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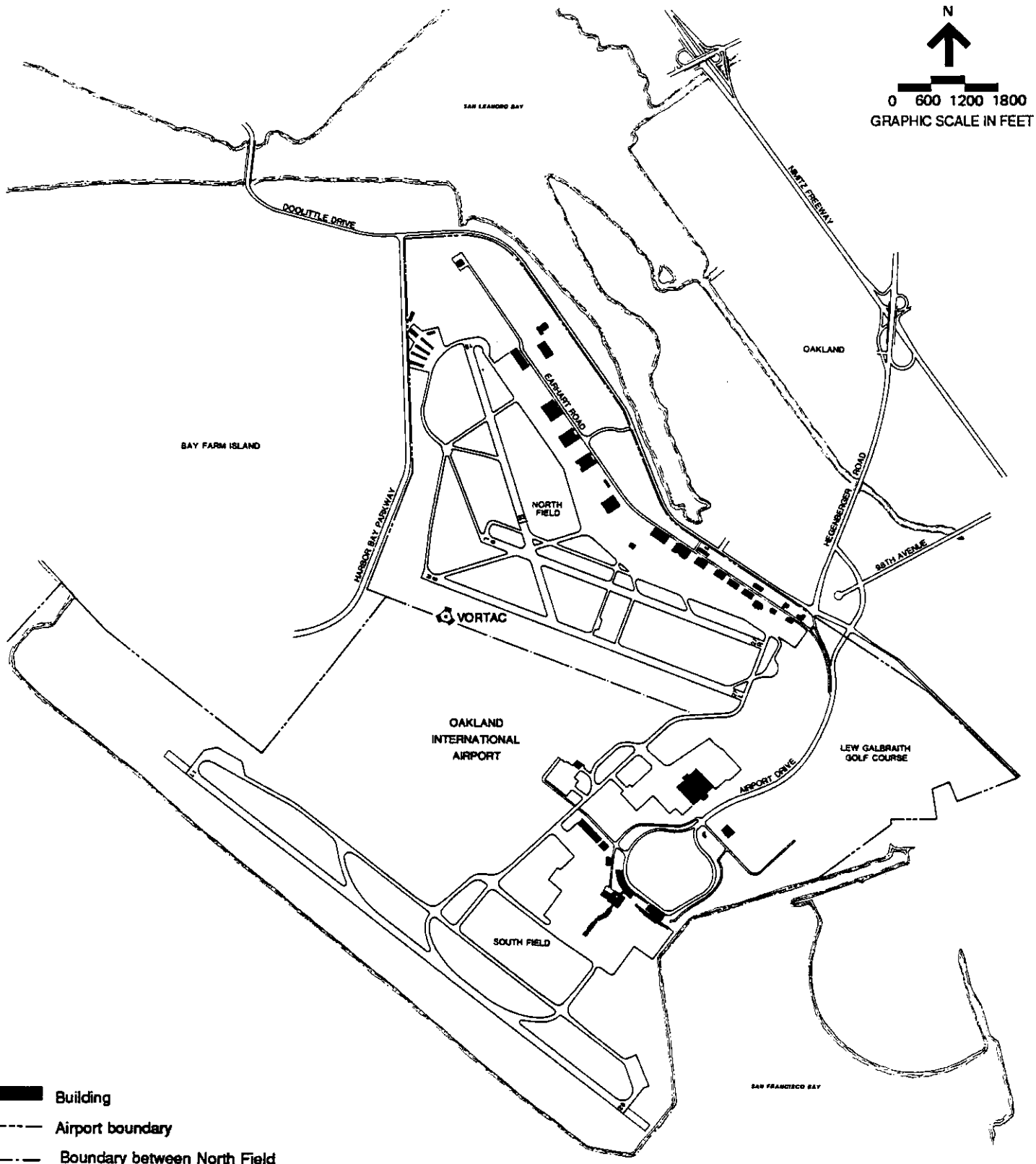
*The Bay Area consists of the nine-county area including Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.



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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

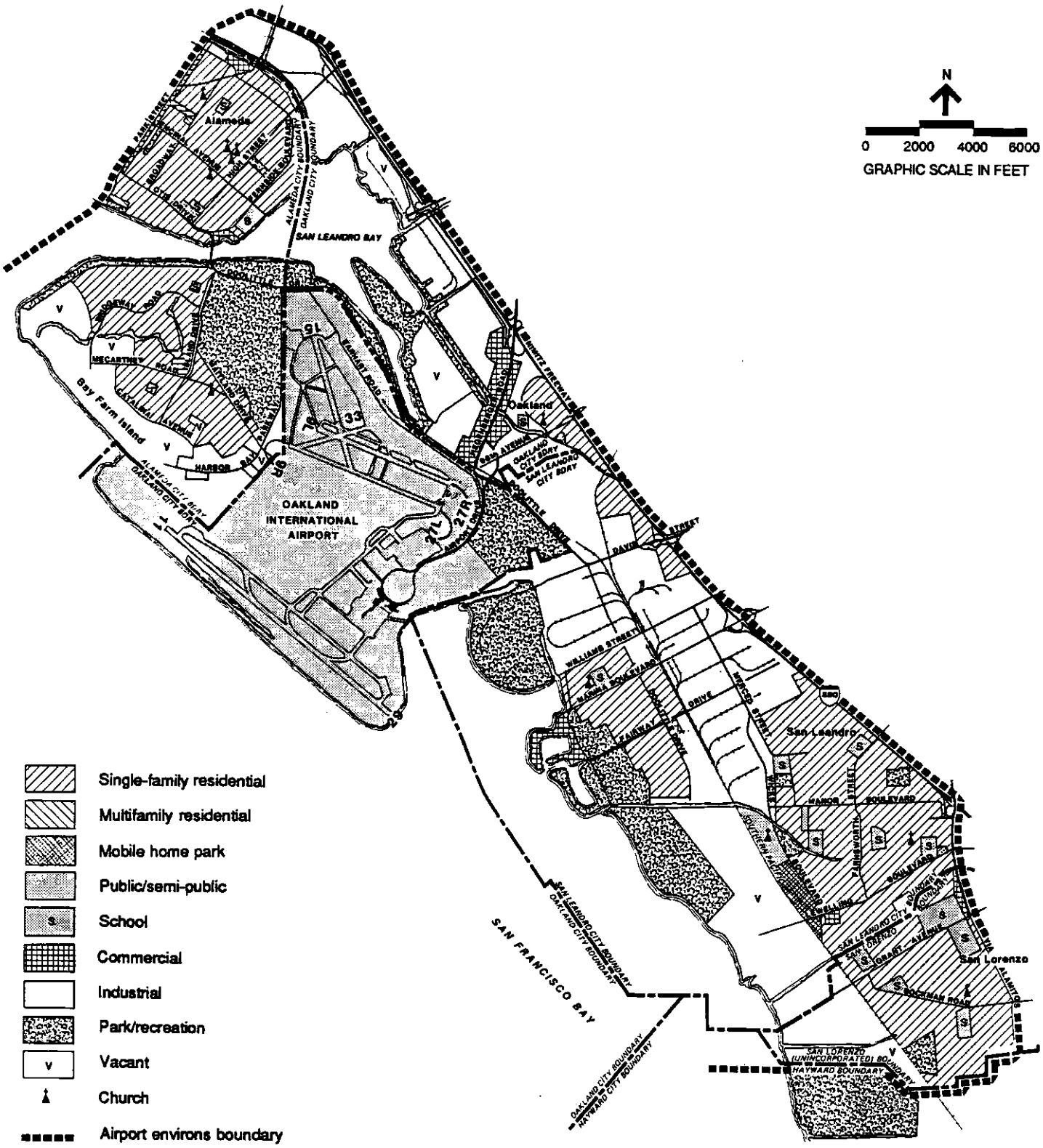
The Airport environs includes portions of the cities of Alameda, Oakland, and San Leandro and San Lorenzo (an unincorporated portion of Alameda County). The boundaries of the Airport environs are depicted on Exhibit 3-1.

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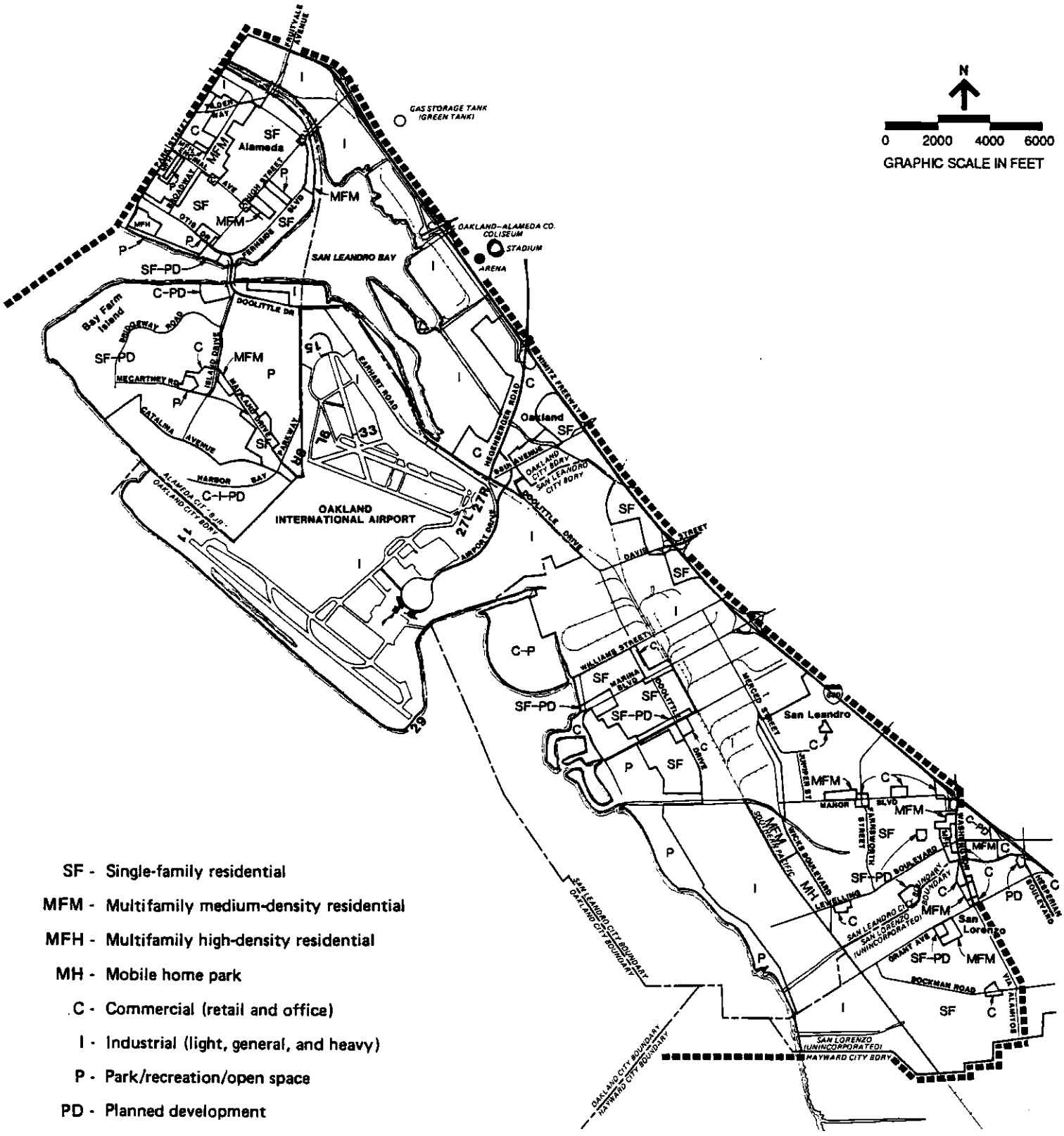
*A net acre consists of 30,492 square feet, which is a gross acre (43,560 square feet) minus 30% for streets.



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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.

The CNEL values used in this analysis are based on several factors that contribute to aircraft noise exposure, such as:

- Aircraft types
- Mix of aircraft types in daily operations and their noise characteristics
- Number of aircraft operations and the time of day they occur
- Runway use
- Flight tracks used by arriving and departing aircraft and training operations

Briefly, the CNEL method involves calculating the noise exposure levels from each aircraft operation (takeoff or landing) at ground level around an airport, and accumulating these noise exposure levels for a typical 24-hour period. Evening and nighttime noise exposure levels are weighted more heavily than daytime exposure levels because noise events during quieter nighttime hours create greater annoyance as a result of the lower ambient base levels. Contour lines are drawn on a map of the airport and its environs to indicate areas of equal noise exposure. The areas within the contours and the number of people who reside within these areas can then be used as general indicators of comparative noise exposure.

The Integrated Noise Model accounts for separate aircraft flight tracks defined as straight-line or curved segments. These flight tracks are coupled with separate tables relating the noise, slant range distance, and engine thrust for each distinctive aircraft type.

On predetermined locations at ground level around an airport, the shortest slant range to each flight track is selected, and the associated noise exposure level is retained for the specific aircraft type and engine thrust level used at that point in the flight track. Additional corrections are applied for excess air-to-ground acoustic attenuation, acoustical shielding of the aircraft engines by other portions of the aircraft itself, and speed variations. The individual aircraft noise exposures are then summed for each location. An evening penalty (equivalent to a 5-decibel weighting) or a nighttime penalty (equivalent to a 10-decibel weighting) for increased annoyance is added to each flight occurring between 7 p.m. and

10 p.m. and between 10 p.m. and 7 a.m., respectively. The cumulative values of noise exposure at each location are then used to interpolate equal noise exposure contours for selected CNEL values.

Limitations of the CNEL Method

The validity and accuracy of CNEL calculations depend on the basic information used. The noise descriptors used in the CNEL method represent average human response (and reaction) to aircraft noise. Because people vary in their response to noise, and because the physical measure of noise accounts for only a portion of an individual's reaction to that noise, the CNEL scale can show only the average response to aircraft noise that might be expected from a community.

In view of these limitations, CNEL mapping was developed as a tool to assist in land use planning around airports. The mapping is best used for comparative purposes, rather than for providing absolute values. That is, CNEL calculations provide valid comparisons between different conditions only if consistent assumptions and basic data are used for all calculations. Thus, sets of CNEL calculations can show areas experiencing relatively different levels of noise exposure. However, a noise exposure contour line drawn on a map by a computer does not imply that a particular noise condition exists on one side of that line and not on the other. CNEL calculations are merely a means for comparing noise exposures, not for precisely defining them relative to specific parcels of land.

Nevertheless, CNEL contours can be used to (1) highlight an existing or potential aircraft noise problem that requires attention; (2) assist in the preparation of airport environs land use plans; and (3) provide guidance in the development of land use controls, such as zoning ordinances, subdivision regulations, and building codes.

Interpretation of CNEL Values

Estimates of total noise exposure resulting from aircraft operations, as expressed in CNEL values, can be interpreted in terms of the probable effect on land uses using the suggested land use compatibility guidelines summarized in Table 5-1. The CNEL values in the table should be interpreted only as indicators of the effect aircraft noise has on people living and working in areas surrounding an airport. Although specific CNEL values were obtained in this study, they do not

Table 5-1

SUGGESTED LAND USE COMPATIBILITY GUIDELINES IN
AIRCRAFT NOISE EXPOSURE AREAS
Oakland International Airport

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

Land use	CNEL 75 noise exposure level and above	CNEL 70 to 75	CNEL 65 to 70
Residential:			
Residential, other than mobile homes and transient lodgings	Incompatible	NLR required[a]	NLR required[a]
Mobile homes	Incompatible	Incompatible	Incompatible
Transient lodgings	Incompatible	NLR required[a]	NLR required[a]
Public use:			
Schools, hospitals, and nursing homes	Incompatible	Incompatible	NLR required[a]
Churches, auditoriums, and concert halls	Incompatible	NLR required[a]	NLR required[a]
Governmental services	NLR required[a]	NLR required	Compatible
Transportation	Compatible[b]	Compatible[b]	Compatible
Parking	Compatible[b]	Compatible[b]	Compatible
Commercial use:			
Offices, business, and professional	NLR required	NLR required	NLR required
Wholesale and retail--building materials, hardware, and farm equipment	Compatible[b]	Compatible[b]	Compatible
Retail trade--general	NLR required	NLR required	NLR required
Utilities	Compatible[b]	Compatible[b]	Compatible
Communication	NLR required	NLR required	NLR required
Manufacturing and production:			
Manufacturing, general	Compatible[b]	Compatible[b]	Compatible
Photographic and optical	NLR required	NLR required	Compatible
Agriculture (except livestock) and forestry	Compatible	Compatible	Compatible
Livestock farming and breeding	Incompatible	Compatible	Compatible
Mining and fishing resources production and extraction	Compatible	Compatible	Compatible
Recreational:			
Outdoor sports arenas and spectator sports	Incompatible	Compatible	Compatible
Outdoor music shells, amphitheaters	Incompatible	Incompatible	Incompatible
Nature exhibits and zoos	Incompatible	Incompatible	Compatible
Amusements, parks, resorts, and camps	Incompatible	Compatible	Compatible
Golf courses, riding stables, and water recreation	Incompatible	Compatible	Compatible

CNEL = Community Noise Equivalent Level.
Compatible = Generally, no special noise attenuating materials are required to achieve an interior noise level of CNEL 45 in habitable spaces, or the activity (whether indoors or outdoors) would not be subject to a significant adverse effect by the outdoor noise level.
NLR = Noise Level Reduction. NLR is used to denote the total amount of noise transmission loss in decibels required to reduce an exterior noise level in habitable interior spaces to CNEL 45. In most places, typical building construction automatically provides an NLR of 20 decibels. Therefore, if a typical structure is located in an area exposed to aircraft noise of CNEL 65, the interior level of noise would be about CNEL 45. If the structure is located in an area exposed to aircraft noise of CNEL 70, the interior level of noise would be about CNEL 50, so an additional NLR of 5 decibels would be required if not afforded by the normal construction.
Incompatible = Generally, the land use, whether in a structure or an outdoor activity, is considered to be incompatible with the outdoor noise exposure, even if special attenuating materials were to be used in the construction of the building.

a. The land use is generally incompatible and should only be permitted in areas of infill in existing neighborhoods or where the community determines that the use must be allowed.
b. NLR required in offices or other areas with noise-sensitive activities.

Source: Peat Marwick, as derived from the U.S. Department of Transportation, Federal Aviation Administration, Federal Aviation Regulations, Part 150, "Airport Noise Compatibility Planning," Code of Federal Regulations, Title 14, Chapter I, Subchapter I, Part 150, Table 1, January 18, 1985.

dictate certain consequences; they are merely intended to guide a community in land use development.

For a specific site, some adjustments to or interpretations of CNEL values may be desirable. Typical influences used to interpret CNEL values include the following:

1. Previous community experience and previous complaint history in the immediate vicinity of the airport in question.

2. Local building construction, particularly as influenced by climatic considerations. In the Alameda-Oakland area or other coastal areas where temperatures are normally cooler, wall and roof construction may be slightly heavier, and houses are likely to be more tightly constructed, thus reducing the extent of noise leakage paths. However, the need for air conditioning is minimal, and windows are often kept open. Therefore, the sound attenuating properties of the homes are reduced, particularly during the summer and fall months.

3. Areas where air conditioning is extensively used in homes, schools, offices, and public buildings. Doors and windows in such areas are normally kept closed for major portions of the year, thus reducing exterior-to-interior sound transmission. This should be taken into consideration when selecting an appropriate CNEL value for noise compatibility interpretation.

4. Effect of industrial or surface transportation noise sources on the existing noise environment. For example, introducing aircraft noise in a rural area, where existing background noise levels are very low, produces a much more apparent change in the noise environment than initiating aircraft operations in a dense urban area long exposed to surface traffic noise.

5. Time of aircraft operations. In basic CNEL values, daytime, evening, and nighttime aircraft operations are considered, and a heavier weighting factor is applied for evening and nighttime operations.

Ranges of Noise Exposure

Three ranges of noise exposure are considered in this study; (1) CNEL 75 or greater; (2) CNEL 70 to 75; and (3) CNEL 65 to 70. These three ranges were selected on the basis of both State and federal laws and guidelines, and on the degree of average human response and annoyance to different levels of noise exposure. Ldn 75 (CNEL 75 in California) or greater is a federal guideline (cutoff point) used in the Aviation Noise Abatement Policy [5.1], and in FAR Part 150 Noise Compatibility Programs. Exposure to Ldn 75 (CNEL 75) is considered to be severe and not suitable for most types of urban development.

The CNEL 70 to 75 range represents a noise level that can disturb the functioning of many urban land uses unless buildings are acoustically treated to reduce interior noise levels.

The CNEL 65 to 70 range is based on both federal and State requirements, and FAR Part 150 specifically refers to the Ldn 65 (CNEL 65) as a "significant aircraft noise level." The California Airport Noise Standards require that all land uses within the CNEL 65 contour be compatible with this level of aircraft noise exposure.

BASIC DATA AND ASSUMPTIONS

To determine existing and future levels of noise exposure, aircraft traffic levels associated with the average day of the year are used in the calculations. The types of aircraft and the number of average daily aircraft operations by time of day in 1986 and 1991 at South Field and North Field, respectively, are listed in Tables 5-2 and 5-3. Data for 1986 are based on FAA Airport Traffic Control Tower records. Calendar year data are used in the INM as required by the FAA for developing noise contours. The aircraft types listed are representative of the types using the Airport; they are not meant to constitute the full range of aircraft that do or will use the Airport.

Stage length refers to the average distance an aircraft travels nonstop from Oakland. About 73% of the air carrier nonstop departures travel 1 to 500 miles, 16% travel 501 to 1,000 miles, 3% travel 1,001 to 1,500 miles, 3% travel 1,501 to 2,000 miles, and 5% travel 2,001 to 3,000 miles. This information is needed to determine the average gross takeoff weight of each aircraft type. Aircraft noise characteristics can vary depending on the takeoff weight of aircraft and on the weather.

Table 5-2

AVERAGE DAILY AIRCRAFT OPERATIONS AT SOUTH FIELD
Oakland International Airport
1986 and 1991

Type of aircraft operation and representative aircraft type	1986				1991			
	Day	Evening	Night	Total	Day	Evening	Night	Total
Air carrier								
B-747	1.4	--	--	1.4	7.4	--	--	7.4
DC-10	5.4	--	--	5.4	21.1	1.8	0.9	23.8
DC-8-71	4.6	--	--	4.6	--	--	--	--
B-707Q	4.9	--	--	4.9	5.0	--	--	5.0
B-727(-17)	8.4	--	--	8.4	5.5	--	--	5.5
B-727(-9) short range	8.0	--	--	8.0	9.2	--	--	9.2
B-727(-9) long range	8.5	--	2.1	10.6	12.3	--	3.1	15.4
B-727(-7)	15.0	--	--	15.0	--	0.9	6.5	7.4
DC-9 and B-737-200	55.6	9.5	3.5	68.6	41.3	7.1	2.6	51.0
B-737-300	9.0	1.6	0.6	11.2	9.7	1.6	0.6	11.9
MD-80	28.3	2.4	3.4	34.1	50.1	4.2	6.0	60.3
B-767	1.5	--	--	1.5	--	--	--	--
BAe 146	21.8	7.2	2.2	31.2	19.4	6.4	1.9	27.7
Total	172.4	20.7	11.8	204.9	181.0	22.0	21.6	224.6
Air taxi/commuter								
Short SH3-36	31.1	1.5	19.7	52.3	32.6	1.6	20.6	54.8
General aviation								
Business jets	8.2	0.4	5.2	13.8	9.5	0.5	6.0	16.0
Twin-engine small aircraft	0.4	0.1	--	0.5	2.3	0.3	0.1	2.7
Single-engine small aircraft	45.4	5.3	3.6	54.3	43.8	5.1	3.5	52.4
Total	54.0	5.8	8.8	68.6	55.6	5.9	9.6	71.1
Military	1.7	--	--	1.7	1.4	--	--	1.4
Total daily aircraft operations	259.2	28.0	40.3	327.5	270.6	29.5	51.8	351.9

Note:

Day = 7 a.m. - 7 p.m.
Evening = 7 p.m. - 10 p.m.
Night = 10 p.m. - 7 a.m.

Sources: 1986: Federal Aviation Administration Airport Traffic Control Tower records.
1991: Peat Marwick, December 1987.

(2/15/88)

Table 5-3

AVERAGE DAILY AIRCRAFT OPERATIONS AT NORTH FIELD
Oakland International Airport
1986 and 1991

Type of aircraft operation and representative aircraft type	1986 Day	1986 Evening	1986 Night	1986 Total	1991 Day	1991 Evening	1991 Night	1991 Total
Air taxi								
Twin-engine turboprop	17.5	0.9	11.2	29.6	16.6	0.8	10.5	27.9
Twin-engine small aircraft	17.5	0.9	11.2	29.6	16.6	0.8	10.5	27.9
Total	35.0	1.8	22.4	59.2	33.2	1.6	21.0	55.8
General aviation								
Twin-engine small aircraft	30.3	3.6	2.4	36.3	34.2	4.0	2.8	41.0
Single-engine small aircraft	551.5	64.7	44.3	660.5	650.0	76.3	52.2	778.5
Total	581.8	68.3	46.7	696.8	684.2	80.3	55.0	819.5
Total daily aircraft operations	616.8	70.1	69.1	756.0	717.4	81.9	76.0	875.3

Note:

Day = 7 a.m. - 7 p.m.
Evening = 7 p.m. - 10 p.m.
Night = 10 p.m. - 7 a.m.

Sources: 1986: Federal Aviation Administration Airport Traffic Control Tower records.
1991: Peat Marwick, December 1987.

For example, a fully loaded aircraft departing on a long flight will probably weigh more than the same aircraft departing on a shorter flight because the longer flight requires more fuel on board. It usually takes the heavier aircraft longer to gain altitude than the lighter aircraft, particularly on hot days. Therefore, more land will be exposed to higher levels of aircraft noise for those aircraft that take longer to gain altitude.

Noise Contour Forecasts for South Field

For South Field, the proportion of aircraft operations remains about the same over the forecast period for day, evening, and night. Night operations accounted for about 12.3% of the total average daily operations in 1986 and are forecast to account for about 14.7% in 1991. For air carrier operations, specific levels of activity were forecast for B-747, DC-10, B-707, B-727, B-737-300, DC-9, MD-80, and BAe 146 aircraft. In 1991, average daily air carrier operations at South Field are expected to be: day, 181.0; evening, 22.0; and night, 21.6.

Air taxi/commuter operations at South Field are expected to increase between 1986 and 1991. For 1991, these operations, which may include numerous types of aircraft, are presented in the tables as operations by the SH3-36.

In 1991, daily air taxi/commuter operations at South Field are expected to total: day, 32.6; evening, 1.6; and night, 20.6.

For 1991, general aviation operations are presented in the tables as operations by twin- and single-engine small aircraft and business jets. In 1991, daily general aviation operations are forecast to total: day, 55.6; evening, 5.9; and night, 9.6.

Military operations are forecast to remain about the same between 1986 and 1991: day, 1.4; evening, 0.0; and night, 0.0.

Noise Contour Forecasts for North Field

For North Field, the proportion of aircraft operations by time of day is forecast to change very little between 1986 and 1991. About 9.1% of the total operations in 1986 were at night (between 10 p.m. and 7 a.m.), and about 8.7% of the 1991 operations are forecast to be at night.

Air taxi operations at North Field are expected to decrease slightly between 1986 and 1991. In 1991, daily air taxi operations are expected to total: day, 33.2; evening, 1.6; and night, 21.0.

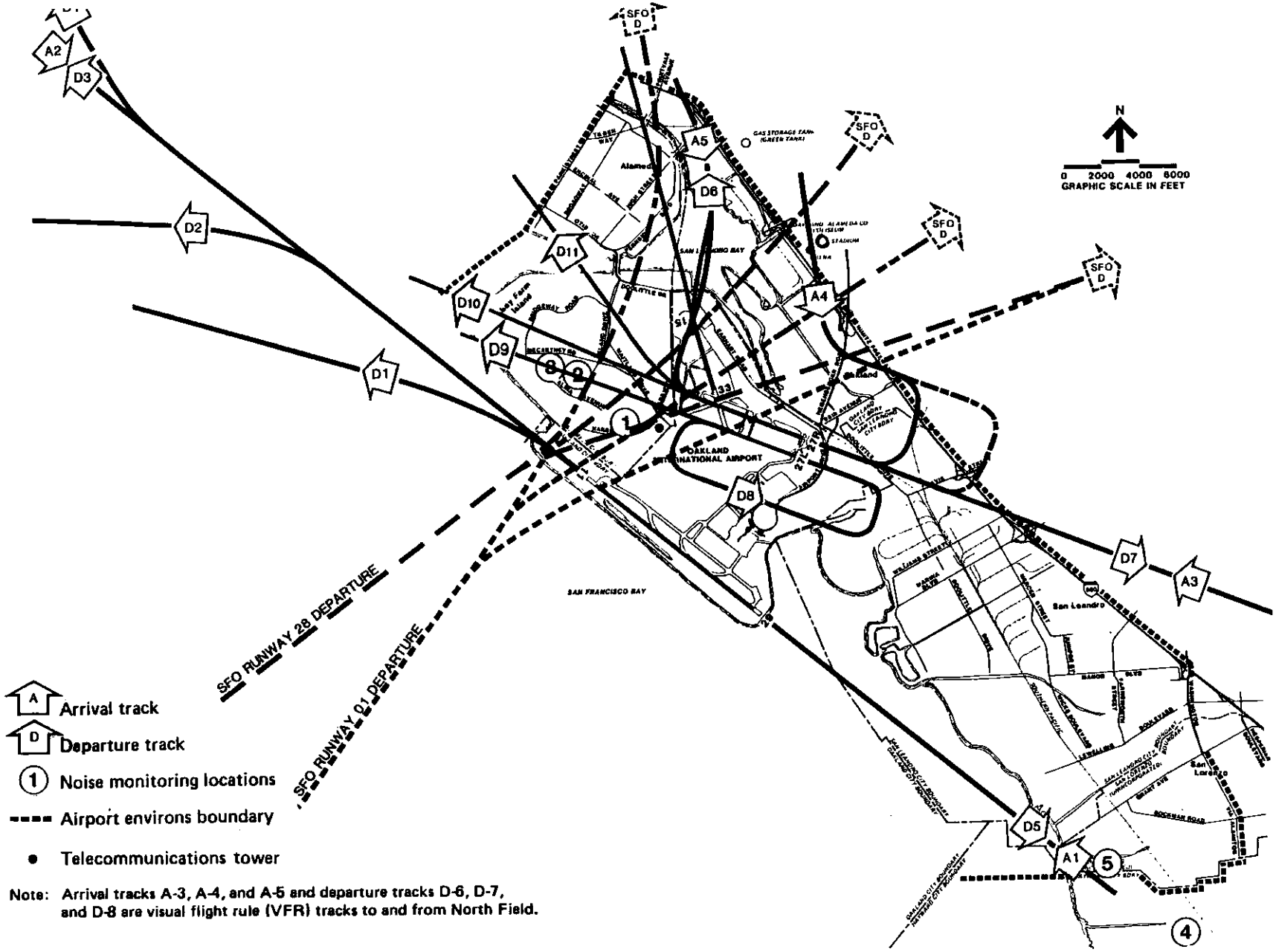
General aviation operations, the primary activity at North Field, are forecast to increase substantially between 1986 and 1991. In 1991, daily general aviation operations are expected to total: day, 684.2; evening, 80.3; and night, 55.0.

Aircraft Flight Tracks

The flight tracks used as input to the INM for the 1986 and 1991 CNEL calculations are shown on Exhibit 5-1. The median track within a specific corridor is indicated, but deviation from the track does occur because of weather, pilot technique, air traffic control, and aircraft weight. The annual runway use assumed in developing the number of operations on each flight track is presented in Table 5-4 for South Field and North Field. The annual flight track use for South Field and North Field is presented in Table 5-5.

In addition, the following overall conditions were assumed:

- All air carrier aircraft use the departure procedure described in FAA Advisory Circular 91-53 [5.2], commonly known as the Air Transport Association (ATA) procedure.
- Departure profiles for general aviation turbojet aircraft, general aviation and commuter turboprop aircraft, and general aviation single-engine propeller aircraft are those typical of aircraft in each of these classifications.
- All approaches are assumed to follow a flight track descending along a 3 degree glide slope, with touchdown at a point 1,000 feet beyond the threshold of the runway.
- Noise, thrust, and altitude information for each specified aircraft type is as contained in Data Base No. 8 of the INM.



Note: Arrival tracks A-3, A-4, and A-5 and departure tracks D-6, D-7, and D-8 are visual flight rule (VFR) tracks to and from North Field.

Exhibit 5-1

FAR Part 150 Noise Compatibility Program -
Oakland International Airport

Noise Monitoring Locations and Average Flight Tracks: 1986 and 1991

PEAT MARWICK

February 1988

Table 5-4

ANNUAL RUNWAY USE
Oakland International Airport
1986 and 1991

Runway	Percent arrivals	Percent departures	Percent touch and go
South Field			
11	15%	15%	--%
29	85	85	--
	100%	100%	--%
North Field			
9L	14%	15%	--%
27R	84	85	--
9R	--	--	15
27L	--	--	85
15	2	--[a]	--
33	--[a]	--[a]	--
	100%	100%	100%

a. Less than 1%.

Source: BBN Laboratories, April 1987.

Table 5-5

ANNUAL FLIGHT TRACK USE
Oakland International Airport
1986 and 1991

Flight tracks	Runway	Percent use
South Field		
Departure tracks		
D1	29	2.55%
D2	29	39.95
D3	29	22.95
D4	29	19.55
D5	11	15.00
Total		100.00%
Arrival tracks		
A1	29	85.00%
A2	11	15.00
Total		100.00%
North Field		
Departure tracks		
D6	27R	85.00%
D7	9L	15.00
D9	27L	--[a]
D10	27R	--[a]
D11	27R	--[a]
Total		100.00%
Arrival tracks		
A3	27R	42.00%
A4	27R	42.00
A5	9L	14.00
A6	15	2.00
Total		100.00%
Training track		
D8	27L	100.00%

Note: These flight track uses do not include airline or military training operations.

a. Less than 1%.

Source: BBN Laboratories, April 1987.

A review of aeronautical and obstruction charts and conversations with FAA Airport Traffic Control Tower personnel indicated that there were airspace and topographic limitations to aircraft operations at the Airport from a noise exposure standpoint. Pilots departing on Runway 29 during the day or evening hours cannot make a noise abatement left turn over San Francisco Bay without interacting with departures from San Francisco International Airport. The erection of a 110-foot high telecommunications tower resulted in the elimination of an experimental, unpublished noise abatement flight track for departures from Runway 27L at the Airport under instrument flight rule (IFR) conditions. Pilots departing to the north on Runways 29, 27L, and 27R under an instrument flight plan are required to gain altitude at a certain rate as specified in existing standard instrument departure (SID) procedures* in order to minimize noise impacts on residences in the Oakland Hills.

NOISE MONITORING PROGRAM

Acoustic measurements were performed by BBN Laboratories [5.3], an acoustic consulting firm. Noise monitors were installed at Sites 1 through 4 near the Airport from January 29, 1986, through February 25, 1986. A noise monitor was installed at Site 5 from February 28, 1986, through March 13, 1986. The site locations were selected using previously-computed CNEL contours as a guide, with the intent of measuring levels close to the estimated CNEL 65 contour in the areas of incompatible land use. Other factors considered in the selection of monitoring sites were noise from other sources and security. As shown on Exhibit 5-1, three locations were selected on the departure side of the Airport on Bay Farm Island, and two were selected under the approach path to Runway 29. Exhibit 5-1 shows the noise monitoring locations.

Digital Acoustics Model DA607 noise monitors were used at each location. The units were set to record individual events in excess of a preset threshold, hourly noise levels, and CNEL values.

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*Nuevo Four SIDs--375 feet per nautical mile from Runways 27L and 27R, and 230 feet per nautical mile from Runway 29. Silent Six SID--230 feet per nautical mile from Runway 29.

During the time the noise monitors were in place, departure information was collected from the FAA. Air traffic control "flight strips" include information about all flights, including the airline, aircraft type, and departure time. This information was tabulated and matched with data recorded by the noise monitors.

The data were then sorted by airline and aircraft type, and average energy values were computed for the major classifications. Table 5-6 provides a summary of the results at Sites 1, 2, and 3.

Daily CNEL values for those days that a full 24 hours of data were recorded are listed in Table 5-7.

The average sound exposure level data acquired at Sites 1, 2, and 3 were used to adjust the data base of the INM. Sound exposure level (SEL) values predicted by the INM at the three departure side monitoring sites were determined using the "DETAIL" feature of the INM. After adjustments were made to the data base, a second calculation was made to verify the changes.

Noise exposure in the vicinity of Bay Farm Island is strongly influenced by departures from San Francisco International Airport, many of which pass directly over Bay Farm Island. Many events recorded during the measurement period did not correspond to flight information on strips from the Airport Traffic Control Tower at Oakland International Airport. However, the noise levels of these events were comparable to noise levels of departures from San Francisco International Airport. For five days, data were collected at each site, and CNEL values were computed for flights specifically identified as departures from the Airport.

Table 5-8 lists the CNEL values from all noise events, together with the CNEL values of departures from Oakland International Airport. The comparison shows that the CNEL values attributable to departures from the Airport were about 1 to 2 dB less than the CNEL values attributable to all sources. At Site 1, departures from the Airport accounted for 53% (512 of 967) of the total number of noise events recorded from February 4, 1986, through February 8, 1986. In the same period, departures from the Airport were responsible for 69% (512 of 738) and 39% (512 of 1,322) of the noise events recorded at Sites 2 and 3, respectively.

Table 5-6

AVERAGE MEASURED SEL VALUES
Oakland International Airport

Aircraft type	Site 1 Number of events	Site 1 SEL (dBA)	Site 2 Number of events	Site 2 SEL (dBA)	Site 3 Number of events	Site 3 SEL (dBA)
B-727	93	92.1	91	91.4	89	92.1
MD-80	104	90.2	101	89.9	94	89.0
BAe 146	17	83.1	5	85.8	13	81.3
B-737/DC-9	207	91.7	196	91.5	187	90.7
B-747	4	90.1	4	95.8	4	93.7
DC-10/L-1011	21	87.7	21	87.9	19	86.8
DC-8-70	14	85.6	10	86.7	11	86.1
B-707	8	91.2	8	92.7	7	92.8

SEL = sound exposure level. The sound exposure level is a time-integrated measure, expressed in terms of the A-weighted sound level of a single noise event. The sound level is integrated over the time period when the level exceeds a threshold (normally 65 dBA). Sound exposure levels for aircraft events depend on the monitoring location (proximity to aircraft), the type of operation, and the type of aircraft.

Source: BBN Laboratories, July 1986.

Table 5-7

MEASURED DAILY CNEL VALUES
Oakland International Airport
(in decibels)

Date	Site 1	Site 2	Site 3	Site 4	Site 5
01/29/86	70.2	67.6	65.2	--	--
01/30/86	67.7	65.5	62.9	--	--
01/31/86	--	66.8	66.9	--	--
02/01/86	--	65.0	64.9	--	--
02/02/86	--	--	65.9	--	--
02/03/86	--	--	--	--	--
02/04/86	67.2	65.8	65.8	--	--
02/05/86	67.8	65.3	65.5	64.7	--
02/06/86	66.3	66.3	64.9	62.9	--
02/07/86	67.4	66.6	66.1	--	--
02/08/86	65.5	64.1	64.0	--	--
02/09/86	64.6	62.7	--	--	--
02/10/86	66.6	65.9	--	63.6	--
02/11/86	68.8	67.9	65.4	64.9	--
02/12/86	--	68.9	64.9	67.0	--
02/13/86	--	68.8	67.0	65.3	--
02/14/86	--	69.1	65.7	68.9	--
02/15/86	69.3	65.4	62.9	68.6	--
02/16/86	67.1	64.4	60.2	65.5	--
02/17/86	70.1	68.0	63.1	--	--
02/18/86	70.2	65.6	--	--	--
02/19/86	69.2	68.2	67.1	--	--
02/20/86	--	68.8	67.6	--	--
02/21/86	69.1	68.5	66.3	--	--
02/22/86	67.5	65.1	63.7	--	--
02/23/86	64.1	63.0	--	--	--
02/24/86	65.7	66.8	--	--	--
02/25/86	--	65.5	--	--	--
02/28/86	--	--	--	--	63.8
03/01/86	--	--	--	--	67.3
03/02/86	--	--	--	--	--
03/03/86	--	--	--	--	--
03/04/86	--	--	--	--	63.0
03/05/86	--	--	--	--	63.0
03/06/86	--	--	--	--	63.3
03/07/86	--	--	--	--	69.8
03/08/86	--	--	--	--	70.8
03/09/86	--	--	--	--	--
03/10/86	--	--	--	--	68.5
03/11/86	--	--	--	--	63.6
03/12/86	--	--	--	--	62.3
03/13/86	--	--	--	--	64.1

(2/15/88)

Source: BBN Laboratories, July 1986.

Table 5-8

COMPARISON OF CNEL VALUES FROM
OAKLAND INTERNATIONAL AIRPORT DEPARTURES
WITH CNEL VALUES FROM ALL EVENTS
Oakland International Airport
(in decibels)

	Site 1		Site 2		Site 3	
Date	Oakland departures	All events	Oakland departures	All events	Oakland departures	All events
02/04/86	65.8	67.2	64.8	65.8	64.1	65.8
02/05/86	66.2	67.8	65.0	65.3	64.2	65.5
02/06/86	64.5	66.3	63.5	66.3	63.3	64.9
02/07/86	65.0	67.4	65.9	66.6	64.0	66.1
02/08/86	64.1	65.5	62.3	64.1	62.6	64.0

Source: BBN Laboratories, July 1986.

The noise analysis of aircraft arrival data was less complete. The measurement conditions were not favorable in the area exposed to noise from arrivals on Runway 29 because of the difficulty in finding a secure location not subject to noise from other sources. A review of the data recorded at Sites 4 and 5 shows that there were many events of long duration not characteristic of noise generated by arriving aircraft. The full effect of these events on CNEL values could not be determined. The data recorded are not inconsistent with the CNEL values computed by the INM, which show that the levels resulting from operations at the Airport do not exceed 65 dB at the monitoring sites.

Residential Noise Measurements

Two residences were selected for noise monitoring purposes in the area affected by the noise from departures on Runway 29 to determine typical noise attenuation characteristics. Exterior noise levels were measured using a DA607 noise monitoring unit located near the residences and away from significant reflecting surfaces. DA607 units were placed in two rooms of the residences that represent different interior noise exposure levels for the structures.

3016 Linda Vista. One residence monitored was 3016 Linda Vista on Bay Farm Island, one of six condominium townhouses in a single structure. The structure is 17 years old, 2-story, with wood frame, stucco exterior, and shake shingle roofing. On the first floor, the kitchen faces San Francisco Bay (and the departing aircraft flight path). The living room, also on the first floor, has a six-foot sliding glass door and a six-foot full-depth picture window. There is a two-story entryway facing Catalina Avenue, with a two-foot square skylight. Upstairs, there are two bedrooms, one in the front and one in the rear. The front bedroom has a three-foot by five-foot glass window facing the Bay. It was not determined if there is insulation in the walls or ceiling.

The noise monitoring units were located in the living room (first floor rear) and the second floor front bedroom. The units were set to record events exceeding 45 dBA. Data were recorded for approximately two hours on February 26, 1986. As shown in Table 5-9, the monitors recorded a number of events exceeding 45 dB. Because of the orientation of the residence relative to the departure flight tracks from San Francisco International Airport, departures from that airport were recorded.

Table 5-9

SINGLE-EVENT NOISE LEVELS RECORDED AT 3016 LINDA VISTA
February 26, 1986

Time	Airline[a]/other	Aircraft type	Noise level (dBA)					
			Outside		First floor		Second floor	
			SEL	ALM	SEL	ALM	SEL	ALM
9:36 a.m.	--	--	89.7	89.7	59.7	50.7	61.9	51.9
9:51	--	--	87.9	78.6	--	--	60.9	51.2
10:11	World	DC-10	85.7	75.9	--	--	59.4	53.1
10:16	General aviation	G-3	83.9	72.7	--	--	--	--
10:28	Piedmont	B-727	92.2	82.0	54.5	46.4	--	55.0
10:35	AirCal	B-737	87.8	77.5	--	--	61.4	50.6
10:39	--	DC-9	92.6	83.0	--	--	64.8	54.9
10:44	PSA	BAe 146	80.2	70.3	--	--	--	--
10:51	Alaska/Frontier[b]	MD-80/B-737	94.1	81.8	--	--	60.4	52.2
					--	--	66.7	56.8
10:58	Interflight	DC-8	86.2	75.0	--	--	59.9	48.8
11:14	PSA	MD-80	86.9	76.5	--	--	60.8	51.2
11:15	Continental	B-737-300	82.7	71.7	--	--	53.7	48.0
11:20	America West	B-737	92.1	81.3	--	--	67.3	55.2
11:36	AirCal	B-737-300	82.1	72.1	--	--	--	--
12:17 p.m.	America West	B-737	87.9	76.6	--	--	61.7	50.7
12:19	AirCal	B-737	93.1	81.3	--	--	67.8	55.8
12:32	United	B-727	91.7	79.9	--	--	66.6	54.7
12:35	American	MD-80	92.3	83.6	50.3	45.9	63.7	53.9
12:37	AirCal	B-737	92.2	80.3	--	--	65.5	54.6

SEL = sound exposure level.
ALM = the instantaneous peak noise level that occurs for a fraction of a second.

a. All identified airline operations are departures from Oakland International Airport.
b. Combined event.

Source: BBN Laboratories, June 1987.

3366 Tonga Lane. Similar measurements were recorded on February 27, 1986, at 3366 Tonga Lane on Bay Farm Island. This structure is a 2-story wood-frame townhouse, about 12 years old, with interior drywall, exterior wood siding, and asphalt shingle roof. The ground floor kitchen faces the Bay and has a three-foot by four-foot window. The living room is in the back and has an eight-foot sliding glass door that leads to a patio. The upstairs front bedroom has an eight-foot sliding glass door that provides access to a balcony facing the Bay. High on the opposite wall is a two-foot by eight-foot window.

The noise monitors were located in the living room and in the upstairs front bedroom. All but the quietest jet aircraft (BAe 146) generated noise levels in excess of 45 dBA in both rooms. Table 5-10 lists the single-event noise levels recorded at 3366 Tonga Lane.

Existing Noise Conditions

Exhibit 5-2 shows the 1986 CNEL 65, 70, and 75 noise contours for aircraft operations at the Airport. Areas within the Airport environs that are currently experiencing noise exposure levels above CNEL 75 include the South Field proper and small portions of San Francisco Bay. Both South Field and the Bay are compatible land uses for CNEL 75 or greater noise exposure levels.

There are two sets of CNEL 70 contours, one at North Field and one at South Field. The CNEL 70 contour at North Field basically surrounds Runway 9R-27L. The CNEL 70 to 75 contour at South Field starts west of the northwest corner of Bay Farm Island and continues southeast of the Airport to the vicinity of the San Leandro Marina. Within these areas exposed to CNEL 65 to 70 are portions of San Francisco Bay and South Field, and vacant parcels of land on the southern end of Bay Farm Island.

The area exposed to CNEL 65 to 70 starts in the Bay northwest of the Airport and extends southeast of the Airport to a point in the Bay west of Lewelling Avenue in San Leandro. The CNEL 65 to 70 contour also bends northward to include portions of North Field, including Runways 9R-27L and 9L-27R. The non-Airport property within the CNEL 65 to 70 contour is residential and industrial land located on the southwest side of Bay Farm Island. There are about 160 people living in approximately 70 single-family units in the area along Catalina Avenue between Fontana Drive and Bismark Lane on Bay Farm

Table 5-10

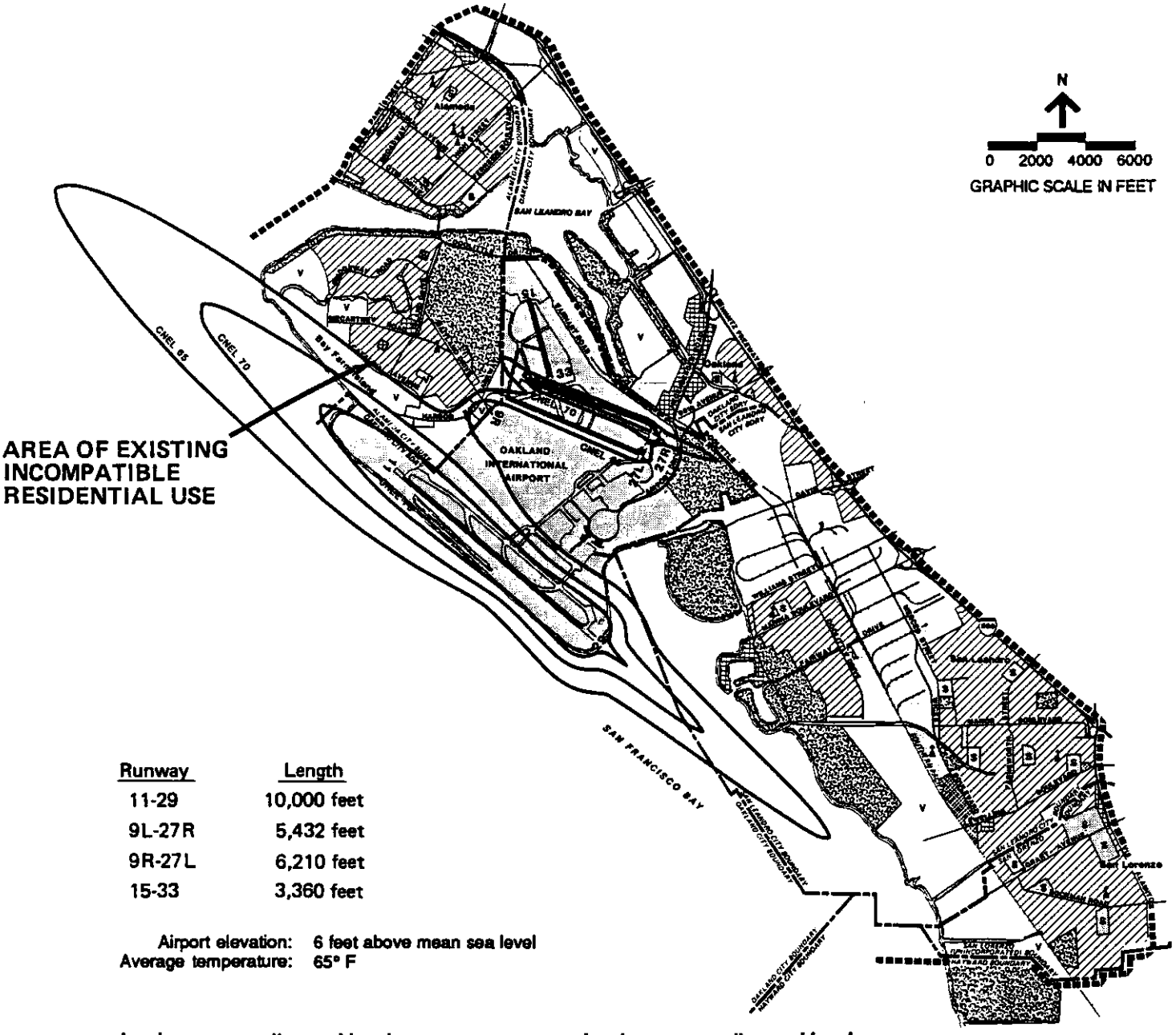
SINGLE-EVENT NOISE LEVELS RECORDED AT 3366 TONGA LANE
February 27, 1986

Time	Airline[b]/other	Aircraft type	Noise level (dBA) Outside SEL	Outside ALM	First floor[a] SEL	First floor[a] ALM	Second floor[a] SEL	Second floor[a] ALM
07:02 a.m.	PSA	MD-80	90.4	80.7	62.6	53.2	61.6	51.1
07:06	Alaska	B-727	94.5	84.2	68.1	56.2	64.9	53.5
07:08	PSA	MD-80	91.9	81.8	64.9	54.4	66.5	57.8
07:09	Western	B-737	93.1	82.7	67.1	54.7	65.1	53.2
07:13	AirCal	B-737	91.9	81.0	65.0	52.1	63.6	51.8
07:14	American	B-727	92.1	81.3	65.5	54.0	66.9	57.5
07:15	AirCal	B-737	91.8	80.8	64.4	53.3	63.4	51.7
07:16	American	B-727	93.4	83.3	66.7	54.2	65.5	58.4
07:20	America West	B-737	92.0	82.5	65.6	55.2	64.7	53.7
07:23	World	DC-10	89.4	81.2	62.9	52.7	60.6	52.0
07:25	Frontier	B-737	96.9	87.1	70.9	58.7	68.6	60.0
07:28	General aviation	G-3	87.0	76.2	58.0	48.3	52.8	45.9
07:32	General aviation	Amphibious	89.1	79.6	68.5	60.4	63.9	55.1
07:37	United	B-727	89.4	78.4	63.7	51.2	59.1	48.2
07:40	Federal Express	DC-10	92.6	81.4	67.1	56.0	65.1	52.7
07:48	General aviation	Turboprop	72.3	67.0	56.0	49.2	57.4	50.0
08:34	AirCal	B-737	94.6	83.6	79.8	71.1	64.6	51.9[a]
08:36	PSA	MD-80	90.0	79.3	79.2	69.6	63.2	54.3[a]
08:39	Western	B-737	95.0	81.5	77.9	67.1	71.4	62.6[a]
08:42	AirCal	B-737	92.4	81.8	65.8	54.0	58.1	48.9
09:02	--[c]	--	82.2	73.8	52.0	46.2	--	--
09:05	--	--	92.9	83.3	65.8	54.9	59.7	50.7
09:12	Continental	MD-80	89.7	79.5	61.7	52.0	52.4	47.0
09:19	--	B-727	91.8	80.4	65.1	59.2	57.9	48.7
09:21	--	--	75.6	72.5	--	--	--	--
09:25	--	--	95.4	85.6	67.5	56.3	63.4	53.9
09:29	--	B-747	92.4	81.5	65.1	54.0	58.4	48.4
09:31	General aviation	Caribou	86.7	74.3	57.6	47.4	--	--
09:49	PSA	BAe 146	83.0	73.1	--	--	--	--

SEL = sound exposure level.
ALM = the instantaneous peak noise level that occurs for a fraction of a second.

a. Windows opened.
b. All identified airline operations are departures from Oakland International Airport.
c. Some aircraft not identified because of fog.

Source: BBN Laboratories, June 1987.



Runway	Length
11-29	10,000 feet
9L-27R	5,432 feet
9R-27L	6,210 feet
15-33	3,360 feet

Airport elevation: 6 feet above mean sea level
Average temperature: 65° F

Land uses generally considered incompatible in areas exposed to aircraft noise levels of CNEL 65 or higher

- Single-family residential
- Multifamily residential
- Mobile home park
- Public/semi-public
- School
- Church

Land uses generally considered compatible in areas exposed to aircraft noise levels of less than CNEL 65

- Commercial
- Industrial
- Park/recreation
- Vacant
- Airport environs boundary
- CNEL Community Noise Equivalent Level (CNEL) contour
- Airport boundary

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FAR Part 150 Noise Compatibility Program
Oakland International Airport

Base Case Noise Exposure Map: 1986

Exhibit

5-2

Island. According to the California Airport Noise Standards, residential land uses are not compatible with levels of aircraft noise greater than or equal to CNEL 65.

Also within the CNEL 65 to 70 contour is a vacant area on Bay Farm Island, west and south of the intersection of Mecartney and Bridgeway Roads that is zoned single-family residential with a planned development overlay. Approximately 500 homes could be constructed in this vacant area. The area exposed to CNEL 65 to 70 extends southeast on Bay Farm Island to include buildings used for light industry on Harbor Bay Parkway. The light industrial uses are compatible with Airport operations.

Although no part of the City of Hayward is exposed to noise levels of CNEL 65 or greater resulting from operations at Oakland International Airport, the arrival track to Runway 29 at South Field passes over parts of Hayward. Local residents in that community could be annoyed by aircraft overflights en route to Oakland and by local aircraft operations at the Hayward Air Terminal.

Future Noise Conditions

Exhibit 5-3 shows future CNEL 65, 70, and 75 noise contours for forecast aircraft operations at the Airport. The flight tracks used as input to the INM for the 1991 CNEL calculations are the same as those used for the 1986 CNEL calculations. The input for the 1991 CNEL calculations contained no additional noise abatement changes except for a small increase in Stage 3 aircraft (B-737-300, BAe 146, or MD-80)* operations. The percentages of Stage 3 aircraft in the air carrier aircraft mix at the Airport is forecast to increase from approximately 40% in 1986 to about 44% by 1991.

Daily air carrier aircraft operations are forecast to increase about 10%, from 204.9 operations in 1986 to 224.6 in 1991. Furthermore, nighttime air carrier aircraft operations are forecast to increase 83% (from 11.8 operations in 1986 to 21.6 operations in 1991) primarily as a result of expanded Federal Express hubbing activity at the Airport. Consequently, the 1991 CNEL contours northwest of the Airport are larger than the 1986 CNEL contours.

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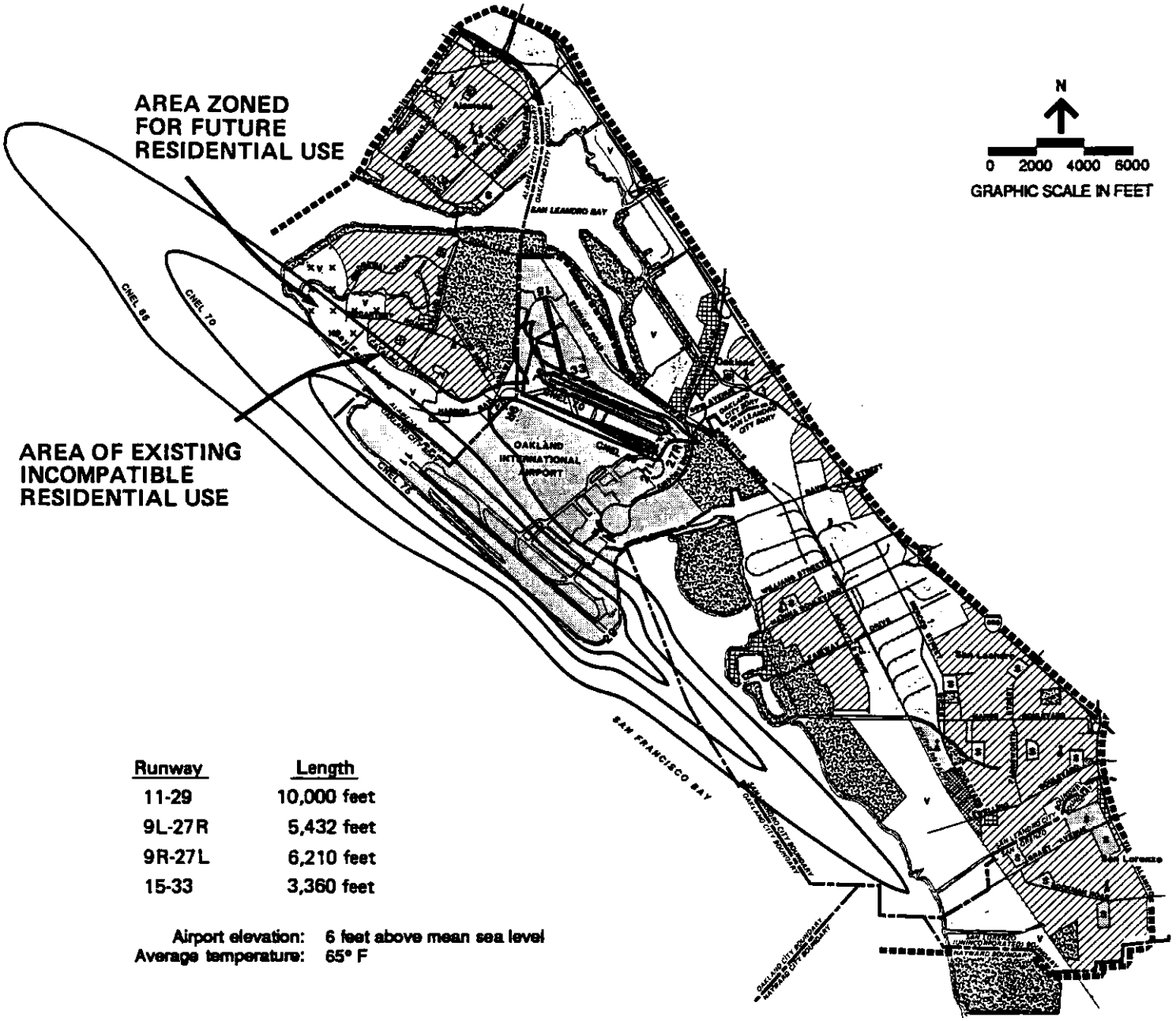
*Aircraft noise characteristics can be classified according to federal noise level standards specified in FAR Part 36 [5.4], as meeting Stage 1, Stage 2, or Stage 3 standards (Stage 3 being the quietest).



Runway	Length
11-29	10,000 feet
9L-27R	5,432 feet
9R-27L	6,210 feet
15-33	3,360 feet

Airport elevation: 6 feet above mean sea level
Average temperature: 65° F

Land uses generally considered incompatible in areas exposed to aircraft noise levels of CNEL 65 or higher

- Single-family residential
- Multifamily residential
- Mobile home park
- Public/semi-public
- School
- Church

Land uses generally considered compatible in areas exposed to aircraft noise levels of less than CNEL 65

- Commercial
- Industrial
- Park/recreation
- Vacant
- Airport environs boundary
- CNEL — Community Noise Equivalent Level (CNEL) contour
- Airport boundary

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Oakland International Airport

Future Conditions Noise Exposure Map: 1991

Exhibit

5-3

The 1991 CNEL contours are basically the same as the 1986 CNEL except that the 1991 CNEL 65 and 70 contours extend farther northwest and southeast than the comparable contours for 1986. These are insignificant differences because the northwestern and southeastern tips of the CNEL 65 and 70 contours for both years are over San Francisco Bay, which represents a compatible land use.

Another difference between the 1986 and 1991 CNEL contours is that, in 1991, there is an additional CNEL 70 contour for North Field. Runway 9R-27L at North Field is surrounded by a CNEL 70 contour for 1986, but both Runways 9R-27L and 9L-27R at North Field are surrounded by a CNEL 70 contour for 1991.

The 1991 CNEL 65 and 70 contours encompass Bay Farm Island farther to the northeast than the 1986 CNEL 65 and 70 contours. This area on the southwest side of the Island contains approximately 260 single-family units with about 590 residents, light industrial buildings along Harbor Bay Parkway, and a vacant area. Approximately 770 homes could be constructed in the part of the vacant area that is zoned single-family residential with a planned development overlay.

NOISE ABATEMENT TRAFFIC PATTERNS AND AIRCRAFT OPERATIONS--NORTH FIELD

The Port of Oakland has established specific noise abatement traffic patterns and prohibited certain aircraft operations for North Field under visual flight rule (VFR) conditions. These traffic patterns and procedures, as set forth in an information sheet [5.5] distributed by the Port of Oakland to pilots using North Field, are described below and depicted on Exhibit 5-4. The information sheet is included in Appendix B. Pilots are also informed of noise abatement procedures by FAA air traffic controllers when workload permits.

The VFR noise abatement traffic patterns are designed to minimize aircraft noise disturbance at homes in the vicinity of the Airport. Pilots are advised not to make straight-out departures off Runways 27L and 27R to avoid flying over residential areas on Bay Farm Island. Instead, pilots departing the Airport on Runway 27R are instructed to make a right turn over San Leandro Bay and proceed to the left of the "green tank" (a large, easily visible gas storage tank). Pilots performing touch-and-go operations on Runway 27L are instructed to make a left turn before reaching the homes on Bay Farm Island.

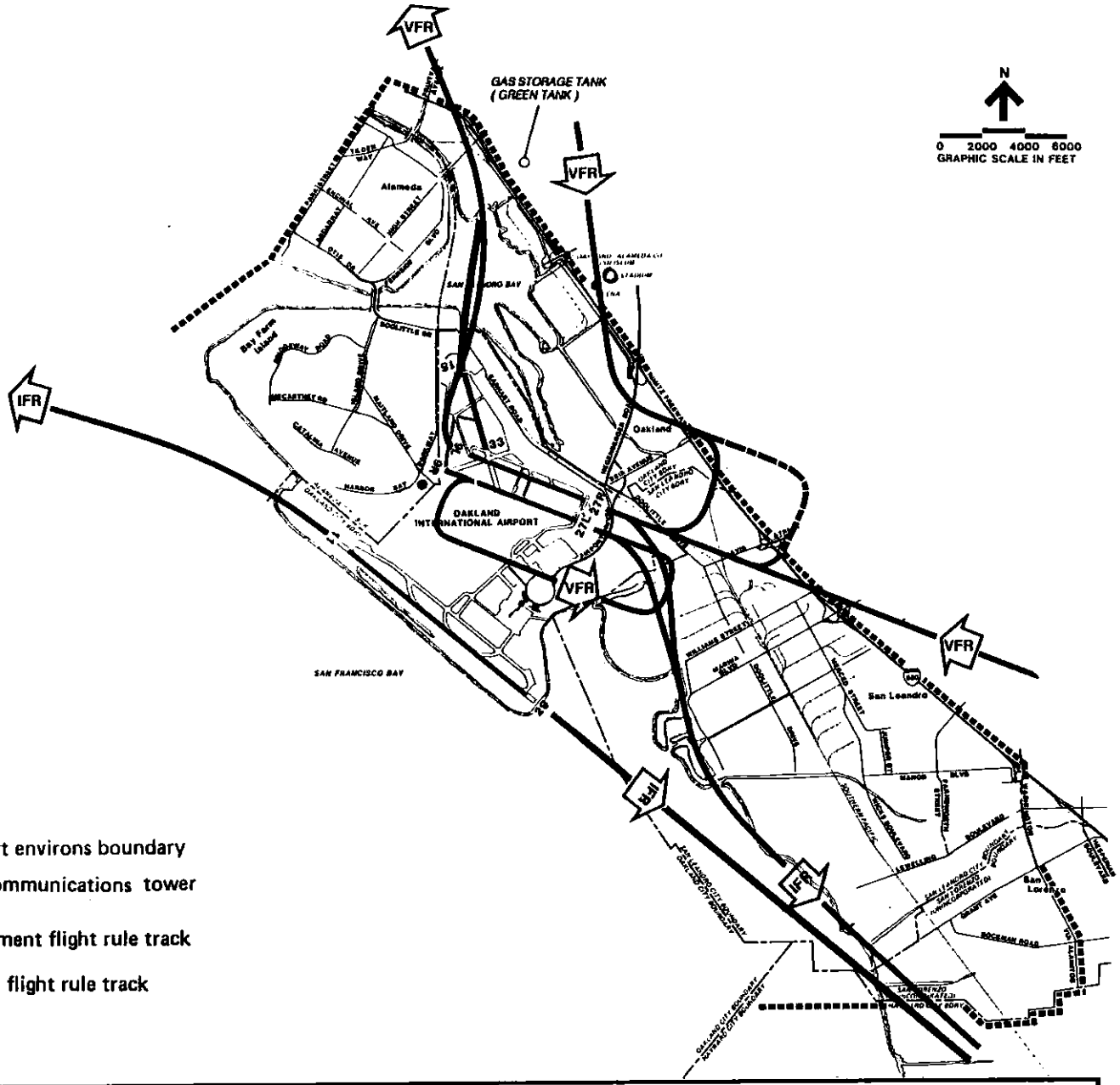

Exhibit 5-4

FAR Part 150 Noise Compatibility Program
Oakland International Airport

IFR and VFR Noise Abatement Traffic Patterns

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The Port of Oakland has established noise abatement departure procedures from Runways 11, 9L, and 9R under IFR conditions. Pilots are advised to use the Marina One, Skyline One, Diablo Three, or Scaggs Island One departures and to make a right turn to increase their distance from residential areas in the City of San Leandro. The Diablo Three and Scaggs Island One departures require a right turn to a 120-degree heading [5.6].

The Port of Oakland had also established an experimental, unpublished noise abatement flight track for departures from Runway 27L under IFR conditions. Pilots departing Runway 27L at night were instructed to follow a 240-degree heading to avoid flying over the residential areas on Bay Farm Island. The erection of a 110-foot high telecommunications tower created a safety hazard for pilots using this procedure. Consequently, the noise abatement track from Runway 27L was eliminated. The FAA Regional Office in Los Angeles approved construction of the tower without taking this track into account, because it was experimental and unpublished.

Pilots departing the Airport on Runway 33 are advised to make a straight-out departure, followed by a 45-degree right turn over San Leandro Bay as soon as possible. The pilots are then instructed to fly to the left of the green tank. Pilots are advised not to make left turns when departing from Runway 33.

In addition, all aircraft with a certificated gross takeoff weight in excess of 12,500 pounds are prohibited from departing on Runways 27L and 27R, unless their takeoff begins at the thresholds of the runways. There are no exceptions to this policy.

NOISE ABATEMENT TRAFFIC PATTERNS--SOUTH FIELD

As shown on Exhibit 5-4, the Port of Oakland has established a noise abatement flight track from Runway 29 for nighttime departures under IFR conditions. This flight track is called the Silent Five Departure. Pilots are advised to make a left turn over San Francisco Bay to increase their distance from the southwestern portion of Bay Farm Island. This flight track is not used during the day or evening hours because of airspace limitations caused by departures from San Francisco International Airport.

AIRPORT PROCEDURES FOR ENGINE RUNUPS

The Port of Oakland has established procedures for aircraft engine runups. These procedures are presented in Chapter 6 under Noise Abatement Action 4.

OTHER PORT OF OAKLAND NOISE ABATEMENT MEASURES

In addition to the noise abatement measures for North Field, the Oakland Board of Port Commissioners has established the following measures [5.7]:

1. All aircraft departing the Airport on Runway 29 are discouraged from making right turns over Bay Farm Island.

2. Airlines are advised and encouraged to schedule all training flights between 7:00 a.m. and 10:00 p.m. to the extent reasonably practicable.

BAY TERMINAL RADAR APPROACH PROCEDURES FOR THE AIRPORT

The FAA Bay Terminal Radar Approach Control (Bay TRACON) has instituted a number of procedures to reduce aircraft noise in populated areas [5.8]. The following two procedures are used by Bay TRACON for noise abatement at Oakland International Airport:

1. During nighttime hours (10 p.m. to 7 a.m.), turbojet aircraft departing Runway 29 under IFR conditions are issued a standard instrument departure procedure (Silent Five) to turn over the San Francisco Bay to fly further south of Bay Farm Island.

2. Turbojet aircraft departures under IFR conditions are not to be turned toward the heavily populated, noise sensitive Oakland Hills at altitudes less than 3,000 feet.

AIRPORT NOISE ABATEMENT TASK FORCE

The Port of Oakland has established a Noise Abatement Task Force, which is composed of Airport management and staff, Airport tenants, and representatives from Bay TRACON, the FAA Airport Traffic Control Tower at the Airport, the Alameda Naval Air Station, the Hayward Air Terminal, and the general public. The Task Force meets quarterly (January, April, July,

and October) to discuss recent noise complaint statistics and problems. The Task Force's objective [5.9] is to solve problems and inform those in attendance of various issues related to noise from Airport and aircraft operations. Concerned members of the public are invited to attend Task Force meetings so that their specific complaints can be addressed. The Task Force meetings are always open to the general public.

PROCESSING OF NOISE COMPLAINTS

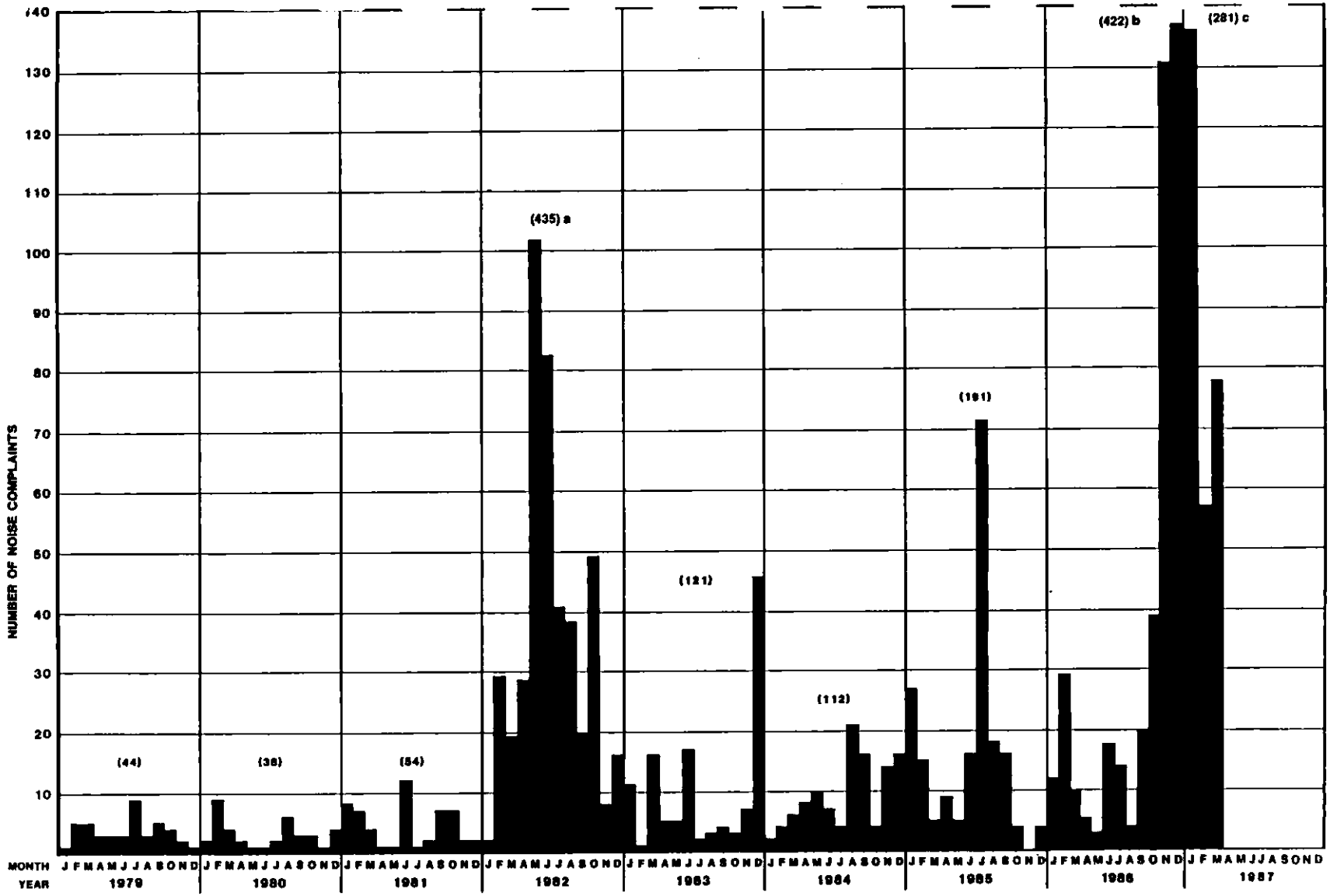
All noise complaints received at the Airport are logged and investigated. Most complainants register their complaints by telephoning either an Airport staff member or the recently established 24-hour Oakland Airport Aircraft Noise Report Line. The Report Line consists of a sophisticated telephone answering machine, which asks the caller for the following information: name, address, telephone number, date and time the noise was heard, the type of noise experienced, and any additional comments. The information gathered on the Report Line or by Airport staff is documented on a one-page form and forwarded to the Supervisor of Airfield Services who investigates the noise complaint and informs the complainant of the findings. A copy of the noise complaint form with the investigative findings is kept for statistical analysis.

In instances where Airport staff determines that the noise complaint was a result of an aircraft operation not in compliance with the Airport noise abatement policies, the pilot and/or owner of the aircraft is notified by letter of the Airport noise abatement policies, and requested to adhere to said policies in the future.

SUMMARY OF NOISE COMPLAINT DATA

Exhibit 5-5 presents a graphic summary of the number of noise complaints registered by the Port, Airport management, and the FAA from January 1979 through March 1987. From 1979 through 1981, there were no more than 54 complaints registered during any one calendar year, and a maximum of 12 complaints during any one month.

The 1982 total of 435 complaints represented an increase of more than 800% over the 54 complaints received in 1981. The majority of the increase in complaints came from one household in the Fernside/East Shore neighborhood of the City of Alameda, which accounted for about 73% (317 out of 435) of the noise complaints registered in 1982 [5.10].



(123) Total number of complaints registered for the year. 1987 total is for January through March.

Number of noise complaints registered.

Note: Noise complaints registered include those recorded by Port of Oakland, Oakland Airport management, and FAA personnel, in the form of a letter, telephone call, or other communication.

a. One household accounted for about 73% of the complaints.
b. One household accounted for about 27% of the complaints.
c. One household accounted for about 35% of the complaints.

Source: Oakland International Airport

Exhibit 5-5

FAR Part 150 Noise Compatibility Program
Oakland International Airport

Noise Complaints Registered Between January 1979 and March 1987

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The number of noise complaints registered in 1983 (121) was significantly lower than the 1982 total. The most noticeable decrease in the number of complaints was from the Fernside/ East Shore neighborhood as a result of a cooperative effort involving the FAA Tower, Airport management, and North Field operators and pilots [5.11].

In 1983, of the total 121 noise complaints, the majority (42) were registered in December. Of the total, 63 came from one household on Bay Farm Island. On the other hand, of the 112 noise complaints recorded in 1984, no more than 18 complaints were filed by one party. Instead, a whole community of new residents on Bay Farm Island registered more than half of the complaints in that year. Of the complaints registered in 1983, 70% were attributed to North Field operations; only 39% of the complaints registered in 1984 were attributed to North Field operations. During 1984, South Field operations were responsible for 34% of the complaints; runups were responsible for 7% of the complaints, and overflights and other unknown noise accounted for 20% [5.12].

In 1985, there was a total of 191 noise complaints, 37 of which were filed by one party. Forty-two of the complaints were filed on July 21 as a result of the emergency shutdown of Runway 29 and the subsequent use of North Field by air carrier aircraft. North Field operations accounted for 65% of the complaints registered in 1985. Overflights from San Francisco International Airport produced 21% of the complaints in that year; South Field operations accounted for 6% of the complaints, and runups and other miscellaneous activities accounted for 8%.

In 1986, most of the noise complaints originated from the City of Alameda, which includes Bay Farm Island. Residents of Alameda outside of Bay Farm Island were responsible for about 43% (178 out of 422) of the noise complaints registered in 1986. Most of these complaints (121 out of 178) were registered from the Fernside/East Shore neighborhood of Alameda. In the same time period, one household in San Leandro accounted for about 27% of the complaints received (115 out of 422), Bay Farm Island residents accounted for 23% (99 out of 422), Oakland residents accounted for 4%, and residents from communities not listed accounted for 3%. About 77% (324 out of 422) of the complaints received in 1986 resulted from general aviation operations at North Field [5.13].

Statistical summaries of noise complaints recorded during the first three months of 1987 show that 35% (98 out of 281) of the noise complaints originated from the San Leandro/Hayward area. Almost all of these complaints were filed by one

household in San Leandro. Residents of Alameda outside of Bay Farm Island were responsible for about 28% (80 out of 281) of the noise complaints received in the first three months of 1987. Forty percent (32 out of 80) of these complaints were from the Fernside/East Shore neighborhood. In the same time period, residents of Bay Farm Island accounted for about 24% (68 out of 281) of the complaints received; Oakland residents accounted for 3% of the complaints, and residents from communities not listed accounted for 10% [5.13].

The most noticeable increase in the number of complaints received in the first three months of 1987 was from the San Leandro/Hayward area and the Fernside/East Shore neighborhood. There were no complaints registered from these two areas in the first three months of 1986, but 46% (129 out of 281) of the complaints were registered from these areas during the same three-month period in 1987. The comparison of statistics from the first three months of 1986 and 1987 also shows that there was a noticeable increase in the number of complaints (from 2 to 37) as a result of air carrier aircraft operations at South Field. However, there were many more complaints (179) received between January 1987 and March 1987 as a result of general aviation operations at North Field [5.13].

Chapter 5

REFERENCES

5.1 U.S. Department of Transportation, Federal Aviation Administration, "Aviation Noise Abatement Policy," Washington, D.C., November 18, 1976.

5.2 U.S. Department of Transportation, Federal Aviation Administration, "Noise Abatement Departure Profile," Advisory Circular 91-53, October 17, 1978.

5.3 BBN Laboratories, "Noise Measurement Program at Oakland International Airport," July 24, 1986.

5.4 U.S. Department of Transportation, Federal Aviation Administration, Federal Aviation Regulations (FAR) Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification," Washington, D.C., December 1969, as amended through 1984.

5.5 Port of Oakland, Oakland North Airport, "Prohibited Aircraft Operations, and VFR Noise Abatement Traffic Pattern."

5.6 Jeppesen Sanderson, Inc., Jeppesen Airway Manual, 1986.

5.7 Oakland Board of Port Commissioners, Resolution No. 24450, "Resolution Establishing a Preferential Runway and Noise Abatement Program at Metropolitan Oakland International Airport," February 8, 1978.

5.8 Federal Aviation Administration, Bay TRACON, Facility Handbook 7210.9, effective March 14, 1984.

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

5.10 Watson, George, "Minutes of the Noise Abatement Task Force Meeting," January 11, 1983.

5.11 Watson, George, "Minutes of the Noise Abatement Task Force Meeting," September 13, 1983.

5.12 Watson, George, "Minutes of the Noise Abatement Task Force Meeting," January 9, 1985.

5.13 Watson, George, "Minutes of the Noise Abatement Task Force Meeting," April 14, 1987.

Chapter 6

EVALUATION OF NOISE COMPATIBILITY PLANNING ALTERNATIVES

BACKGROUND

This chapter presents various alternatives that were considered for noise abatement and noise mitigation as part of the Noise Compatibility Program for Oakland International Airport. A brief description of each alternative is presented to show its applicability to the Airport and its environs.

Noise abatement actions are those that the Port of Oakland, the airlines, other Airport users, and the FAA Airport Traffic Control Tower can implement to reduce the amount of noise exposure in the Airport environs, such as changing aircraft operational procedures, Airport operations, and/or relocating Airport facilities. Noise mitigation actions, in contrast, are those that would minimize the impact of aircraft noise in affected communities and neighborhoods after all measures to reduce noise at the source have been implemented. Such mitigation actions include comprehensive planning, zoning, acoustical treatment of homes, and the granting of avigation easements.

The noise abatement and noise mitigation actions required to be evaluated under FAR Part 150 and actions taken or considered at other airports were reviewed to determine their applicability to the Airport and its environs. In addition, a number of actions specific to the Airport were formulated and evaluated.

NOISE ABATEMENT ACTIONS

Noise abatement actions reduce noise at the source, that is, in the aircraft itself or at the airport. Typical noise abatement actions include:

- Physical changes to the airport (aircraft landing threshold displacement, runway extensions, new aircraft runup pads, construction of noise barriers).
- Changes in airport operations (preferential runway use, limited operation times, nighttime engine test procedures).

- Changes in aircraft operational measures (takeoff or landing procedures, preferential flight tracks, aircraft noise emission characteristics).

- Periodic monitoring of aircraft noise exposure levels and the regular review of adopted noise remedy programs to ensure implementation.

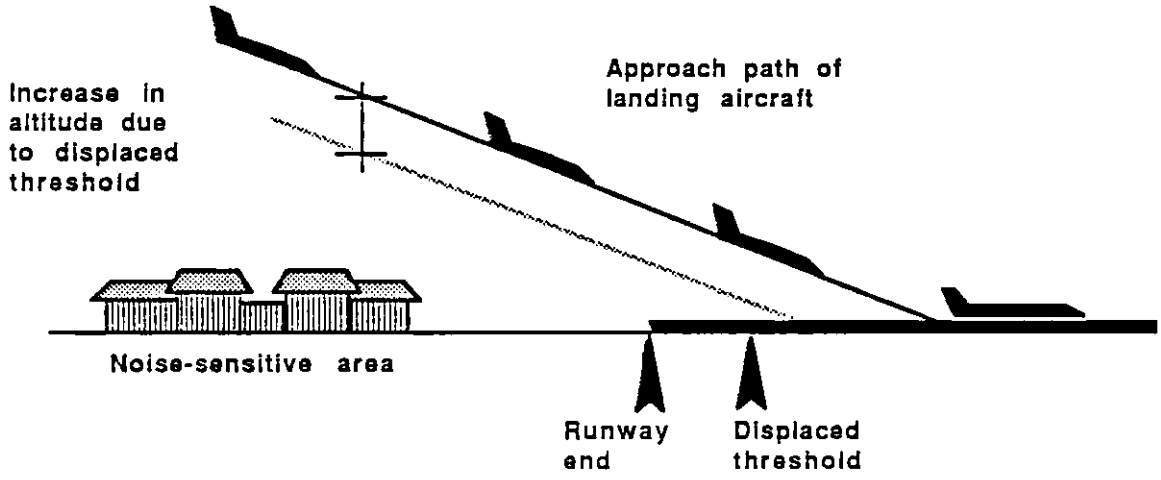
- Changes in aircraft and engine noise characteristics through advancement in technology.

Table 6-1 lists 25 such actions and their applicability to Oakland International Airport. The appropriate implementing agencies for the various actions described in this section are also listed in Table 6-1. Some of the actions have already been implemented, and others, after careful consideration, have not been recommended.

The following presents a discussion of each of the 25 noise abatement actions listed in Table 6-1.

1. Indicate Displaced Threshold or Construct Runway Extension

The indication of a displaced threshold or the construction of a runway extension permits aircraft altitudes to be raised along approach and departure flight tracks, thereby increasing the distance between the noise source (the aircraft) and the noise receivers (people). Generally, threshold displacement may reduce noise levels in the approach areas near an airport. As shown below, a displaced threshold for arriving aircraft at the end of the runway nearest the community would allow aircraft to fly higher over the noise-sensitive areas under the flight path.



(2/15/88)

Table 6-1

NOISE ABATEMENT ACTIONS EVALUATED FOR IMPLEMENTATION
Oakland International Airport

Action	Implementation	Implementing agency
1. Indicate displaced threshold or construct runway extension	Yes	Port of Oakland
2. Construct new runway	No	n.a.
3. Establish noise abatement procedures for helicopters	Yes*	Port of Oakland
4. Relocate engine runup areas, restrict runup times, or change runup procedures	Yes*	Port of Oakland
5. Equalize or rotate the use of runways	No	n.a.
6. Establish preferential runway use procedures	Yes*	Port of Oakland/Federal Aviation Administration
7. Eliminate or modify military jet operations	No	n.a.
8. Impose nighttime restrictions or curfews	No	n.a.
9. Restrict training flights	Yes*	Port of Oakland/Federal Aviation Administration
10. Change takeoff, climbout, or landing procedures	Yes*	Airlines
11. Change approach and departure flight tracks	Yes*	Federal Aviation Administration/ airlines
12. Fan-out departure tracks	No	n.a.
13. Shift air carrier operations to another airport	No	n.a.
14. Establish a permanent noise-monitoring system	Yes*	Port of Oakland
15. Require FAR Part 36 compliance	Yes	Port of Oakland/Federal Aviation Administration
16. Establish noise abatement staff	Yes*	Port of Oakland
17. Establish noise abatement committee	Yes*	Port of Oakland
18. Tighten noise emission standards	Yes	Port of Oakland/Federal Aviation Administration/NASA/ other federal agencies
19. Construct high-speed exit taxiways	Yes*	Port of Oakland
20. Relocate facilities such as aircraft parking aprons	No	n.a.
21. Restrict ground movement of aircraft	No	n.a.
22. Limit number or types of operations or types of aircraft	Yes*	Port of Oakland/Federal Aviation Administration
23. Base landing fees on aircraft noise or on the time of aircraft arrival	No	n.a.
24. Construct noise barriers or berms	No	n.a.
25. Enforce prescribed flight patterns	Yes*	Port of Oakland/Federal Aviation Administration

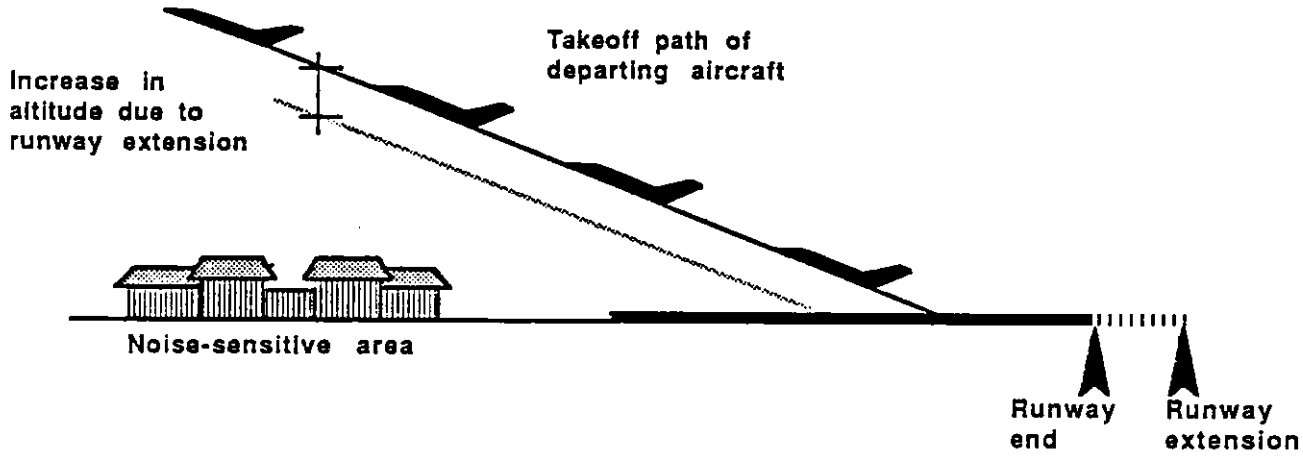
n.a. = not applicable.
NASA = National Aeronautics and Space Administration.

*Recommended actions that have been implemented or are being implemented (although the text may indicate actions needed beyond those already in effect). (2/15/88)

Source: Peat Marwick, December 1987.

There are very few people living below the aircraft arrival tracks at Oakland International Airport; therefore, a displaced threshold will not benefit the Airport environs.

For departure tracks over the same community, it could be beneficial to construct a runway extension at the other end of the runway, as shown below.



With a runway extension, the departing aircraft would achieve greater altitude by the time they overfly the noise-sensitive community. Depending on the length of the runway extension, larger (and sometimes noisier) aircraft may be able to use the airport. However, this is not a factor at Oakland International Airport because the larger aircraft (e.g., B-747) are already using the Airport.

There are only about 70 residential units on Bay Farm Island that may be subjected to levels of aircraft noise between CNEL 65 to 70, primarily caused by aircraft departing on Runway 29. The departure flight track from Runway 29 is over San Francisco Bay and does not pass over the residential neighborhoods. The homes inside the CNEL 65 contour are affected by sideline noise from aircraft flying over the Bay. Therefore, a runway extension would not reduce noise in the affected residential areas. However, the Port of Oakland has a permit to construct a proposed 2,500-foot extension of Runway 29 to the northwest to accommodate heavier aircraft with international destinations.

There are homes on Bay Farm Island and in the Fernside/East Shore neighborhood of the City of Alameda that are affected by general aviation departures from North Field. The southeast end of Runway 15-33 should be extended 2,000 feet to its original length of 5,360 feet to permit the establishment of a noise abatement standard instrument departure (SID) from Runway 33 under IFR conditions provided that such a SID is determined by the FAA to be practicable and feasible (see Noise Abatement Action 11).

2. Construct New Runway

At some airports, the construction of a new runway is one means of reducing adverse noise exposure in neighboring communities. The new runway is constructed in a location and with an orientation that permits aircraft to avoid overflights of adjacent residential neighborhoods.

At Oakland International Airport, the location of existing air carrier Runway 11-29 allows aircraft to avoid overflying residential neighborhoods in the Airport environs because all of the flight tracks to and from the runway are over San Francisco Bay.

There are, however, approximately 70 homes on Bay Farm Island within the CNEL 65 to 70 noise contour that currently may be affected by sideline noise from Runway 11-29. Also, Harbor Bay Isle plans to construct an additional 770 homes (known as Village 5) within the CNEL 65 noise contour on Bay Farm Island in areas as yet undeveloped but zoned for residential use. However, the Village 5 homes will be subject to noise easements and therefore legally compatible with noise levels of CNEL 65 or greater. So that the existing and proposed residential development would not be within the CNEL 65 to 75 noise contour, a new runway would have to be constructed parallel to and south of Runway 11-29 on fill in San Francisco Bay. The representative of the San Francisco Bay Conservation and Development Commission (BCDC) on the Project Coordination Committee indicated that BCDC would be opposed to the construction of a new runway in the Bay unless it was shown that there were no other alternatives. Given the small number of homes that are, or could be, affected by noise exposure levels above CNEL 65, this option is currently not economically or environmentally feasible and was not recommended.

3. Establish Noise Abatement Procedures for Helicopters

Approximately 3% of the operations at Oakland International Airport are by helicopters [6.1]. This level of helicopter activity has an insignificant environmental impact on the Airport environs.

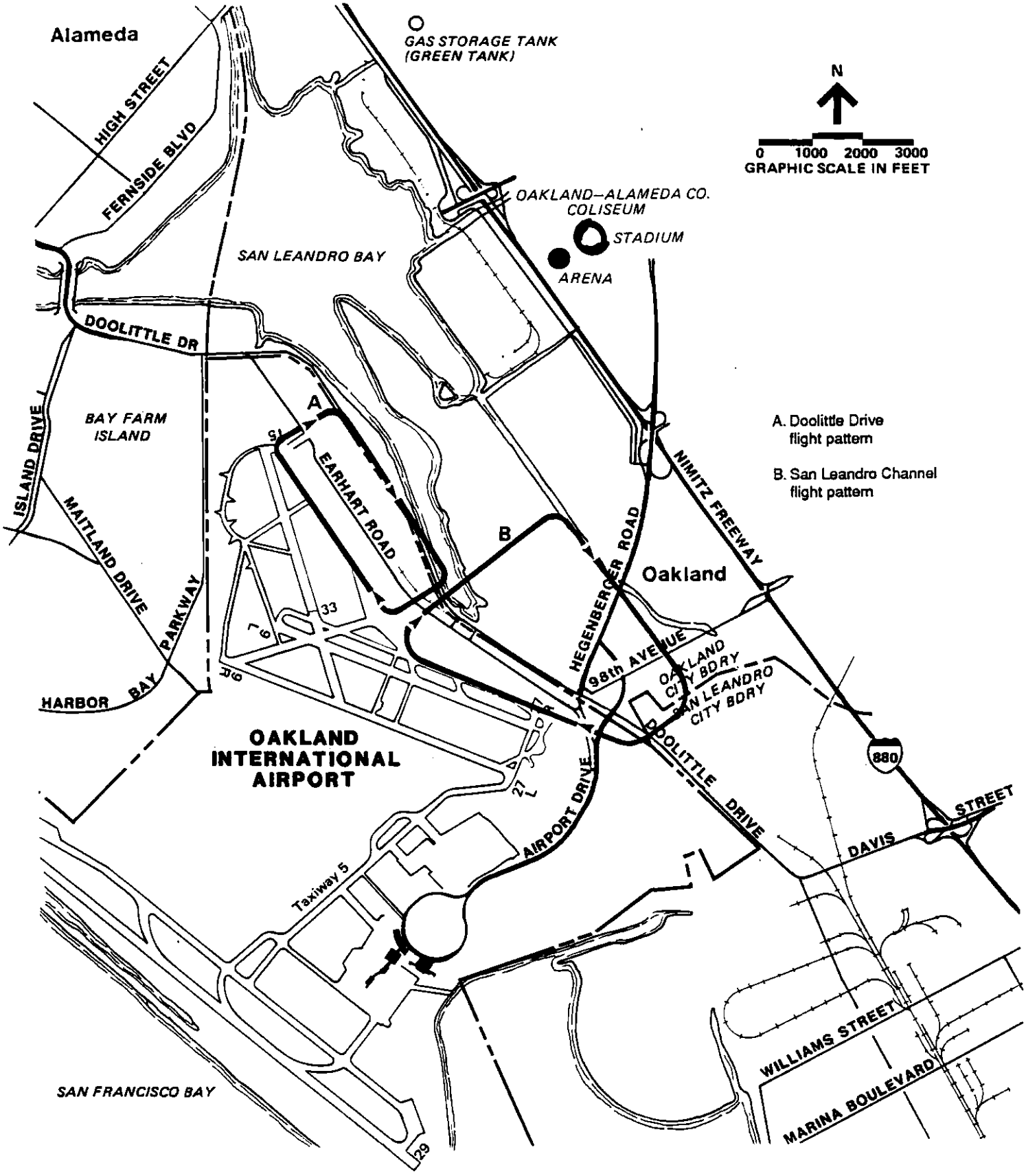
The Port of Oakland has established specific helicopter noise abatement traffic patterns for North Field. These traffic patterns, as set forth in an information sheet [6.2] distributed by the Port of Oakland to pilots using North Field, are described below. The noise abatement traffic patterns for North and South Fields are depicted on Exhibit 6-1.

There are two noise abatement traffic patterns designed to minimize helicopter noise disturbance to noise sensitive areas in the vicinity of the Airport, such as the Oakland Airport Hilton Hotel. For the San Leandro Channel Flight Pattern, pilots are advised to enter the approach pattern above the San Leandro Channel and proceed southeasterly until passing 98th Avenue, where they are instructed to make a right turn. Then the pilots are instructed to make another right turn after passing Doolittle Drive and proceed to the northwest parallel Runway 27R. For departures, helicopter pilots are advised to overfly the apron areas along the east side of Runway 9L-27R and to make a standard right turn between Hangar 5 and Hangar 6 at or above 200 feet above mean sea level (MSL).

The other helicopter noise abatement traffic pattern is called the Doolittle Drive Flight Pattern. For this pattern, pilots are advised to enter the approach pattern over Doolittle Drive and to proceed southeasterly before making a right turn between Hangar 5 and Hangar 6 at or above 200 feet above MSL. For departures, pilots are advised to overfly the apron areas along the east side of Runway 15-33 and to make a standard right turn near the threshold of Runway 15.

All other approach and departure flight patterns are as directed by the Airport FAA Airport Traffic Control Tower. Standard helicopter traffic pattern altitude is 500 feet above ground level. When Runway 9L or 9R is in use, pilots are instructed to fly in the reverse directions for the San Leandro Channel and Doolittle Drive Flight Patterns.

The Port of Oakland should continue the use of specific helicopter noise abatement traffic patterns for North Field as described above. However, additional restrictions are not necessary.



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FAR Part 150 Noise Compatibility Program
Oakland International Airport

North Field Helicopter Noise Abatement Traffic Patterns

Exhibit

6-1

4. Relocate Engine Runup Areas, Restrict Runup Times, or Change Runup Procedures

Aircraft engine runups are a source of noise at most airports. Actions to reduce noise include relocating runup areas, rotating the use of runup areas on the basis of climatic conditions, and constructing noise barriers or berms (see Noise Abatement Action 24). Many airports restrict runups to certain hours, keeping nighttime operations to a minimum.

It may also be possible to restrict engine power settings to specified levels and to reduce the amount of operating time at various levels. "Hush-houses" have been constructed at many airports for testing the engines of smaller aircraft, such as, military aircraft. "Hush-houses" are not large enough to accommodate larger air carrier aircraft.

The Port of Oakland has established the following procedures for aircraft engine runups:

1. No aircraft engines shall be run up between the hours of 2300 and 0600 (local time) without special permission of the Airport Manager [6.3].

2. No aircraft engine shall be started, warmed up, or run up except in areas designated by the Airport Manager [6.4].

3. Aircraft engine test runups between the hours of 7:00 p.m. and 7:00 a.m. shall be prohibited except where the level of noise generated by such testing at the nearest residential property on Bay Farm Island on July 21, 1976, does not exceed 75 dBA between the hours of 7:00 p.m. and 10:00 p.m. and 70 dBA between the hours of 10:00 p.m. and 7:00 a.m.; provided, however, that engine test runups shall not include any preflight engine runups on apron areas, taxiways and runways [6.5].

At South Field, runups are authorized at (1) the north and west blast fences at the George P. Miller Maintenance (World Hangar) Facility and (2) Taxiway 8. At North Field, runups are permitted at the Hangar 6 Maintenance Facility blast fence, and at the runup pad adjacent to Taxiway A for reciprocating engine aircraft that weigh 12,500 pounds or less. The Port of Oakland has evaluated an alternate runup site on Taxiway 5 between Taxiways 1 and 2 that is farther away from residential areas than the two sites listed above. The Taxiway 5 site has been proven feasible and has been

designated as a location for engine testing during nighttime hours. The Port is continuing to look for other sites that meet or exceed the requirements stated above.

Regardless of the location or time, aircraft operators should continue to notify the Airport Operations Department and the FAA Airport Traffic Control Tower on the Airport prior to running up turbine aircraft engines, and to monitor the FAA Tower radio frequency during the runup to be aware of other traffic in the area.

Between 11 p.m. and 6 a.m., the Airport Duty Supervisor may grant air carriers permission to run up engines for test purposes provided that the aircraft operator does the following [6.6]:

- Informs the Airport Operations Supervisor 30 minutes prior to the proposed runup about the number and type of engines, percent of throttle, starting time, and duration of testing.
- Agrees to run the engines at a location on the Airport determined by the Duty Supervisor.
- Agrees to monitor the appropriate ground control frequency throughout the duration of the proposed runup operation.
- Agrees to move the aircraft, reduce power, or cease further engine runup, as directed by the Duty Supervisor, if such runup generates complaints from the surrounding communities.

In general, the above procedures are followed by the Airport tenants, including American Airlines and the National Airmotive Corporation (NAC). Both American Airlines and NAC have large maintenance facilities at the Airport. A significant amount of noise is generated at the NAC facility on the north end of Earhart Road (North Field) when NAC uses its outdoor test stand for engine runups. However, NAC has discontinued use of its outdoor test stand at night and on weekends.

NAC should proceed with its plan to discontinue using its outdoor test stand for engine runups. The Port of Oakland should extend the hours when no aircraft shall be run up without special permission from the Airport Manager. The current hours (11 p.m. to 6 a.m.) should be extended to 10 p.m. to 7 a.m. on weekdays and to 10 p.m. to 8 a.m. on weekends. The Port should also continue to enforce the other

procedures for aircraft engine runups mentioned above so that engine runups will be only a minor source of noise at the Airport and in its environs.

Oakland International Airport is not the only source of engine runup noise for residents in the Airport environs. During certain climatic conditions, residents can hear engine runups performed at San Francisco International Airport or the Alameda Naval Air Station (NAS). Some of the engine noise from the Alameda NAS can be attributed to the A-6 military aircraft, which cannot be tested in a "silencing chamber" [6.7].

5. Equalize or Rotate the Use of Runways

Equalizing or rotating the use of runways can reduce the effects of aircraft noise if some of the noise is shifted to less sensitive areas of the Airport environs. In most instances, however, this strategy is designed to distribute aircraft noise so that many communities--rather than one or two--share the noise exposure. Implementation of this type of measure obviously requires that the airport in question have a sufficient number of runways to permit operations in different directions when allowed by weather conditions.

Because of prevailing weather patterns, Runway 11 at South Field can only be used for a small proportion (about 15%) of annual aircraft operations at the Airport. Therefore, equalizing the use of Runway 11-29 as a noise abatement measure is not feasible.

Runway 9R-27L at North Field can accommodate limited air carrier aircraft operations. However, air carrier operations on Runway 11-29 should not be transferred to Runway 9R-27L because air carrier departures from Runway 27L would significantly increase the adverse effects of aircraft noise on residents of Bay Farm Island. Therefore, equalizing the use of the runways on North and South Fields by moving some air carrier operations from Runway 11-29 to Runway 9R-27L is not feasible as a noise abatement measure at the Airport and was not recommended.

6. Establish Preferential Runway Use Procedures

Preferential runway use procedures involve the use of specific runway(s) to reduce overflights of noise-sensitive areas. Preferential runway use can also include a conscious effort to maximize or restrict the use of specific runways by class and

type of aircraft to reduce aircraft noise exposure. In this instance, use of a runway with approach and departure paths over dense residential areas may be restricted to light general aviation aircraft.

At Oakland North Field, nighttime operations from Runways 27L and 27R have resulted in some overflights of residential areas. To reduce these overflights, the Port has requested the operators using North Field at night to use Runways 9R and 9L for departures unless wind, weather, or air traffic conditions dictate otherwise. It is recommended that the Port of Oakland formalize this procedure in its noise abatement policies. It is further recommended that FAA air traffic control personnel continue the informal practice of advising pilots operating aircraft at North Field of this preferential runway use procedure established by the Port of Oakland.

The preferential runway use procedure described above will minimize the number of noisy departures to the northwest over the residential areas in Alameda.

7. Eliminate or Modify Military Jet Operations

At most civilian airports, military aircraft contribute very little to cumulative noise exposure values because of the low number of military operations (compared with the number of airline operations).

Combined military activity at North and South Fields represents less than 1% of the total aircraft operations at Oakland International Airport. The reduction or elimination of military aircraft operations would have little or no effect on reducing CNEL noise exposure values in the Airport environs and was not recommended.

8. Impose Nighttime Restrictions or Curfews

Curfews are regulations banning aircraft operations during certain hours. An airport operator may adopt and enforce a nighttime curfew under certain conditions. The operator must, however, work very closely with airport users to identify economic impacts or hardships on interstate or foreign commerce that might occur, and weigh them against the benefits. Because the impetus for a curfew probably comes from neighboring communities and because FAA Tower operations would undoubtedly change, representatives from cities in the airport environs and from the FAA must also be included in the decision-making process.

The economic impact of a curfew varies widely from one airport to another. For example, a curfew imposed at a small general aviation facility with less than 10 late-night operations would probably have minor economic consequences. At a major facility, on the other hand, many parties (including air cargo and mail carriers) could be severely affected.

Approximately 12% to 13% of the daily scheduled airline and commuter operations into and out of Oakland International Airport occur during nighttime hours (after 10 p.m. and before 7 a.m.). These operations respond to the travel needs of passengers and also facilitate the positioning of airline equipment to meet route structure and scheduling requirements. Few of these operations could be rescheduled to daytime hours without downgrading service or adversely affecting the ability of the airline to make the most cost effective use of its aircraft fleet.

Approximately 50% of the scheduled air cargo/express package operations into and out of Oakland International Airport occur during nighttime hours [6.1]. Air cargo/express package operations, like airline operations, must meet national route structure and scheduling requirements, so rescheduling these operations would probably cause unacceptable delays.

Approximately 10% of all aircraft operations at the Airport occur during nighttime hours [6.8]; therefore, a strict curfew on nighttime operations could result in a significant economic loss to the community.

However, to offset the noise impacts associated with nighttime departures from South Field, pilots departing Runway 29 are advised to make a left turn to a 270-degree heading over San Francisco Bay to increase their distance from the southwestern portion of Bay Farm Island. This noise abatement procedure, called the Silent Five Departure, is possible at night because lower nighttime aircraft activity levels would prevent conflicts with aircraft traffic from other airports (See Noise Abatement Action 11).

Relative to North Field, citizen input during the course of the study indicated that a nighttime curfew should be imposed on aircraft operations at North Field. The times suggested for the curfew varied but generally covered the period from 9 p.m. to 8 a.m. Average daily nighttime operations (10 p.m. to 7 a.m.) at North Field in 1986 were 69, approximately 9% of total daily operations. The majority of nighttime operations were by local operators based at North Field providing air

taxi services for banks and other financial institutions (the pickup and delivery of checks and other financial documents) and some air cargo.*

At night, under VFR conditions, the local operators using North Field normally will follow the noise abatement departure tracks when departing from Runway 27L, 27R, or 33 or, during calms or low wind conditions, using Runways 9R or 9L. At night, under IFR conditions, or when operating under an IFR flight plan, the local operators usually will request one of the standard instrument departures from Runway 9R or 9L. When weather or air traffic conditions preclude a Runway 9 departure, nighttime departures under instrument conditions are straight out from Runway 27R or 27L or are assigned to the 313-degree radial from the Oakland VORTAC (located between North and South Fields). The 313-degree radial instrument departure was designed to pass over the fewest number of homes on Bay Farm Island. A survey of North Field operators overflying the City of Alameda conducted between February 9 and February 23, 1987 [6.9], indicated that there were an average of four to five nighttime overflights of residential areas in Alameda (6% to 7% of the total nighttime operations). The majority of the overflights (77%) were departures from Runway 27R assigned to the 313-degree radial. One third of the total nighttime overflights of Alameda recorded during the survey occurred between the hours of 10 p.m. and midnight, one-quarter between 1 a.m. and 2 a.m., one-quarter between 6 a.m. and 7 a.m., and the remainder scattered throughout the time period of midnight to 6 a.m.

The nighttime overflights, primarily instrument departures from Runways 27R and 27L at North Field, are of major concern to the residents on Bay Farm Island and have resulted in the demand for a nighttime curfew. The citizens contend that all nighttime operations should be required to use South Field.

Because of the low average number of nighttime aircraft operations to and from North Field that overfly residential areas in the City of Alameda, a total nighttime curfew on operations at North Field is not warranted and was not recommended. However, to eliminate those nighttime oeprations over Alameda that do occur, the preferential use of Runways 9R and 9L at night (see Noise Abatement Action 6) and the

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*The major all-cargo airlines operate from South Field. Local operators carrying freight in support of the all-cargo airlines also conduct their flying operations from South Field.

establishment of a noise abatement standard instrument departure procedure from Runway 33 (see Noise Abatement Actions 1 and 11) at night were recommended.

9. Restrict Training Flights

Restrictions on training flights may include, but are not limited to: (a) restrictions on multiple practice instrument landings or approaches; (b) diversion of training flights to other less noise-sensitive airports; (c) restrictions on altitude for certain aircraft operations or types of aircraft; and (d) in the case of military aircraft, restrictions on formation approaches or departures, restrictions on overhead landing patterns, and rescheduling of flights to less noise-sensitive times. The "touch-and-go" (continuous takeoff and landing) type of training operation is annoying because the plane repeatedly flies at low altitudes in the airport traffic pattern.

A high level of training activity at an airport increases the number of overall operations, and can also increase aircraft noise exposure in neighboring communities.

Oakland International Airport has a significant amount of training activity at this time. Almost 90% of the training flights are by single- and twin-engine propeller aircraft at North Field, especially on Runway 27L [6.8]. There is also some general aviation training activity at South Field and a small amount of military training activity at both North and South Fields.

In effect, the Port of Oakland has addressed the noise problem associated with single- and twin-engine propeller aircraft by establishing a VFR noise abatement training pattern for Runway 27L, which avoids overflying residential areas on Bay Farm Island (except when winds are from the southeast and the touch-and-go training is conducted from Runway 9R in the opposite direction). Pilots performing touch-and-go operations on Runway 27L are instructed to make a left turn before reaching the Airport boundary and then to make another left turn north of the terminal building at South Field. The training pattern altitude is 600 feet.

In part because of this VFR noise abatement training pattern, these training activities and the training operations on Runway 27L have a minimal effect on the overall noise exposure at the Airport, and no specific actions are required to curtail operations. However, pilots should perform touch-and-go operations within the Airport boundary, and the Port of

Oakland should continue to advise and encourage Airport users to schedule all training flights between 7 a.m. and 10 p.m. to the extent reasonably practicable as stated in paragraph 5 of Resolution No. 24450 [6.5].

10. Change Takeoff, Climbout, or Landing Procedures

Takeoff, climbout, and landing procedures can be changed to minimize aircraft noise exposure, and such changes have been adopted at some airports in the United States provided that aircraft performance, safety, and air traffic control requirements are met.

The FAA has established standard noise abatement departure profile procedures, which are described in FAA Advisory Circular 91-53 [6.10] and are commonly referred to as the Air Transport Association (ATA) procedures. These procedures generally direct flight crews to perform a steep climb, using full takeoff power, to an altitude of about 1,000 feet above ground level, and allow the aircraft to achieve a relatively high altitude while still close to the airport boundary. After climbing to 1,000 feet above ground level, the rate of climb and the engine power settings are reduced, and wing flaps are retracted in increments. When the aircraft reaches an altitude of approximately 3,000 feet above ground level, normal en route climb configurations are assumed. This combination of a rapid climb to 1,000 feet followed by a reduced engine power climb to 3,000 feet helps to reduce the level of noise perceived in areas below the route of flight.

United Airlines has begun a new noise abatement departure procedure for its fleet of Boeing 727s and 737s at Oakland International Airport. The procedure calls for pilots to adjust their engine thrust shortly after takeoff even before reaching an altitude of 1,000 feet. After reaching an altitude of 3,000 feet, the pilot is instructed to return to a normal climb thrust. According to United Airlines, the procedure mainly will reduce noise exposure for residents living about 1-1/2 to 5 miles from the Airport [6.11].

Air carrier aircraft operations at Oakland International Airport are conducted and should continue to be conducted in conformance with the ATA procedures summarized above. Because relatively few people are now or are expected to be exposed to high levels of aircraft noise, changes in takeoff, climbout, or landing procedures do not appear necessary at the Airport.

11. Change Approach and Departure Flight Tracks

Changing approach and departure flight tracks could significantly reduce noise exposure if substantial numbers of the "noisiest" types of aircraft were routed over areas that are less sensitive to noise or if the amount of time an aircraft flies at low altitudes over noise-sensitive areas could be reduced. Other factors, such as airport congestion, induced delay, route of flight, and safety must also be considered in determining the feasibility of changing flight patterns.

The Port of Oakland has established a noise abatement flight track (see Exhibit 5-4, page 5-27) for nighttime departures from Runway 29 under IFR conditions, called the Silent Five Departure. Pilots are advised to make a left turn over San Francisco Bay to increase their distance from the southwestern portion of Bay Farm Island. This flight track is not used during daytime or evening hours because of airspace limitations caused by departures from San Francisco International Airport.

The Port of Oakland has established noise abatement departure procedures from Runways 9L, 9R, and 11 under IFR conditions. Pilots are advised to use the Marine One, Skyline One, Diablo Three, or Scaggs Island One departure and to make a right turn to increase their distance from residential areas in the City of San Leandro. The Marina One and Skyline One departures require a right turn to intercept the 121-degree radial from the Oakland VORTAC. The Diablo Three and Scaggs Island One departures require a right turn to a 120-degree heading [6.12].

The Port of Oakland has also established informal noise abatement traffic patterns for North Field under VFR conditions. These traffic patterns are also depicted on Exhibit 5-4 and set forth in the Port's information sheet [6.13] distributed to pilots, indicating the following:

1. **Runways 27R and 27L**

   DO NOT MAKE STRAIGHT-OUT DEPARTURES.

   Right crosswind departure: Make standard right crosswind turn; overfly center of San Leandro Bay, avoiding northwest shoreline. Fly to left of Green Tank; then establish departure heading.

   Right downwind departure: Make normal downwind departure.

Left crosswind/downwind departure; touch-and-go pattern (27L): Make crosswind turn before reaching houses.

2. **Runways 33**

Straight-out departure: Make 45° right turn as soon as possible after takeoff. Overfly center of San Leandro Bay, avoiding northwest shoreline. Fly to left of Green Tank; then establish departure heading.

DO NOT MAKE LEFT CROSSWIND/DOWNWIND DEPARTURE.

Right crosswind/downwind departure: Make normal departure.

Several years ago, the Port of Oakland and the FAA established an informal noise abatement flight track for departures from Runway 27L under IFR conditions. Pilots departing Runway 27L at night were instructed to follow a 240-degree heading to avoid flying over residential areas on Bay Farm Island. The erection of a 110-foot high telecommunications tower on Bay Farm Island created a safety hazard for pilots using this procedure. Consequently, the informal IFR noise abatement track from Runway 27L was eliminated. The FAA Regional Office in Los Angeles approved the tower without taking this track into account, because the procedure was experimental and unpublished.

The current noise abatement patterns described above minimize the number of people exposed to aircraft noise and should remain in effect. FAA air traffic control personnel should continue the informal practice of advising pilots of these patterns.

As noted in Noise Abatement Action 8, nighttime overflights, primarily instrument departures from Runways 27L and 27R, of residential areas in the City of Alameda have been of great concern to local residents. Although most nighttime instrument departures from North Field use Runway 9R or 9L, there are occasions when weather or air traffic conditions dictate the use of Runway 27R or 27L.

A change in the current, published standard instrument departures from Runways 27R and 27L to conform with the VFR noise abatement flight tracks was reviewed by FAA Bay TRACON personnel and found to be infeasible. A noise abatement standard instrument departure from Runway 33 was not evaluated

because the current 3,360-foot length was deemed too short to accommodate the aircraft normally operating from North Field at night.

The establishment of a noise abatement standard instrument departure from Runway 33 would require lengthening this runway by approximately 2,000 feet as recommended in Noise Abatement Action 1. The feasibility of a standard instrument departure from Runway 33 that follows the current VFR noise abatement flight track from this runway should be evaluated by FAA Bay TRACON. Recognizing that such a standard instrument departure could conflict with instrument approaches to the Naval Air Station, Alameda, the FAA feasibility study should be limited to an evaluation of a noise abatement standard instrument departure from Runway 33 that would be used only between the hours of 10 p.m. and 7 a.m.

The established noise abatement patterns summarized above (the Silent Five, Marina One, Skyline One, Diablo Three, and Scaggs Island One) for departures from Runways 9L, 9R, 11, and 29 under IFR conditions should remain in effect.

12. Fan-Out Departure Tracks

The fanning out of departure tracks refers to the use of divergent departure headings. Each successive aircraft on takeoff is given a different heading so that the noise impact of aircraft operations is spread over a broad area rather than concentrated along a single flight track. As an operational procedure, fanning can be used to provide early separation between aircraft using the same departure track or between aircraft using divergent departure tracks within the same general quadrant. In this way, fanning can significantly increase airport capacity and decrease operational delays by reducing the amount of time required to obtain and maintain minimum separation distances between departing aircraft.

Fanning can also be used as a deliberate attempt to diffuse noise over a wide area. Thus, surrounding communities would share equally the adverse noise impacts of aircraft operations. This sharing can be accomplished by equal use of individual flight tracks or by equal use of quadrants consisting of two or more flight tracks. The obvious disadvantage of attempting to equalize, or spread, the noise among a number of neighborhoods is that areas without a noise problem do not want one in the future.

Because the current and projected flight tracks from Oakland International Airport do not overfly heavily populated areas, there is no need to implement a fanning-out procedure. Fanning out departures would increase rather than decrease the number of people and residences adversely affected by aircraft noise. Therefore, this procedure was not recommended for the Airport.

13. Shift Air Carrier Operations to Another Airport

Shifting air carrier operations to another airport or denying airport access to certain types or classes of aircraft is another possible noise abatement action. A few metropolitan regions have two air carrier airports, but the other airports serving a region are almost always general aviation or military facilities that are not suitable for air carrier operations. An alternative would be to build an entirely new airport and shift all air carrier operations to it, but the cost is usually too high and a lead time of at least 10 years is required.

The FAA has classified the following three public airports in the Bay Area as serving either a large or medium hub: Oakland International Airport (large), San Francisco International Airport (large), and San Jose International Airport (medium). 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.

In 1986, there were 1,858,396 passengers enplaned at South Field. Multiplying this enplanement level by 75% equals about 1,393,800, which is the estimated number of airline passengers that resided in or visited Alameda County or Contra Costa County in 1986. Therefore, shifting all air carrier operations at South Field to another airport would be infeasible because more than a million passengers would be forced to travel farther to use San Francisco International or San Jose International airports. Furthermore, the airspace and airfield capacities of these two airports would not be able to adequately accommodate South Field's passengers or air carrier operations. Also, the termination of air carrier operations at South Field would have an adverse economic impact on the cities in Alameda County.

It would be possible to shift some general aviation operations to another of the 12 public airports in the Bay Area. However, general aviation operations contribute very little to cumulative noise exposure in the area surrounding the Airport. Therefore, this action was not recommended.

14. Establish a Permanent Noise-Monitoring System

Although a noise-monitoring system does not directly reduce cumulative aircraft noise exposure, it can be used to continuously monitor individual areas that experience aircraft noise problems and to quantify levels of community noise exposure.

As part of this FAR Part 150 Program, Bolt Beranek and Newman (BBN) Laboratories, Inc., studied the feasibility of installing a permanent noise-monitoring system at Oakland International Airport. The BBN report, "Noise Monitoring System Evaluation for Oakland International Airport," is presented as Appendix A.

On the basis of the BBN report, the Port of Oakland should establish a "basic" permanent noise monitoring system that would (a) measure noise continuously, (b) separate Oakland International Airport noise events from other noise source events, particularly aircraft overflights from other airports, (c) measure and document CNEL values, (d) meet the performance specifications of the California Noise Standards, and (e) provide a basis for later expansion of the system if Airport and community needs change. The system should consist of at least four stations (three on Bay Farm Island and one in San Leandro) to monitor aircraft using South Field, and at least four stations (two on Bay Farm Island and one in the Fernside neighborhood in Alameda, and one in San Leandro) to monitor aircraft using North Field.

15. Require FAR Part 36 Compliance

FAR Part 36 [6.14] requires that commercial aircraft that do not meet acceptable aircraft noise emission levels be modified or retired from the fleet. FAR Part 91 [6.15], Subpart E, specifies the compliance schedule for FAR Part 36, as follows:

- Four-engine jet aircraft

  January 1, 1983--50%.

  January 1, 1985--100%, except that, in late 1984, the FAA granted conditional exceptions to some foreign-flag carriers.

- Three-engine jet aircraft

  January 1, 1983--100%, except that some aircraft may be exempt until January 1, 1985, if a replacement plan is in effect by January 1, 1983.

- Two-engine jet aircraft

  January 1, 1983--100%, with the following exceptions:

  - Some aircraft may be exempt until January 1, 1986, if a replacement plan is in effect by January 1, 1983.

  - Aircraft serving small cities are exempt until January 1, 1985, if they have more than 100 seats, and until January 1, 1988, if they have 100 seats or less.

At some larger airports with severe noise exposure problems, airport sponsors have adopted policies that prohibit the operation of aircraft that are not certificated under FAA Part 36. As a consequence, certain (but not all) airlines have a policy of shifting older, noisier aircraft to routes serving airports where noise complaints have not been as plentiful. The airlines should not be permitted to solve their noise problems at some airports at the expense of other airports, and such a policy should not be permitted at Oakland International Airport.

Aircraft noise characteristics can be classified according to federal noise level standards specified in FAR Part 36 as meeting Stage 1, Stage 2, or Stage 3 standards (Stage 3 being the quietest). In 1986, approximately 40% of the air carrier aircraft using the Airport met Stage 3 standards (e.g., B-737-300, B-767, BAe 146, DC-8-70 series, and MD-80). The percentage of Stage 3 aircraft in the air carrier mix at the Airport is forecast to increase to about 44% in 1991.

Port of Oakland management should continue to insist that the provisions of FAR Part 36 be met by all airlines, both scheduled and nonscheduled, serving Oakland in order to reduce (a) the types of engine noise (high-frequency front end and low-frequency rear end) and (b) the total amount of aircraft-generated noise.

16. Establish Noise Abatement Staff

Noise abatement staffs have been created at many airports to process complaints and to initiate and coordinate noise compatibility programs for the control of aircraft noise. Recently, a considerable effort has been made to make the public aware of airport efforts to control aircraft noise.

The present system of processing noise complaints in relation to the Airport involves primarily the Airport Operations Division at the Airport and, to a lesser extent, the Port of Oakland Planning Division in Downtown Oakland. The individuals who handle noise complaints do so only part-time. It would be more efficient to centralize the processing of noise complaints by creating a full-time "noise abatement officer" position at the Airport. This person should be assigned the responsibilities of (a) coordinating with the airlines and other Airport users to ensure that agreed-upon flight procedures are followed, (b) monitoring the planning and development activities of Alameda County and the cities of Alameda, Oakland, and San Leandro regarding the potential expansion of residential and other noise-sensitive land uses in areas exposed to high levels of aircraft noise (above CNEL 65), (c) supervising the operation and maintenance of a permanent noise monitoring system, and (d) working with the public-at-large regarding noise complaints and other Airport operational concerns.

17. Establish Noise Abatement Committee

Establishment of a noise abatement committee is not an "operational strategy," but an effort to maintain open lines of communication between an airport and neighboring communities regarding aircraft noise problems and programs designed to remedy those problems. To plan and implement a noise abatement program, such a committee should have broad representation from the affected communities, airport users, the FAA, and the airport operator.

One such committee, the Noise Abatement Task Force, has been established by the Port of Oakland and has been in operation since 1973 [6.16]. The Noise Abatement Task Force is composed of members of Airport management and staff, Airport tenants, and representatives from FAA Bay TRACON, the FAA Airport Traffic Control Tower at the Airport, the Alameda Naval Air Station, the Hayward Air Terminal, and the general public. The Task Force meets quarterly (January, April, July, and October) to discuss recent noise complaint statistics and problems. Concerned members of the public are invited to attend the Task Force meetings so that their specific complaints can be addressed. The Task Force meetings are always open to the general public. The Task Force's objective is to solve the noise complaint problems and inform those in attendance at the meetings of various noise issues related to Airport and aircraft operations.

An open dialogue between Airport management and the neighboring communities is essential to the successful implementation of any noise compatibility program. To maintain communications with local jurisdictions, the Port of Oakland should invite representatives from the Airport Land Use Commission and the planning departments of Alameda County and the cities of Alameda, Oakland, and San Leandro to serve on the Noise Abatement Task Force.

18. Tighten Noise Emission Standards

As noted in Noise Abatement Action 15, the FAA has established a time schedule for aircraft compliance with noise emission standards in accordance with FAR Part 36. However, in the past, Congress has amended this time schedule to give airlines more time to meet the standards. For example, under the original provisions of FAR Part 36, all aircraft were to have been in compliance by 1985. However, compliance for certain two-engine narrowbody aircraft was extended until 1988.

Every extension of the compliance schedule increases the adverse noise impact at Oakland International Airport, as well as at other airports in the United States. The Port of Oakland should pass a resolution that opposes any further changes in the provisions of FAR Part 36 that would extend the retention of Stage 1 aircraft in the U.S. domestic airline fleet beyond January 1, 1988.

The Port of Oakland and the local political jurisdictions should support and actively encourage legislation that would establish a phase-out, over time, of Stage 2 aircraft and a conversion of the U.S. domestic airline fleet to Stage 3 aircraft. The Port and local jurisdictions should also support programs designed to make general aviation aircraft quieter.

Many airports in the United States are located in urban environments similar to the environs of Oakland International Airport. Such an urban location creates incompatibility problems between the airport and its neighboring communities. Every possible effort is being made by the Port of Oakland to reduce the incompatibilities between Oakland International Airport and the surrounding communities. However, even with the best of intentions, residual incompatibilities, particularly with regard to aircraft noise, will remain. Therefore, every effort should be made by the FAA, other federal agencies (such as the National Aeronautics and Space Administration), and aircraft manufacturers to continue their research into new technology for designing quieter aircraft and thereby reducing aircraft noise at the source and assisting airports and local communities in solving their noise problems.

19. Construct High-Speed Exit Taxiways

High-speed exit taxiways form an angle of about 30 degrees to the runways they serve, while typical non-high-speed taxiways often require a full 90-degree turn. With the smaller turn, aircraft can taxi at higher than normal speeds and spend less time on the runway during the landing roll. As a noise abatement action, construction of high-speed exit taxiways may lead to less frequent use of thrust reversal and can reduce the need to add the power that is sometimes required to exit via perpendicular taxiways.

This action is not necessary at Oakland International Airport because high-speed exit taxiways are already in place.

20. Relocate Facilities Such as Aircraft Parking Aprons

The relocation of facilities can sometimes benefit an airport, especially when a neighborhood is located off to the side of the major runways or very near an aircraft parking ramp (perhaps for cargo or general aviation aircraft). Under such circumstances, residents may be bothered more by noise from ground equipment, engine starts, and taxi operations than by flight operations. As a general rule, the aircraft parking ramp should be located as far as possible from residential areas.

The terminal and apron areas at Oakland International Airport are sufficiently far from noise-sensitive development, and the noise generated by taxiing aircraft and engine startup does not adversely affect the Airport environs.

21. Restrict Ground Movement of Aircraft

This action is intended to reduce the need to use ground equipment and power backs, make engine starts, and taxi. An appropriate regulation might require that aircraft not be moved to alternate gates--or not be moved from a maintenance hangar to a gate under its own power--but that it be towed instead. Hours during which the regulation would be in effect may or may not be specified. Other types of restrictions on ground operations could require pilots to check for delays with ground control prior to engine start. Such "gate hold" procedures reduce idling time, taxi noise, and fuel consumption.

This action should not be implemented at Oakland International Airport because ground movement of aircraft is not a noise problem.

22. Limit Number or Types of Operations or Types of Aircraft

This action encompasses a wide range of ways to reduce airport noise through regulated limits on operations and on aircraft types. Quotas can be set on the number of annual or daily operations through slot allocations or lease agreements, or regulations can prohibit aircraft that do not meet some specified noise limit from using an airport. There are many other examples--some apply only to operations on a particular runway rather than to the entire airport. In all cases, the basic principle behind the limitation is to reduce noisy aircraft operations.

The airport operator is generally responsible for any noise abatement regulation that limits the number or type of operations at the airport. However, the regulatory process typically involves input from all affected parties, including users, members of the community, and representatives of the FAA.

Current Port of Oakland policy prohibits scheduled supersonic transport (SST; e.g., the Concorde) operations at the Airport. The Port should continue to enforce this policy.

One very important point is that, although the operator does retain the authority to impose use restrictions, the U.S. Constitution prohibits anyone from taking any action that imposes unreasonable burden on interstate or foreign commerce or unjustly discriminates between different categories of airport users.

23. Base Landing Fees on Aircraft Noise or on the Time of Aircraft Arrival

Currently in the United States, landing fees are not based on aircraft noise or on the time of aircraft arrival. At most airports, landing fees are determined by aircraft landed weight. Heavy aircraft, which generally require a longer runway, thicker pavement, and larger terminal areas, therefore, pay a larger share of the cost of the facilities. A similar arrangement could be put into effect for noise. An airport could base a portion of its landing fee on the noise produced by aircraft.

Two basic benefits might be derived from landing fees based on aircraft noise and arrival time. First, the income accrued from the noise- and arrival-time-related portion of the fee could be used to fund other noise abatement actions. The money could be used to purchase property to be used as a buffer, to

soundproof noise-impacted buildings, to install a noise-monitoring system, or to implement any other action suitable to the needs of an airport. Second, the fees could encourage airlines to use quieter aircraft. The result, in either case, is a reduction in aircraft noise around an airport.

It is not clear how effective this action would be because only one airport in the United States has adopted a noise- and arrival-time-related landing fee and the elasticity of the market is unknown.

Imposition of noise- and arrival-time-related landing fees does not appear practical at this time because all of the airlines serving Oakland International Airport conform with FAR Part 36 requirements. Furthermore, the number of people exposed to levels of aircraft noise of CNEL 65 or higher is small (about 160 in 1986) and is not expected to increase significantly by 1991. Therefore, there appears to be no justifiable basis at this time for imposing noise- and arrival-time-related landing fees at the Airport.

24. Construct Noise Barriers or Berms

Noise barriers or berms have limited value in abating noise. In certain instances, a noise barrier or berm functions more as an effective psychological control than as an actual aircraft noise abatement action.

Noise barriers or berms are effective only for the first 100 to 150 feet from the barrier. Because there are no noise-sensitive land uses located within 150 feet of Oakland International Airport, this action would be of little value and was not recommended.

25. Enforce Prescribed Flight Patterns

Arrival and departure flight tracks or patterns are often established by personnel in the FAA airport traffic control tower in conformance with accepted procedures to aid air traffic control and to enhance safety. Terrain and obstructions, interaction with other airports, the amount of traffic, weather, and other conditions also play a role in the establishment of specific flight patterns. At some airports, flight patterns are established and enforced by local Tower Orders for noise abatement purposes. Such orders exist at both San Francisco International and Los Angeles International airports, and at other airports around the country.

At Oakland International Airport, in instances where the Supervisor of Airfield Services determines that an aircraft operation was not in compliance with the Airport noise abatement policies, the pilot and/or owner of the aircraft is notified by letter of the Airport noise abatement policies, and requested to adhere to such policies in the future.

The noise exposure maps for Oakland International Airport were prepared assuming the prevalent flight tracks shown on Exhibit 5-1 (page 5-11). On the basis of existing and planned land use, adherence to these flight tracks and the noise abatement flight tracks shown on Exhibit 5-4 (page 5-27) results in the least number of people being exposed to high levels of aircraft noise. As mentioned under Noise Abatement Action 11, if practicable, a noise abatement standard instrument departure should be established for North Field under instrument flight rule conditions.

NOISE MITIGATION ACTIONS

Noise mitigation actions are either preventive or remedial. Preventive actions are effective in areas that are not yet developed. The goal is to prevent incompatible land use from occurring in areas where noise exposure is high. Such preventive actions include comprehensive planning, zoning, and regulation of the utility and road infrastructure.

Remedial actions, on the other hand, are needed where development has already taken place. The goal is to minimize existing noise incompatibilities to the greatest degree possible. Remedial actions include acquisition and relocation, acoustical treatment of homes, and avigation easements.

Twenty-four noise mitigation actions that have been considered at other airports around the country were evaluated to determine their applicability in the Airport environs.

Table 6-2 lists the noise mitigation actions evaluated, recommendations concerning implementation, and the agencies responsible for such implementation.

Table 6-2

NOISE MITIGATION ACTIONS EVALUATED FOR IMPLEMENTATION
Oakland International Airport

Action	Implementation	Implementing agency
1. Perform comprehensive planning	Yes	Cities of Alameda, Oakland, and San Leandro/Alameda County
2. Change zoning in undeveloped areas	Yes	Cities/County
3. Change zoning in developed areas	Yes	Cities/County
4. Adopt height/noise/safety zoning overlay	Yes	Port of Oakland/Cities/County
5. Establish acoustical treatment standards for new structures	Yes*	Cities/County (and building contractors)
6. Establish acoustical treatment program for existing structures	Yes	Port of Oakland/Cities/County
7. Acquire avigation easements	Yes*	Port of Oakland
8. Purchase development rights	No	n.a.
9. Transfer development rights	No	n.a.
10. Offer transaction assistance	No	n.a.
11. Institute acquisition programs	No	n.a.
12. Institute redevelopment programs	No	n.a.
13. Institute a land banking program	No	n.a.
14. Modify building codes	Yes*	Cities/County
15. Modify subdivision regulations	Yes	Cities/County
16. Time capital improvements	No	n.a.
17. Insure mortgages	No	n.a.
18. Manage urban growth	No	n.a.
19. Adopt height restriction ordinance	No**	n.a.
20. Initiate tax incentives	No	n.a.
21. Obtain funding for noise mitigation	Yes	Federal Aviation Administration/ Port of Oakland
22. Obtain funding for continued planning	Yes	Federal Aviation Administration/ Port of Oakland/Cities/County
23. Airport Land Use Commission adopt noise compatibility program	Yes	Airport Land Use Commission
24. Incorporate the noise compatibility program in the regional transportation plan	Yes	Metropolitan Transportation Commission

n.a. = not applicable.

*Recommended actions that have been implemented or are being implemented (although the text may indicate actions needed beyond those already in effect).
**Unless Noise Mitigation Action 4 is not adopted; then Cities/County would be the implementing agencies.

Source: Peat Marwick, December 1987.

(2/15/88)

The following presents a discussion of each of the 24 noise mitigation actions listed in Table 6-2.

1. Perform Comprehensive Planning

Perhaps the most important element in achieving compatibility between an airport and its environs is the development of a comprehensive plan or plans that take into account both community and airport needs. Comprehensive planning for airport environs must be a coordinated effort to ensure compatibility of aircraft operations with the needs of the people in the airport environs and the region. Such planning can safeguard the general public welfare by recommending actions that minimize adverse socioeconomic impacts and mitigate unavoidable environmental impacts to the maximum extent possible. The purpose of the planning is to seek practical solutions and to formulate and implement compatible short- and long-range land use strategies consistent with airport development.

The effectiveness of comprehensive planning may be limited in a multijurisdictional situation. Also, if it is to be successful, a comprehensive plan must be more than just a guide to future growth that can be ignored when development decisions are made.

The responsibility for developing and carrying out comprehensive planning for the environs at Oakland International Airport is jointly shared by four jurisdictions. These jurisdictions--the cities of Alameda, Oakland, and San Leandro and Alameda County (for San Lorenzo, an unincorporated portion of the County)--have each developed general plans for their respective areas. These individual plans have been reviewed separately to determine compatibility of the respective land use recommendations with noise exposure levels generated by aircraft operations at the Airport.

The environs of Oakland International Airport are almost completely developed. However, there are vacant parcels northwest of the Airport on the southern and southeastern portions of Bay Farm Island. These vacant parcels are depicted in the City of Alameda Combined Land Use Plan [6.17] as either commercial-industrial (C-M) or single-family residential (R-1) uses. Portions of the vacant parcels planned for residential use are exposed to aircraft noise levels in excess of CNEL 65.

It is recommended that the City of Alameda consider amending its Combined Land Use Plan to reflect a change in the proposed residential land use in areas exposed to CNEL 65 or higher on

Bay Farm Island to commercial-industrial uses (i.e., an extension of the Harbor Bay Industrial Park). This change in land use has been suggested by the City of Alameda in the past, but it was strongly opposed by the residents of Bay Farm Island who were concerned about increased traffic through their neighborhoods. A new roadway extending from Harbor Bay Parkway through the Airport to Airport Drive and then to 98th Avenue in Oakland has been proposed and could alleviate many of the traffic problems on Bay Farm Island.

2. Change Zoning in Undeveloped Areas

Changes in zoning require the cooperation of affected jurisdictions if they are to ensure land use control and compatibility in undeveloped areas that are exposed to high levels of aircraft noise. Such zoning changes are intended to (a) prohibit future incompatible land uses, or (b) restrict noise-sensitive land uses to specified building or population densities. This restriction might be implemented by requiring that the maximum allowable concentrations of employees, customers, or persons in public assembly be specified in the zoning ordinance.

State of California law requires that zoning conform to the general plans for an area. The area within the CNEL 65 contour on Bay Farm Island that is proposed for residential development in the City of Alameda Combined Land Use Plan has been zoned as a single-family residential-planned development district (R-1-PD). An amendment to the Combined Land Use Plan to reflect a change in the proposed residential land use to a compatible use (recommended in Noise Mitigation Action 1) would require rezoning the noise impacted area to a commercial-industrial-planned development district (C-M-PD). This rezoning is recommended to achieve noise compatibility and to ensure that the zoning is in conformance with the amendments to the Combined Land Use Plan recommended in Noise Mitigation Action 1.

3. Change Zoning in Developed Areas

Although changes in zoning are more difficult to implement in developed areas than in undeveloped areas, such changes may effectively preclude or restrict future incompatible land uses. Land use compatibility with aircraft operations may still be a worthwhile endeavor in developed areas.

For parcels of land that have never been improved, the principal differences between developed areas and undeveloped areas are: (a) the smaller size of the vacant parcels, and (b) the location of the parcels in the existing urban pattern. In already developed areas, vacant parcels may range in size from individual residential lots to tracts of 10 to 20 acres that were bypassed during initial development or that are included in the last segment of a larger development program.

Equally important as the size of the vacant parcel is its location relative to adjacent urban development. Where vacant parcels are completely surrounded by a single type of land use such as residential, it is very difficult to deny the owner the right to develop the property in a similar use of the same density.

However, where the vacant property is located between two dissimilar uses, such as residential and commercial or industrial, it may be possible to reevaluate the present zoning and change it to a use compatible with aircraft operations. The same holds true with regard to vacant parcels fronting on major thoroughfares. If the parcel is large enough, it might be possible to develop it for commercial use if there is a demand for such use.

The responsibility for accomplishing changes in zoning in developed areas rests with the local political jurisdiction. Because of the typically scattered location of vacant parcels, the need to take into account their compatibility with adjacent land uses, and the economic feasibility of development, each parcel for which rezoning potential exists must be evaluated individually. Even where it may not be feasible to change the zoning, it may be possible to approve the development on a conditional basis--to regulate density or provide acoustical treatment--so that land use compatibility with aircraft operations is achieved to the maximum degree possible.

A number of small vacant lots are intermixed with existing residential development on Bay Farm Island in the City of Alameda. The Alameda County Airport Land Use Commission policy on infilling should be followed for all cases of infill.

4. Adopt Height/Noise/Safety Zoning Overlay

Height/noise/safety zoning overlays of airport environs are adopted to (a) ensure aircraft safety by specifying maximum height limits on structures, utility poles, antennas, and

trees within the airport environs, (b) restrict noise-sensitive land uses in areas exposed to high levels of aircraft noise, and (c) provide safety areas under the approaches to each runway.

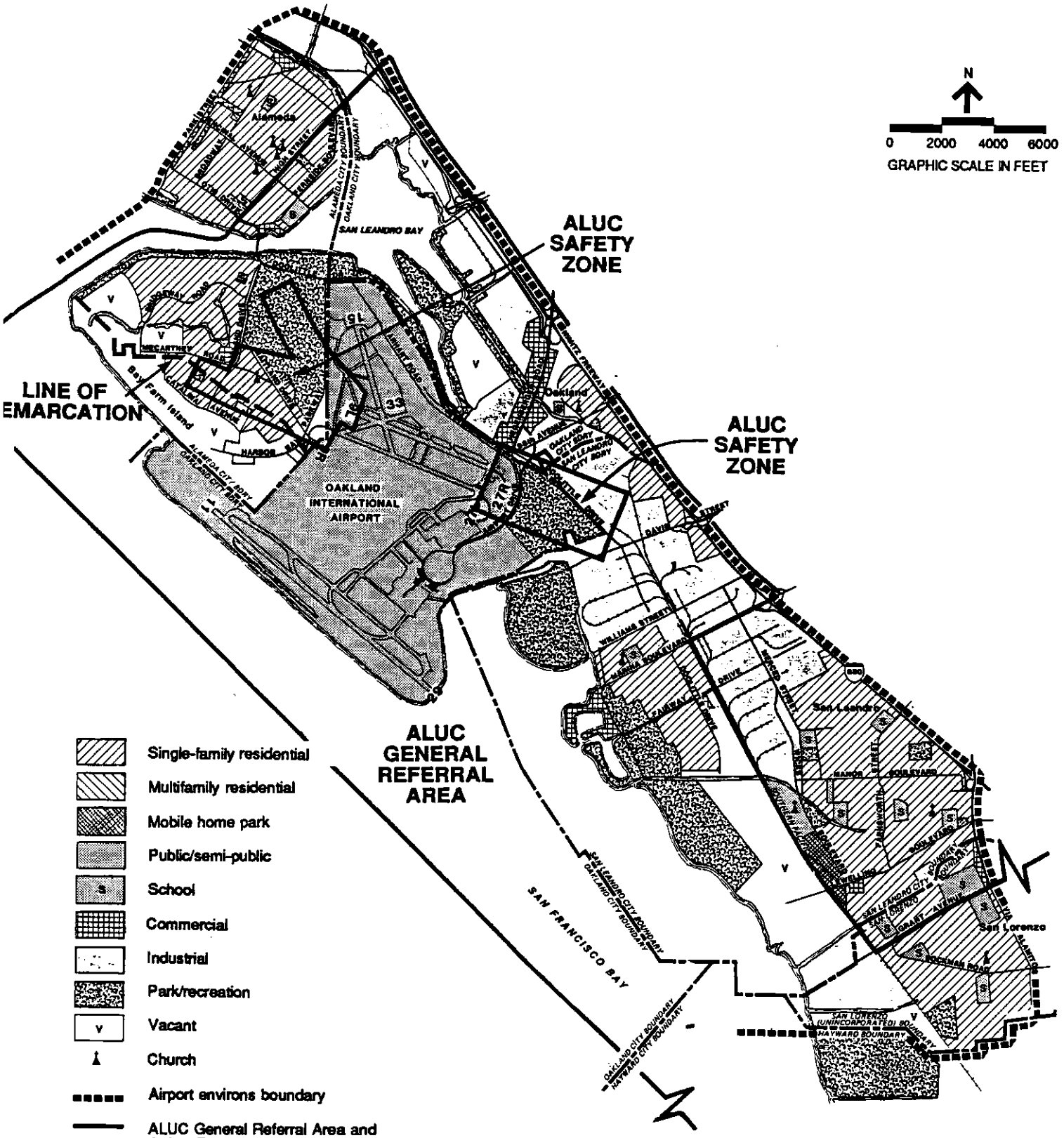
This type of overlay is developed by first determining noise-compatible zones and then combining the noise zones with height restriction criteria. Noise-compatible zones are identified through the use of aircraft noise exposure maps that are based on existing and forecast levels of aircraft operations. Noise exposure information is displayed on a map through the use of contours or grid cells to form noise zones. Noise abatement procedures for aircraft operations (recommended as a part of a noise compatibility program) are incorporated into the descriptions of noise-compatible zones.

The noise zone map is then combined with a height restriction map to form a height/noise overlay. The height restriction map is prepared in accordance with FAR Part 77 [6.18] and depicts the specific height levels over and around the airport that structures, poles, and natural vegetation should not be permitted to exceed. Safety areas (approach and clear zones) off the ends of all runways, in which all forms of development are severely restricted, are then added to the height/noise overlay.

The height/noise/safety overlay is a useful tool for determining conforming and nonconforming land uses for other mitigation actions, such as changes in zoning, acoustical treatment, and land acquisition and redevelopment. Official adoption of such an overlay would help substantiate the avigation easement program.

For Oakland International Airport, the Airport Land Use Commission (ALUC) of Alameda County has adopted planning boundaries related to project referral, noise impact, height, safety, and hazard prevention. These boundaries are shown on Exhibit 6-2, and represent the boundaries of a height/noise/safety zoning overlay.

All proposed projects that would affect property within a General Referral Area must be referred to the ALUC for a Determination of Plan Consistency. In the vicinity of Oakland International Airport, the ALUC General Referral Area includes the area bordered by the Nimitz Freeway (Interstate 880) to the east between High Street and Marina Boulevard, and by the Southern Pacific Railroad tracks between Marina Boulevard and Grant Avenue in San Leandro.



Note: General Referral Area extends south to State Route 92 and encompasses the area affected by operations from Hayward Air Terminal.

PEAT MARWICK

February 1988

FAR Part 150 Noise Compatibility Program
Oakland International Airport

Alameda County Airport Land Use Commission (ALUC) General Referral Area and Safety Zones

Exhibit

6-2

The Alameda County Airport Land Use Policy Plan (ACALUPP) contains the following noise policies that the ALUC has established for the Airport.

- For new development within 500 feet north of the 65 CNEL Line of Demarcation on Bay Farm Island (shown on Exhibit 6-2), insulation shall meet the standards established in this Plan (the ACALUPP), based on assumed exterior 65 CNEL.

- New residential development shall be allowed between the 65-70 CNEL Line of Demarcation on Bay Farm Island if the property is subject to a noise easement and if insulation standards defined in this Plan for 70 CNEL exterior noise are met.

- Depending on the findings of the ALUC study of notification, for new development within 500 feet north of the 65 CNEL Line of Demarcation on Bay Farm Island, it is recommended that the City of Alameda adopt procedures to ensure that prospective property owners are informed of the current and anticipated airport noise impact, as recognized in this Plan.

- It is recommended that all individual developments on Bay Farm Island above 70 CNEL, where noise easement and insulation standards of this Plan are met, be referred to the ALUC for evaluation on a case-by-case basis for land use compatibility and noise mitigation.

The ALUC Height Referral Area for Oakland International Airport is also shown on Exhibit 6-2. Within this area, the ALUC height restriction policies for new structures and vegetation are consistent with standards and procedures set forth in FAR Part 77, including Subpart D.

ALUC Safety Zones are established off both ends of Runways 9L-27R, 9R-27L, and 15-33 at North Field. These safety zones are identical to those adopted by the City of Alameda in the Airport Safety Study for its Safety Element. ALUC policies for new land uses within the first quarter mile from the end of the runway emphasize maintenance of clear space; beyond this distance new uses must be low density, limited building coverage, and nonresidential. There are no safety zones established for South Field because all departures and approaches on Runway 11-29 are over San Francisco Bay.

The ALUC Hazard Prevention Zone, which corresponds with the General Referral Area, is established to prevent hazards to safe avigation such as concentrations of birds, electrical interference, glare, and smoke.

Adoption of the ALUC boundaries and policies for new structures, which is the responsibility of local political jurisdictions, was recommended.

5. Establish Acoustical Treatment Standards for New Structures

Acoustical treatment standards for new structures can be established to ensure the use of sound-attenuating construction techniques in areas exposed to moderately high levels of noise. When incorporated in building codes, such standards can provide a relatively satisfactory method of achieving land use compatibility without unduly restricting development in communities that have limited areas available for development.

Acoustical treatment to reduce interior noise levels resulting from outside noise is recommended as a condition of approval by the local jurisdictions for all new residential and other noise-sensitive land uses (schools, health facilities, and community facilities) in areas exposed to noise above CNEL 65.

The principal federal agencies involved in noise analyses consider noise exposure values of CNEL 75 and above to be "unacceptable" for residential and other noise-sensitive land uses. New residential construction (with or without sound insulation) is not recommended in areas exposed to noise levels of CNEL 75 or higher.

Noise exposure levels between CNEL 65 and CNEL 75 are considered "normally unacceptable" for residential and other noise-sensitive uses, although such uses may be permitted with acoustical treatment. The type and degree of acoustical treatment for new construction in the CNEL 65 to CNEL 75 area will vary depending upon the noise level and noise frequency. The general objective is to achieve a maximum interior noise level of CNEL 45 from exterior noise sources (such as aircraft noise) when windows are partially open.

On Bay Farm Island, the interior of a conventional wood frame structure with windows and doors closed will experience noise exposure levels about 25 dBA less than the exterior. With such a reduction in noise exposure levels at CNEL 65, no additional acoustical treatment is required. However, central air conditioning would be required to ensure that windows and doors can be kept closed during the warmer summer months.

As noise exposure levels increase above CNEL 65, however, additional acoustical treatment may be needed. The weather-stripping of windows and doors, the installation of well-sealed storm windows, the installation of solid-core exterior doors, and the placing of baffles in interior-to-exterior vents may be needed to maintain interior cumulative annual noise exposure levels at or below CNEL 45.

The developer-owner of new residential or other noise-sensitive structures should retain the services of an acoustical engineer to assist in the design and construction of the buildings. A good acoustical engineer can help assure that the recommended interior noise exposure level of CNEL 45 can be reasonably attained.

The City of Alameda currently requires and should continue to require acoustical treatment of new structures on Bay Farm Island.

6. Establish an Acoustical Treatment Program for Existing Structures

A program for the acoustical treatment of existing structures should be established in areas where the conversion of land use would destroy a community or where the conversion is prohibitively expensive. Such treatment can be accomplished at the expense of the airport sponsor or through some form of cost sharing, and is usually provided in exchange for an avigation easement. Acoustical treatment alleviates noise problems in the interior of structures, and the avigation easement confirms the right of the airport to continue aircraft operations in the area.

Many methods of acoustical treatment are available, including (a) sealing or weather-stripping windows, doors, vents, and external openings; (b) replacing hollow-core doors with solid doors, thereby eliminating direct paths of exterior-interior noise transmission; (c) installing central air conditioning, acoustically treated ceiling panels, wall panels, and double-glazed windows; and (d) insulating entryways, attics, and crawl spaces. Ventilating systems would be required where windows are sealed. The method of sound insulation should be selected on a case-by-case basis.

As with the acoustical treatment of new structures, the acoustical treatment of existing structures should be undertaken to achieve an interior noise level at or below CNEL 45. The techniques for acoustically treating an existing structure would be the same as for a new structure, as noted in Noise

Mitigation Action 5. However, with existing structures, there will undoubtedly be a wide variation in building construction techniques and in how well a particular structure has been maintained over the years. Therefore, acoustical treatment of existing structures should be carried out only after the structure is thoroughly inspected to determine its suitability for such treatment and also whether the CNEL 45 level can be achieved and maintained within. No building should be accepted for an acoustical treatment program if it is not structurally sound and/or capable of meeting all applicable building codes.

As mentioned earlier, two residences in the Airport environs that are affected by the noise from departures on Runway 29 were selected for noise monitoring purposes to determine typical noise attenuation characteristics. Exterior and interior noise levels were measured using noise monitoring units that recorded events exceeding 45 dBA. One residence monitored was 3016 Linda Vista on Bay Farm Island, one of six condominium townhouses in a single structure. The other residence monitored was 3366 Tonga Lane on Bay Farm Island.

At 3016 Linda Vista, the average instantaneous peak noise level (ALM) for 17 single-noise events was about 80 dBA outside of the residence and approximately 53 dBA inside on the first floor. At 3366 Tonga Lane, the ALM for 25 single-noise events was about 81 dBA outside of the residence, approximately 56 dBA inside on the first floor, and about 53 dBA inside on the second floor. Therefore, the sound attenuation properties of these two rather typical structures on Bay Farm Island reduced noise exposure levels by an average of 25 to 27 dBA and helped the structures achieve a maximum interior noise level of CNEL 45 from exterior noise sources. With such a reduction in noise exposure levels, no acoustical treatment may be required for homes exposed to noise levels up to CNEL 70.

An acoustical treatment program for existing residential structures should be established in areas with current or projected noise levels above CNEL 65. Participation in the program should be voluntary on the part of the property owner.

A program for acoustical treatment of existing structures, if necessary, can be carried out either by the Port of Oakland or by the local jurisdiction in which the structures are located. Acoustical treatment should be performed only on homes that are in sound structural condition where there is a reasonable expectation that an interior noise level of CNEL 45 can be achieved. Under the FAA's current Airport Improvement Program (AIP), local jurisdictions are eligible to receive federal

funding for acoustical treatment programs provided that such programs are in accordance with an accepted FAR Part 150 Noise Compatibility Program. Implementation of an acoustical treatment program will be dependent upon the availability of funding. However, it is apparent that any acoustical treatment program in the Airport environs would be minimal if required at all.

Any acoustical treatment program should include the requirement for granting of an avigation easement over the property on which the structure to be treated is located, so that the Port of Oakland or the local jurisdiction is protected from future legal action on the part of the property owner.

7. Acquire Avigation Easements

Avigation easements can be required to be dedicated as part of new subdivisions or can be used for an acquisition program based on less-than-fee purchase price. One form of easement grants an airport sponsor the right to perform aircraft operations over the property, including those that might cause noise, vibrations, and other adverse effects.

Avigation easements can be acquired through negotiated purchase or condemnation. The cost in a negotiated settlement is based on the value to the owner of the rights surrendered. Easements are permanent and enforceable through civil courts, and the title is held until sold or released.

There are limitations to avigation easement programs. For example, the actual number of citizens willing to participate in a voluntary program may be quite low. Also, the cost to the airport could amount to millions of dollars, although the amount of money received by individual property owners would not necessarily be considered adequate.

An avigation easement is a less-than-fee simple interest granted by the property owner to the airport operator in perpetuity in the form of a deed restriction on the property that normally entitles the airport operator to (a) regulate the maximum heights of structures and trees on the property, (b) permit noise vibration and other effects of aircraft operations over the property, and (c) prohibit uses on the property that would generate smoke, glare, or electromagnetic interference.

Various methods can be used to obtain avigation easements, in addition to negotiated purchase or condemnation, such as:

- In exchange for the acoustical treatment of a residence or other noise-sensitive structure. In the Oakland area, no acoustical treatment should be performed with public funds except in exchange for an avigation easement.

- As a condition of approval for new development. The local jurisdiction having control over new development could require, as a condition of approval for the development, that the developer grant the Port of Oakland an avigation easement.

In accordance with a June 3, 1980, agreement between the Port of Oakland, Harbor Bay Isle, Utah International, and Doric Development, Inc., if any of these parties acquires title to any real property on Bay Farm Island located south of the CNEL 65 contour line on the then-present City of Alameda noise exposure map, that party is required to grant the Port a noise easement.

Because avigation easements are enforceable through civil courts, they provide a form of protection for the Port of Oakland against future noise litigation.

As part of this Noise Compatibility Program, Floyd A. Hibbitts, Inc., Appraisers and Consultants, analyzed the sales of 124 properties (primarily single-family residential dwellings and townhouse units) during 1986 and 1987 on Bay Farm Island. The analysis showed that there was no recognizable diminution in value to the properties because of aircraft noise [6.19].

8. Purchase Development Rights

The purchase of development rights is the public acquisition of a landowner's right to develop property with uses incompatible with airport/aircraft operations. This action applies more to undeveloped areas because the purpose is to restrict the ways the property may be used. Maximum heights of structures may also be specified. The airport sponsor is protected against damage claims, and the landowner is compensated for the limits placed on developing the property and for the effects of continued aircraft operations. In addition, the property remains on the local tax rolls. This measure does not apply to Oakland International Airport because almost all of the Airport environs is developed.

9. Transfer Development Rights

The transfer of development rights allows a property owner to buy all or part of the development rights on a particular property (usually prescribed by zoning or other regulations) and transfer those rights to another property within the same jurisdiction that otherwise would be limited by zoning to less intensive use. (A property owner could also transfer the rights to another parcel owned by the same person or entity.) The transfer of development rights could be applicable in an airport environs, especially if the land is in agricultural use and has a high potential for urbanization. The benefit of a transfer of rights compared with a purchase of development rights by an airport sponsor is that the transfer does not require any airport funds.

Because there is not much land available for development in the City of Alameda, this action would not be effective as a means of maintaining the vacant land on Bay Farm Island near the Airport and was not recommended.

10. Offer Transaction Assistance

Under a transaction assistance (or purchase assurance) program, an airport sponsor guarantees owners of residential property that their homes will be purchased at fair market value if they decide to sell. The goal of a transaction assistance program is to improve noise-impacted residential neighborhoods to (a) make such areas more stable, (b) protect the existing (and future) property tax base, and (c) enhance local property values [6.20]. The program is only recommended in residential areas where it is desirable to maintain the residential land use throughout the foreseeable future.

Transaction assistance programs are offered in neighborhoods exposed to aircraft noise where a majority of the residents choose to remain, but a few may desire to move because they perceive the noise levels to be too high. If these residents have difficulty selling their property, in part because of the noise levels, transaction assistance may be offered. The program should be a purely voluntary one, with no relocation benefits available to the property owner.

A review of noise compatibility programs at U.S. airports that have adopted the concept of transaction assistance showed that no airport sponsor has yet established an ongoing program of assistance because of the limited amount of funds available for noise mitigation [6.20].

Finally, transaction assistance programs should only be offered in the most severely noise-impacted residential areas, i.e., where noise levels exceed CNEL 70 and are forecast to continue to do so in the future. Because no residents in the environs of Oakland International Airport are exposed to aircraft noise levels of CNEL 70 or higher, this measure is not necessary at this time and was not recommended.

11. Institute Acquisition Programs

Another means of achieving land use compatibility in airport environs is outright fee simple acquisition of all properties in land use incompatible with aircraft/airport operations. Such lands could then be: (a) leased for airport-compatible uses; (b) resold with avigation easements and deed restrictions that would permit only specified compatible land uses; (c) retained by the airport for airport purposes or maintained as permanent open space; or (d) used by other governmental agencies for public purposes, such as storage, parks, or similar noise-tolerant uses.

However, because acquisition programs can severely disrupt residential neighborhoods, they are typically limited to residential areas where noise exposure levels exceed CNEL 75 and where other solutions are not practical or possible.

A financial consideration in any acquisition program is that all lands and improvements would be publicly owned and no longer produce property tax revenues unless they were resold with deed restrictions to ensure that future land uses would be compatible. If it is determined that open space uses would be most compatible with the airport, it is unlikely that such lands would ever be resold unless they could be used exclusively for agriculture.

As part of any acquisition program that includes the development of residential land, relocation programs and assistance (both economic and social aspects) must be considered--particularly if federal funding is involved.

Because there are no residents in the Oakland International Airport environs who are exposed to levels of aircraft noise in excess of CNEL 70, this measure is not necessary and was not recommended.

12. Institute Redevelopment Programs

Redevelopment programs involve removing incompatible land uses and replacing them with compatible ones. Redevelopment can be a viable means of achieving land use compatibility, especially in blighted areas. However, implementation of redevelopment programs can be expensive in social and economic terms. Redevelopment programs remove those land uses most sensitive to noise exposure (e.g., residential) and replace them with uses more compatible with existing and projected levels of aircraft noise (e.g., warehousing or open space).

A redevelopment program is not necessary in the Airport environs because the Port of Oakland is not acquiring any property where the land use is incompatible with aircraft/Airport operations.

13. Institute a Land Banking Program

Land banking is a means of ensuring the future development rights of an airport to expand or relocate by acquiring land or options to purchase land for future use. Land banking is not often pursued because (a) the airport sponsor does not want to expend funds for land that may or may not be needed in the future, and (b) local jurisdictions vigorously protest the loss of taxable land unless the need is immediate. Normally, land banking involves the acquisition--well in advance of actual development--of a new site for an airport, together with sufficient property around the site to protect against future land use incompatibilities.

As mentioned previously in Noise Abatement Action 13, relocating the main air carrier airport for Metropolitan Oakland is infeasible. Also, there is no land available for expanding the present Airport site. Therefore, land banking is not applicable as a noise mitigation action for the Airport.

14. Modify Building Codes

Building codes can be modified to include acoustical treatment where local conditions indicate that substantial gains in the overall living environment would result. Although acoustical treatment does not eliminate noise, it can improve the indoor environment, and it may be very useful for commercial and industrial facilities. Where there is a considerable amount of outdoor activity during much of the year, acoustical treatment is less effective as a noise mitigation action, but it also assists in conserving energy.

The City of Alameda's building codes require that the average annual cumulative interior noise levels resulting from exterior noise sources should not exceed CNEL 45 in any habitable room. The building codes also require that an acoustical analysis be performed on new residential structures located within an area exposed to annual noise levels of CNEL 60 showing that the structure has been designed to limit intrusive noise to no more than CNEL 40 [6.21]. The City of Alameda should retain the building code requirements described above.

15. Modify Subdivision Regulations

Subdivision regulations are ordinances adopted by local jurisdictions to regulate the division of property and its subsequent development. Subdivision regulations can be modified to require that transmission of sound from exterior sources is minimized in new development. To protect the airport, subdivision regulations could require that avigation easements be granted for development proposed within the airport environs. Subdivision regulations could also require fair disclosure or buyer information notices upon the sale or transfer of existing property. Local jurisdictions are responsible for modifying subdivision regulations.

Where noise exposure levels exceed CNEL 65, and it is not feasible for local jurisdictions to rezone the property to a noise compatible use (see Noise Mitigation Action 2), the affected local jurisdictions should modify their subdivision regulations to require acoustical treatment as specified in local building codes (see Noise Mitigation Action 12) as a condition of approval for all new residential development. Also, it is recommended that avigation easements be granted to the Port of Oakland as a condition of approval for new residential development exposed to noise levels above CNEL 65 or located in areas where heights are regulated in accordance with FAR Part 77, "Objects Affecting Navigable Airspace."

The rationale for modifying the subdivision regulations, as well as the zoning ordinances of the local jurisdictions, is that when property is already zoned for residential use, rezoning would not be required for an owner to develop the property. Therefore, acoustical treatment would not be required as a condition of approval for property development as a result of a zoning change. It is necessary, then, to include the requirement for acoustical treatment and avigation easements in the subdivision regulations to ensure that any new residential development in areas of high noise exposure would have the proper acoustical treatment.

16. Time Capital Improvements

The timing of capital improvements and public works projects can strongly influence land use trends and demands. Such projects may include constructing or widening roads, developing schools, parks, and recreational facilities, and building water and sewer mains and flood control facilities. The timing of these projects is related to urban growth management because the delay of projects can discourage development, while early completion of such projects encourages development.

Because the infrastructure in the Airport environs is in place and the environs is already developed, this action does not apply.

17. Insure Mortgages

Improving mortgage policies and practices can involve the denial of insurance for incompatible development adjacent to airports.

The Federal Housing Administration (FHA) and the Veterans Administration (VA) generally do not insure mortgages in locations exposed to cumulative annual average noise levels above CNEL 75 unless a special clearance and an environmental impact statement are approved by the U.S. Department of Housing and Urban Development (HUD) [6.22].

This noise mitigation action does not apply to Oakland International Airport because the high price of homes in the Airport environs generally excludes the use of FHA- or VA-insured mortgages.

18. Manage Urban Growth

The management of urban growth, among other things, is used to identify the demand on municipal facilities, improvements, or services created by any proposed residential, commercial, industrial, or other type of development. It is most applicable in undeveloped areas where policies must be formulated to avoid scattered pockets of isolated development.

Urban growth management does not apply to the Oakland International Airport environs because the Airport environs is almost completely developed.

19. Adopt Height Restriction Ordinance

A height restriction ordinance is part of the height/noise/safety zoning overlay described under Noise Mitigation Action 4. If communities in the Oakland International Airport environs do not want to adopt the complete height/noise/safety zoning overlay, they should at least be encouraged to adopt a height restriction ordinance. However, a height restriction ordinance should be recommended only when it is impossible to convince a local jurisdiction to adopt the full height/noise/safety zoning overlay.

20. Initiate Tax Incentives

Tax incentives are a means of allocating noise reduction costs equitably. Such incentives can be used to induce current and future property owners to comply with performance standards for noise relief contained in the housing and building codes. Lowered property taxes can provide a form of compensation to owners of property exposed to aircraft noise. Tax incentives can also discourage the conversion of facilities, such as golf courses or agriculture, to more intensive uses by offering preferential tax treatment for compatible land uses.

This action does not apply to the environs of Oakland International Airport.

21. Obtain Funding for Noise Mitigation

Funding for noise mitigation programs can come from a wide variety of sources, including the federal government, the airport sponsor, and local municipalities. The federal government has established procedures, through the Aviation Safety and Noise Abatement Act of 1979 (ASNA) [6.23], by which airport sponsors and local communities are authorized to obtain funds for noise compatibility purposes.

ASNA authorizes 80% funding by the federal government for approved noise compatibility programs. The FAA grants funds for noise mitigation purposes authorized under ASNA through the Airport Improvement Program. Provided that the FAA approves a completed FAR Part 150 Program for the Airport, the Port of Oakland will be eligible for continued funding for other noise mitigation programs if such funds are available.

22. Obtain Funding for Continued Planning

The funds to carry out this Noise Compatibility Program were provided, in part, by a grant from the FAA under the Airport Improvement Program. The Program was enacted by the U.S. Congress in September 1982 and it is in effect through September 1987. On December 30, 1987, the Airport and Airway Safety and Capacity Expansion Act of 1987 was signed into law by President Reagan. This act provides for a specific set-aside for the planning and implementation of noise compatibility programs. The Port of Oakland should take advantage of these funds when implementing its program.

23. Airport Land Use Commission Adopt Noise Compatibility Program

Section 21670 of the Public Utilities Code of the State of California [6.24] states:

> It is the purpose of this article to protect public health, safety, and welfare by ensuring the orderly expansion of airports and the adoption of land use measures that minimize the public's exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses.

To achieve the purposes stated above, Section 21670 requires that every county with an airport served by a scheduled airline establish a seven member airport land use commission (ALUC). Section 21675 states that the ALUC has the power and responsibility to prepare and adopt a comprehensive land use plan that will "provide for the orderly growth of each public airport and the area surrounding the airport within the jurisdiction of the commission, and will safeguard the general welfare of the inhabitants within the vicinity of the airport and the public in general." [6.24]

Section 21675 [6.24] further states:

> In formulating a land use plan, the commission may develop height restrictions on buildings, may specify use of land, and may determine building standards, including soundproofing adjacent to airports, within the planning area.

Many of these issues that the ALUC of Alameda County will encounter in its formulation of a land use plan for Oakland International Airport are addressed in this FAR Part 150 Noise

Compatibility Program. The Program and Noise Exposure Maps should be submitted to the Alameda County ALUC for consideration by the Commission for incorporation into its land use plan.

24. Incorporate the Noise Compatibility Program in the Regional Transportation Plan

The Noise Compatibility Program for Oakland International Airport should be a regional planning effort because it affects three principal cities and Alameda County. The purpose of the Noise Compatibility Program is to guarantee the longevity of the principal air transportation facility serving the Oakland metropolitan region by achieving long-term compatibility between the Airport and its neighboring communities. Therefore, it is recommended that the Metropolitan Transportation Commission adopt the final recommendations of the Noise Compatibility Program as part of the regional transportation plan. Incorporation into the regional transportation plan will also help ensure that the Port of Oakland maintains its eligibility for federal funding in support of its noise remedy programs.

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Chapter 7

NOISE COMPATIBILITY PROGRAM MEASURES

On the basis of the evaluations of noise abatement and noise mitigation actions and input from community representatives on the Project Coordination Committee, Port of Oakland staff, Airport users, the FAA, and the public-at-large, the following noise abatement and noise mitigation measures are included for implementation as the Noise Compatibility Program for Oakland International Airport.

1. NOISE ABATEMENT MEASURES

A. If Measure 1.I is determined by the FAA to be practicable and feasible, the southeast end of Runway 15-33 would be extended 2,000 feet to its original length of 5,360 feet to permit the establishment of a noise abatement departure track from Runway 33 under IFR conditions. If Measure 1.I is found infeasible, Runway 15-33 will not be extended.

B. The Port of Oakland will continue the use of specific helicopter noise abatement traffic patterns for North Field. The patterns are designed to minimize helicopter noise disturbance in noise-sensitive areas in the vicinity of the Airport.

C. The Port of Oakland will continue to enforce the following procedures for aircraft engine runups:

(1) No aircraft engines shall be run up between the hours of 2300 and 0600 (local time) without special permission of the Airport Manager [7.1].

(2) No aircraft engine shall be started, warmed up, or run up except in areas designated by the Airport Manager [7.2].

(3) Aircraft engine test runups between the hours of 7 p.m. and 7 a.m. shall be prohibited except where the level of noise generated by such testing at the nearest residential property on Bay Farm Island on July 21, 1976, does not exceed 75 dBA between the hours of 7 p.m. and 10 p.m. and 70 dBA between the hours of 10 p.m. and 7 a.m.; provided, however, that engine test runups shall not include any preflight engine runups on apron areas, taxiways and runways [7.3].

At South Field, runups will be permitted only at (1) the north and west blast fences at the George P. Miller Maintenance (World Hangar) Facility and (2) Taxiway 8. At North Field, runups should continue to be permitted only at the Hangar 6 Maintenance Facility blast fence, and at the runup pad adjacent to Taxiway A for reciprocating engine aircraft weighing 12,500 pounds or less. The Port of Oakland has evaluated an alternate runup site on Taxiway 5 between Taxiways 1 and 2 that is farther away from residential areas than the two sites listed above. The Taxiway 5 site has been proven feasible, and has been designated as a location for engine testing during nighttime hours. The Port is continuing to look for other sites that meet or exceed the requirements stated above.

National Airmotive Corporation will proceed with its plan to discontinue using its outdoor test stand for engine runups. NAC has discontinued use of its outdoor test stand at night and on weekends.

Regardless of the location or time, aircraft operators will continue to notify the Airport Operations Department and the FAA Airport Traffic Control Tower on the Airport prior to running up turbine aircraft engines, and to monitor the FAA Tower radio frequency during the runup to be aware of other traffic in the area.

The Port of Oakland will extend the hours when no aircraft shall be run up without special permission from the Airport Manager. The current hours (11 p.m. to 6 a.m.) will be extended to 10 p.m. to 7 a.m. on weekdays and 10 p.m. to 8 a.m. on weekends. The Port will also continue to enforce the other procedures for aircraft engine runups mentioned above so that engine runups will be only a minor source of noise at the Airport and in its environs.

D. The Port of Oakland will adopt the following preferential use policy for aircraft operations at North Field, Oakland International Airport:

(1) All aircraft departing from Runways 27R and 27L, with the exception of touch-and-go training operations, shall use the threshold of said runways.

(2) During the nighttime hours of 10 p.m. to 7 a.m., the preferential runways for aircraft departures from North Field will be Runways 9R and 9L unless wind, weather, or air traffic conditions dictate otherwise.

(3) The Port shall take such reasonable actions available to it as the airport proprietor to discourage right turn climbout departures over Bay Farm Island from Runway 29 for all aircraft.

The Port will request that FAA air traffic control personnel continue the informal practice of advising pilots operating aircraft at North Field of procedures established by the Port of Oakland.

E. Pilots performing touch-and-go operations at North Field should avoid overflying residential neighborhoods on Bay Farm Island and the Port of Oakland will continue to advise and encourage Airport users to schedule all training flights between 7 a.m. and 10 p.m. to the extent reasonably practicable.

F. Air carrier aircraft operations at Oakland International Airport are conducted and will continue to be conducted in conformance with the standard noise abatement departure profile procedures established by the Federal Aviation Administration (FAA), commonly referred to as the Air Transport Association (ATA) procedures.

G. The following recommended noise abatement traffic patterns for North Field under VFR conditions set forth in the Port's information sheet distributed to pilots operating aircraft from North Field [7.3] currently in use will remain in effect:

(1) **RUNWAYS 27R AND 27L**

DO NOT MAKE STRAIGHT-OUT DEPARTURES.

Right crosswind departure: make standard right crosswind turn; overfly center of San Leandro Bay, avoiding northwest shoreline. Fly to left of Green Tank; then establish departure heading.

Right downwind departure: make normal downwind departure.

Left crosswind/downwind departure; touch-and-go pattern (27L): make crosswind turn before reaching houses.

(2) **RUNWAY 33**

Straight-out departure: make 45° right turn as soon as possible after takeoff. Overfly center of San Leandro Bay, avoiding northwest shoreline. Fly to left of Green Tank; then establish departure heading.

DO NOT MAKE LEFT CROSSWIND/DOWNWIND DEPARTURE.

Right crosswind/downwind departure: make normal departure.

The Port will request that FAA air traffic control personnel continue the informal practice of advising pilots operating aircraft at North Field of these noise abatement traffic patterns.

H. The following noise abatement patterns for departures under IFR conditions [7.4] currently in use will remain in effect:

(1) Pilots departing Runway 29 at night are advised to make a left turn over San Francisco Bay to increase their distance from the southwestern portion of Bay Farm Island. This flight track, called the Silent Five Departure, is not used during daytime or evening hours because of airspace limitations caused by departures from San Francisco International Airport.

(2) Pilots departing Runways 9L, 9R, and 11 are advised to use the Marina One, Skyline One, Diablo Three, or Scaggs Island One departure and to make a right turn to increase their distance from residential areas in the City of San Leandro. The Marina One and Skyline One departures require a right turn to intercept the 121-degree radial from the Oakland VORTAC. The Diablo Three and Scaggs Island One departures require a right turn to a 120-degree heading.

I. If practicable and feasible, a noise abatement standard instrument departure will be established for North Field under IFR conditions to route departures from Runway 33 away from residential areas on Bay Farm Island and the eastern end of Alameda. The feasibility of such a standard instrument departure should be evaluated by FAA Bay TRACON and the standard instrument departure should be published if acceptable.

J. The Port of Oakland will establish a "basic" permanent noise monitoring system that would (1) measure noise continuously, (2) separate Oakland International Airport noise events from other noise source events, particularly aircraft overflights from other airports, (3) measure and document CNEL values, (4) meet the performance specifications of the California Noise Standards, and (5) provide a basis for later expansion of the system if Airport and community needs change. The system should consist of at least four stations (two on Bay Farm Island and one in the Fernside neighborhood in Alameda, and one in San Leandro) to monitor aircraft using South Field, and at least two stations (Bay Farm Island and Fernside neighborhoods) to monitor aircraft using North Field [7.5].

K. A member of the Airport management staff will be assigned the full-time responsibilities of (1) coordinating with the airlines and other Airport users to ensure that agreed-upon flight procedures are followed, (2) monitoring the planning and development activities of Alameda County and the cities of Alameda, Oakland, and San Leandro regarding the potential expansion of residential and other noise-sensitive land uses in areas exposed to high levels of aircraft noise (above CNEL 65), (3) supervising the operation and maintenance of a permanent noise monitoring system, and (4) working with the public-at-large regarding noise complaints and other Airport operational concerns.

L. To maintain communications with local jurisdictions, the Port of Oakland will invite representatives from the Airport Land Use Commission and the planning departments of Alameda County and the cities of Alameda, Oakland, and San Leandro to serve on the Noise Abatement Task Force.

M. The Port of Oakland will work with the City of Alameda to establish a forum composed of members of the Alameda City Council and the Board of Port Commissioners to consider issues that are unresolved by other means.

N. The Port of Oakland will work cooperatively with other East Bay jurisdictions to seek alternate routing of jet aircraft departing San Francisco International Airport.

O. The Port of Oakland will continue to enforce its policy prohibiting scheduled supersonic transport (SST; e.g., the Concorde) operations at the Airport.

2. NOISE MITIGATION MEASURES

A. The Port of Oakland will work with and encourage the City of Alameda to amend its Combined Land Use Plan to reflect a change in the proposed residential land use in areas exposed to CNEL 65 or higher on Bay Farm Island to commercial-industrial uses (i.e., an extension of the Harbor Bay Industrial Park).

B. The area within the CNEL 65 contour on Bay Farm Island that is proposed for residential development in the City of Alameda Combined Land Use Plan has been zoned as a single-family residential-planned development district (R-1-PD). An amendment to the Combined Land Use Plan to reflect a change in the proposed residential land use to a compatible use (Measure 2.A) would require rezoning the noise impacted area to a commercial-industrial-planned development district (C-M-PD). The Port of Oakland will work with and encourage the City of Alameda to rezone the property to achieve noise compatibility and to ensure that the zoning is in conformance with the amendments to the Combined Land Use Plan presented in Measure 2.A. Such conformance is required by California law.

C. A number of small vacant lots are intermixed with existing residential development on Bay Farm Island in the City of Alameda. The Port of Oakland will encourage local jurisdictions to follow the Alameda County Airport Land Use Commission policy for all cases of infill.

D. The Port of Oakland will encourage the City of Alameda to continue to enforce its building code, which requires that the average cumulative interior noise levels resulting from exterior noise sources not exceed CNEL 45 in any habitable room and that an acoustical analysis be performed on new residential structures located within an area exposed to annual noise levels of CNEL 60 showing that the structure has been designed to limit intrusive noise to no more than CNEL 45 [7.6].

E. The Port of Oakland will establish an acoustical treatment program for existing residential structures in areas with current or projected noise levels above CNEL 65. Participation in the program will be voluntary on the part of the property owner.

A program for acoustical treatment, if necessary, can be carried out either by the Port of Oakland or by the local jurisdiction in which the structures are located. Acoustical treatment should be performed only on homes

Acoustical treatment should be performed only on homes that are in sound structural condition where there is a reasonable expectation that an interior noise level of CNEL 45 can be achieved, and in exchange for an avigation easement. Under the FAA's current Airport Improvement Program, local jurisdictions are eligible to receive federal funding for acoustical treatment programs provided that such programs are in accordance with an accepted FAR Part 150 Noise Compatibility Program. Implementation of an acoustical treatment program will be dependent upon the availability of funding. However, it is apparent that any acoustical treatment program in the Airport environs would be minimal if required at all.

F. Where noise exposure levels exceed CNEL 65, and it is not feasible for local jurisdictions to rezone the property to a noise compatible use (see Measure 2.B), the Port of Oakland will work with and encourage affected local jurisdictions to modify their subdivision regulations to require acoustical treatment as specified in local building codes as a condition of approval for all new residential development. Also, the Port of Oakland will request avigation easements be granted to the Port as a condition of approval for new residential development exposed to noise levels above CNEL 65 or located in areas where heights are regulated in accordance with FAR Part 77, "Objects Affecting Navigable Airspace."

G. The Noise Exposure Maps and Noise Compatibility Program will be submitted to the Alameda County Airport Land Use Commission for consideration and incorporation in its land use plan.

3. GENERAL MEASURES

A. The Port of Oakland will, and the local political jurisdictions should, support and actively encourage federal legislation that would establish a phase-out, over time, of Stage 2 aircraft, a conversion of the U.S. domestic airline fleet to Stage 3 aircraft, and programs designed to make general aviation aircraft quieter.

B. The Port of Oakland will request the Metropolitan Transportation Commission to adopt the final recommendations of the Noise Compatibility Program as part of the regional transportation plan. Incorporation into the regional transportation plan will also help to ensure that the Port of Oakland maintains its eligibility for federal funding in support of its noise remedy programs.

C. The Port of Oakland will publish all of its noise rules, regulations, and procedures in a single document for ease of reference by local jurisdictions and affected citizens.

D. The Port of Oakland will provide notice to all Airport users of its noise abatement policies and procedures.

The relative contribution of each of the foregoing noise abatement or mitigation measures to overall noise compatibility program effectiveness, as well as the actual or anticipated effects the overall program has on reducing noncompatible uses, is in some instances difficult to quantify. The majority of the measures included herein are to reduce noise annoyance in the Bay Farm Island and Fernside neighborhoods of Alameda. As noted, noise exposure levels in these neighborhoods are currently, and are anticipated to remain over the five year period, below CNEL 65. Also, the implementation of some measures that could significantly reduce noise exposure impacts (such as a time schedule for the phasing out of Stage 2 aircraft in the domestic airline fleet) is dependent upon Congressional action that may or may not occur. Table 7-1 lists the various selected program measures and comments on the relative contribution of each--to the extent that such individual effectiveness can be quantified at this point in time.

Table 7-1

SELECTED PROGRAM MEASURES AND THE RELATIVE CONTRIBUTION OF
EACH TO NOISE COMPATIBILITY PROGRAM EFFECTIVENESS
FAR Part 150 Noise Compatibility Program
Oakland International Airport

Selected Program measure	Relative contribution
1. NOISE ABATEMENT MEASURES	
A. Extend Runway 15-33 2,000 feet.	Will permit a nighttime noise abatement standard instrument departure (SID) from Runway 33 to reduce overflights of residential neighborhoods.
B. Continue the use of specific helicopter noise abatement traffic patterns at North Field.	Avoid overflights of residential neighborhoods (existing procedure, not quantified).
C. Continue to enforce engine runup procedures.	
(1) No engine test runups between 10 p.m. and 7 a.m. without permission of the Airport Manager.	Reduces sleep disturbances of residents in the Bay Farm Island neighborhood (existing procedure, not quantified).
(2) No engine test runups except in designated areas.	Ensures that runups are conducted at locations remote from residential areas (existing procedure, not quantified).
(3) Engine text runup noise levels shall not exceed 75 dBA between 7 p.m. and 10 p.m. and 70 dBA between 10 p.m. and 7 a.m. at the nearest residence.	Sets the maximum permissible noise levels from engine test runups at levels acceptable to neighboring communities (existing procedure, not quantified).
D. Continue preferential runway use procedures.	
(1) All aircraft departing from Runways 27L and 27R shall use the threshold of said runways.	Increases the altitude of departing aircraft when passing over the end of the runway enabling the aircraft to make the noise abatement turns (cited below) without passing over residential areas (existing procedure, not quantified).
(2) Runways 9R and 9L will be the preferential departure runways between 10 p.m. and 7 a.m. unless wind, weather, or air traffic conditions dictate otherwise.	Reduces annoying nighttime overflights of residential areas by general aviation aircraft. Relative contribution not quantifiable because noise exposure levels in affected residential neighborhoods would be below CNEL 65 with or without this measure.
(3) Discourage right turn climbout departures over Bay Farm Island from Runway 29 for all aircraft.	Eliminates low-level departures over residential areas by jet air carrier aircraft (existing procedure, not quantified).
E. Discourage touch-and-go operations over residential areas and limit training flights to the 7 a.m.-10 p.m. time period.	Reduces frequent, annoying, overflights of light aircraft. Not quantified because the noise exposure in residential neighborhoods would be below CNEL 65 with or without this measure.
F. Air carrier aircraft to use the standard noise abatement departure profile.	Existing procedure, not quantified.
G. Continue North Field noise abatement traffic patterns.	
(1) Runways 27R and 27L--do not make straightout departures.	Runway 27R departures make a right turn over San Leandro Bay to avoid overflying the Bay Farm Island and Fernside neighborhoods (existing procedure, not quantified). Runway 27L touch-and-go operations make a left 180-degree turn to avoid overflying residential areas (existing procedure, not quantified).
(2) Runway 33--make 45-degree right turn over San Leandro Bay.	Avoids overflights of the Fernside neighborhood of Alameda (existing procedure, not quantified).

Table 7-1 (page 2 of 3)
SELECTED PROGRAM MEASURES AND THE RELATIVE CONTRIBUTION OF EACH TO NOISE COMPATIBILITY PROGRAM EFFECTIVENESS
FAR Part 150 Noise Compatibility Program
Oakland International Airport

Selected Program measure	Relative contribution
1. NOISE ABATEMENT MEASURES (continued)	
H. Continue IFR nighttime noise abatement departures.	
(1) Runway 29 nighttime departures to use the Silent Five standard instrument departure (SID).	Increases the distance between departing aircraft and residential areas on Bay Farm Island (existing procedure, not quantified).
(2) Runways 9L, 9R, and 11 nighttime departures to use the Marina One, Skyline One, Diablo Three, or Skaggs Island One SID.	Avoids overflights of residential areas in San Leandro (existing procedures, not quantified).
I. Establish nighttime noise abatement SID for Runway 33.	Reduces annoying nighttime overflights of Bay Farm Island residential areas. Not quantified because noise exposure levels would be below CNEL 65 with or without this measure.
J. Establish a permanent noise monitoring system for the Airport.	Enables Airport management to monitor noise exposure on a continuous basis. An extremely valuable tool in dealing with community noise concerns. Contribution is not quantifiable.
K. Assign Airport staff member full time responsibilities for noise-related issues.	Ensures that noise-related issues are given maximum priority by Airport management. Contribution is not quantifiable.
L. Request local jurisdictions to assign representatives to serve on the Noise Abatement Task Force.	Provides for local input regarding noise-related issues. Contribution is not quantifiable.
M. Establish Board of Port Commissioners/Alameda City Council forum to consider unresolved issues.	Provides for a top level forum for resolving issues that Port and City staff cannot handle. Contribution is not quantifiable.
N. Cooperate with other jurisdictions to seek alternate routings for aircraft departing San Francisco International Airport.	Does not specifically relate to Airport noise issues but does show willingness to work with other communities to solve overall aircraft noise problems. Contribution is not quantifiable.
O. Continue existing prohibition of scheduled supersonic transport operations at the Airport.	Existing procedure, not quantified.
2. NOISE MITIGATION MEASURES	
A. Encourage City of Alameda to amend its Land Use Plan to change proposed residential uses on Bay Farm Island to commercial-industrial uses.	Would prevent the construction of approximately 770 homes in areas forecast to have a noise exposure level above CNEL 65.
B. Rezone area within CNEL 65 on Bay Farm Island from residential to commercial-industrial uses.	Implementation for Measure 2.A above.
C. Follow Airport Land Use Commission policy on infilling individual vacant residential parcels.	Requires parcel-by-parcel review before infilling is permitted.
D. Encourage City of Alameda to continue to enforce its building code requiring acoustical treatment of new homes in areas above CNEL 60.	Continues existing City of Alameda acoustical treatment requirement. Measure not quantified.
E. Establish a voluntary acoustical treatment program for residential properties with aircraft noise exposure above CNEL 65.	Gives the owners of approximately 260 residential properties (1991 CNEL 65 noise levels) the option of having their homes acoustically treated by the Port in exchange for an aviation easement.

Table 7-1 (page 3 of 3)
SELECTED PROGRAM MEASURES AND THE RELATIVE CONTRIBUTION OF EACH TO NOISE COMPATIBILITY PROGRAM EFFECTIVENESS
FAR Part 150 Noise Compatibility Program
Oakland International Airport

Selected Program measure	Relative contribution
2. NOISE MITIGATION MEASURES (continued)	
F. Encourage local jurisdictions to require acoustical treatment and the granting of avigation easements to the Port for all new residential development in areas of CNEL 65 or higher.	Provides a measure of noise relief for new development in the event that Measures 2.A and 2.B are not adopted by the City of Alameda. Could involve up to 770 residences.
G. Submit Noise Exposure Maps and Noise Compatibility Program to ALUC for incorporation in its Land Use Plan.	Updates ALUC Land Use Plan and program to reflect latest noise exposure information for the Airport. Contribution is not quantifiable.
3. GENERAL MEASURES	
A. Support legislation to phase out Stage 2 aircraft.	Could reduce area exposed to CNEL 65 or greater by one-half to two-thirds and result in no incompatible uses inside the CNEL 65 contour.
B. Incorporate adopted Noise Compatibility Program into the regional transportation plan.	Gives regional recognition to local noise remedy programs. Contribution is not quantifiable.
C. Port will publish all of its noise rules, regulations, and procedures in a single document.	Will assist local jurisdictions to understand the rules and procedures being followed. Contribution is not quantifiable.
D. Provide notice to Airport users of noise abatement policies and procedures.	Ensures that pilots are aware of the policies and procedures to be followed. Contribution is not quantifiable.

Chapter 7

REFERENCES

7.1 Port of Oakland, Port Ordinance 1047, Article 7, "Running Engines," Section 7.05, August 1974.

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Chapter 8

PROGRAM COSTS, SOURCES OF FUNDING, IMPLEMENTATION SCHEDULE, AND GENERAL CONDITIONS

PROGRAM COSTS

The cost of extending Runway 15-33 (Noise Abatement Measure 1.A) was not calculated because the runway pavement is in place. The installation of a permanent noise monitoring system (Noise Abatement Measure 1.J) is estimated to be $350,000. The cost of providing sound insulation for homes that are presently or anticipated to be inside the CNEL 65 noise exposure area was not calculated because it is not known at this time how many of the property owners may wish to participate in the program.

SOURCES OF FUNDING

Sources of funding for implementation of the Noise Compatibility Program will be Airport funds and FAA grants-in-aid for noise compatibility purposes. The actual amount expended in any given year will depend on the availability of funds from these sources.

IMPLEMENTATION SCHEDULE

The measures in this Noise Compatibility Program will be implemented through 1991. The Program will be updated at that time or sooner if an increase in aircraft operations at the Airport or changes in the airfield layout result in an increase in CNEL value of 1.5 or greater or new residential neighborhoods and other noise-sensitive uses not identified in this Program are exposed to noise levels in excess of CNEL 65.

GENERAL CONDITIONS

The Noise Compatibility Program may require a change in the Airport Layout Plan if the recommendation to extend Runway 15-33 is implemented.

The Program has been designed to reduce existing noncompatibility and to prevent, or reduce the probability of, establishing new noncompatibilities.

As can be seen from the evaluation of alternatives, actions that could (1) impose an undue burden on interstate or foreign commerce, (2) be considered unjustly discriminatory, or (3) derogate safety or adversely affect airspace efficiency were not recommended.

The Program meets both local needs and the needs of the national air transportation system and can be implemented in a manner consistent with the powers and duties of the FAA Administrator.

Chapter 9

PUBLIC AND AIRPORT USER CONSULTATION

The Noise Exposure Maps and the Noise Compatibility Program for Oakland International Airport were prepared with the assistance of the Airport and Port of Oakland staff, local planning officials, FAA air traffic control personnel, Airport users, and local citizens affected by aircraft operations.

During the preparation of the FAR Part 150 Noise Compatibility Program, data were presented regularly to the Project Coordination Committee (PCC), which was formed in September 1986 to provide input to the Program. Meetings were held with the PCC on September 3, 1986, October 20, 1986, February 3, 1987, and May 8, 1987. Copies of the minutes of these four PCC meetings are included in Appendix B.

The following organizations, agencies, and persons were requested to participate on the PCC.

Air Transport Association, Western Regional Office
Alameda Board of Realtors, President
Alameda County, Assistant Planning Director
City of Alameda, Assistant City Manager
City of Alameda, City Manager

City of Alameda, Director of Public Works
City of Alameda, Director of Planning
Associated Homeowners of San Leandro
Bank of America, Senior Pilot
Bay Conservation and Development Commission

Brown-Buntin Associates, Incorporated, Vice President
Cal Air Charter
California Department of Transportation, Division of Aeronautics
Casitas Homeowners' Association
Community of Harbor Bay Isle Owners' Association

Cortright and Seibold, Principal
Davis, Young and Mendelson, Attorney
East Bay Regional Park District
Federal Aviation Administration: Area Coordinator
Federal Aviation Administration: Bay TRACON

Federal Aviation Administration: Oakland Control Tower
Harbor Bay Isle Airport Noise & Safety Committee
Harbor Bay Isle Associates
Hayward Air Terminal
Islandia Homeowners Association

KaiserAir, Incorporated
Metropolitan Transportation Commission, Airport Planner
City of Oakland, Senior Planner
Oakland International Airport, Management
Oakland International Airport, Operations

Peach Tree Community Association Services, Incorporated
Peat Marwick Main & Co., Project Manager
Port of Oakland, Director of Aviation
Port of Oakland, Planning Department
Port of Oakland, Public Relations Department

City of San Leandro, City Planner
San Leandro Associate Homeowners
U.S. Army Corps of Engineers
Walt Gillfillan and Associates

Data were presented quarterly, as they were developed, to the Noise Abatement Task Force, which is composed of Airport management and staff, Airport tenants and users, and representatives from Bay TRACON, the FAA Airport Traffic Control Tower at the Airport, the Naval Air Station Alameda, the Hayward Air Terminal, and the general public. Meetings with the Task Force were held on April 9, 1986, July 25, 1986, October 14, 1986, January 27, 1987, and April 14, 1987. Copies of the minutes are included in Appendix B. Concerned members of the public were invited to attend Task Force meetings, which were always open to the general public.

In addition to making presentations before the Noise Abatement Task Force, members of the consultant team conducted public information meetings on March 16, 1987, April 30, 1987, May 27, 1987, and June 9, 1987, to acquaint residents with the FAR Part 150 Program and elicit comments and questions on the Program.

The Director of Aviation for the Port of Oakland chaired the March 16 meeting, which was held at the Amelia Earhart School on Bay Farm Island in Alameda before approximately 60 people. The meeting began with a discussion of the results of a two-week (February 9-23, 1987), 24-hour-a-day survey of aircraft from North Field overflying the Bay Farm Island and Fernside neighborhoods of Alameda. The objective was to count the number of operations that were not in compliance with noise abatement procedures.

The discussion was followed by a viewgraph presentation depicting present and forecast aircraft operations at the Airport, flight tracks and noise monitoring locations, generalized existing zoning, generalized existing land use, noise exposure maps for existing and future conditions, and an outline of noise compatibility programs to be considered during the next phase of the FAR Part 150 Program. Copies of the viewgraphs used at the public information session are included in Appendix B.

After the viewgraph presentation, the meeting was opened to comments and questions from the audience. Concerns expressed by those in attendance focused on:

1. The poor weather that occurred during part of the survey period. (It was explained that it was beneficial to have a variety of weather conditions.)

2. How to get input into the Part 150 Program. (The audience was encouraged to attend future public information meetings and to send any written comments to the Port of Oakland.)

3. The reasons that the airlines could not be forced to use quieter aircraft. (It was explained that the federal government requires airports to allow access to those aircraft and there is no schedule yet for the phasing out of those aircraft.)

4. The types of planes that will be used for the new air cargo activity. (Primarily DC-9s, B-727s, and DC-8s.)

5. The reasons that the planes cannot taxi from North Field and take off from South Field during nighttime hours. (It was explained that the additional seven to eight minutes of taxiing time to South Field could have severe economic impacts on some operators at North Field. For example, one operator lost a major contract for missing two scheduled flights.)

6. The plans for North Field. (At North Field, there are about 250 to 350 departures by general aviation aircraft each day, which is much less than the 500 or so daily departures that took place in the early 1980s.)

7. The way that the first public information meeting was publicized. (The Port of Oakland paid for notices to be printed on March 6 and March 9 in The Alameda Times Star, The (Oakland) Tribune, and The (Hayward) Daily Review. Copies of these public notices are included in Appendix B.)

The public information meeting on April 30, 1987, was held at the John Muir school in San Leandro before approximately 12 residents. Like the March 16 meeting, the purpose was to acquaint the residents of that community with the FAR Part 150 Program and elicit comments and questions on the Program. The consultant used the same viewgraphs (described above) in the presentation, which was similar to the presentation given on March 16. After the viewgraph presentation, the meeting was opened for comments and questions from the audience. These included:

1. Has a noise analysis been done for North Field as part of this study? (Yes.)

2. Can San Francisco International Airport be asked to do a noise compatibility program? (Yes, they completed one that is restricted to San Mateo County.)

3. There are problems with overflights. (Many of the air carrier overflights are from San Francisco International Airport.)

4. Are you recommending a new Standard Instrument Departure (SID)? (It was explained that the consultant is working with the FAA on establishing a new SID from North Field.)

5. Can departures from Runway 29 make a 20-degree left turn over San Francisco Bay? (There is already a noise abatement departure from Runway 29 used primarily at night that goes over the Bay.)

6. Why cannot the descent slope be made steeper? (In the mid-1970s the 2-stage approach with 6-degree and 3 degree descent slopes was strongly opposed by the Air Line Pilots Association.)

7. Will your study make specific recommendations about the plans to redevelop a large parcel in San Leandro? (General recommendations can be made. However, the consultant can respond to specific requests from the City of San Leandro.)

8. What happens to the contours if you have departures to the southeast? (The contours in the handout and on the viewgraphs already include operations to the southeast.)

9. What is your distribution plan for the final report? (We will distribute the final report primarily to local libraries and planning departments. There will be only a limited number of copies for members of the public to pick up on a first-come-first-served basis.)

The Director of Aviation chaired the third (May 27) Public Information Meeting, which was held at the Amelia Earhart School on Bay Farm Island before approximately 40 people. The Director began the meeting by giving a brief overview of the status of the Part 150 Program. The overview was followed by a viewgraph presentation depicting noise monitoring locations and average flight tracks, and noise exposure maps for existing (1986) and future (1991) conditions. Copies of the handouts distributed to the audience are included in Appendix B.

After the viewgraph presentation, the meeting was opened to comments and questions from the audience. These included:

1. The reason that the 1991 CNEL contours are not smaller given the increase in the use of Stage 3 aircraft. (The increase in the use of Stage 3 aircraft was offset by the increase in nighttime air cargo operations.)

2. The reason that there is an increase in nighttime operations. (Federal Express is building a new regional air freight sorting hub at South Field. When this hub is completed, Federal Express will increase its operations at the Airport.)

3. The claim that homeowners only get notice of public information meetings on the day of the meetings. (The notice received on the day of the meeting was not issued by the Port of Oakland. The Port had sent out letters about this meeting to about 100 individuals, including representatives of homeowners associations in San Leandro, Alameda, and Bay Farm Island and had notices published in the Tribune, the Alameda Times Star, and the Daily Review about one week before the meeting. Copies of the public notices are included in Appendix B.)

4. The capabilities of the permanent noise monitoring system recommended for installation in the Airport environs. (The noise monitoring system will be able to record the time of the noise events, but will not be able to identify the types of aircraft causing the events.)

5. The reason that the public information meeting has been held in Oakland when there is a problem with noise from overflights in the Oakland Hills and East Oakland. (It was explained that most of the problem in Oakland is caused by overflights from San Francisco International Airport. On May 29, 1987, the Port of Oakland scheduled a public information meeting in Oakland for June 9, 1987.)

6. Opportunities for the public to participate in the Noise Abatement Task Force meetings. (The minutes of the meetings are available to the public and the meetings are open to the public. It has been recommended that representatives from local jurisdictions serve on the Task Force.)

7. Whether or not the Concorde is permitted to use the Airport. (The Port of Oakland has established a resolution that does not permit scheduled supersonic aircraft operations. However, there are no prohibitions on charter operations.)

8. The reason that the Concorde is allowed to use the Airport for charter flights. (The resolution was written about six years ago when noise from the Concorde was not a factor. The main concern was the effect of supersonic aircraft on the ozone layer.)

9. Whether or not the use of Stage 2 aircraft can be restricted to certain times. (Airport operators must permit airport access to aircraft that meet federal noise standards, such as the Stage 2 aircraft. Every airport in California, except for Sacramento Metropolitan, is a noise-impacted airport. Oakland International Airport is competing with all other airports for the use of Stage 3 aircraft.)

10. Whether or not there is a way to follow up on pilots who violate VFR noise abatement procedures. (Glenn Woodman is in charge of that.)

11. The use of Runways 9L and 9R at night during the last two months. (All aircraft departing from North Field use the Runway 9 pair when wind conditions permit.)

12. The possibility of departures from Runway 9 flying over residential areas. (There are noise abatement departures from Runway 9, which involve making a right turn before overflying residential neighborhoods in San Leandro.)

13. Safety considerations of general aviation aircraft flying over Amelia Earhart School. (The pilots are following an instrument flight plan in which the 313-degree radial puts them in the area of the school. The flight path has been evaluated for obstructions and other safety hazards.)

14. The reasons that aircraft cannot always take off from Runways 9L and 9R. (There are arrivals on Runways 27L and 27R that make departing on Runway 9L or 9R more difficult starting at 6 a.m.)

15. The purpose and effectiveness of the "Oakland Airport Aircraft Noise Report Line" and the "Hotline" established by the City of Alameda. (The purpose of the "Report Line" is to help Airport staff respond to the complainant regarding the cause of the noise event. Airport staff will try to respond more frequently by letter or phone. The Alameda "Hotline" is used by the public works department just to determine the location of the complainant.)

16. The minimum altitude for aircraft. (Pilots may not fly under 1,000 feet except for takeoffs and landings.)

17. The situations that causes a pilot to use IFR procedures rather than VFR procedures. (Weather conditions, company policies, and insurance requirements often force pilots to use IFR procedures. Of the flights over Alameda during a two-week survey conducted by Cortright & Siebold, 85% used IFR procedures.)

18. The problem of pilots flying over homes and schools on Bay Farm Island. (The possibility of establishing new departure paths is being investigated.)

19. Whether or not Runway 33 will definitely be extended. (The new departure path from an extended Runway 33 needs to be evaluated by the FAA for safety.)

20. The reason that some pilots do not make the noise abatement turn when departing from Runway 27R. (Some of them do not have to turn. There is a straight-out departure path from Runway 27R, which is not used very often.)

21. The status of plans to expand the United Parcel Service (UPS) facilities on wetlands. (The UPS site cannot be filled until the lawsuit with the Audubon Society is settled. UPS is trying to consolidate its operations, while Federal Express is expanding its operations.)

22. The extent of future Federal Express operations. (There will be about three DC-10s departing around 7 p.m. for Memphis and returning at about 7 a.m. daily. Between 10 p.m. and 12 a.m. Federal Express operations will occur at the Airport to serve the West Coast.)

23. The reason that engine runups cannot be performed only in the daytime. (The Airport also prefers that engine runups be performed in the daytime, but sometimes engines need to be tested before morning departures.)

24. The decision of local jurisdictions to permit new homes to be constructed near the Airport. (Comprehensive planning and rezoning would help solve that kind of problem.)

25. The way that the Airport environs boundary used on the exhibits was determined, and why the South Shore area in Alameda and Ballena Bay were not included in the boundary. (The environs boundary was determined from the locations of the noise contours and noise complainants. The contours do not extend to the South Shore and Ballena Bay areas, and there have not been any complaints from those areas.)

In addition to verbal comments made by the public, letters were received and are included in Appendix B.

At the request of the City of Alameda, meetings were held with City staff, the consultant for the City of Alameda, Port of Oakland staff, FAA air traffic control personnel, and Peat

Marwick to discuss specific concerns of Alameda. The issues and recommendations prepared by the City of Alameda (included in Appendix B) were the topic of discussion at these meetings, held on May 15 and May 20, 1987.

On July 15, 1987, an open public hearing concerning the noise compatibility program was held at the Metro Center in Oakland before approximately 50 people. The Vice President of the Board of Port Commissioners chaired the meeting and briefly reviewed the Part 150 Program process at Oakland. The review was followed by a viewgraph presentation, similar to the presentation given on April 30. After the viewgraph presentation, the hearing was opened for comments and questions from the audience. These included:

1. Are there any real future plans to have permanent noise monitoring stations? (The Port of Oakland has adopted the recommendation to establish a "basic" permanent noise monitoring system--see Measure 1.J*).

2. Were the Oakland Hills included in the noise compatibility program? (No, because aircraft operations at the Airport do not significantly impact residents in the Oakland Hills.)

3. What is the total economic impact of having pilots taxi from North Field to Runway 29 for nighttime departures? (The precise economic impacts were not measured because other recommended actions would preclude requiring aircraft to taxi from North Field to Runway 29.)

4. How can more emphasis be placed on single event noise levels? (A permanent noise monitoring system will provide information on single event noise levels.)

Parties unable or desiring not to appear at the public hearing were urged to file a signed letter presenting their views on the noise compatibility recommendations by August 14, 1987. Listed below are the principal concerns raised in these letters dated between February 10, 1987, and August 16, 1987. The last name of the letter writer and the page on which the letter can be found in Appendix B are also included.

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*"Measure" refers to the Noise Compatibility Program measures listed in Chapter 7.

1. Concern (Davis, pp. B-103 and B-155; Greene, p. B-124; Rupp, p. B-152; Hatch, p. B-222): Noisy SST (Concorde) operations.

   Response: Current Port policy prohibits scheduled SST operations. See Measure* 1.O.

2. Concern (Davis, pp. B-102 and B-155; Hackbarth and Eichten, p. B-122; Greene, p. B-129; Gallinatti, p. B-139; Pearce, p. B-164; Signorelli, p. B-163; Roper, p. B-177; Tuleja and 405 petitioners, pp. B-180 through B-206): Enforcement of noise abatement procedures.

   Response: Current Port enforcement procedures for noise abatement are included on pages 5-26 through 5-28 of this report and in the recommendations.

3. Concern (Davis, p. B-102; Withrow, pp. B-130 and B-135; McKray, p. B-131; Skezas, p. B-132; Balasz, p. B-133; Pifer, p. B-134; Pagones, pp. B-136, B-137, B-146, and B-148; Weidkamp, pp. B-138 and B-147; Gallinatti, p. B-139; Tuleja, p. B-142; Mitchell, p. B-150; Mavrakis, p. B-160; Leong, p. B-172; Roper, p. B-177; Yee, p. B-218; Young, p. B-219; Gammell, p. B-220; Rupp, p. B-226): Overflights of Bay Farm Island or Alameda east end under IFR or VFR.

   Response: Current Airport noise abatement policies encourage aircraft under VFR to avoid overflights of Alameda residential areas (See Measure 1.G.) Measure 1.I calls for the establishment of a noise abatement SID from Runway 33 to prevent overflights during IFR conditions.

4. Concern (Hackbarth and Eichten, p. B-122; Sherman, Reynolds, Karrasch, Harper, DeSimone, p. B-125; Davis, p. B-154; Roper, p. B-177; Lim, p. B-207; Jonas, p. B-229): No operations from North Field at night (various time periods, as early as 9 p.m. and as late as 8 a.m.).

   Response: Measures 1.D, 1.G, and 1.H, which call for the preferential runway use of 9R and 9L, preclude the need for a curfew.

5. Concern (Greene, p. B-128): The need to monitor noise underneath North Field flight tracks in San Leandro.

   Response: See Measure 1.J.

6. Concern (Cox, p. B-100): Close North Field.

   Response: Closure of North Field could result in (a) relocation of all North Field activity to South Field, which does not have the airfield capacity to accommodate such an increase in operations, (b) the relocation of general aviation activity to other East Bay airports, or (c) the complete loss of such general aviation activity because of the inability to accommodate it at South Field or other airports; all of which can result in a severe economic loss to Oakland and the region.

7. Concern (Withrow, pp. B-130 and B-135; McKray, p. B-131; Skezas, p. B-132; Balasz, p. B-133; Pifer, p. B-134; Pagones, pp. B-136, B-137, B-146, and B-148; Weidkamp, pp. B-138 and B-147; Mitchell, p. B-149; Lim, p. B-207): Safety of residences and schools in Bay Farm Island and Alameda east end.

   Response: Safety is enhanced by limiting overflights. See #3 and #4 above.

8. Concern (Gallinatti, p. B-139; Andrews, p. B-215; Goodel, p. B-216; Gammell, p. B-220): Night and early morning engine testing.

   Response: See Measure 1.C.

9. Concern (Bowers, Charles, Wagner, Patel, p. B-141; Cochran, p. B-162; Pearce, p. B-165; Strohl, p. B-167; Leong, p. B-173; Roper, p. B-177; Sweeney, p. B-236): All approaches and departures from San Francisco International Airport and/or Oakland International Airport should be over water.

   Response: Limits on airspace capacity over the San Francisco Bay would greatly reduce operations at San Francisco International Airport and Oakland International Airport if this was implemented. Most operations on Runway 11-29 at Oakland International Airport are already over the Bay.

10. Concern (Tuleja, p. B-142): Inadequacy of present Airport Noise Complaint Line.

    Response: See Measure 1.K.

11. Concern (Gallinatti, p. B-139; Tuleja, p. B-142): Increased overflights since Airport Radar Service Area (ARSA) was introduced on April 9, 1987.

    Response: There has been no appreciable increase of overflights with the introduction of the ARSA.

12. Concern (Withrow, p. B-143; Davis, p. B-157): Opposition to the rezoning of Village V on Bay Farm Island.

    Response: The best way to achieve land use compatibility is to prohibit residential development in areas of high noise exposure. See Measures 2.A and 2.B.

13. Concern (Withrow, p. B-143): Incentive programs to convert to a Stage 3 fleet.

    Response: See Measure 3.A.

14. Concern (Preminger, p. B-208; Hatch, p. B-221): Opposition to any increased operations at the Airport.

    Response: Limiting operations at the Airport can have significant adverse economic impact on the East Bay economy.

15. Concern (Hatch, p. B-221): Residences within CNEL 65.

    Response: Measure 2.A would prohibit new residential development within CNEL 65. Existing residential units within CNEL 65 should be acoustically treated (Measure 2.F).

16. Concern (Hatch, p. B-221): Increased cargo operations.

    Response: Air cargo operations will be conducted from South Field using noise abatement arrival and departure tracks.

17. Concern (Phillips, p. B-223): Study combination of noise impacts on Alameda west end from the Alameda Naval Air Station, San Francisco International Airport, and Oakland International Airport.

    Response: Such a study is beyond the scope of this Part 150 Program.

18. Concern (Strohl, p. B-167): Acoustically treat homes.

    Response: See Measure 2.F.

19. Concern (Davis, p. B-102; Mavrakis, p. B-158; Pearce, p. B-166; Strohl, p. B-168; Hughes, p. B-176): Relocation of telecommunications tower.

    Response: The number of IFR operations eliminated by the tower was so small that the relocation of the tower would not be economically feasible and was not recommended.

20. Concern (Andrews, p. B-215; Goodel, p. B-217): Close entire Airport at night.

    Response: See #14 above.

21. Concern (Brennan, p. B-174): Impose noise abatement tax.

    Response: See pages 6-25 and 6-26.

22. Concern (Sweeney, p. B-236): No jet aircraft overflights of Alameda west end from the Airport.

    Response: Jet aircraft from the Airport do not generate noise levels greater than CNEL 65 at the west end of Alameda.

23. Concern (Pearce, p. B-165): Route all-cargo flights over the San Francisco Bay.

    Response: See #16 above.

24. Concern (Mitchell, p. B-151): No operations at North Field unless North Field tower is open.

    Response: Because of the low level of nighttime activity, North Field operations can be handled by the tower at South Field.

25. Concern (Mitchell, p. B-151; Signorelli, p. B-163): Make Runway 15-33 a primary runway, which includes lengthening it.

    Response: See Measures 1.A and 1.I.

26. Concern (Mitchell, p. B-151; Rupp, p. B-153): Restrict Runways 9L and 9R to takeoffs only.

    Response: Runways 9L and 9R are currently used for takeoffs at night except when wind or weather, or air traffic conditions dictate otherwise. See Measure 1.D.

27. Concern (Mitchell, p. B-151): Restrict Runways 27L and 27R to landings only.

    Response: Takeoffs from Runways 27L and 27R are permitted with the use of noise abatement procedures.

28. Concern (Mitchell, p. B-151): Touch-and-go patterns should not overfly residences.

    Response: See Measure 1.E.

29. Concern (Christopherson, pp. B-169 and B-231): There was not enough time for public response after the open public hearing held on July 15, 1987.

    Response: The 30-day period after the hearing was more than adequate.

30. Concern (Smart, p. B-119; Bowers, Charles, Wagner, Patel, p. B-141; Rupp, p. B-153; Cochran, p. B-162): Departures from San Francisco International Airport over Bay Farm Island and Oakland.

    Response: See Measure 1.N.

31. Concern (Withrow, pp. B-130 and B-135; McKray, p. B-131; Skezas, p. B-132; Balasz, p. B-133; Pifer, p. B-134; Pagones, pp. B-136, B-137, B-146, and B-148; Weidkamp, pp. B-138 and B-147): Encourage long-range compatibility between Harbor Bay Island and Oakland International Airport.

    Response: This is one of the purposes of this FAR Part 150 Noise Compatibility Program.

32. Concern (Withrow, pp. B-130 and B-135; McKray, p. B-131; Skezas, p. B-132; Balasz, p. B-133; Pifer, p. B-134; Pagones, pp. B-136, B-137, B-146, and B-148; Weidkamp, pp. B-138 and B-147): Increase of violations of suggested take off routes and required noise and safety procedures.

    Response: There has been no appreciable increase in violations of the Port's noise abatement policies for the Airport.

33. Concern (Rupp, p. B-153): Recommendation II.J should be placed in Section III.

    Response: Recommendation II.J is Measure 3.D.

34. Concern (Rupp, p. B-153): Port should codify all of its noise rules, regulations, procedures, etc., in a single reference document.

    Response: See Measure 3.E.

35. Concern (Rupp, p. B-153): Port should provide public notice of its noise regulations.

    Response: See Measure 3.F.

36. Concern (Rupp, p. B-153): A forum of Alameda City Council and Port of Oakland Board Members should be established to consider issues that are unresolved by other means.

    Response: See Measure 1.M.

37. Concern (Yee, p. B-218): Air carrier operations on Runway 11-29.

    Response: Limiting air carrier operations on Runway 11-29 can have significant adverse economic impact on the East Bay economy.

38. Concern (Davis, p. B-156; Jonas, p. B-229): FAA approval of telecommunications tower.

    Response: See page 5-28.

39. Concern (Seidler, p. B-211): Use best technology available to reduce aircraft noise.

    Response: See Measure 3.A.

40. Concern (Pearce, p. B-165): Construct a new runway to direct planes away from noise sensitive areas.

    Response: See page 6-5.

41. Concern (Pearce, p. B-165): Number of Federal Express departures.

    Response: Based on a 1991 forecast provided by Federal Express, on a typical day there will be 8 air carrier departures (day, 0; evening 2; and night, 6), 9 departures by small general aviation feeder planes at night (between 10 p.m. and 7 a.m.), and 4 helicopter departures (day, 2; evening, 2; and night, 0).

42. Concern (Pearce, p. B-165): Current noise abatement procedures at the Airport.

    Response: See pages 5-26 through 5-28.

43. Concern (Strohl, p. B-168): Night operations should be restricted to Runway 11-29.

    Response: See pages 6-11 through 6-14.

44. Concern (Leong, p. B-172): The frequency that aircraft land on or take off from each runway at the Airport.

    Response: See Table 5-4.

45. Concern (Leong, p. B-172): The decibel level of various aircraft.

    Response: See Tables 5-9 and 5-10.

46. Concern (Leong, p. B-172): The negative impact of steady droning noise on mental and emotional health.

    Response: Studies conducted by EPA, FAA, NASA, and others have not conclusively shown the relationship of aircraft noise to mental and emotional health.

47. Concern (Leong, p. B-172): The lack of concern by the Port of Oakland for the health and welfare of people negatively impacted by aircraft noise.

    Response: See page 1-1.

48. Concern (Brennan, p. B-174): Change aircraft flight patterns.

    Response: See pages 6-16 through 6-18.

49. Concern (Yee, p. B-218): Helicopter operations at North Field.

    Response: See page 6-6, Exhibit 6-1, and Measure 1.B.

50. Concern (Rupp, p. B-226; Jonas, p. B-230): The Port of Oakland should consider the acquisition of vacant land currently proposed for residential use on Bay Farm Island.

    Response: Given the small number of homes that are, or could be, affected by noise levels above CNEL 65, this option is currently not economically feasible. Furthermore, the Village 5 homes, which Harbor Bay Isle plans to construct within the CNEL 65 noise contour in undeveloped areas zoned for residential use, will be subject to noise easements and therefore legally compatible with noise levels of CNEL 75 or greater.

51. Concern (Rupp, p. B-226): The Port of Oakland should establish a maximum allowable single-event noise level for aircraft departing Runways 27L, 27R, and 29.

    Response: Current Airport noise abatement procedures preclude the need for further restrictions on aircraft operations at the Airport.

52. Concern (Jonas, p. B-228): Correct number of churches on Bay Farm Island, and nodes of commercial development on High Street in Alameda.

    Response: See page 3-1.

53. Concern (Jonas, p. B-224): Correct zoning of residential and non-residential areas on Bay Farm Island.

    Response: See page 3-4.

54. Concern (Jonas, p. B-228): Land use recommendations that have been deleted from the Combined Land Use Plan for the City of Alameda.

    Response: See pages 3-8 and 3-9.

55. Concern (Jonas, p. B-228): The exhibit does not show flight tracks over the east end of Alameda.

Response: See Exhibit 5-1.

56. Concern (Jonas, p. B-229): The reason why Runway 29 was shut down on July 21, 1985.

Response: Runway 29 was shut down for an emergency.

57. Concern (Brittle, p. B-234): The establishment of a noise budget.

Response: Because of the small noise exposure associated with aircraft operations (see pages 5-24 and 5-26) at the Airport, a noise budget is not warranted.