Peat Marwick

Airport Consulting Services

Final Report

FAR Part 150 Noise Exposure Maps and Noise Compatibility Program Oakland International Airport

Prepared for

Port of Oakland

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Chapter 1

INTRODUCTION

In December 1985, Peat Marwick was retained by the Port of Oakland to prepare a noise compatibility program for Oakland International Airport under the provisions of Federal Aviation Regulations (FAR) Part 150. The purpose of the program is to ensure that (1) noise and land use compatibility between the Airport and neighboring communities is maintained through noise remedy programs that are realistic and that are capable of being implemented by the Port of Oakland, the Federal Aviation Administration (FAA), and local jurisdictions in the Airport environs, (2) the provisions of the State Airport Noise Standards are met, and (3) the Port of Oakland maintains its eligibility for federal funds for noise compatibility purposes under the FAA Airport Improvement Program.

As will be discussed in later chapters of this report, the Port of Oakland has an ongoing noise compatibility program for the Airport. The program consists of a number of elements, including aircraft flight procedures for noise abatement, strict limitations on the use of certain runways by jet aircraft, policies and procedures for aircraft engine testing and runups, and the establishment of a noise abatement committee to periodically review noise abatement procedures and make recommendations for changes in procedures to maintain noise compatibility.

The Port of Oakland initiated this study to provide it with a comprehensive, independent review of its ongoing noise compatibility program in light of changes in the aviation industry, increasing levels of activity at Oakland International Airport, and the desire to continue to be a good neighbor to the surrounding communities and neighborhoods. By performing the study within the framework of FAR Part 150, the Port also ensures that compliance with applicable federal and State regulations is maintained.

In January 1981, the FAA issued its Interim Rule on FAR Part 150, "Airport Noise Compatibility Planning." The final rule on FAR Part 150 became effective in January 1985. The regulations were issued in response to provisions in the Aviation Safety and Noise Abatement Act (ASNA) of 1979 [1.1]*, which

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*Numbers in brackets refer to the references at the end of each chapter.

allow airport operators to receive funding to prepare airport noise maps and land use compatibility programs, if they so choose. After these maps and programs have been approved by the FAA, the airport operator is also eligible for federal funding of noise abatement (on-airport) and noise mitigation (off-airport) programs. FAR Part 150 sets forth the methodology and procedures to be followed by those airport operators who wish to prepare noise maps and develop land use compatibility programs in conformance with ASNA to receive such federal funding.

Noise and land use compatibility planning is not new--the FAA has had guidelines and grant programs for planning and implementation since the mid-1970s. However, FAR Part 150 is more comprehensive than previous regulations and, for the first time, FAA grants can be applied to implement programs in the communities affected by airport noise.

Under FAR Part 150, noise compatibility planning is divided into two parts, (1) preparation of noise exposure maps for existing and five-year future conditions with the identification of present and future noise incompatibilities and (2) the development of a noise compatibility program to reduce, to the greatest degree possible, the incompatibilities identified on the noise exposure maps. The noise compatibility program, in turn, identifies noise abatement or noise mitigation actions that are (1) within the airport operator's implementation authority, (2) within the authority of another local agency or state or local government body, and (3) under federal authority.

In addition, the State of California Airport Noise Standards [1.2] require that all land uses within the community noise equivalent level (CNEL) 65 contour in airport environs be compatible with aircraft operations as of January 1, 1986. This study documents the extent of incompatible land uses within the CNEL 65 contour at Oakland International Airport.

This report meets both the federal and State requirements and contains information on the following topics:

- Airport setting (Chapter 2)
- Land use and zoning (Chapter 3)
- Aviation demand forecasts (Chapter 4)
- Aircraft noise exposure analysis (Chapter 5)

- Evaluation of noise compatibility planning alternatives (Chapter 6)
- Recommended noise compatibility program (Chapter 7)
- Program costs, sources of funding, implementation schedule, and general conditions (Chapter 8)
- Public and Airport user consultation process (Chapter 9)
- Noise monitoring system evaluation (Appendix A)
- Public comments (Appendix B)

Chapters 2 through 5 present the documentation required for preparation of the noise exposure maps. Chapters 6 through 8 define the noise compatibility program. Chapter 9 describes the public and Airport users consultation process required for both the preparation of the noise exposure maps and the noise compatibility program.

The Appendixes are presented in a separate volume.

Chapter 1

REFERENCES

1.1 U.S. Congress, "Aviation Safety and Noise Abatement Act of 1979," Public Law 96-193, February 18, 1980.

1.2 State of California, Division of Aeronautics, "Airport Noise Standards," Title 21, Subchapter 6, Article 2, May 26, 1979.

Chapter 2

AIRPORT SETTING

LOCAL SETTING

Oakland International Airport is under the jurisdiction of the City of Oakland, the largest city in Alameda County. The Airport is within the Port Area and is operated by the Oakland Board of Port Commissioners. The Airport is located on the east shore of San Francisco Bay in Oakland, and abuts the City of Alameda to the west and the City of San Leandro to the southeast.

Oakland International is one of 13 public airports in the Bay Area,* and is one of four served by certificated airlines [2.1]. The Airport is physically and functionally divided into two independent facilities--South Field (airlines and air cargo) and North Field (general aviation).

SOUTH FIELD

The South Field facility, constructed on fill in San Francisco Bay, was opened in 1962. It is about one mile south of North Field. The separation of the two facilities was warranted for several reasons: (1) an increase in overall Airport runway capacity, (2) the desirability of overwater approaches and takeoffs from the new runway at South Field, and (3) noise problems associated with North Field aircraft operations over new Bay Farm Island residential developments.

South Field has over 200 acres of pavement to accommodate the operations of air carrier and other large aircraft. As shown on Exhibit 2-1, the northern half of South Field contains two passenger terminals with a total of 23 aircraft loading gates, an International Arrivals facility, a 6,000-car parking lot [2.2], and a number of ancillary facilities for fueling, food service, cargo, major aircraft maintenance, and other aspects of commercial aviation.

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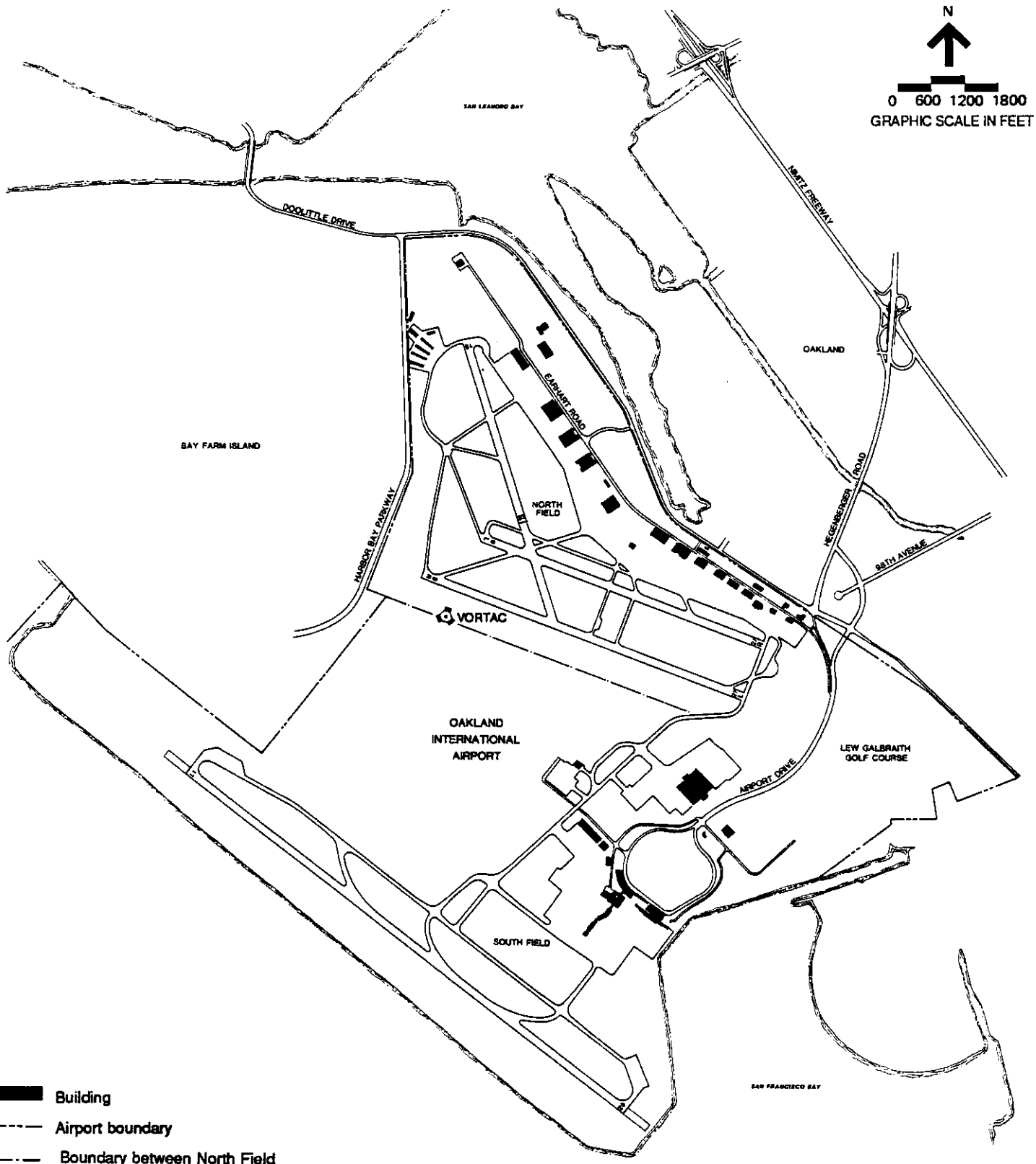
*The Bay Area consists of the nine-county area including Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.



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February 1988

FAR Part 150 Noise Compatibility Program
Oakland International Airport

Existing Airport Facilities

Exhibit

2-1

The southern half of South Field is occupied by the airfield, which consists of one runway, a series of taxiways, and aircraft aprons. Runway 11-29 is 10,000 feet long and 150 feet wide, and is surfaced with grooved asphalt. Runways 11 and 29 are equipped with centerline and high intensity runway lights, and instrument landing systems (ILS), which give vertical and horizontal guidance to aircraft landing in inclement weather. Much of the 1,500 acres that compose South Field remains undeveloped.

The certificated and commuter airlines that serve South Field are as follows [2.3, 2.4]:

- Alaska Airlines
- Alpha Air
- American Airlines
- America West Airlines

- Continental Airlines
- Delta Air Lines (formerly Western Airlines)
- Pacific Southwest Airlines (PSA)
- Sunworld International Airways

- United Airlines
- United Express (formerly operated as Westair Airlines)

In 1985, 34,616 aircraft departures were performed at South Field by the certificated passenger airlines. All of the certificated passenger airlines except American Airlines and PSA operate from Terminal I. These two airlines occupy the new Terminal II, which opened in 1985 [2.2]. Passenger enplanements at South Field in 1986 totaled 1,858,396, which is about a 57% increase over the number of passenger enplanements in 1980 (1,180,762).

The following airlines carrying only cargo also use South Field [2.4]:

- Airborne Express
- Braniff
- Burlington Northern Air Freight
- Federal Express Corporation
- United Parcel Service

Itinerant aircraft operations at South Field include air carrier, air taxi/commuter, general aviation, and military activity, as well as local civil and military activity. In 1986, air carrier operations at South Field totaled 72,620, which was about 67% of that period's total South Field operations (109,178). The remaining 33% of the total operations at South Field consisted of: 16% air taxi/commuter, 10% local civil, 6% itinerant general aviation, and 1% military.

NORTH FIELD

North Field has been used for airport purposes since the 1920s. It was the original air carrier airport for Oakland. Today, North Field principally accommodates general aviation operations. In 1986, there was a total of 239,860 general aviation operations at North Field, which was 92% of North Field's total aircraft operations. The remaining 8% of the total operations at North Field consisted almost entirely of air taxi/commuter operations with a small number of air carrier and military operations (less than 1%).

About 450 of the total 980 acres of land that compose North Field are paved for runways, taxiways, apron areas, roadways, and vehicle parking areas, or occupied by buildings and other structures [2.1]. There are also major airline aircraft maintenance facilities located on North Field.

The airfield (Exhibit 2-1) includes three runways. The primary parallel runways, 9L-27R and 9R-27L, are 5,432 feet long and 6,210 feet long, respectively. They are connected by five cross taxiways, the easternmost of which extends to South Field. Crosswind Runway 15-33 is 3,360 feet long [2.1].

Because Runway 27R is equipped with one of the few instrument landing systems dedicated solely to general aviation operations, North Field is extensively used for instrument training by pilots of light aircraft [2.1].

Located at the south edge of North Field is a VORTAC* used for en route aircraft navigation and for VOR instrument approaches to Runways 9R and 27L. On approaches, this equipment gives course and distance information to the pilot; it is also used for both instrument flight rule (IFR) and visual flight rule (VFR) practice instrument approaches. Other instrumentation at North Field includes a visual approach slope indicator (VASI), which provides glideslope guidance for Runway 27L; and runway visual range (RVR) and other equipment necessary for determining weather conditions [2.1].

The North Field Control Tower, from which FAA air traffic controllers direct all North Field operations, is located at the southern boundary of the airfield, south of Runway 9R-27L.

Runway 9R-27L serves as a backup air carrier runway, and in the past has been used, along with Taxiway 5, as a taxi route for large aircraft moving between South Field and the North Field maintenance areas [2.1].

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*Very high frequency omnidirectional range (VOR) navigation transmitter for civilian aircraft use and an ultra-high frequency tactical air navigational (TACAN) aid transmitter for military aircraft use. The combined facility is referred to as a VORTAC.

Chapter 2

REFERENCES

2.1 Port of Oakland, Planning Division, Oakland North Airport Master Development Plan, July 1984.

2.2 Tong, David, "Oakland Airport Taking Off," Oakland Tribune, December 8, 1985.

2.3 Official Airline Guides, Inc., Official Airline Guide, North American Edition, Volume 12, Number 21, August 1, 1986.

2.4 Woodman, Glenn, Supervisor of Airfield Services, Oakland International Airport, telephone conversation on August 5, 1986.

Chapter 3

LAND USE AND ZONING

EXISTING LAND USE IN THE AIRPORT ENVIRONS

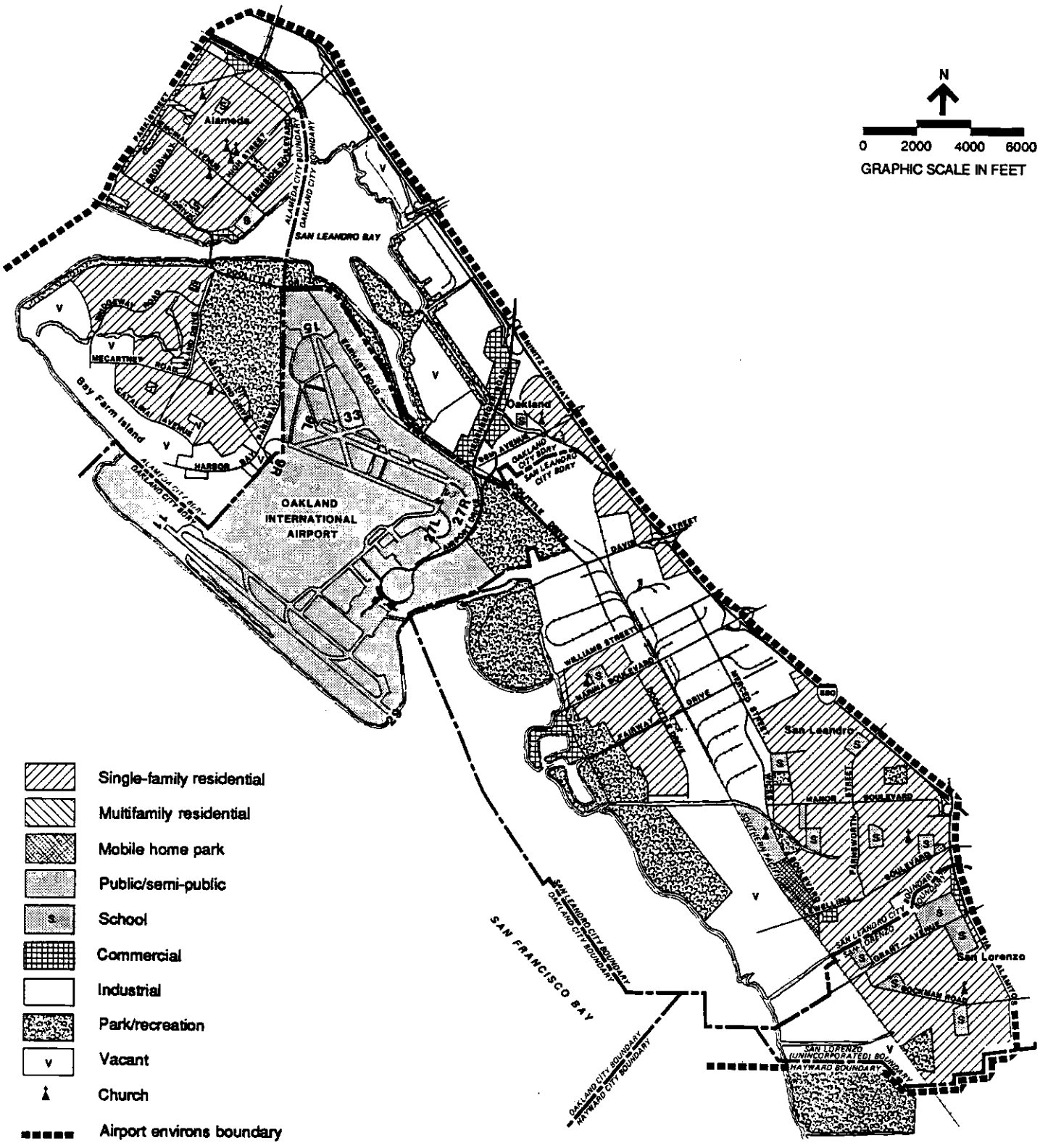
The Airport environs includes portions of the cities of Alameda, Oakland, and San Leandro and San Lorenzo (an unincorporated portion of Alameda County). The boundaries of the Airport environs are depicted on Exhibit 3-1.

The primary land uses in the area surrounding the Airport are single-family residential, with supporting park/recreational and commercial uses, and industrial, as depicted on Exhibit 3-1.

City of Alameda

The portions of the City of Alameda within the Airport environs are the eastern end of the island of Alameda and Bay Farm Island. Both areas are primarily single-family residential neighborhoods. There are six schools and six churches east of Park Street on the main island. One school and two churches are located on Bay Farm Island. There are commercial developments on the main island along Park Street, High Street, Santa Clara Avenue between Park Street and Broadway, and on Tilden Way at the Fruitvale Bridge. There is also an industrial area at the east end of Park Street.

The southern and southeastern portions of Bay Farm Island closest to South Field are mostly vacant, except for new light industrial uses along Harbor Bay Parkway. A 110-foot high (above mean sea level) telecommunications tower is located off Harbor Bay Parkway, about 50 feet from the Airport's northern boundary. A golf course is adjacent to North Field, and a retail commercial area is located at the intersection of Island Drive and Mecartney Road. The northern shoreline of Bay Farm Island on San Francisco and San Leandro Bays is a regional shoreline operated by the East Bay Regional Parks District.



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FAR Part 150 Noise Compatibility Program
Oakland International Airport

Generalized Existing Environs Land Use

Exhibit

3-1

City of Oakland

Within the Airport environs, an approximately two-mile long single-family residential area is located east of the Airport adjacent to the west side of the Nimitz Freeway (Interstate 880, formerly State Highway 17) between Hegenberger Road in Oakland and Williams Street in San Leandro. An elementary school and a church are located in the Oakland portion of this residential area.

Except for the residential area and a commercial strip along Hegenberger Road, most of the land in the City of Oakland east of the Airport and west of the Nimitz Freeway is used for industry. The shoreline of San Leandro Bay in Oakland is an extension of the regional shoreline previously described. The Lew Galbraith Golf Course is located on the east side of Airport Drive under the approaches to Runways 9L-27R and 9R-27L at North Field.

City of San Leandro

Industrial development occurs in the majority of that part of the City of San Leandro that lies within the Airport environs. Along the shoreline south of Marina Boulevard, there is a commercial recreation area that includes a marina, a park, a hotel, and several restaurants. There is a single-family residential neighborhood that contains one school and one church east of this commercial recreation area.

Another single-family residential area is located east of Wicks Boulevard and west of the Nimitz Freeway in the City of San Leandro. There are five schools, one church, three parks, and several mobile home parks in this area that extends southward to the San Leandro/San Lorenzo boundary.

San Lorenzo (Unincorporated Alameda County)

The Airport environs east of the Southern Pacific railroad tracks in San Lorenzo consists of single-family residential units, five schools, one church, one park, and a strip of commercial development along Via Alamitos.

EXISTING ZONING

The cities of Alameda, Oakland, and San Leandro and Alameda County have adopted comprehensive zoning ordinances [3.1, 3.2, 3.3] that divide the land within each jurisdiction into specific zoning districts. The generalized existing zoning in the Airport environs is depicted on Exhibit 3-2. Table 3-1 lists the districts that combine to form the generalized designations on the zoning map. Because the Airport environs is almost completely developed, the map depicting existing zoning reflects future land uses as well.

Zoning ordinances are implemented to regulate, among other things, exposure to aircraft noise and other potentially adverse effects of airport operations, and to achieve land use compatibility in the airport environs. Although zoning ordinances can be amended at any time and do not necessarily provide assurance that land use compatibility will always be maintained, they do indicate the willingness of a community to protect the health and safety of its residents.

As shown on Exhibit 3-2, most of the land use and zoning in the Airport environs is either single-family residential or industrial. A single-family residential district is defined in the various zoning ordinances as having one to six dwelling units per net acre.*

City of Alameda

That part of the City of Alameda within the Airport environs is zoned mostly single-family residential, except for a few scattered commercial, multifamily residential, industrial, and park districts. Bay Farm Island is zoned R-1 (single-family residential) and R-2 (two-family residential) with a Planned Development (PD) overlay [3.4].

The nonresidential areas of Bay Farm Island are predominantly zoned C-M (commercial manufacturing) with a PD overlay, except for a golf course adjacent to North Field and a retail commercial district at Island Drive and Mecartney Road. The undeveloped land on Bay Farm Island adjacent to the north end of South Field is zoned C-M-PD. A development plan for the land has been approved to permit a business park, with predominantly office and research uses [3.5].

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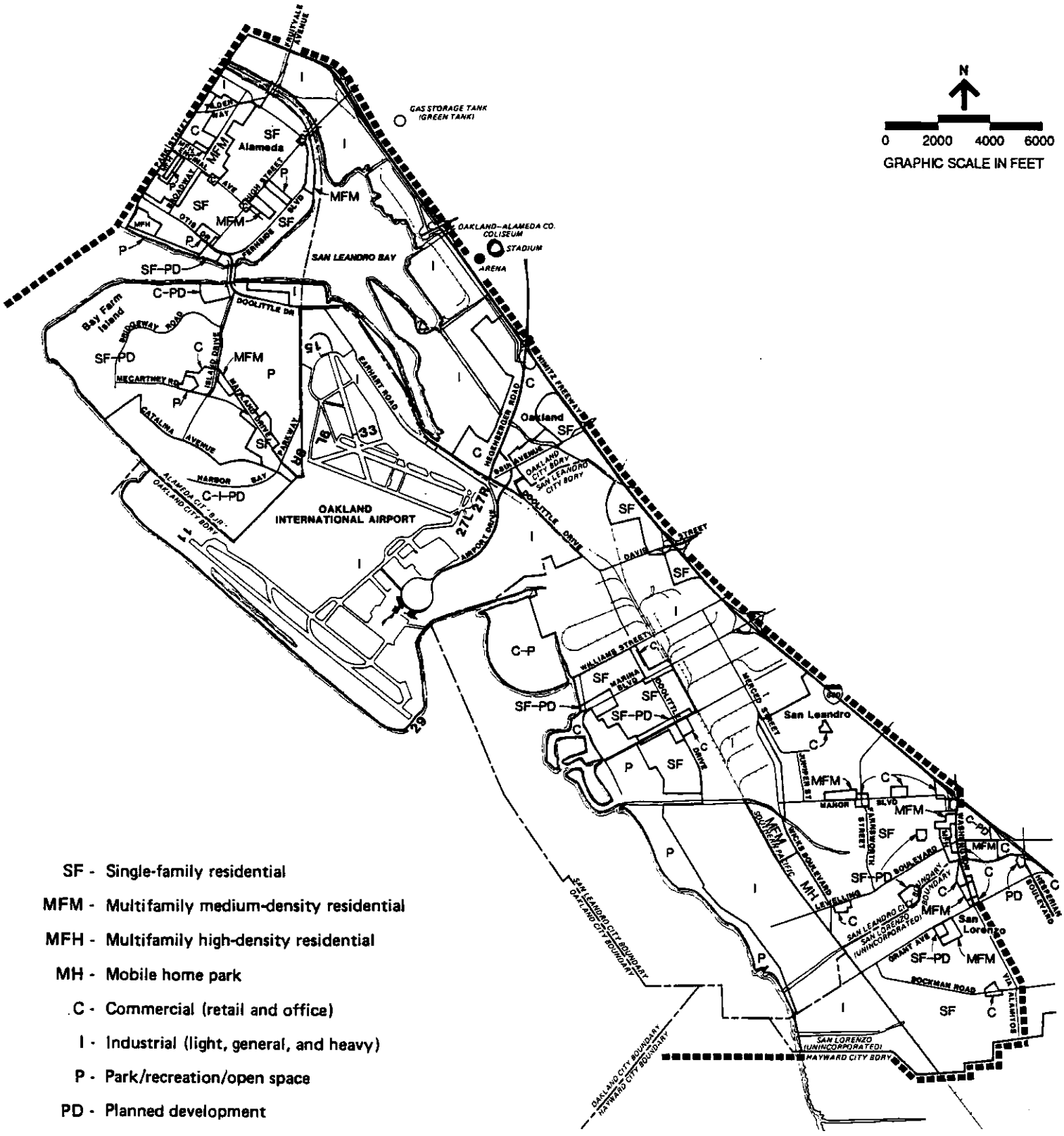
*A net acre consists of 30,492 square feet, which is a gross acre (43,560 square feet) minus 30% for streets.



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February 1988

FAR Part 150 Noise Compatibility Program
Oakland International Airport

Generalized Existing Zoning

Exhibit

3-2

Table 3-1

GENERALIZED ZONING DISTRICTS IN THE ENVIRONS OF OAKLAND INTERNATIONAL AIRPORT

Zoning designation on Exhibit 3-1		Zoning designations in City/County zoning ordinances			
		City of Alameda	City of Oakland	City of San Leandro	Alameda County (San Lorenzo)
SF:	Single-family Residential	R-1, R-1-A-H-30, R-1-A-H-40, R-1-A-PD	R-30	R-1, 0	R-1
MFM:	Multifamily Medium-density Residential	R-2, R-4, R-2-H-40		R-2, R-3	R-2, R-S-S-D-25
MFH:	Multifamily High-density Residential	R-5, R-6		R-4, R-5	R-4
PD:	Planned Development	PD		PDC	P-D
P:	Park/Recreation/ Open Space	O		C-R	
C:	Commercial (retail and office)	C-1, C-2, C-M	C-36	C-2, C-4, C-N, C-R, N, P	C-1, C-2, C-N, C-O
I:	Industrial (light, general, and heavy)	M-1, M-2	M-30 M-40	I-2, I-P	M-1, M-2
MH:	Mobile Home Park			R-2, R-3	

Note: Only those districts within the Airport environs study area are included in this table.

Sources: Zoning maps for the City of Alameda amended through February 21, 1986; zoning maps for the City of Oakland amended through August 5, 1983; zoning maps for the City of San Leandro amended through February 6, 1986; and zoning maps for Alameda County amended through April 17, 1986. Generalized zoning compiled by Peat Marwick, June 1986; revised November 1986.

City of Oakland

Within the Airport environs, an approximately two-mile area adjacent to the west side of the Nimitz Freeway is zoned single-family residential. Except for this residential district and a strip along Hegenberger Road zoned commercial (C), most of the land in the City of Oakland within the Airport environs is zoned for general (M-30) and heavy (M-40) industrial uses [3.6].

City of San Leandro

Most of the western portion of the City of San Leandro in the Airport environs is zoned for either an industrial park (I-P) or general industry (I-2), except for the shoreline between Marina Boulevard and Grant Avenue, which is zoned for commercial recreation (CR) and a park (P). Most of the Airport environs east of Wicks Boulevard in San Leandro is zoned single-family residential (R-1) [3.7].

San Lorenzo (Unincorporated Alameda County)

The area east of the Southern Pacific railroad tracks in San Lorenzo is zoned mostly single-family residential (SF), except for small scattered districts zoned multifamily medium density residential (MFM), commercial (C), and planned development (PD). The area of San Lorenzo south of Grant Avenue and west of the railroad tracks is zoned for light (M-1) and heavy (M-2) industrial uses [3.8].

PLANNED LAND USE

It is important that jurisdictions in the vicinity of an airport plan future land use to ensure long-term compatibility with the airport. This is particularly important with regard to noise-sensitive land uses.

City of Alameda

The need to ensure land use compatibility with aircraft operations is recognized in the Combined Land Use Plan for the City of Alameda [3.4], which includes the following land use recommendations regarding noise impacts on Bay Farm Island:

- Because of the crucial impacts of noise levels on land use planning, all Harbor Bay Isle residential construction should satisfy State and local noise insulation standards as a minimum and should strive, through attention to developments in sound insulation technology, to maximize the protection of future residents from impacts of aircraft-related noise; interior noise levels should be limited to 45 dB on all units.

- The current R-1 districts in the Highlands [a development bounded by Catalina Avenue, Fontana Drive, Mecartney Road, and Holly Street] should remain Single Family. Parcels with CNEL levels in excess of 65 dB should have a delayed development overlay, pending compliance with City noise standards and policies.

- The land used for agriculture south of Oleander Avenue and east of the Garden Isle Townhouses, including the 5.94-acre Victorian Village property, and the 2.85-acre Olivera Farm, should be designated Single Family with a delayed development overlay pending compliance with the Noise Element and Airport Safety Element standards and policies; the portion of the agricultural land including the 17.82-acre Silva Farms property should be designated Special Single Family with a delayed development overlay pending compliance with the Noise Element standards and policies and the Airport Safety Element constraint limiting density [3.9].

- The land currently used for agriculture west of the Casitas townhouses [on Fontana Drive] and currently zoned R-1-PD should be designated as Single Family with a delayed development overlay, pending compliance with City noise standards and policies. Cluster housing would be relatively compatible with the surrounding development.

- The vacant 0.94-acre site at the end of Magnolia Drive should be designated as Special Single Family. Any developments must conform to the applicable standards of the City's Noise Element and the Airport Safety Element density constraint [3.9].

The Combined Land Use Plan includes several more land use recommendations for the undeveloped residential, commercial, industrial, and open space areas on Bay Farm Island. In general, the Plan recommends that the area south of Catalina Avenue be developed for industrial and manufacturing uses, and that the open land north of Mecartney Road should be used for single-family residential development.

City of Oakland

The Oakland Policy Plan [3.10] includes the following statement regarding development in areas exposed to Airport noise:

> The City strongly opposes the continued development of Bay Farm Island or other areas near the Metropolitan Oakland International Airport in such a manner as to hamper desirable growth of the Airport or to expose the occupants of such development to excessive noise levels.

Most of the City of Oakland that is in the Airport environs has been developed and will retain present land uses.

City of San Leandro

The Draft San Leandro General Plan [3.11] includes the following policies regarding development of noise sensitive land uses in the Airport environs:

- Discourage or deny approval for noise sensitive land uses in areas with high noise levels which cannot be effectively reduced or mitigated.

- Restrict structure height and land use in areas close to airports designated by the Airport Land Use Commission.

Most of the City of San Leandro that is in the Airport environs has been developed and will retain present land uses. However, there is a large 450-acre parcel of vacant land (Citation/ Roberts Landing Property) at the westerly end of Lewelling Boulevard, bounded by the Southern Pacific Railroad, San Lorenzo Creek channel, Tony Lema Golf Course, and a flood control channel. The land has been acquired by a large residential development firm and initial steps for determining future development have been taken. The Draft San Leandro General Plan lists the following uses as appropriate for the site:

- Continuing disposition of marina channel dredge spoils.
- Substantial areas of open space, to protect wetlands and other environmentally sensitive land, should be retained with exact location and amount based on the environmental studies and environmental impact report.
- A mix of residential uses of low to medium density (Ranges A through C). Housing should include a variety of design types, with both rental and sales, detached and attached units. Units for elderly, young families, and differing incomes should be provided to reflect the housing market and housing needs at the time of development.
- A minor amount of commercial services for residential uses could be included to minimize travel and conserve energy.
- Public and private recreational facilities, parks, schools, and similar neighborhood facilities should be provided to the extent needed.

San Lorenzo (Unincorporated Alameda County)

The General Plan for the Central Metropolitan, Eden, and Washington Planning Units, Alameda County--including San Lorenzo [3.12]--advises that the guidelines for exterior noise levels should not exceed:

- 60 Ldn* for single-family residential uses.
- 65 Ldn for multifamily residential uses and transient lodgings.
- 70 Ldn for schools, libraries, churches, hospitals, nursing homes, playgrounds, neighborhood parks, and commercial uses.
- 75 Ldn for industrial uses, agricultural areas, and active outdoor recreation areas such as golf courses, water recreation areas, riding stables.

*Although the FAA normally requires aircraft noise to be described in units of day-night average sound level (Ldn), it accepts CNEL for projects in the State of California. CNEL is similar to Ldn except that it includes a weighted evening penalty not included in measurements of Ldn.

Chapter 3

REFERENCES

3.1 City of Alameda, California, "Zoning," November 1985.

3.2 City of Oakland, California, "Zoning Regulations," adopted August 21, 1965, revised through November 19, 1985.

3.3 City of San Leandro, California, "Zoning Ordinance of the City of San Leandro, California," adopted May 22, 1961, revised through November 13, 1985.

3.4 City of Alameda, California, Planning Department, "Combined Land Use Plan--Land Use, Open Space and Circulation," adopted July 3, 1979, revised through August 5, 1980.

3.5 Jonas, Arnold B., Planning Director, City of Alameda Planning Department, letter dated August 14, 1987.

3.6 City of Oakland, California, Zoning Map, drafted July 27, 1982, revised through August 5, 1985.

3.7 City of San Leandro, California, Zoning Maps, prepared January 1979, revised through February 6, 1986.

3.8 Alameda County, California, Zoning Maps, prepared 1965, revised through April 17, 1986.

3.9 City of Alameda, California, Planning Department, "General Plan Amendment GPA-80-5," approved by the City Council, August 5, 1980.

3.10 City of Oakland, California, "Oakland Policy Plan," adopted October 24, 1972, amended through September 1980.

3.11 City of San Leandro, California, "Draft San Leandro General Plan," February 24, 1987.

3.12 Alameda County, California, Planning Commission, "General Plan for the Central Metropolitan, Eden, and Washington Planning Units, Alameda County, California," adopted by the County of Alameda Board of Supervisors, January 13, 1981.

Chapter 4

AVIATION DEMAND FORECASTS

Aviation demand forecasts for Oakland International Airport are a critical component in the development of noise exposure maps. The basic method used to derive the forecasts provided in this chapter was to (1) review data and reports concerning the population growth of the area served by the Airport, and (2) assemble and analyze historical data on aircraft operations. An analysis of the information then provided the basis for the forecasts of aircraft operations for 1991.

HISTORICAL AND FORECAST POPULATION

According to the Metropolitan Transportation Commission, in August 1985, approximately 75% of the passengers enplaned at Oakland International Airport were residents of, or visitors to, either Alameda County or Contra Costa County. The corresponding percentages of passengers enplaned at the Airport in 1975 and 1980 were 88% and 81%, respectively. These percentages indicate that the Airport has become more attractive to residents of other parts of the San Francisco Bay Area as a result of increases in airline service at the Airport. However, the two counties are considered to be the primary Airport service region.

Table 4-1 presents historical and forecast population for Alameda and Contra Costa counties. In 1972, the combined population of the two counties was 1,662,000. In 1986, the population had increased to 1,922,300, for an average annual increase of about 1%.

In 1991, the forecast horizon year for this study, the population of the two counties is forecast to increase to 2,021,400, for an average annual increase since 1986 of 1.0%, according to the Association of Bay Area Governments [4.1].

HISTORICAL AVIATION ACTIVITY

Total Airport Operations

Historical data on total aircraft operations at Oakland International Airport are presented in Table 4-2. Total aircraft operations increased from 347,240 in Fiscal Year (FY) 1972 to a high of 523,453 in FY 1979 (for fiscal years

Table 4-1

HISTORICAL AND FORECAST POPULATION
Alameda and Contra Costa Counties
1972-1986 and 1991

Year	Alameda County	Contra Costa County	Alameda and Contra Costa Counties
Historical			
1972	1,092,500	569,500	1,662,000
1973	1,088,300	573,500	1,661,800
1974	1,087,200	578,800	1,666,000
1975	1,090,600	586,500	1,677,100
1976	1,092,400	588,000	1,680,400
1977	1,101,100	600,700	1,701,800
1978	1,101,500	608,300	1,709,800
1979	1,098,800	631,800	1,730,600
1980	1,105,379	656,331	1,761,710
1981	1,124,700	668,100	1,792,800
1982	1,138,200	679,600	1,817,800
1983	1,156,600	691,700	1,848,300
1984	1,176,800	698,600	1,875,400
1985	1,187,000	711,600	1,898,600
1986	1,201,400	720,900	1,922,300
Forecast			
1991	1,252,260	769,140	2,021,400

Sources: Historical: State of California, Department of Finance, Population Research Unit, various publications.

Forecast: Association of Bay Area Governments, "Projections-85," July 1985.

Table 4-2

HISTORICAL AIRCRAFT OPERATIONS
Oakland International Airport
1972-1986

Fiscal Year	Air carrier	Air taxi/ commuter	General aviation	Military	Total
1972	57,041	2,407	283,693	4,099	347,240
1973	58,685	4,860	287,799	4,792	356,136
1974	57,054	5,890	271,674	4,724	339,342
1975	53,607	7,752	268,476	4,270	334,105
1976	48,909	12,761	331,835	5,443	398,948
1977	41,097	12,412	393,752	5,047	452,308
1978	46,990	18,920	378,296	4,450	448,656
1979	45,266	18,609	456,059	3,519	523,453
1980	36,156	15,876	433,594	1,958	487,584
1981	33,291	22,146	402,426	1,791	459,654
1982	39,026	35,336	310,717	1,249	386,328
1983	47,814	38,052	273,547	1,141	360,554
1984	59,564	41,600	271,948	1,357	374,469
1985[a]	69,231	38,921	261,668	1,108	370,928
1986[a]	72,660	37,732	258,852	1,140	370,384

a. Federal Aviation Administration (FAA) Airport Traffic Control Tower records.

Source: FAA, "Air Traffic Activity," for 1972 through 1984.

ending September 30). Since FY 1979, aircraft operations at the Airport have decreased, principally because of a decrease in general aviation activity. Since FY 1979, general aviation operations at the Airport have decreased 43%.

Table 4-3 presents information on general aviation aircraft operations and based aircraft at the Airport. As shown in the table, based general aviation aircraft and operations per based aircraft have varied considerably between 1972 and 1986.

South Field Operations

South Field at Oakland International Airport accommodates airline aircraft and operations of other large aircraft. The certificated and commuter airlines that currently serve Oakland are as follows:

- Alaska Airlines
- Alpha Air
- American Airlines
- America West Airlines

- Continental Airlines
- Delta Air Lines (formerly Western Airlines)
- Pacific Southwest Airlines
- Sunworld International Airlines

- United Airlines
- United Express (formerly operated as Westair Airlines)

Table 4-4 presents historical data on certificated airline activity at South Field, in terms of passenger enplanements and aircraft departures. Passenger enplanements remained relatively constant between 1972 and 1976; however, since that time, there have been significant increases in passenger enplanements. As shown in Table 4-4, in 1972, 1,040,396 enplanements occurred at South Field. In 1986, the total increased to 1,858,396.

The increase in passenger enplanements between 1972 and 1986 averaged 4.2% per year. However, between 1980 and 1986, the increase averaged nearly 8% per year.

Table 4-3

GENERAL AVIATION ACTIVITY
Oakland International Airport
1972-1986

Year	Aircraft operations	Based aircraft	Operations per based aircraft
1972	283,693	440	645
1973	287,799	440	654
1974	271,674	n.a.	n.a.
1975	268,476	440	610
1976	331,835	349	950
1977	393,752	528	746
1978	378,296	n.a.	n.a.
1979	456,059	591	772
1980	433,594	611	710
1981	402,426	618	651
1982	310,717	673	462
1983	273,547	668	410
1984	271,948	439	619
1985	261,668[a]	452	579
1986	258,852[a]	350	740

n.a. = not available.

a. Federal Aviation Administration (FAA) Airport Traffic Control Tower records.

Sources: Aircraft operations: FAA, "Air Traffic Activity," for 1972 through 1984.

Based aircraft: FAA Form 5010-1.

Table 4-4

HISTORICAL CERTIFICATED AIRLINE ACTIVITY AT SOUTH FIELD
Oakland International Airport
1972-1986

Year	Passenger enplanements	Air carrier aircraft departures	Enplanements per departure
1972	1,040,396	28,521	36
1973	1,113,247	29,343	38
1974	1,147,935	28,527	40
1975	1,041,843	26,804	39
1976	1,077,107	24,455	44
1977	1,249,927	20,549	61
1978	1,397,880	23,495	59
1979	1,386,631	22,633	61
1980	1,180,762	18,078	65
1981	1,240,343	16,646	75
1982	1,410,478	19,513	72
1983	1,449,416	23,907	61
1984	1,801,450	29,782	60
1985	2,059,457	34,616	59
1986	1,858,396	36,330	51

Sources: Passenger enplanements: Port of Oakland, calendar years.

Aircraft departures: Federal Aviation Administration Airport Traffic Control Tower records, fiscal years.

As shown in Table 4-4, in 1972, 28,521 air carrier aircraft departures were performed at South Field by the certificated airlines; in 1986, the number increased to 36,330. The number of departures has varied significantly through the years, both in absolute terms and in relation to passenger enplanements. The number of enplanements per departure increased rather steadily from 1972 to 1981. Since 1982, however, the number of enplanements per departure has decreased significantly. The decrease is principally the result of the introduction of service by new airlines and of changes in service by those airlines with a longer history of service at the Airport.

In addition to the certificated and commuter airlines, the following airlines carrying only cargo also use South Field:

- Airborne Express
- Braniff
- Burlington Northern Air Freight
- Federal Express Corporation
- United Parcel Service

Table 4-5 presents historical aircraft operations at South Field for itinerant operations, consisting of air carrier, air taxi/commuter, general aviation, and military activity and local operations, consisting of civil and military activity, for FY 1986. In FY 1986, air carrier operations totaled 72,620, which was about 67% of the total 109,178 operations at South Field.

Table 4-6 presents the aircraft mix at South Field for May 1985. May is considered the average month of the year for aircraft activity at the Airport.

North Field Operations

North Field at Oakland International Airport principally accommodates general aviation operations. As shown in Table 4-7, in FY 1986, itinerant and local general aviation activity totaled 239,860 operations, which was 92% of the total aircraft operations at North Field.

Table 4-5

HISTORICAL AIRCRAFT OPERATIONS AT SOUTH FIELD
Oakland International Airport
FY 1986

Type of operation	1985 October	1985 November	1985 December	1986 January	1986 February	1986 March	1986 April	1986 May	1986 June	1986 July	1986 August	1986 September	Total
Itinerant													
Air carrier	5,812	5,278	6,245	5,835	5,264	6,081	6,305	6,428	6,418	6,384	6,488	6,082	72,620
Air taxi/commuter	1,705	1,341	1,616	1,238	1,232	1,471	1,480	1,238	1,135	1,466	1,568	1,453	16,943
General aviation	736	785	767	749	678	665	698	591	691	810	853	695	8,718
Military	53	53	47	26	31	42	67	60	37	45	62	61	584
Total itinerant	8,306	7,457	8,675	7,848	7,205	8,259	8,550	8,317	8,281	8,705	8,971	8,291	98,865
Local													
Civil (GA)	735	1,178	1,055	1,016	728	892	757	602	676	889	693	1,053	10,274
Military	--	6	2	2	6	4	2	--	--	9	4	4	39
Total local	735	1,184	1,057	1,018	734	896	759	602	676	898	697	1,057	10,313
Total operations	9,041	8,641	9,732	8,866	7,939	9,155	9,309	8,919	8,957	9,603	9,668	9,348	109,178

GA = general aviation.

Source: Federal Aviation Administration Airport Traffic Control Tower records.

(2/15/88)

Table 4-6

AIRCRAFT MIX AT SOUTH FIELD[a]
Oakland International Airport
May 1985[b]

Aircraft type	Average daily departures	Percent
B-747	2.17	2.0%
DC-10	6.78	6.4
B-757	0.03	--[c]
B-707	5.05	4.8
B-727	16.91	16.0
B-737 and DC-9	37.05	35.0
MD-80	19.28	18.2
BAe 146	3.55	3.4
DC-3	1.20	1.1
Turbojet GA	8.36	7.9
Propeller GA	5.56	5.2
Total	105.94	100.0%

GA = general aviation.

a. Does not include helicopter operations.
b. May is considered the average month of the year for operations at the Airport.
c. 0.0003%.

Source: Airport management, tabulation of flight strips.

Table 4-7

AIRCRAFT OPERATIONS AT NORTH FIELD
Oakland International Airport
FY 1986

Type of operation	1985 October	1985 November	1985 December	1986 January	1986 February	1986 March	1986 April	1986 May	1986 June	1986 July	1986 August	1986 September	Total
Itinerant													
Air carrier	4	2	3	3	15	--	3	2	--	4	1	3	40
Air taxi/commuter	1,876	1,716	1,478	1,794	1,671	1,840	1,870	1,732	1,589	1,694	1,780	1,749	20,789
General aviation	11,050	9,674	9,672	8,876	8,471	10,740	11,857	11,591	11,690	12,359	11,163	10,440	127,583
Military	36	52	29	68	24	34	71	30	43	33	22	24	466
Total itinerant	12,966	11,444	11,182	10,741	10,181	12,614	13,801	13,355	13,322	14,090	12,966	12,216	148,878
Local													
Civil (GA)	4,370	6,676	8,752	9,281	6,669	10,529	11,039	10,634	11,043	11,063	10,710	11,511	112,277
Military	16	4	6	2	2	--	4	8	--	9	--	--	51
Total local	4,386	6,680	8,758	9,283	6,671	10,529	11,043	10,642	11,043	11,072	10,710	11,511	112,328
Total operations	17,352	18,124	19,940	20,024	16,852	23,143	24,844	23,997	24,365	25,162	23,676	23,727	261,206

GA = general aviation.

Source: Federal Aviation Administration Airport Traffic Control Tower records.

(2/15/88)

FORECAST AVIATION ACTIVITY

South Field

Table 4-8 presents the forecasts of passenger enplanements and air carrier aircraft departures at South Field by the certificated airlines. The passenger enplanement forecast reflects the assumption that the increasing trend of travel per capita (in Alameda and Contra Costa counties) will continue through 1991. The forecast of air carrier aircraft departures reflects the assumption that the aircraft mix at the Airport will continue to change, as shown in Table 4-9.

Passenger enplanements at South Field are forecast to increase from 1,858,396 in 1986 to 2,700,000 in 1991, at an average annual rate of 7.8%. Air carrier aircraft departures are forecast to increase from 36,330 in 1986 to 39,000 in 1991.

Table 4-10 presents historical and forecast aircraft operations at South Field. Air carrier aircraft operations, including air cargo operations, are forecast to increase from 72,620 in 1986 to 82,000 in 1991. The forecast of air carrier aircraft operations is derived from Table 4-8. Air taxi operations include those of United Parcel Service and Federal Express Corporation. United Parcel Service is assumed to approximate its current levels of activity. Federal Express is constructing a new regional air freight sorting hub at South Field. By 1991, Federal Express expects 5,000 annual air cargo operations at South Field [4.2]. The forecast general aviation activity is related to the forecast aircraft mix shown in Table 4-9, corrected to include the small aircraft operations of carriers under contract to United Parcel Service.

As shown in Table 4-10, total aircraft operations at South Field are forecast to increase from 109,178 in 1986 to 128,500 in 1991, at an average annual rate of 3.3%.

North Field

Table 4-11 presents historical and forecast aircraft operations at North Field. Air taxi/commuter operations are assumed to approximate their current levels of activity. General aviation operations are forecast to increase from 239,860 in 1986 to 299,000 in 1991. This forecast of general aviation activity at North Field is based on the forecast that the overall number of based aircraft at the Airport will

Table 4-8

HISTORICAL AND FORECAST PASSENGER ENPLANEMENTS
AND AIR CARRIER AIRCRAFT DEPARTURES AT SOUTH FIELD
Oakland International Airport
1986 and 1991

These forecasts have been prepared on the basis of the information and assumptions given in the text. The achievement of any forecast is dependent upon the occurrence of future events that cannot be assured. Therefore, the actual results may vary from the forecasts.

	Historical 1986	Forecast 1991
Passenger enplanements	1,858,396	2,700,000
Air carrier aircraft departures	36,330	39,000
Enplanements per departure	51	69

Sources: Historical: Table 4-4.
Forecast: Peat Marwick, December 1987.

Table 4-9

HISTORICAL AND FORECAST AIRCRAFT MIX AT SOUTH FIELD[a]
Oakland International Airport
1986 and 1991

These forecasts have been prepared on the basis of the information and assumptions given in the text. The achievement of any forecast is dependent upon the occurrence of future events that cannot be assured. Therefore, the actual results may vary from the forecasts.

	Percent of daily operations	
Aircraft type	Historical 1986	Forecast 1991
B-747	0.4%	2.0%
DC-10	1.7	7.0
DC-8-71	1.4	--
B-707	1.5	1.0
B-727	12.9	11.0
B-737-200 and DC-9	21.0	14.0
B-737-300	3.4	3.0
MD-80	10.5	17.0
B-767	0.5	--
BAe 146	9.6	8.0
Short SH3-36	16.1	16.0
Turbojet GA	4.2	5.0
Propeller GA	16.8	16.0
Total	100.0%	100.0%

GA = general aviation.

a. Does not include helicopter operations.

Sources: Historical: Federal Aviation Administration Airport Traffic Control Tower records.
Forecast: Peat Marwick, December 1987.

Table 4-10

HISTORICAL AND FORECAST AIRCRAFT OPERATIONS AT SOUTH FIELD
Oakland International Airport
1986 and 1991

These forecasts have been prepared on the basis of the information and assumptions given in the text. The achievement of any forecast is dependent upon the occurrence of future events that cannot be assured. Therefore, the actual results may vary from the forecasts.

	Historical 1986	Forecast 1991
Air carrier[a]	72,620	82,000
Air taxi/commuter	16,943	20,000
General aviation	18,992	26,000
Military	623	500
Total	109,178	128,500

a. Includes air cargo operations.

Sources: Historical: Table 4-5.
Forecast: Peat Marwick, December 1987.

Table 4-11

HISTORICAL AND FORECAST AIRCRAFT OPERATIONS AT NORTH FIELD
Oakland International Airport
1986 and 1991

These forecasts have been prepared on the basis of the information and assumptions given in the text. The achievement of any forecast is dependent upon the occurrence of future events that cannot be assured. Therefore, the actual results may vary from the forecasts.

	Historical 1986	Forecast 1991
Air carrier	40	100
Air taxi/commuter	20,789	20,000
General aviation	239,860	299,000
Military	517	500
Total	261,206	319,600

Sources: Historical: Table 4-7.
Forecast: Peat Marwick, December 1987.

increase from 350 in 1986 (236 single engine, 86 multiengine, and 28 jet aircraft) to 500 in 1991, and that the number of operations per based aircraft will decrease from 746 in 1986 to 650 in 1991.

In total, aircraft operations at North Field are forecast to increase from 261,206 in 1986 to 319,600 in 1991, at an average annual rate of 4.1%.

Total Airport

Table 4-12 summarizes the forecasts of total aircraft operations at Oakland International Airport. Total operations are forecast to increase from 370,384 in 1986 to 448,100 in 1991.

Table 4-12

HISTORICAL AND FORECAST TOTAL AIRCRAFT OPERATIONS
Oakland International Airport
1986 and 1991

These forecasts have been prepared on the basis of the information and assumptions given in the text. The achievement of any forecast is dependent upon the occurrence of future events that cannot be assured. Therefore, the actual results may vary from the forecasts.

	Historical 1986	Forecast 1991
Air carrier	72,660	82,100
Air taxi/commuter	37,732	40,000
General aviation	258,852	325,000
Military	1,140	1,000
Total	370,384	448,100

Sources: Tables 4-10 and 4-11.

Chapter 4

REFERENCES

4.1 Associations of Bay Area Governments, "Projections-85," July 1985.

4.2 Taddia, Don, Airport Relations and Development, Federal Express Corporation, telephone conversation, April 1987.

Chapter 5

AIRCRAFT NOISE EXPOSURE ANALYSIS

This chapter presents (1) the methodology, the basic data, and the assumptions used to develop the community noise equivalent level (CNEL) 60, 65, 70, and 75 noise exposure contours for 1986 and 1991 noise conditions in the Airport environs, (2) the existing noise abatement measures and procedures, and (3) a discussion of the Airport Noise Abatement Task Force and the processing of noise complaints. The Integrated Noise Model (INM), Version 3.8, developed by the FAA was used to calculate the CNEL contours.

The effects of aircraft noise on existing and future noise-sensitive land uses (such as residences, schools, and hospitals) are important in relation to the forecast growth of the Airport and its environs. The achievement of land use compatibility in the environs of Oakland International Airport is the principal objective of this FAR Part 150 Noise Compatibility Program.

CALCULATION OF AIRCRAFT NOISE EXPOSURE USING THE CNEL METHOD

The unit of noise measurement required by the State of California and used in this study is the CNEL, which represents the daily A-weighted average sound level in decibels (dBA) during a 24-hour period, adjusted to an equivalent level to account for the lower tolerance of people to noise during evening hours (7 p.m. to 10 p.m.) and nighttime hours (10 p.m. to 7 a.m.) compared with daytime hours (7 a.m. to 7 p.m.).

According to the California Airport Noise Standards, the level of noise acceptable to a "reasonable" person residing in the vicinity of an airport is CNEL 65. This criterion was chosen for urban residential areas where houses are of typical California construction, and where windows may be partially open. The CNEL 65 criterion was selected with regard to speech, sleep, and community reaction. CNEL may also be used for measuring noise from sources other than aircraft, such as automobile traffic, to determine combined impacts.