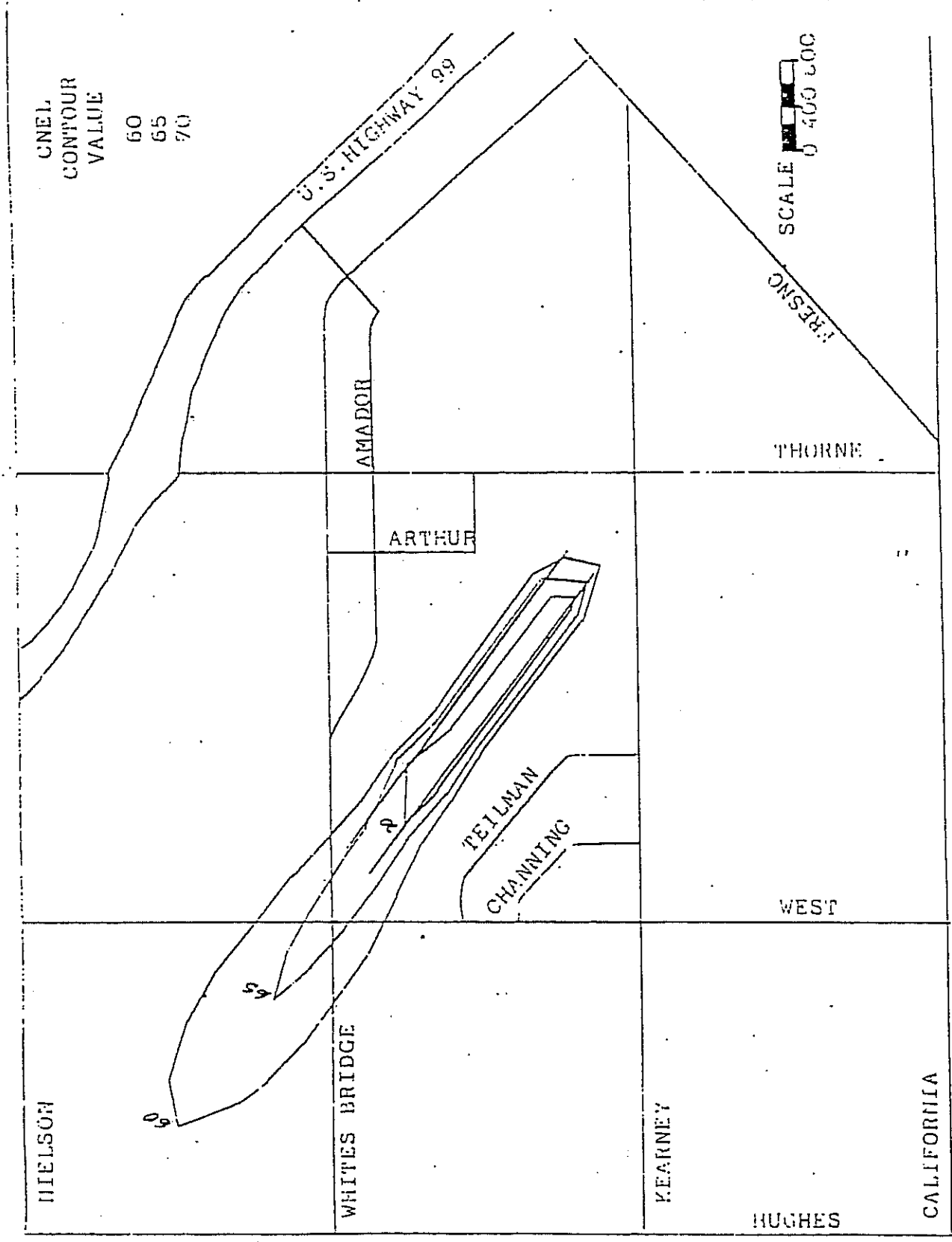


FIGURE 3 - FRESNO-CHANDLER DOWNTOWN AIRPORT
1985

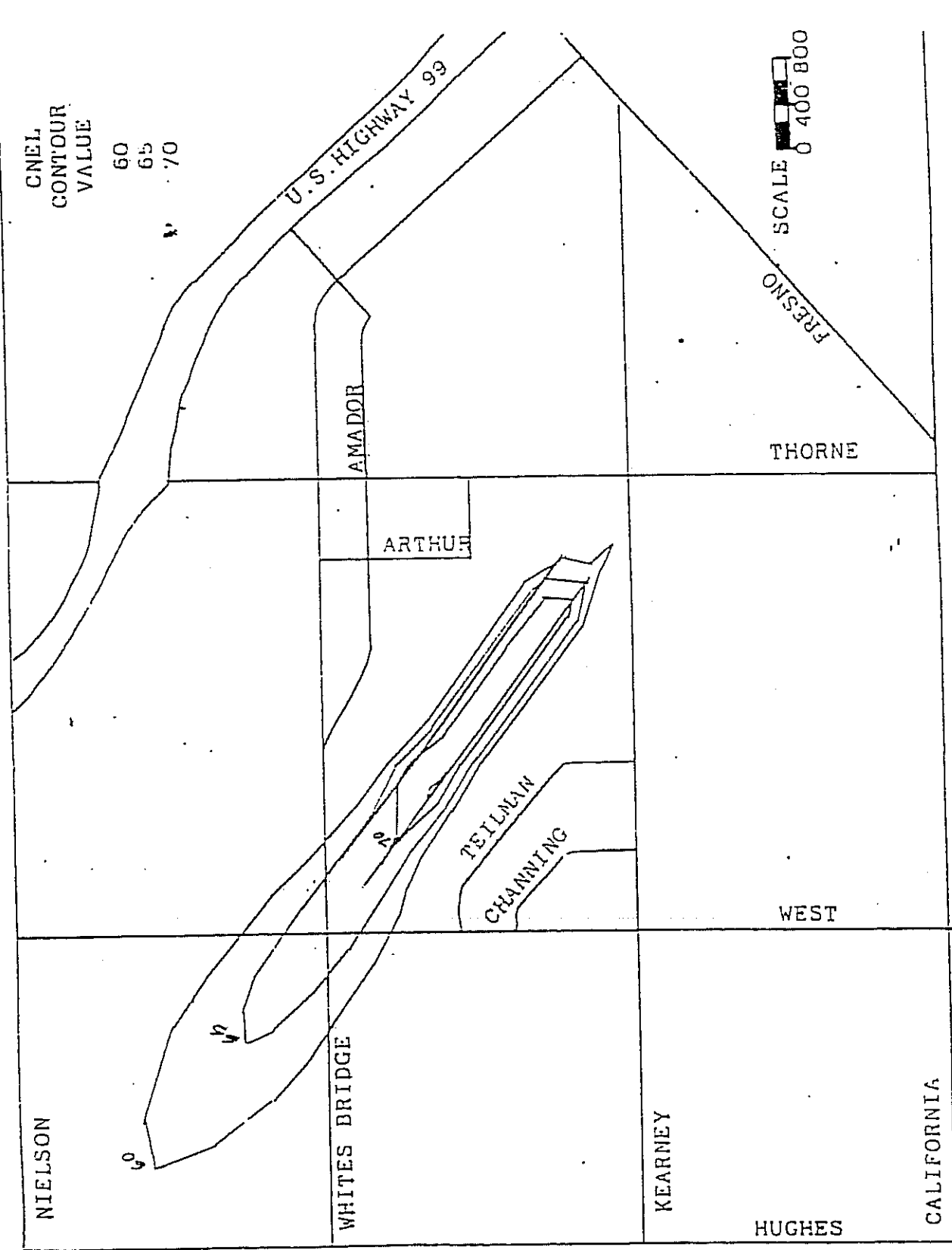


FIGURE 4 - FRESNO-CHANDLER DOWNTOWN AIRPORT
199C

CNEL
CONTOUR
VALUE

60
65
70
75

U.S. HIGHWAY 99

AMADOR

ARTHUR

TELLMAN
CHANNING

SCALE 0 400 800
FRESNO

THOPNE

WEST

NIELSON

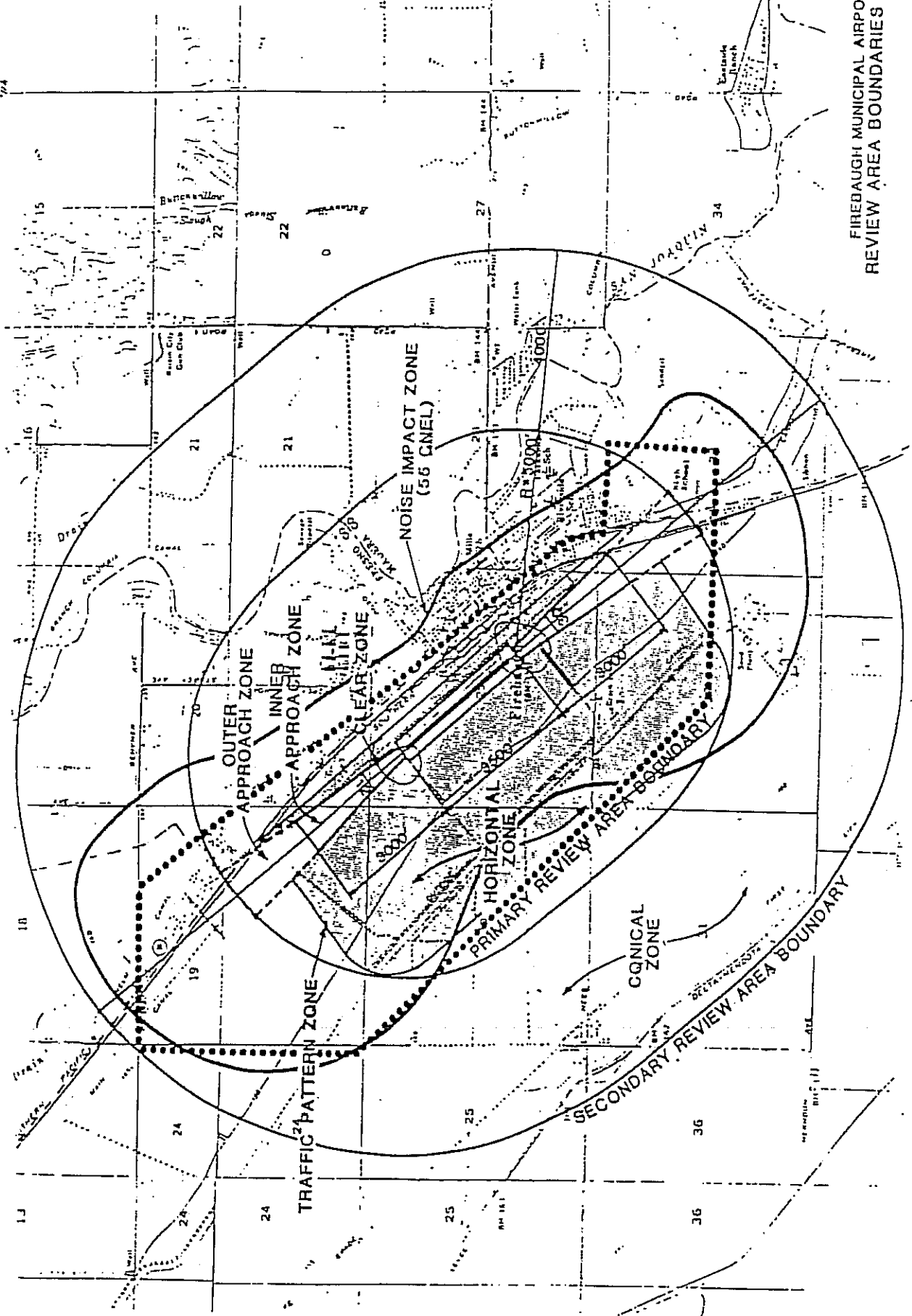
WHITES BRIDGE

KEARNEY

HUGHES

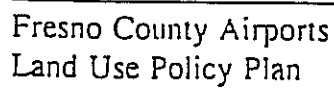
CALIFORNIA

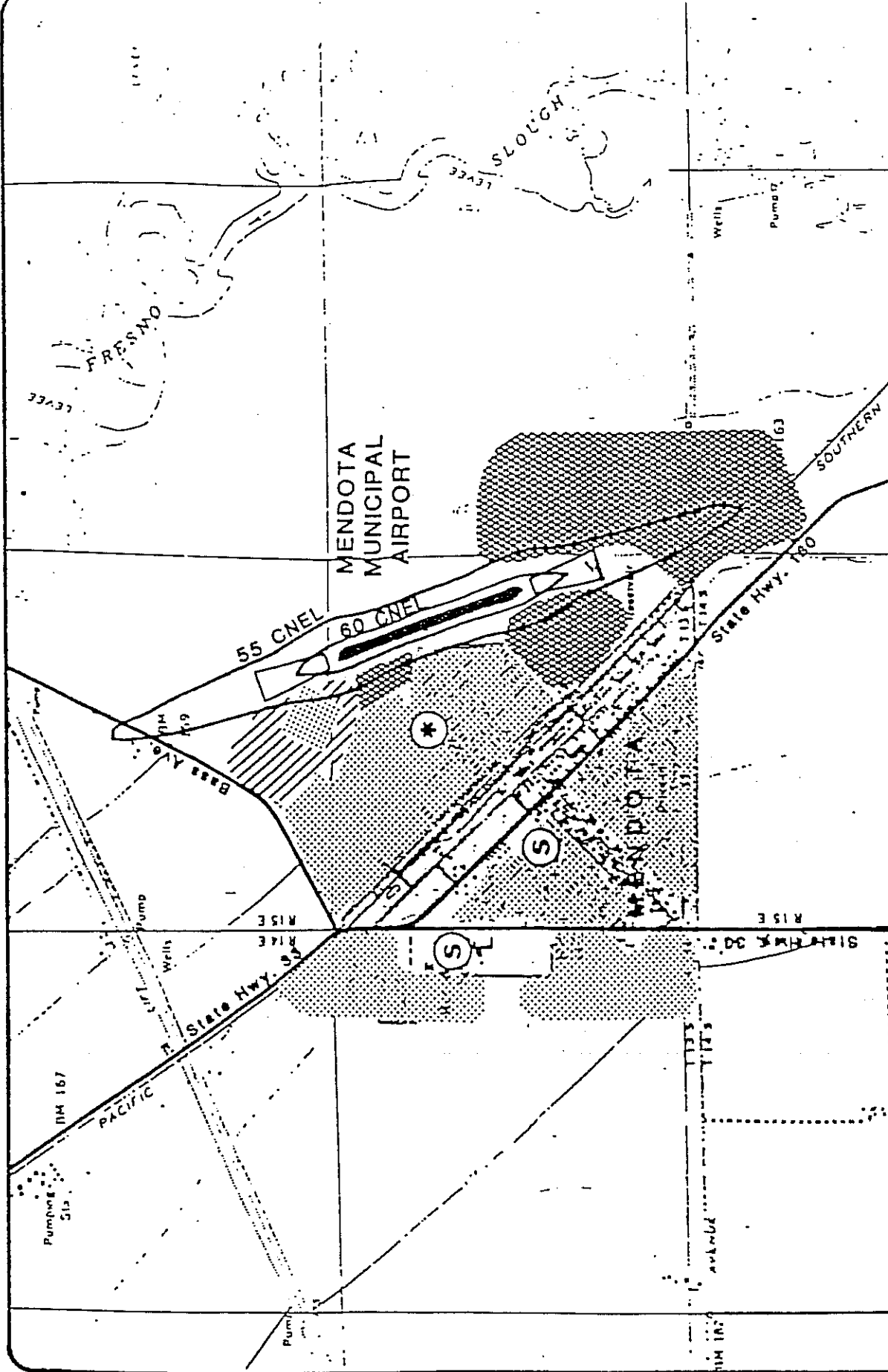
FRESNO-CHANDLER DOWNTOWN AIRPORT
2000



A vertical scale with a black arrow pointing upwards, labeled '2' inside. The scale has a black bar at the bottom and a white bar above it. The numbers 0, 2000, and 4000 are printed on the right side of the scale. The word 'feet' is printed at the bottom right.

AVIATION PLANNING SERVICES
HODGES & SHUTT





Source:
Contour locations
calculated by
Wyle (1982)

MENDOTA MUNICIPAL AIRPORT

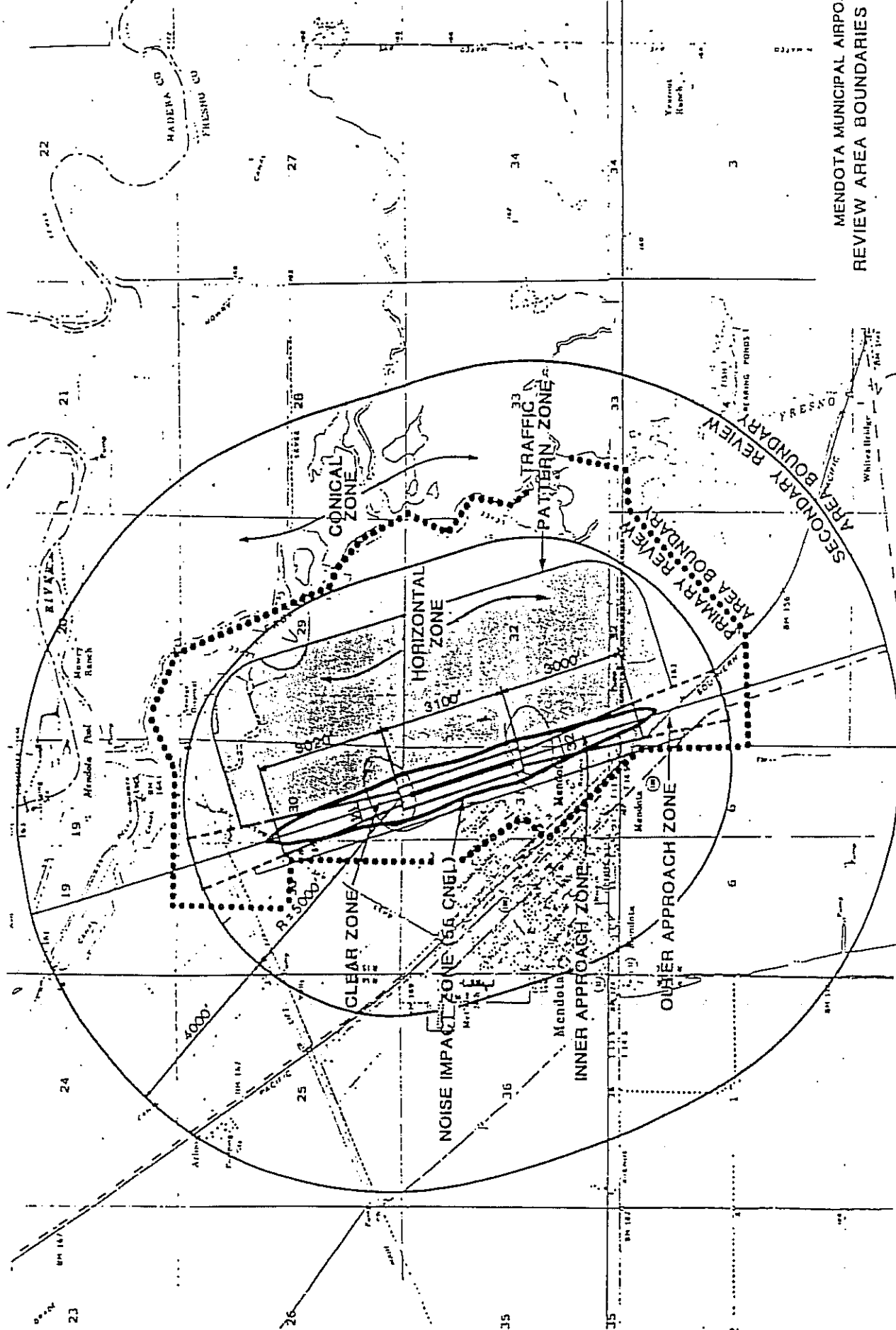
NOISE IMPACT (YEAR 2000)

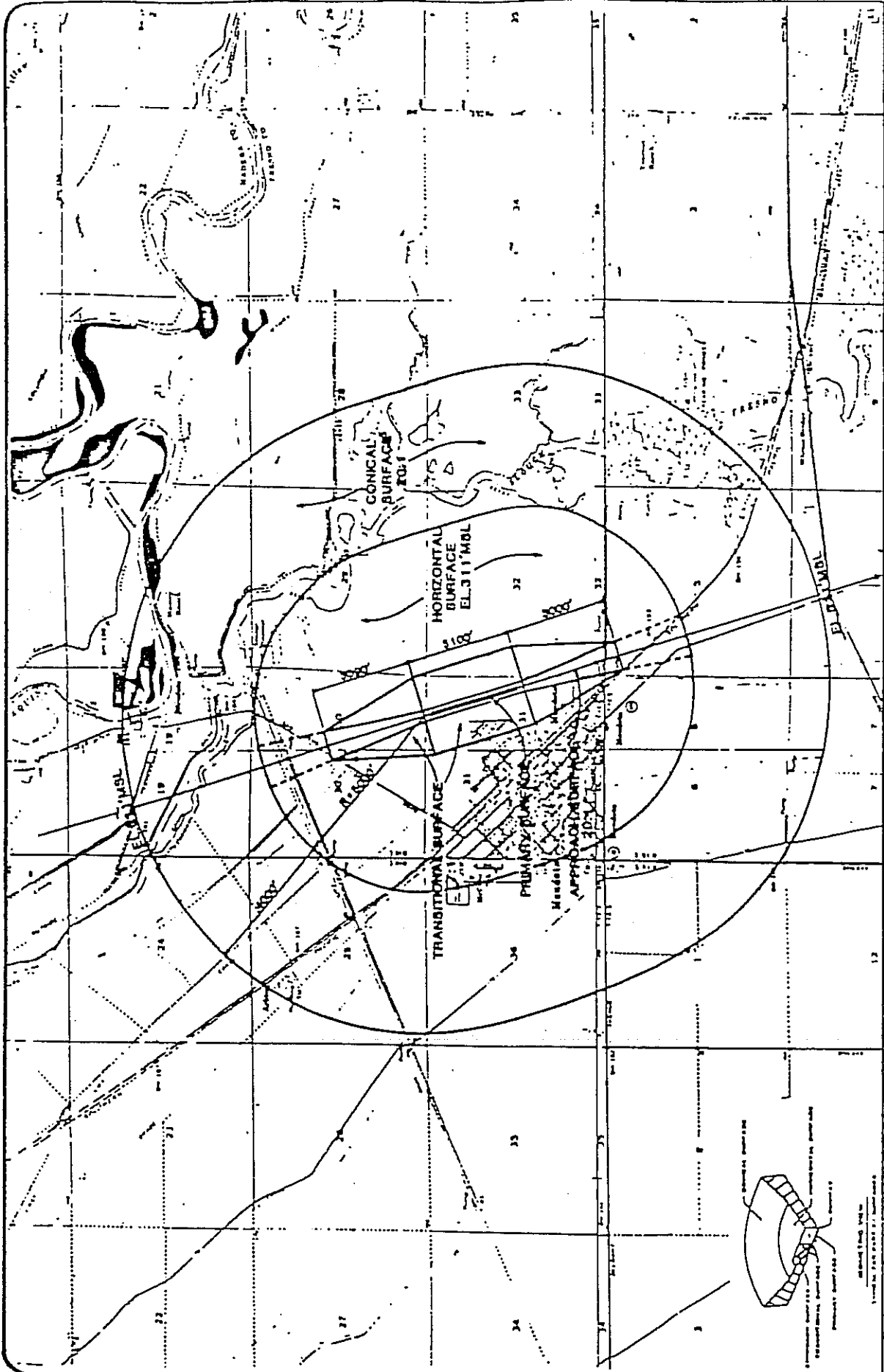
COMMERCIAL/INDUSTRIAL
 RESIDENTIAL
 FUTURE COMMERCIAL/INDUSTRIAL
 FUTURE RESIDENTIAL
 SCHOOL FUTURE SCHOOL

N

 0 2000 feet

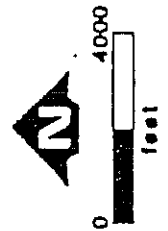
Fresno County Airports Land Use Policy Plan

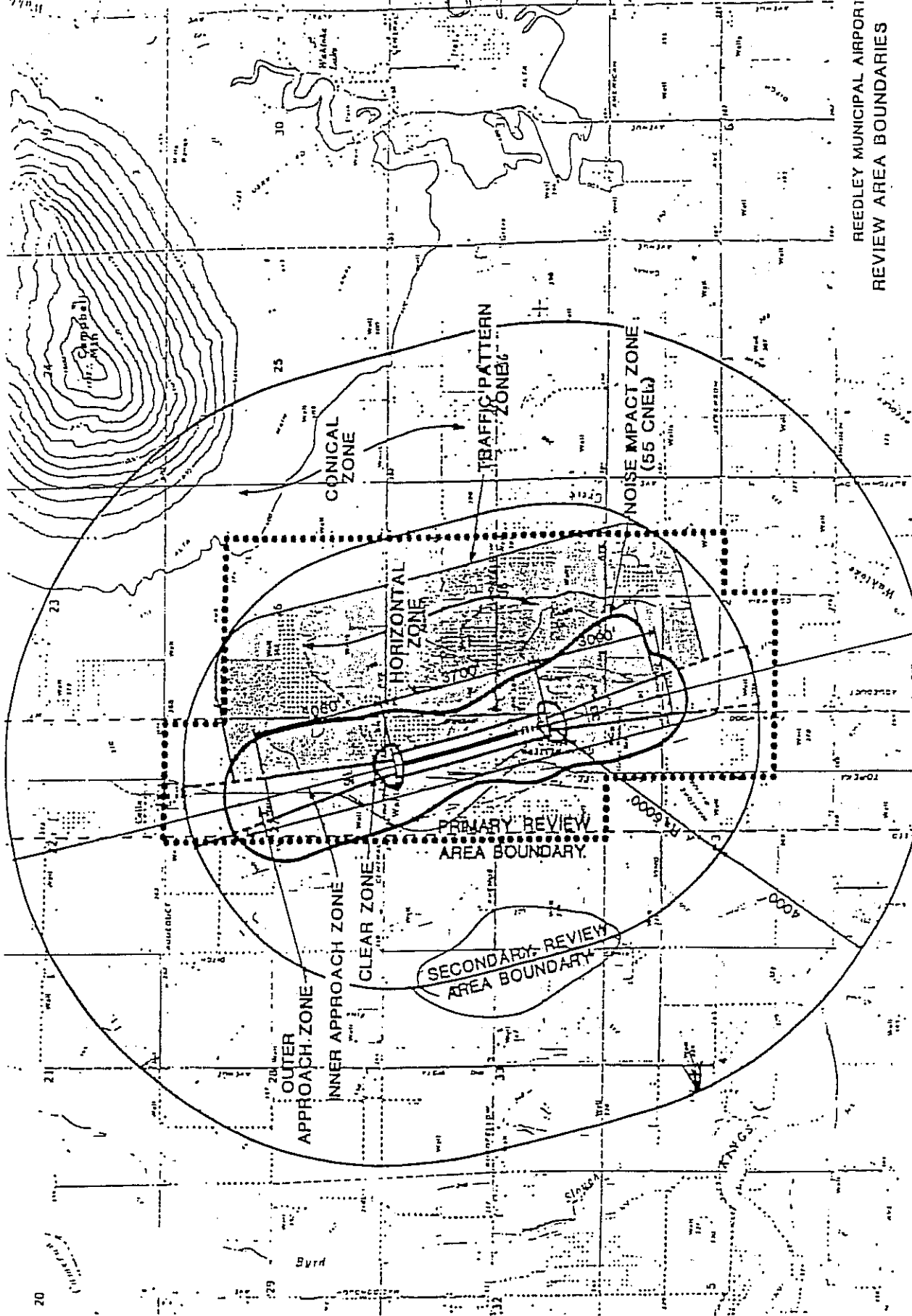




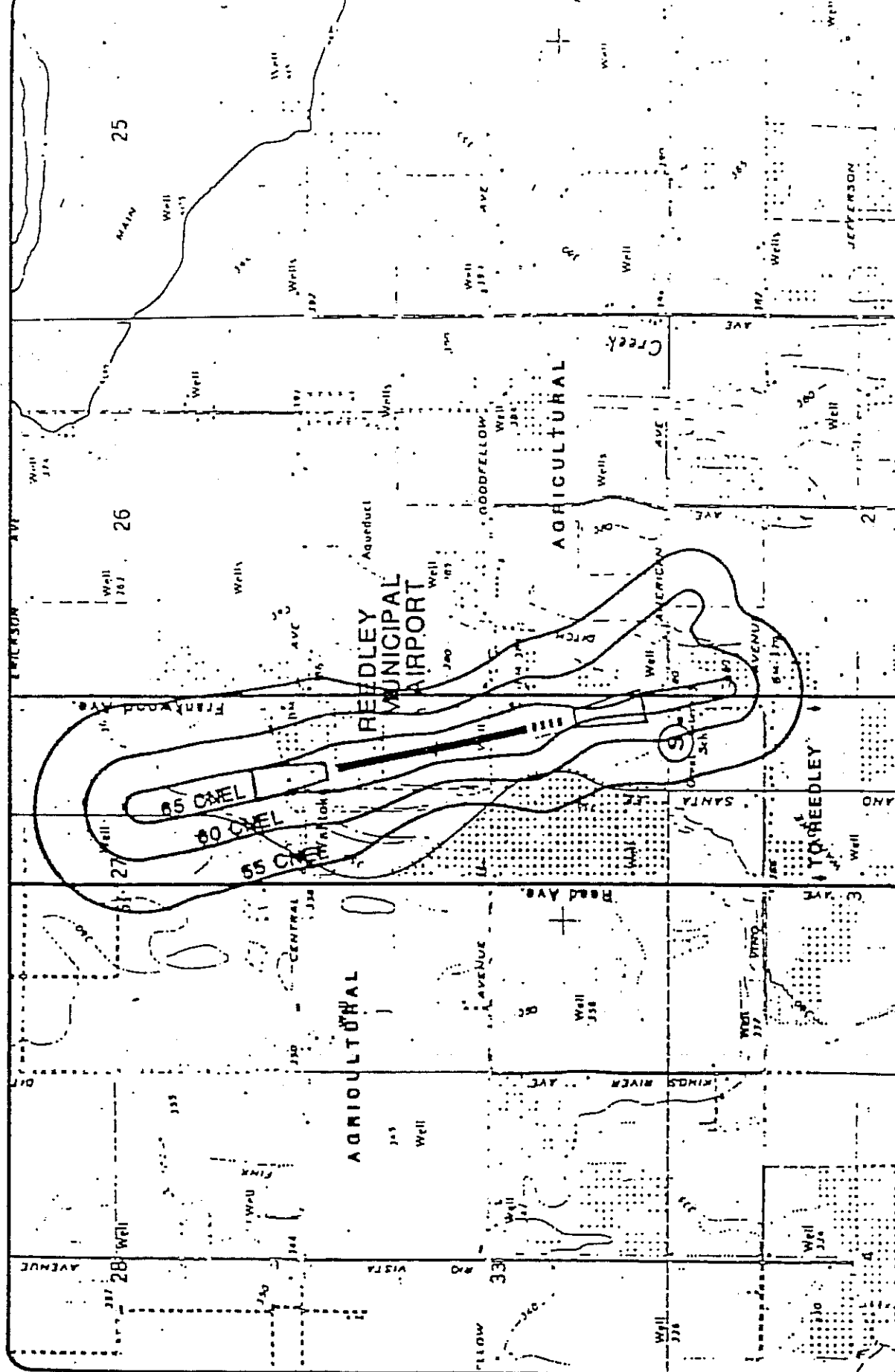
MENDOTA MUNICIPAL AIRPORT

FAR PART 77 AIRSPACE PLAN

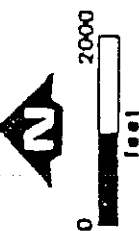




REEDLEY MUNICIPAL AIRPORT
REVIEW AREA BOUNDARIES



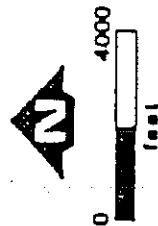
REEDLEY MUNICIPAL AIRPORT NOISE IMPACT (YEAR 2000)



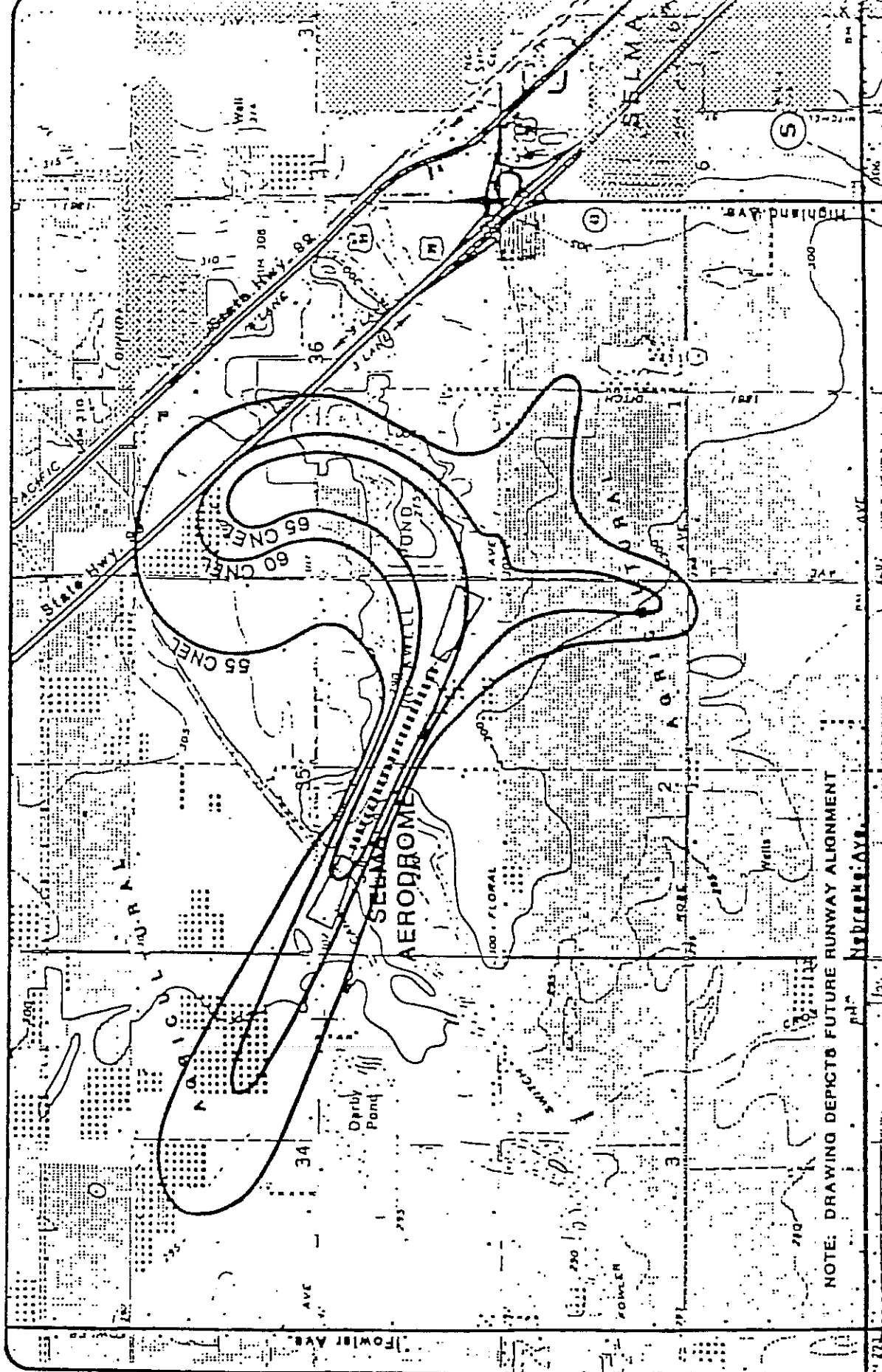
Source:
Contour locations
calculated by
Wyle (1982)



REEDLEY MUNICIPAL AIRPORT FAR PART 77 AIRSPACE PLAN



AVIATION PLANNING SERVICES
FALL HODGES & SHUTT

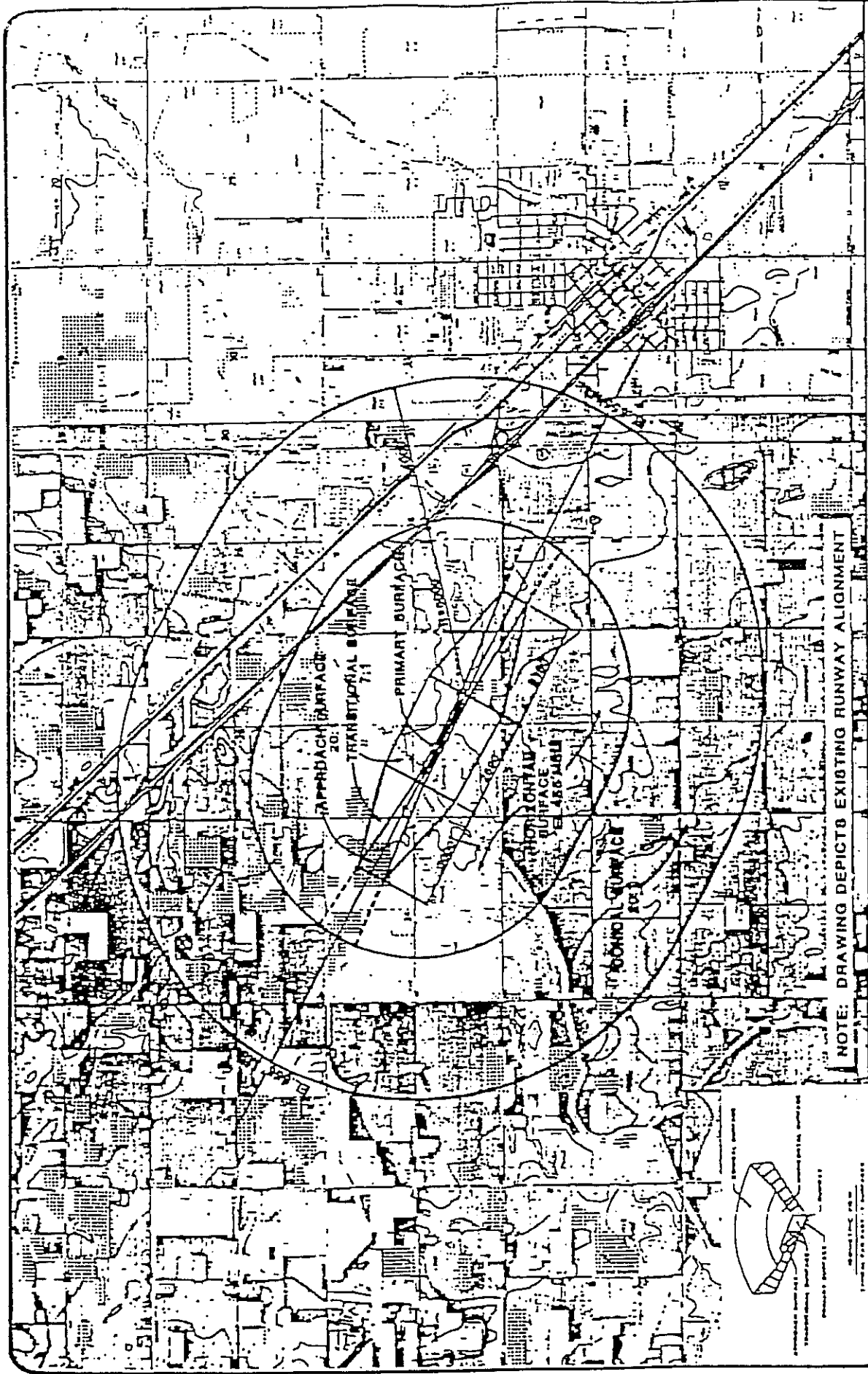


Source:
Contour locations
calculated by
Parry Co. (1980a)



COMMERCIAL/INDUSTRIAL
 RESIDENTIAL
 SCHOOL

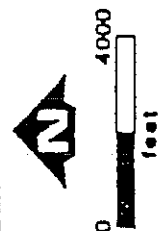
SELMA AERODROME NOISE IMPACT (YEAR 2000)



SELMA AERODROME

FAR PART 77 AIRSPACE PLAN

NOTE: DRAWING DEPICTS EXISTING RUNWAY ALIGNMENT



AVIATION PLANNING SERVICES
HOOPER & SHUTT

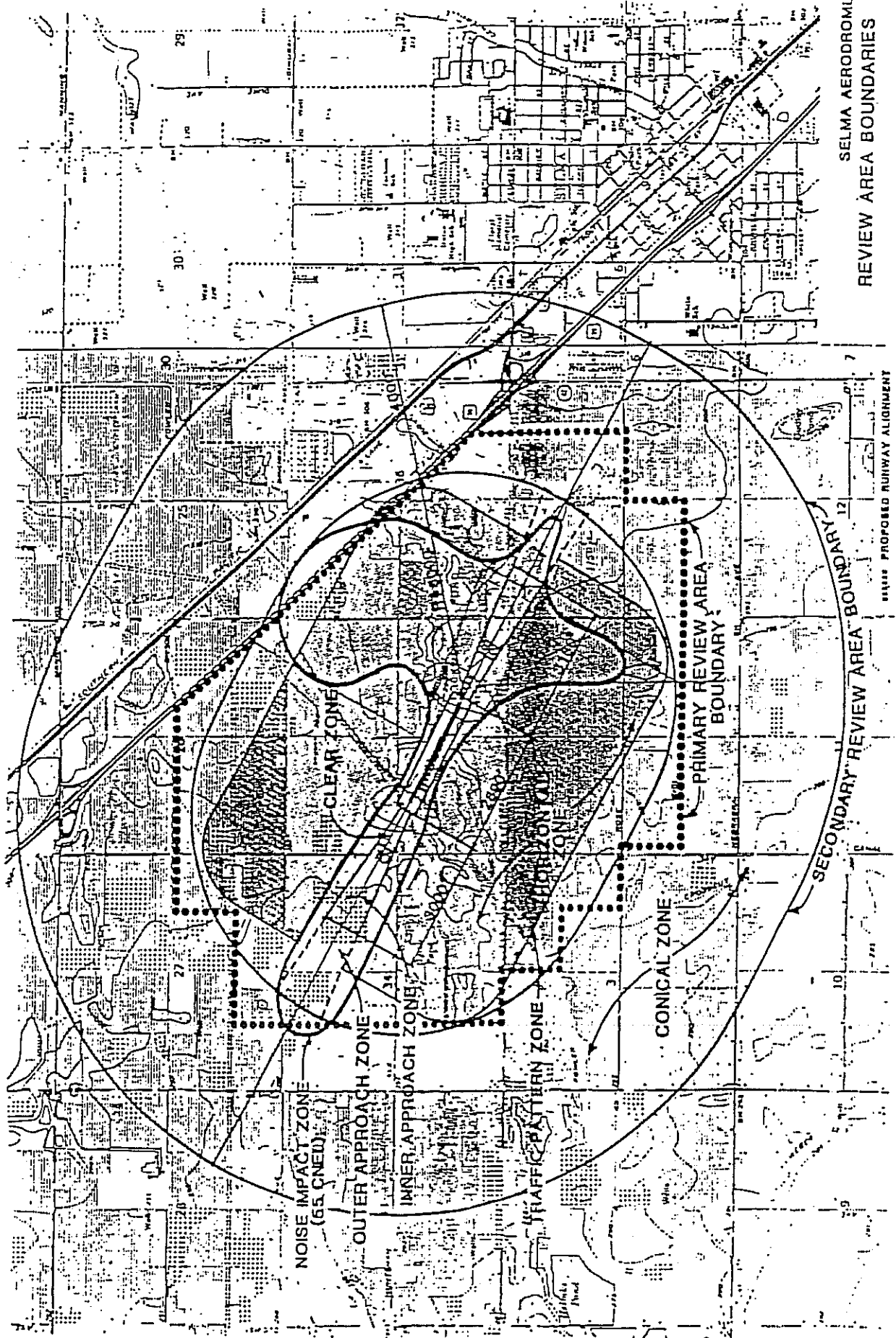


Figure E-14

VICINITY LAND USE AND AICUZ

FRESNO CO		MIN LOT ACRES
AE 40 EXCLUSIVE AGRICULTURAL		40
AE 20 EXCLUSIVE AGRICULTURAL		20
KINGS CO		
AX EXCLUSIVE AGRICULTURAL		40
AG GENERAL AGRICULTURAL		20

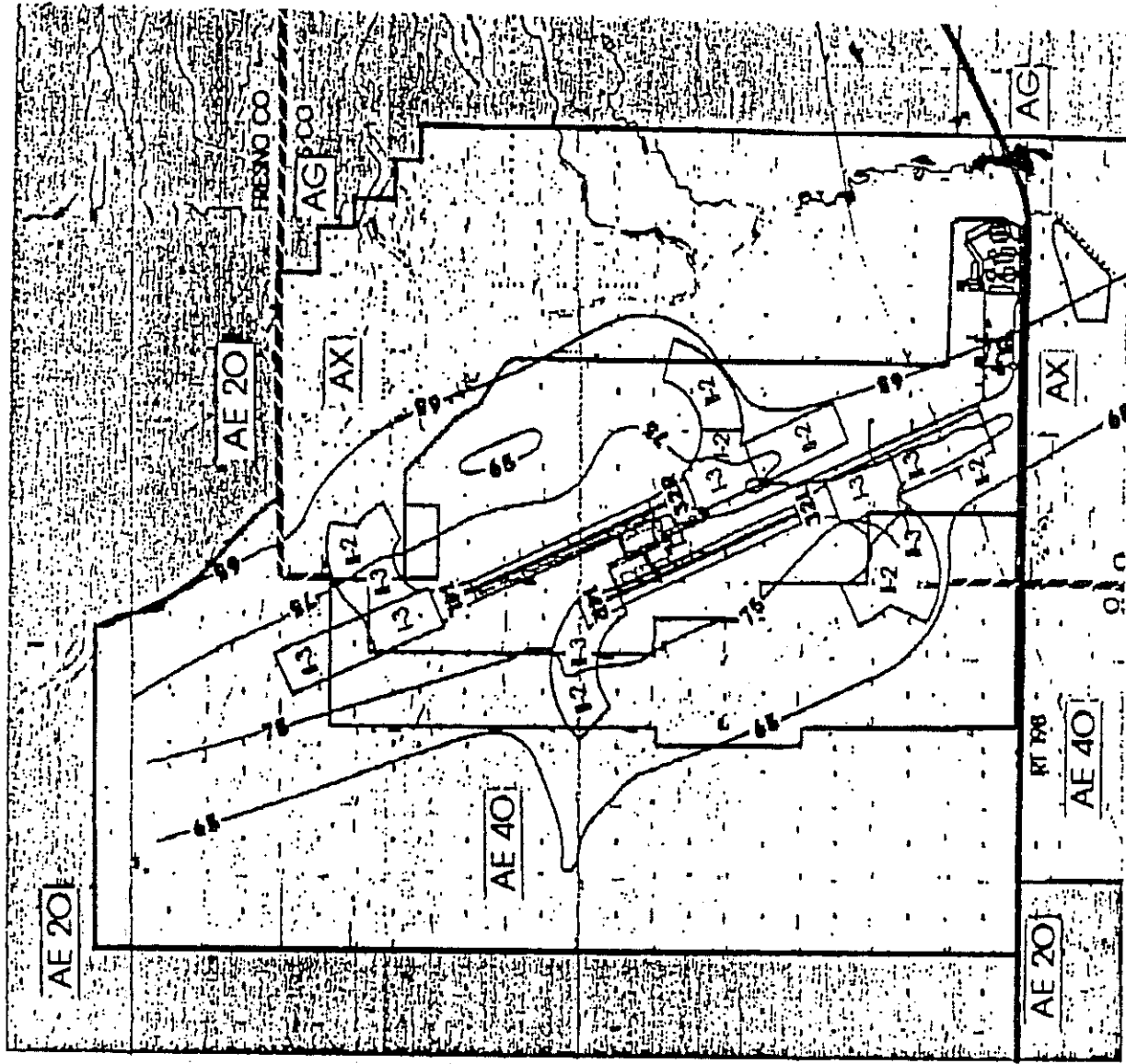


Figure E-12

N AICUZ - 1981

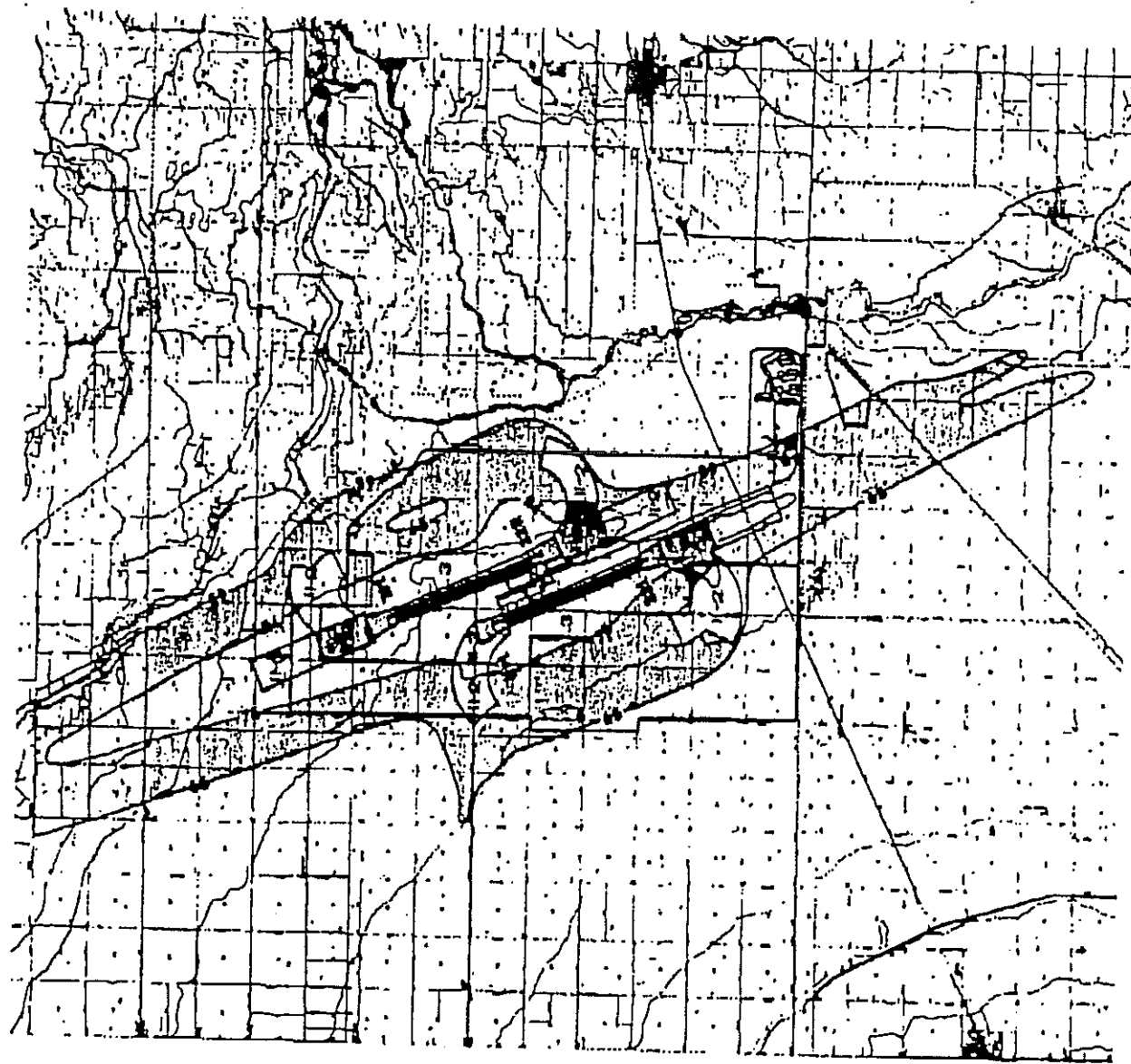


Figure E-7

N NOISE CONTOURS - 1981

