Technical Report
LAX Master Plan EIS/EIR

14c. Safety Technical Report

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Prepared for:

Los Angeles World Airports

U.S. Department of Transportation
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Prepared by:

Camp Dresser & McKee Inc.
Landrum & Brown

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1. INTRODUCTION

This Technical Report presents detailed information on methodology and baseline conditions related to the risk of upset associated with implementation of the Los Angeles International Airport (LAX) Master Plan. This report provides data and analysis in support of the Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) for the LAX Master Plan prepared pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

This Technical Report provides information on the model inputs and methodologies used, as well as the existing facilities and their regulatory and operational safeguards, that is supplemental to the risk of upset material presented in Section 4.24.3, *Safety*, of the EIS/EIR. Impacts associated with the information contained in this Technical Report are addressed in the Section 4.24.3, *Safety*, of the EIS/EIR. Additional information on aviation incidents and accidents is provided in Attachment A to this Technical Report.

2. GENERAL APPROACH AND METHODOLOGY

Potential impacts associated with the risk of upsets at facility that store flammable or toxic materials at LAX were evaluated by comparing the overall risks[1] posed by LAX facilities under baseline conditions to those projected under the No Action/No Project Alternative and the three build alternatives. The risk of upset analysis considers the likelihood and consequences of an upset, as well as the regulatory and operational safeguards in place to prevent an upset or minimize its effects.

Four facilities at LAX currently handle large volumes of toxic or flammable materials: the Central Utility Plant (CUP), the fuel farm, the Liquefied Natural Gas (LNG) Facility, and the Compressed Natural Gas (CNG) Station. These four facilities were identified as those that had the potential to present the greatest risk of a major upset. New or expanded facilities of these types would be constructed under the three build alternatives.

The scenarios examined in the risk of upset analysis are:

- Release of sulfuric acid from the existing and proposed LAX CUPs.
- Bulk fuel release from the largest tank at the existing and proposed LAX fuel farm facilities.
- Fire or explosion occurring at the existing and proposed LAX fuel farm facilities.
- Pool fire, flash fire, and flame jet hazards at the existing and proposed LNG/CNG facilities.

Although other facilities at LAX use and store hazardous and flammable materials, they do so in quantities that are substantially less than the CUP, the fuel farm, and the LNG/CNG facilities. These other facilities are not located any closer to people, aircraft, or buildings than the CUP, fuel farm, and LNG/CNG facilities, and therefore do not pose a greater risk of upset.

The analysis for each facility focused on the reasonably-foreseeable, worst-case accident scenario, as these accidents are likely to pose the highest risk to people and/or property. These scenarios are highly unlikely and have never occurred at LAX to date. The reasonably-foreseeable, worst-case scenarios were identified from existing risk analyses or were selected based on industry standards for the types of incidents most likely to occur at a specific facility. The probability and consequences of these scenarios were determined from previous analyses supplemented with new modeling, where necessary.

In general, emergency procedures at LAX are outlined in the *LAX Rules and Regulations Manual* and the *LAX Air/Sea Disaster Preparedness Plan*. The responsibility for emergency response lies with LAWA's Superintendent of Airfield Operations. These policies and procedures are addressed in Section 4.26.1, *Fire Protection*, of the EIS/EIR. Small releases of hazardous materials are addressed in Section 4.23, *Hazardous Materials,* of the EIS/EIR.

This analysis does not examine consequences associated with deliberate, malicious actions, including terrorist activities, civil unrest, or acts of war. These possible occurrences are addressed by the *LAX Rules and Regulations Manual* for LAX, Section 5, *Emergency Procedures*.

The following provides additional information regarding the model inputs and methodologies used to assess the impacts of a release of sulfuric acid at the CUP(s); pool fire at the fuel farm; and pool fire, flame jet, or flash fire at the LNG/CNG facilities. Of primary concern is the area within which serious

[1] Risk is a combined measure of the probability and severity of a potential scenario.

effects to human health and/or the environmental would result. These areas, commonly referred to as "hazard footprints," have been determined by modeling and are depicted or otherwise portrayed for the different upset scenarios examined in this analysis. Similar methodologies were used to delineate hazard footprints for both existing facilities and new facilities that would be constructed under the alternatives. The methodology for a fuel release without subsequent ignition is not addressed, as these impacts are evaluated qualitatively; a complete explanation of the methodology used for this scenario is provided in Section 4.24.3, *Safety*, of the EIS/EIR.

2.1 Central Utility Plant

Several potential release scenarios were developed in support of the preparation of a Risk Management and Prevention Plan (RMPP) for the existing CUP in August 1994. The RMPP for the CUP relied on several technical assessments, which were prepared and incorporated into the program. These technical assessments examined potential scenarios that could cause a release of hazardous materials, and assessed the potential effects of such releases. The assessments conducted include a seismic assessment, hazard and operability study (HAZOP), and a hazard analysis. The scenarios included the most severe incidents that were considered most likely to occur.

As part of the RMPP, an off-site consequence analysis (OCA) was conducted to assess the effects of several release scenarios identified during the HAZOP study and the seismic assessment, and to model the potential transport and dispersion consequence of an atmospheric release. In accordance with standard industry practices pertaining to RMPP studies, these scenarios were carried forward for analysis.

These scenarios include releases of chlorine gas and sulfuric acid. At the time of the preparation of the RMPP, the CUP was using chlorine gas for disinfection; thus, incident scenarios involving chlorine gas were addressed as part of the RMPP. Since then, LAWA has discontinued use of chlorine gas at the CUP, replacing it with a less hazardous liquid bleach solution. Therefore, the chlorine gas release scenarios were eliminated from consideration.

The scenario considered the most likely to occur at the CUP is the potential release of sulfuric acid caused by a line break between the sulfuric acid tank and a variable stroke injector pump. This would result in the release of sulfuric acid into a water-filled berm, and subsequent formation of a cloud comprised of dilute sulfuric acid vapors.

Risk analyses were performed for releases of sulfuric acid using the DEnse GAs DISpersion (DEGADIS) model. DEGADIS was specifically designed by the Federal Emergency Management Agency (FEMA) to examine the results of an accidental release of dense, or "heavier-than-air," gases, such as sulfuric acid mist. Parameters used for modeling the scenario are presented in **Table 1**, Sulfuric Acid Release Scenario Modeling Input Parameters. Worst-case meteorological conditions of one meter per second wind velocity and stable wind conditions (stability class F) were assumed for modeling purposes. These conditions tend to occur at night, and are generally associated with an easterly wind (i.e., with the wind coming from the east and blowing west), the statistically prevalent wind condition at LAX. Stable wind conditions are a conservative assumption because a higher wind speed would tend to disperse the material more quickly. The conservative assumption that the release would occur at ground level was also made.

Table 1

Sulfuric Acid Release Scenario Modeling Input Parameters

		Value Used
Meteorological and Terrain Parameters	Ambient Wind Speed (m/s)	1
	Windspeed Reference Height (m)	10
	Ambient Air Temperature (K)	293
	Ambient Air Pressure (atm)	1
	Relative Humidity (%)	50
	Pasquill Stability Class	F
	Surface Roughness (m)	0.2
Chemical Properties of Source Material	Chemical Name	Sulfuric Acid
	Molecular Weight (g/mol)	98.01
	Average Heat Capacity (J/Kg K)	N/A[1]
	Vapor Pressure (mm at 293 K)	1
	Vapor Density (air = 1)	3.4
	Specific Gravity (liquid)	1.8
	Boiling Point (K at 760 mm)	563
Release Conditions (Aerosol Cloud)	Storage Temperature (K)	293
	Storage Pressure (atm)	1
	Source Temperature at Time of Release (K)	293
	Release Density at Time of Release (kg/m^3)	1.4
	Mass Release Rate (kg/s)	1.04
	Source Area (m^2)	N/A
	Source Height (m)	0.0
	Source Duration (min.)	30
	Total Quantity Released (kg)	4,776

Source: Team Environmental Services, Inc., Off-Site Consequence Analysis for City of Los Angeles, Department of Airports, Central Utility Plant, August 17, 1994.

Hazard footprints were based on time-adjusted values of the Emergency Response Planning Guidelines (ERPGs) ERPG-2 guidelines. ERPGs were developed by the American Industrial Hygiene Association Emergency Response Planning Committee to assist emergency response personnel planning for a catastrophic chemical release to the community. While they are have not been incorporated into regulations by an agency with jurisdiction, ERPGs are frequently used as guidelines for exposure levels in preparing documents such as Risk Management Plans. ERPGs are provided at three levels:

- ERPG-1 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing any deleterious effects other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.
- ERPG-2 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.
- ERPG-3 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing life-threatening health effects.

Table 2, Emergency Response Planning Guidelines for Sulfuric Acid, lists the ERPGs for sulfuric acid.

Table 2

Emergency Response Planning Guidelines for Sulfuric Acid

	ERPG-1	ERPG-2	ERPG-3
Sulfuric Acid	2 mg/m^3	10 mg/m^3	30 mg/m^3

Source: American Industrial Hygiene Association, Emergency Response Planning Guidelines and Workplace Environmental Exposure Level Guides Handbook, 1997.

The capacities of the proposed CUP were based on the same ratio of terminal space to capacity as the existing CUP and terminals. In order to provide the proposed 4.7 million square feet of terminal space with heating and air conditioning, the Westside CUP for Alternatives A and B would need to be approximately 1.5 times the size of the existing CUP. The Westside CUP for Alternative C would be similar in size to the existing CUP. Section 4.17.1, *Energy Supply*, of the EIS/EIR presents more detailed information regarding the CUP(s). The release scenarios were based on the amount of sulfuric acid that is stored at the facility. Although the Alternative A and B CUP facilities would be slightly larger than the existing CUP, due to delivery and storage requirements, it is likely that approximately the same quantity of sulfuric acid would be stored at the new CUP as is currently stored at the existing CUP.

2.2 Fuel Farm

Since the majority of the fuel stored at LAX is located at the LAXFUEL Fuel Farm, which also has the largest capacity tanks, this site was selected for evaluating the consequences of a fire or explosion of jet fuel under baseline conditions. The LAXFUEL Fuel Farm is located a similar distance away from public areas as other, smaller fuel storage facilities at LAX. As indicated in Chapter 3, *Alternatives (Including Proposed Action)*, of the EIS/EIR, the fuel farm would be in a different location under each alternative.

In December 1997, Camp Dresser & McKee Inc. conducted a hazard analysis of the potential for fire and/or explosion at the LAXFUEL Fuel Farm. The following worst-case scenarios for fire or explosion at the fuel farm facility were considered.

- **Scenario 1:** This scenario assumes that a single 2,520,000-gallon tank in the largest containment area were to rupture and the fuel were to subsequently ignite. The berm of the containment area is assumed to remain intact.
- **Scenario 2:** This scenario could be initiated from Scenario 1. If the fire was not immediately controlled, the heat caused by the contained flames could result in the rupture (with possible explosion) of one or more of the other tanks within the bermed area.
- **Scenario 3:** The impact of a large aircraft crashing into the fuel farm could be expected to cause a similar but larger event. With such an occurrence, the secondary containment would probably be damaged, and unable to control the released fuel. Under this scenario, burning fuel could flow along the ground surface to the storm drain system surrounding the facility. Ignited fuel might flow within the system, creating thermal damage, although there would be little risk of explosion. It is likely that a fire within the storm drain system would quickly burn out due to a lack of oxygen.

The aircraft fuel stored in the largest quantities at LAX is termed "Jet A fuel," which is a kerosene type fuel, made up of hundreds of different hydrocarbons. Due to the physical properties of Jet A fuel (e.g., low volatility and low explosion potential), an explosion would only be expected under confined conditions and, as flame speeds associated with Jet A fuel are not conducive to detonation, the probability of explosion is very low. Due to the use of floating roof tanks, which limit the accumulation of vapor and provide good fire coverage, Scenario 2 is not considered to be a reasonably foreseeable scenario and was not further examined. Due to the unlikelihood of an aircraft crash at the facility, only Scenario 1 was considered reasonably foreseeable and was further examined.

For the fuel farm pool fire incident analysis, the Automated Resource for Chemical Hazard Incident Evaluation (ARCHIE) model was used. ARCHIE is a model developed by FEMA, the U.S. Department of Transportation (USDOT), and the U.S. Environmental Protection Agency (USEPA) to provide emergency planning personnel with the resources necessary to undertake comprehensive evaluations of potentially hazardous facilities and activities. ARCHIE is considered a conservative model and may overestimate the size of the hazard footprint associated with a particular incident.

Because each fuel farm site would have secondary containment of sufficient capacity to contain a spill of the largest tank, it was assumed that all pool fires would be limited to the size of the secondary containment area necessary to contain the volume of fuel. For all sites, these areas are irregularly shaped. ARCHIE bases the hazard footprint on a circular pool fire. In order to approximate the hazard footprint based on a circular shape, the area of secondary containment was determined and the radius of a circle of equivalent area was used in the ARCHIE model.

Jet A is a kerosene-like fuel composed of a combination of several different hydrocarbons, including paraffins, cycloparaffins, olefins, and aromatic compounds, as well as impurities such as mercaptans and other sulfur compounds. The Jet A designation is based more upon usage requirements and less upon the detailed chemistry of the fuel. The lack of a clear definition of the composition of Jet A fuel means that precise values for such characteristics as boiling point, specific gravity, and molecular weight are not easily obtained. ARCHIE, like many other modeling programs, requires these inputs in order to determine flame height and the hazard footprint. In order to calculate the hazard footprint as accurately as possible, the molecular weight, boiling point, and specific gravity were based upon existing documentation. The molecular weight was assumed to be 175 atomic mass units. This is based upon a paraffinic absorbent oil (a component of kerosene) of approximately "average" molecular weight and boiling point.[2] The boiling point and specific gravity were obtained from the *Handbook of Aviation Fuel Properties*.[3] For analysis of the fuel farm upset scenarios, the properties of Jet A fuel as listed in **Table 3**, Properties of Jet A Fuel Used in Fuel Farm Pool Fire Analysis, were used.

Table 3

Properties of Jet A Fuel Used in Fuel Farm Pool Fire Analysis

Molecular Weight	175
Boiling Point	450EF
Specific Gravity	0.8

Source: Camp Dresser & McKee Inc., 1998.

For the pool fire scenarios, it was assumed that an incident flux (a measure of thermal radiation level per unit time per unit area) of approximately 1,600 British Thermal Units (BTU)/hr-ft^2 would cause second degree burn injuries on bare skin and that an incident flux level of 3,200 BTU/hr-ft^2 would cause third degree burns that may cause death. These two levels are based on experimental data and are typically used in determining injury and fatality hazard footprints.[4] It was assumed that an exposure of greater than 3,000 BTU/hr-ft^2 of heat flux would cause any buildings that are not fire resistant to ignite. This value is based on the National Fire Protection Agency's (NFPA) Guidance 59A (Standard for the Production, Storage, and Handling of Liquefied Natural Gas [LNG]) and the regulations of 49 CFR Section 193 (Liquefied Natural Gas Facilities Federal Safety Standards).[5]

2.3 LNG/CNG Facilities

A hazard analysis of the potential for fire related to a release at the LNG/CNG facilities was performed in 1997 using the ARCHIE and DEGADIS models. The accidental release scenarios considered for the LNG/CNG facilities include the following:

- Release of methane through a 0.5-inch opening in a CNG tank and subsequent ignition of a methane vapor cloud (flash fire).
- Release of methane through a 0.5-inch opening in a CNG tank and immediate ignition of high-pressure methane vapor as it escapes the CNG tank (flame jet).
- Release of methane through a 2-inch opening in an LNG tank and subsequent ignition of a methane vapor cloud (flash fire).
- Release of methane through a 2-inch opening in an LNG tank and subsequent ignition of a liquid pool of methane in the containment area surrounding the LNG tank (pool fire).

Some reasonably foreseeable events that could result in such a release include: faulty metallurgy in the storage tanks, a moderate earthquake resulting in a vessel or pipeline crack, corrosion, or a leaking relief valve.

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[2] Gruse, William A., and Donald R. Stevens, The Chemical Technology of Petroleum, 1942.

[3] Coordinating Research Council, Inc., Handbook of Aviation Fuel Properties, 1988.

[4] FEMA, USDOT, and USEPA, Handbook of Chemical Hazard Analysis Procedures, 1989.

[5] In order to be consistent, the same threshold heat flux for building ignition was used for incidents at the LNG/CNG Facility or the fuel farm. Although these values were derived from LNG-related sources, the source of the heat flux does not affect ignition.

Possible consequences of the release scenarios include flash fires, flame jets, and pool fires:

- A flash fire is the non-explosive combustion of a vapor cloud resulting from a release of flammable material into the open air, which, after mixing with air, contacts an ignition source. The primary dangers of a flash fire are thermal radiation and direct flame contact. Flash fires generally last no more than a few tenths of a second.
- A flame jet occurs when flammable gas is released from a pipe or vessel at high pressures, is ignited, and combusts as it is released. Because the release is under high pressure, the flame generated can reach a significant distance from the release point. The primary danger of a flame jet is direct flame contact.
- A pool fire occurs when a pool of flammable liquid is ignited. The actual combustion takes place within the material evaporating from a layer of liquid at the base of the fire. Pool fires can burn until the fuel is consumed. The primary dangers of a pool fire are thermal radiation and direct flame contact.

Research indicates that it is highly unlikely that an unconfined vapor cloud of methane release from the LNG/CNG facilities would occur.[6] Therefore, the effects of an explosion were not included in further analysis.

The effects of each scenario were modeled based on the size of the individual LNG and CNG containers. Because each facility (under baseline and future conditions) would use similarly sized containers, the hazard footprint can be applied to all facilities under all alternatives. The land uses that would be potentially affected by these hazard footprints were evaluated.

Table 4, Properties of Methane Used in LNG/CNG Facilities Incident Analysis, presents the physical properties of methane used for the analysis.

Table 4

Properties of Methane Used in LNG/CNG Facilities Incident Analysis

Molecular Weight	16.04
Atmospheric Boiling Point	-259EF
Lower Flammability Limit	5%
Upper Flammability Limit	15%
Flash Point	-306EF

Source: Camp Dresser & McKee Inc., Final Initial Study, Proposed LNG/CNG Fueling Facility, July 21, 1997.

The potential impacts of the release scenarios were predicted under both the most conservative and the most prevalent meteorological conditions, as described in **Table 5**, Meteorological Conditions Used in LNG/CNG Facilities Incident Analysis.

6 Camp Dresser & McKee Inc., Proposed LNG/CNG Facility Final Initial Study, July 1997.

Table 5

Meteorological Conditions Used in LNG/CNG Facilities Incident Analysis

	Most Conservative	Most Prevalent
Atmospheric Stability Class	F	D
Temperature	54EF	69EF
Windspeed	2.0 m/s	7.0 m/s

Source: Camp Dresser & McKee Inc., Final Initial Study, Proposed LNG/CNG Fueling Facility, July 21, 1997.

As with the fuel farm pool fire analysis, for pool fire scenarios associated with the LNG and CNG facilities, it was assumed that an incident flux of approximately 1,600 BTU/hr-ft^2 would cause second degree burn injuries on bare skin and that an incident flux level of 3,200 BTU/hr-ft^2 would cause third degree burns that may cause death. These two levels are based on experimental data and are typically used in determining injury and fatality hazard footprints. For flash fire scenarios, the hazard footprint was determined by the location of the lower flammability limit of the methane vapor cloud from the release point. For flame jet scenarios, the hazard footprint was based on the length of the flame jet.

It was assumed that an exposure of greater than 3,000 BTU/hr-ft^2 of heat flux would cause any buildings that are not fire resistant to ignite. This value is based on the NFPA's Guidance 59A and the regulations of 49 CFR Section 193.

3. AFFECTED ENVIRONMENT/ENVIRONMENTAL BASELINE

The subsections below present supplemental information regarding the existing CUP, fuel farm, and LNG/CNG facilities. **Figure 1**, Hazard Footprint for the CUP, Baseline Conditions, through **Figure 4**, Hazard Footprint for the CNG Station, Baseline Conditions, present the hazard footprints associated with each scenario under baseline conditions.

3.1 Central Utility Plant

The Central Terminal Area (CTA) CUP covers approximately 0.4 acre, and is located on airport property at 275 Center Way. The CUP is situated approximately one-half mile south of Lincoln Boulevard, one-half mile west of Sepulveda Boulevard, one mile north of Interstate 105, and two miles east of the Pacific Ocean.

The CUP provides chilled water and hot water for use in heating and air conditioning at LAX; surplus electricity generated by the cogeneration facility is sold to the City of Los Angeles Department of Water and Power (DWP) for credits against LAWA's bills. The CUP operations rely on cooling towers to dissipate excess heat gathered through the air conditioning process. Operation of the cooling towers requires substantial quantities of water, which is treated to prevent biological growth and scaling. The cooling tower is supported by an adjoining water treatment and supply facility, which employs sulfuric acid to adjust the pH of the cooling tower water.

3.1.1 Description of Hazards

Sulfuric acid is stored at the CUP in a 1,000-gallon capacity glass-lined tank, with no more than 700 gallons of sulfuric acid stored in the tank at any time. Sulfuric acid is injected into the cooling tower water by a pump activated by an automatic pH controller. Long-term exposure to low concentrations of sulfuric acid vapors, or short-term exposure to high concentrations, can result in adverse health effects from inhalation. Exposure symptoms include eye, nose, and throat irritation, pulmonary edema, bronchitis, emphysema, conjunctivitis, and skin and eye burns. Contact with eyes can be extremely irritating, and may result in total loss of vision if exposed to severe concentrations for a prolonged period of time.

3.1.2 Release Scenarios

Of the various scenarios examined in the RMPP for the LAX CUP prepared in 1994, two scenarios involving a release at the CUP were deemed the most likely to occur. Scenario #3 involved the escape of chlorine gas, and Scenario #7 considered a sulfuric acid release. The chlorine gas release scenario is not considered in this analysis, as the use of chlorine gas at the CUP has been discontinued.

The sulfuric acid release scenario (Scenario #7) considered a release of sulfuric acid caused by a line break between the sulfuric acid tank and a variable stroke injector pump that feeds sulfuric acid to the cooling tower. This would result in the release of sulfuric acid into a water-filled berm, and subsequent formation of a cloud comprised of diluted sulfuric acid vapors.

Using the DEGADIS model, the analysis identified the approximate maximum downwind distances from the CUP within which a risk to human health would exist. These maximum distances are based on time-weighted ERPG-2 and ERPG-3 values for each chemical. **Table 6**, Maximum Downwind Distances for CUP Release Scenario, presents the maximum downwind distances that would be subject to a risk to human health. **Table 7**, Estimated Population Effects for CUP Release Scenario - Baseline Conditions, presents estimates of the population that would be affected by a sulfuric acid release scenario. **Figure 1** presents the potentially affected area for a sulfuric acid release scenario. The depiction of the hazard footprint accounts for the most conservative wind direction and dispersion. As seen in this figure, the hazard footprint extends to some of the public and terminal areas of the airport. This sulfuric acid release scenario would not affect any of the sensitive receptors identified in Technical Report 1, *Land Use*.

Table 6

Maximum Downwind Distances for CUP Release Scenario

Scenario	Level of Concern (ppm)	Maximum Downwind Distance (feet)
Sulfuric Acid Release	2.4, ERPG-2	459
	7, ERPG-3	262

Source: Team Environmental Services, Off-Site Consequence Analysis , August 17, 1994.

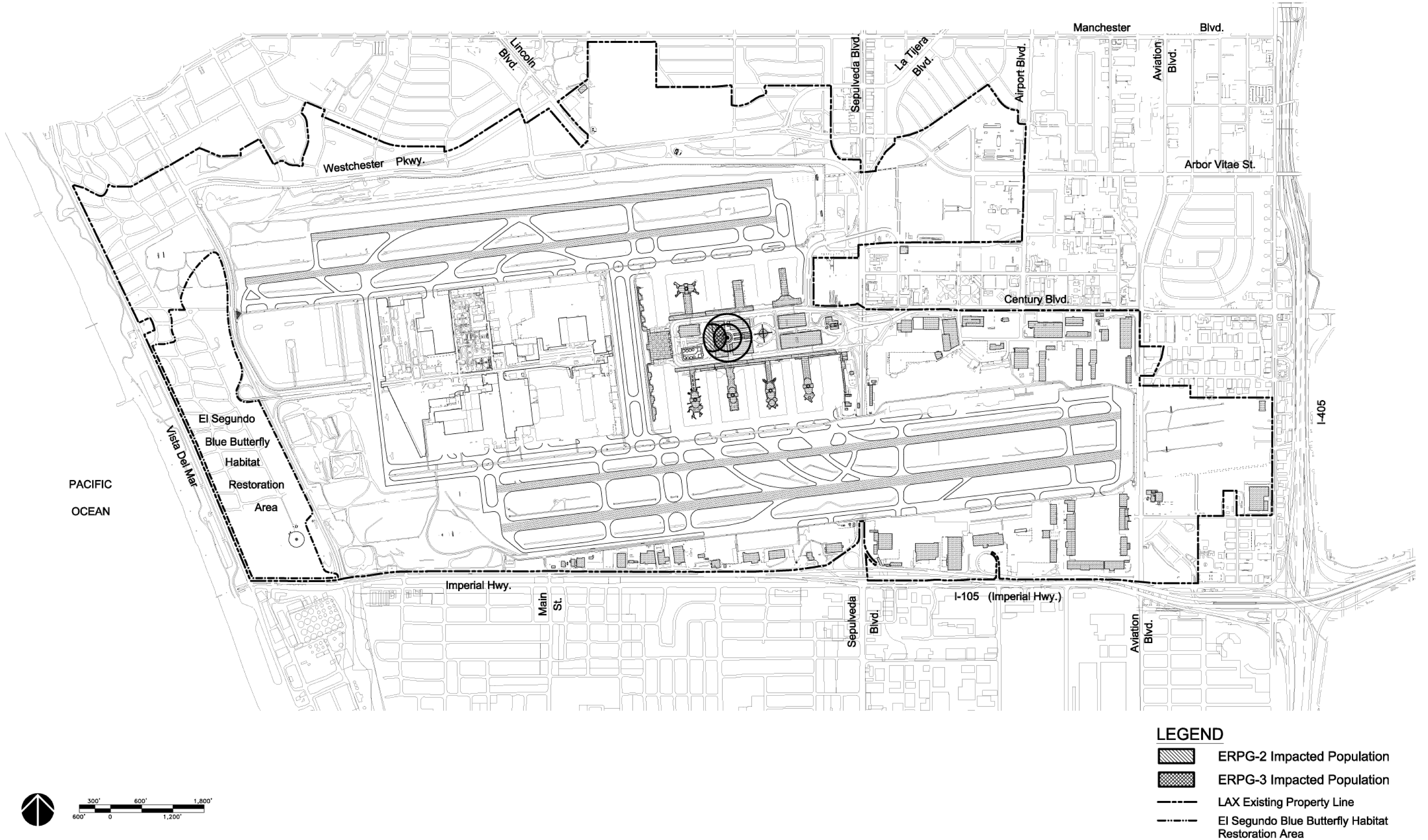
Table 7

Estimated Population Effects for CUP Release Scenario – Baseline Conditions

Release Scenario	ERPG-2 Distance (feet)	Residential Population at Risk	Residential Population Affected	Commercial Population at Risk	Commercial Population Affected
Sulfuric Acid Release Scenario	459	0	0	180	60

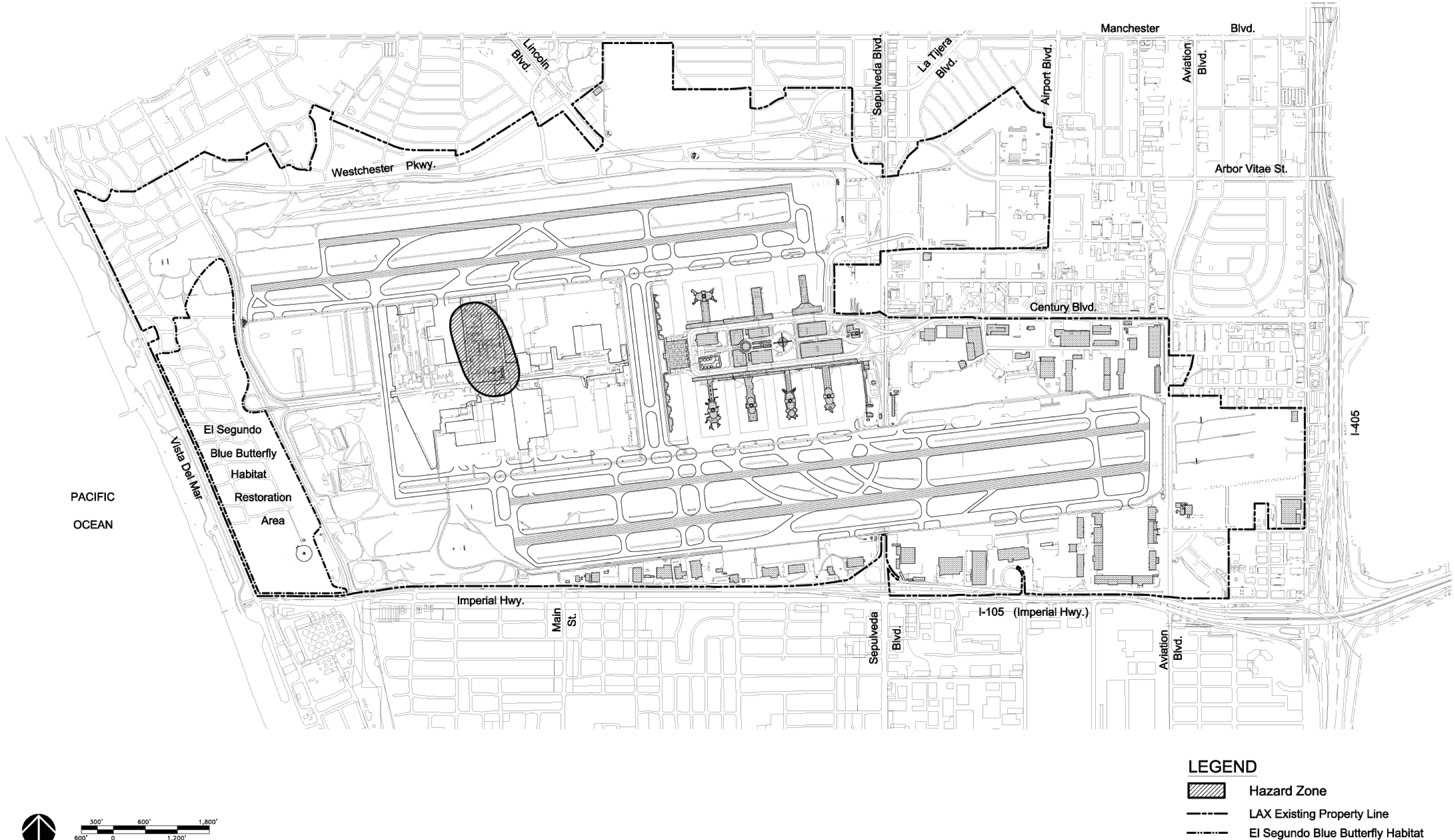
ERPG2 = Emergency Response Planning Guidelines 2.

Source: Team Environmental Services, Off-Site Consequence Analysis, August 17, 1994.



Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

Los Angeles International Airport Master Plan	**Hazard Footprint for the CUP Baseline Conditions**	Figure 1



LEGEND

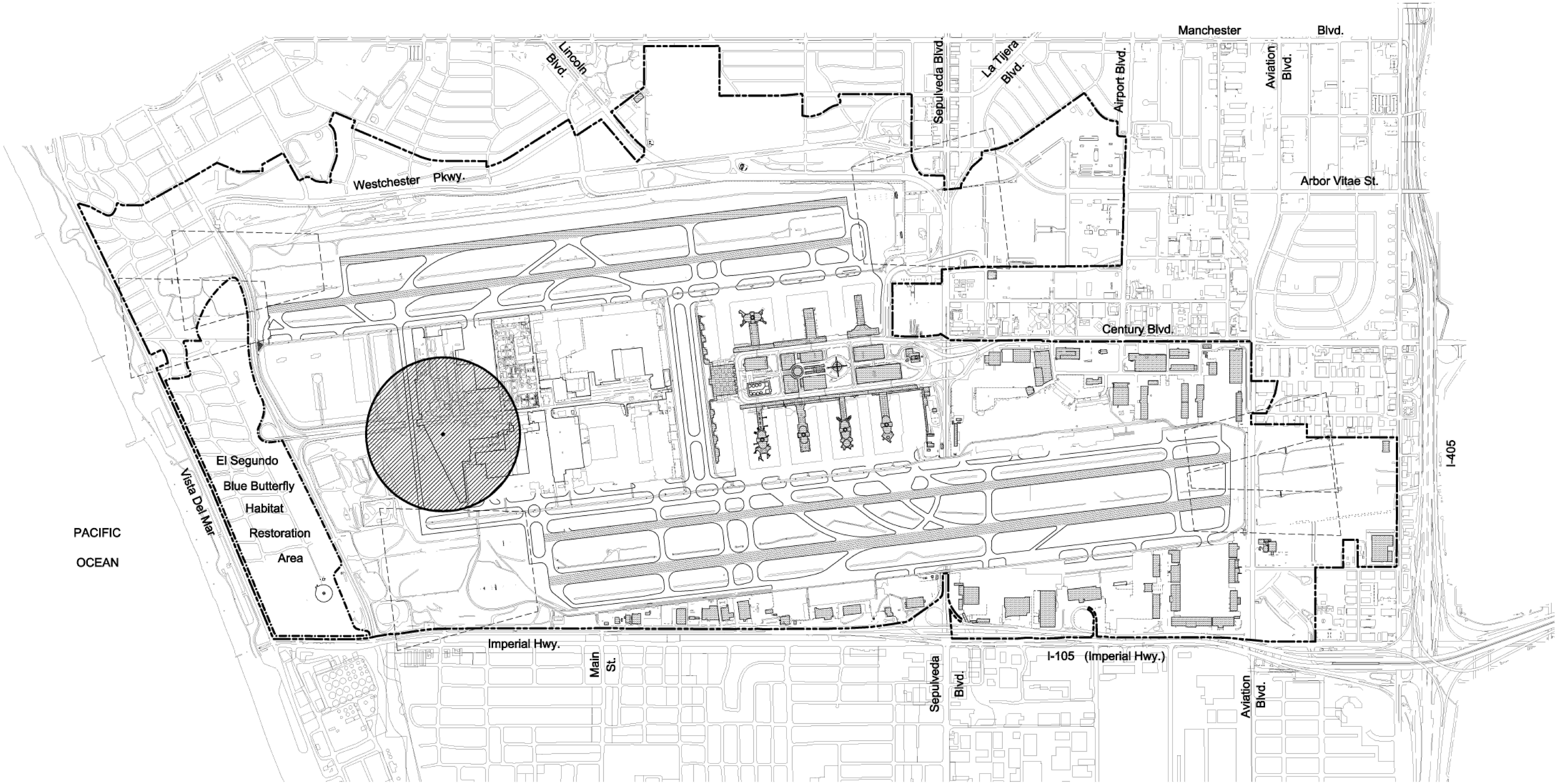
(hatched box)	Hazard Zone
(dashed line)	LAX Existing Property Line
(dash-dot line)	El Segundo Blue Butterfly Habitat Restoration Area

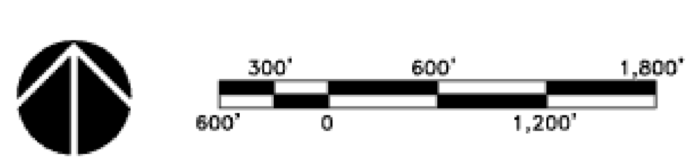
Source: Camp Dresser & McKee Inc., 2000.

Los Angeles International Airport Master Plan

Hazard Footprint for the LAXFUEL Fuel Farm Baseline Conditions

Figure 2





Source: Camp Dresser & McKee Inc., 1998, 2000.

LEGEND

- Hazard Zone
- LAX Existing Property Line
- El Segundo Blue Butterfly Habitat Restoration Area

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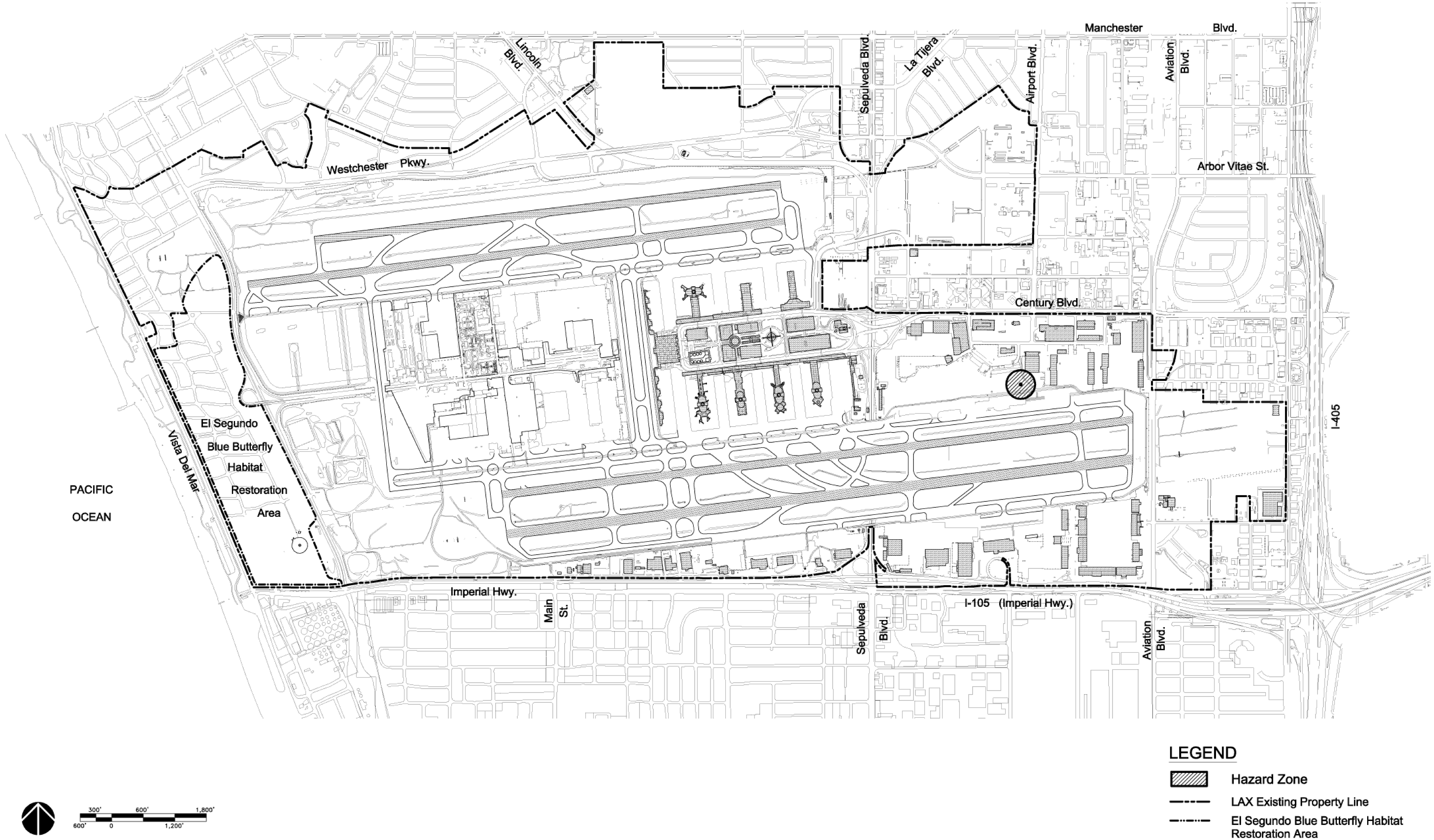
Los Angeles International Airport Master Plan

Hazard Footprint for the LNG Facility
Baseline Conditions

Figure
3



Source: Camp Dresser & McKee Inc., 1998, 2000.

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Los Angeles International Airport Master Plan	**Hazard Footprint for the CNG Station Baseline Conditions**	Figure 4

3.1.3 Historical Accidents and Reportable Release

An accident is defined to be an uncontrolled event, which includes all unintended releases of chlorine or sulfuric acid, near misses, and events resulting in worker injury while working on or near the process equipment. According to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), for sulfuric acid, the reportable quantity is 1,000 pounds or more in a 24-hour period. During the required reporting period, extending from February 1990 through RMPP completion in August 1994, no sulfuric acid related accidents or reportable releases occurred at the CUP. Additionally, no CUP accidents or reportable releases have occurred through September 2000.[7] The CUP has been operating since 1961.

3.1.4 Preventive Measures

Preventive measures currently incorporated into the CUP operations include specific procedures addressing the following:

- Safety and design features
- Engineered failsafe and back-up systems
- Sulfuric acid handling practices
- Equipment start-up and shut-down procedures
- Sulfuric acid detection and monitoring
- Maintenance and employee training programs
- Emergency response procedures
- Management responsibilities
- Auditing and inspection programs

Local regulations pertaining to an upset condition at LAX consist of policies aimed at fire protection and emergency response. LAX fire protection services operate under the requirements and guidelines of the City of Los Angeles Fire Department (LAFD), the city's Fire Protection and Prevention Plan (an element of the city's General Plan), and the city's Fire Code. The most pertinent provisions of the City of Los Angeles Fire Code[8] are found in Division 31, which includes specific requirements for tanks that are stored indoors. Storage of sulfuric acid at the CUP is subject to the requirements of Division 31 of the Los Angeles Fire Code regarding atmospheric tanks. The existing CUP complies with these requirements.

3.2 Fuel Farm

As described in Section 4.23, *Hazardous Materials*, of the EIS/EIR, petroleum fuels are stored by various tenants throughout LAX. The LAXFUEL Corporation stores more fuel than any other tenant at LAX, and is by far the largest supplier of fuel consumed at the airport. LAXFUEL Corporation supplies 121 million gallons of fuel per month, and maintains approximately 26 million gallons of fuel storage in an aboveground storage tank (AST) facility. The facility consists of 17 ASTs, 15 of which contain Jet A fuel, several of which have a capacity of 2.5 million gallons each. Additionally, the facility includes two smaller tanks, including one relief tank and one waste fuel tank. The LAXFUEL Fuel Farm underwent major expansion and renovation and has been operating at this location in this configuration since January of 1995. Among the other tenants at LAX, no entity stores more than 500,000 gallons of fuel.

The LAXFUEL Fuel Farm is located on airport property, approximately 1.5 miles east of the Pacific Ocean (at Dockweiler State Beach), two miles west of Sepulveda Boulevard, one mile north of Imperial Highway, and 0.75 mile south of Westchester Parkway.

A major fuel spill occurring at the LAXFUEL Fuel Farm could cause various adverse health and environmental effects, including inhalation or ingestion hazards to both humans and wildlife. An uncontrolled fuel spill could affect soil, groundwater, and/or surface water resources. As soil and groundwater at this facility are already known to be contaminated by fuel, it is likely that additional impacts would be remediated in a manner consistent with on-going activities, as described in Section 4.23,

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[7] LAWA, Central Utility Plant.

[8] City of Los Angeles, City of Los Angeles Fire Code, Article 7 of Chapter V of the Los Angeles Municipal Code, 1992.

Hazardous Materials, of the EIS/EIR. Section 4.7, *Hydrology and Water Quality*, of the EIS/EIR describes conditions pertaining to surface waters and surface water quality.

3.2.1 Release Scenarios

The fuel farm release scenario assumes that the largest single tank (2,520,000-gallon) in the largest containment area ruptures and the fuel subsequently ignites. It is assumed that the containment area berm would remain intact. Using the ARCHIE model, pool fire modeling indicated that, if the fire were not extinguished, the following consequences would be expected:

- The nominal flame height would be approximately 208 feet.
- Within 270 feet of the center of the pool, exposure could result in fatality.
- Within 386 feet of the center of the pool, a human would experience second degree burns with severe pain.

Figure 2, Hazard Footprint for the LAXFUEL Fuel Farm, Baseline Conditions, shows the hazard footprint for the facility, assuming that the fire was contained within the bermed areas. For all hazard footprints, the largest radius of injury is indicated in the figure. As indicated on the figure, in the event of a worst-case fire at the LAXFUEL facility, individuals may be injured on the access road near the operations center, and at adjacent buildings, including those currently occupied by Dobbs House, Marriott Corporation, and the Los Angeles West Terminal Fuel Corporation (LAWTFC). The ignition of surrounding structures is not expected to occur due to the fact that the incident flux at the nearest building would be less than 3,000 BTU/hr-ft^2.

3.2.2 Historical Incidents

Between January 1994 and December 1997 there were 254 reported fuel spills at LAX. The vast majority of these spills involved less than 100 gallons and were typically caused by operational errors. Most of these spills were immediately contained and cleaned-up using absorbent material. Technical Report 13, *Hazardous Materials,* presents additional information regarding these occurrences.

Between 1989 and 1998, there were five fuel spills reported at LAX involving quantities exceeding 1,000 gallons. Although these spills were reportedly contained and cleaned-up, such occurrences are more likely to occur than the worst-case upset scenario. **Table 8**, Fuel Spills at LAX Exceeding 1,000 Gallons, 1989 to 1998, presents additional information about these spills. No fires or explosions have occurred at the LAXFUEL Fuel Farm.

Table 8

Fuel Spills at LAX Exceeding 1,000 Gallons, 1989 to 1998

Date	Fueler/Airline	Quantity	Area	Clean-up
Oct 1990	Private	2,000 gal	750 ft^2	Dryzit/Vacuum
Jan 1992	Singapore	1,500 gal	Unknown	Dryzit
Feb 1992	LAXFUEL	1,500 gal	Unknown	Contained in storm drain outfall and recovered.
April 1992	PLH Aviation	10,000 gal	1,600 ft^2	Dryzit/Boom
Nov 1992	ASI	4,000 gal	100,000 ft^2	Excavation

Source: Camp Dresser & McKee Inc., Stormwater Pollution Prevention Plan, 1997; LAWA, Hazardous Materials Incident Inventory, May 23, 1998.

3.2.3 Preventive Measures

The following state and federal regulations require the preparation of plans or contingency measures to avoid and contain fuel releases:

- **Clean Water Act Spill Prevention, Control, and Countermeasure Plan (SPCC):** SPCC provisions require fuel handlers at LAX to document preventive measures to avoid oil discharges to navigable waters and to control releases, should they occur.

- **Oil Pollution Act (OPA) of 1990:** OPA requires certain facilities with an aboveground storage capacity of greater than or equal to one million gallons to develop and implement an OPA plan, often termed a Facility Specific Response Plan (FSRP). Technical Report 6, *Hydrology and Water Quality,* identifies tenants at LAX that currently have OPA plans.
- **Oil Spill Prevention and Response Act:** The Oil Spill Prevention and Response Act was enacted to improve the State of California's response to, and management of, oil spills that occur in marine waters. It requires facilities that store petroleum in volumes greater than certain thresholds (one million gallons), and have the potential to release petroleum into coastal or navigable waters, to prepare and gain approval of an Oil Spill Prevention and Response Plan (OSPR Plan). Additionally, the act created a new Administrator for Oil Spill Response within the California Department of Fish and Game. The Administrator is charged with developing response and training programs and coordinating emergency drills, developing an interstate compact, and conducting oil spill clean-up studies.

Local regulations pertaining to an upset condition at LAX consist of policies aimed at fire protection and emergency response. LAX fire protection services operate under the requirements and guidelines of the LAFD, the city's Fire Protection and Prevention Plan (an element of the city's General Plan) and the city's Fire Code. Section 4.26.1, *Fire Protection,* of the EIS/EIR discusses these policies and guidelines in detail. Pertinent provisions of the City of Los Angeles Fire Code[9] are identified below.

- Division 31 of the Fire Code specifies that floating roof tanks, such as those used to store jet fuel at the LAXFUEL Fuel Farm, must be:
  - Separated from buildings or buildable property by a distance of one-half of the tank diameter.
  - Separated from streets, alleys, or public ways by a distance of one-sixth of the tank diameter.
  - Separated from each other by a distance of one-sixth of the sum of the diameters of the two tanks.
- Division 31 also specifies requirements for foundation and supports, spill protection, drainage, venting, and grounding of aboveground atmospheric tanks.

Consistent with LAFD requirements, the LAXFUEL Corporation has developed numerous design, operational, maintenance, safety, and emergency response plans designed to ensure that petroleum release events at the fueling facility do not occur. Some of the more significant plan elements and facility safeguards employed at the LAXFUEL Fuel Farm are briefly described below.

- **Facility Design**: Each tank, or set of tanks (with a maximum of four), is located within a lined secondary containment area. In accordance with applicable regulations, the secondary containment areas are large enough to hold the contents of the largest tank, as well as rainfall from a 24-hour, 25-year storm event. The impervious secondary containment areas have a 30-millimeter thick liner fastened to the dike walls. The perimeter walls of the containment areas are eight feet high and the containment areas are equipped with fuel detection systems. The secondary containment areas drain into one of two oil-water separators. The valves leading to the oil-water separator remain closed and locked and stormwater is released only after visual inspection. Liquid, primarily from precipitation, is discharged from the oil-water separator to the airport storm drain system, where it is conveyed to an on-site detention basin and further treated in a clarifier operated by LAWA prior to discharge to the Hyperion Treatment Plant (see Section 4.7, *Hydrology and Water Quality,* of the EIS/EIR).
- The tanks are also fitted with high-level detectors, which both warn operators of an impending overfill and provide automatic shutoff of incoming fuel. All inlet and outlet fuel valves are motorized and controlled remotely by operators. The fuel handling system at the LAXFUEL Fuel Farm is designed to detect the release of jet fuel from the tanks or associated pipelines.

The LAXFUEL Fuel Farm is designed and operated to minimize the risk of an upset of any kind, including a pool fire, and minimize the effects on an upset, should one occur. Offset distances to adjacent facilities appear sufficient to withstand the thermal radiation flux without ignition.

9 Los Angeles, City of, City of Los Angeles Fire Code, Article 7 of Chapter V of the Los Angeles Municipal Code, 1992.

- **Operations, Maintenance, and Safety Procedures**: Self-inspection procedures include daily visual inspections of the facility for leaks, abnormal operations, or observed hazards. A Tank Inspection Checklist has been developed to aid in the self-inspection process. These procedures cover the tanks, foundation, and piping. Inspection procedures and schedules have also been developed for checking emergency response equipment and secondary containment structures.
- **Emergency Response Procedures**: LAXFUEL Corporation has developed a comprehensive FSRP, which incorporates the requirements of the Oil Pollution Act of 1990, OSPR, and SPCC Plans. This program includes a complete Emergency Response Action Plan, which describes notification procedures, facility response team responsibilities, role of the crisis management team, facility evacuation plan, and immediate response actions. The remainder of the FSRP discusses the hazard evaluation, discharge scenarios, and the automated discharge detection systems. It also establishes procedures for plan implementation, self-inspection, spill response training, and facility drills and exercises.
- **Emergency Response Resources**: The LAFD fire response team is trained to fight hydrocarbon fuel fires and has several stations located at LAX. In addition, fire suppression systems are located in the tanks as well as in the bermed area. (Section 4.26.1, *Fire Protection*, of the EIS/EIR discusses these services in greater detail.)

3.2.4 Off-Site Fuel Farm Sites

Two sites close to LAX are being considered for the construction of an off-site fuel farm under Alternative B: Scattergood Electric Generating Station and an oil refinery south of the airport. The baseline conditions at these sites are addressed in their entirety in Section 4.24.3, *Safety,* of the EIS/EIR.

3.3 LNG/CNG Facilities

Currently, some airport ground shuttles are fueled by LNG and some small ground support equipment is fueled by CNG. There are two on-airport fueling locations for these alternative fuels. The existing LNG Facility is located on World Way West, near the Continental Airlines leasehold. The LNG Facility currently consists of two 4,500-gallon LNG tanks used by approximately 21 ground shuttles per day. The CNG Station is currently located on the United Airlines leasehold, although it is operated by Pickens Fuel Corp. The CNG Station consists of six 10,000 standard cubic feet (SCF) CNG tanks.

3.3.1 Release Scenarios

Both LNG and CNG consist primarily of methane, a flammable hydrocarbon. A CNG release could form a vapor cloud of gaseous methane and an LNG release could form a boiling liquid vapor pool or a vapor cloud of gaseous methane.

The effects of a release at the LNG/CNG facilities were modeled using the ARCHIE model and are based on a release from the largest tank. This analysis indicated that, depending upon the scenario and meteorological conditions, the hazard radii range from 70 to 1,345 feet. **Table 9**, Calculated Hazard Radii for LNG/CNG Facilities, presents these hazard radii.

Table 9

Calculated Hazard Radii for LNG/CNG Facilities

Scenario	Hazard Radius
Release of methane through a 0.5-inch opening in a CNG tank and subsequent ignition of a methane vapor cloud (flash fire)	70 – 274 feet
Release of methane through a 0.5-inch opening in a CNG tank and immediate ignition of high pressure methane vapor as it escapes the CNG tank (flame jet)	108 feet
Release of methane through a 2-inch opening in an LNG tank and subsequent ignition of a methane vapor cloud (flash fire)	308 – 1,345 feet
Release of methane through a 2-inch opening in an LNG tank and subsequent ignition of a liquid pool of methane in the containment area surrounding the LNG tank (pool fire)	164 feet

Source Camp Dresser & McKee Inc., 1998.

Figure 3 and **Figure 4** show the extent of the potential hazard footprints. As indicated on the figure, in the event of a worst-case incident at the LNG Facility, individuals may be injured along World Way West, and at adjacent buildings, including those currently occupied by Continental Airlines and LAWA offices. In the event of an incident at the CNG Station, individuals on the United Airlines leasehold may be injured.

3.3.2 Historical Incidents

There have been no incidents at the existing LNG/CNG facilities. The LNG Facility has been operating since April of 1997.

3.3.3 Preventative Measures

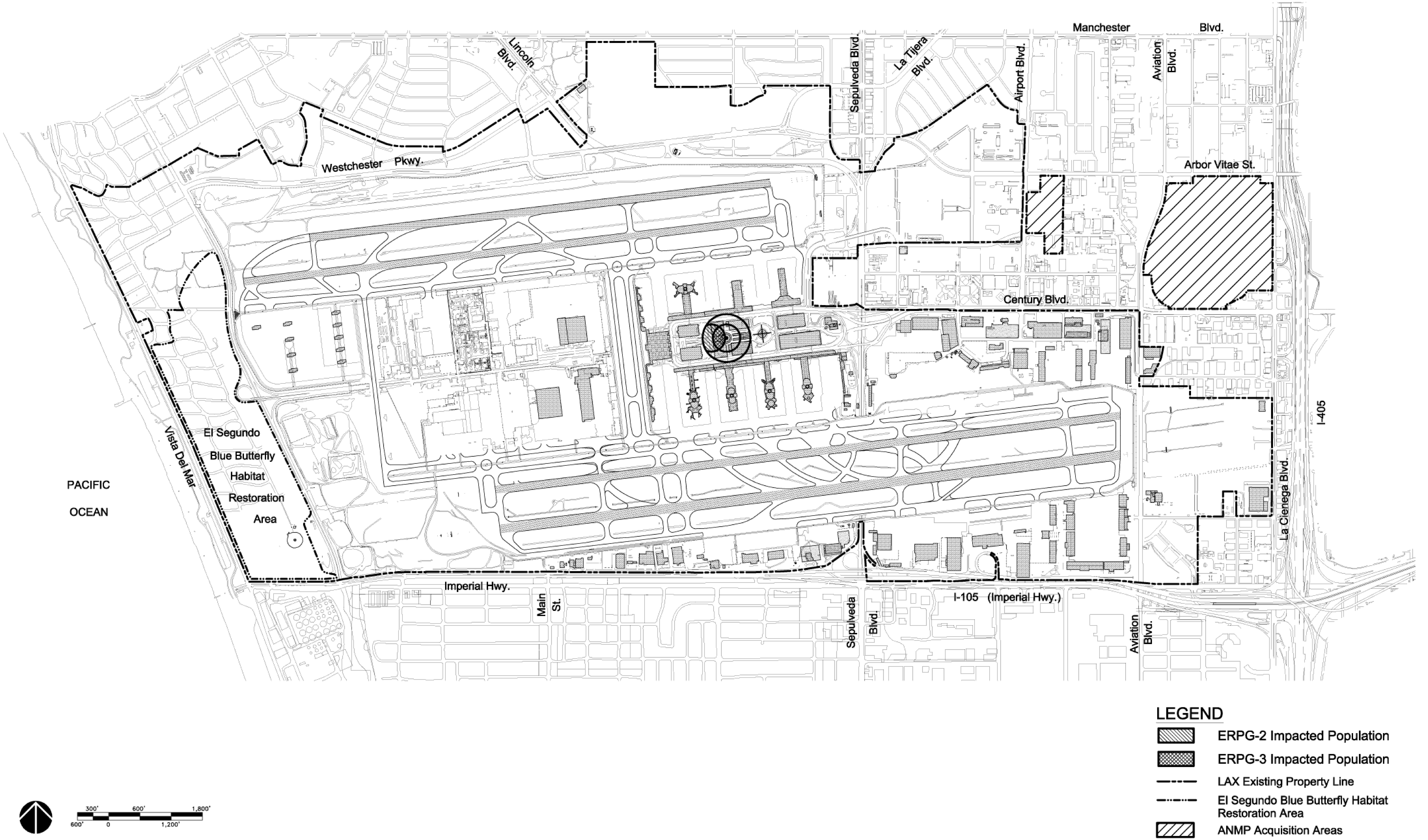
Pertinent provisions of the City of Los Angeles Fire Code[10] to the siting of LNG/CNG facilities are identified below:

- Division 42 of the Fire Code specifies that the location of LNG/CNG tanks of the size in use at the LAX LNG/CNG facilities must be located greater than:
  - 75 feet from the buildings and adjacent property lines which may be built upon and the opposite side of streets, alleys and public ways.
  - 37.5 feet from streets, alleys, and public ways.
- Division 42 also includes specific requirements for container construction, design pressure, and installation.
- Additionally, LNG facilities in particular are regulated by 49 CFR 193, which includes specific requirements for many aspects of the design, construction, and operation of LNG facilities, including the following:
  - Siting of facilities to minimize the hazards to persons and off-site property
  - Vapor barriers
  - Impoundment capacity
  - Emergency procedures
  - Tank inspection
  - Corrosion protection
  - Training
  - Gas detection
  - Fire detection
  - Warning signs

[10] City of Los Angeles, City of Los Angeles Fire Code, Article 7 of Chapter V of the Los Angeles Municipal Code, 1992.

4. ENVIRONMENTAL CONSEQUENCES

To determine the potential impacts associated with the risk of upset under each alternative, the effects as they relate to the CUP, fuel farm, and LNG/CNG facilities were determined and hazard footprints delineated. **Figures 5** through **26** present the hazard footprints associated with each scenario for each alternative. A discussion of the environmental consequences associated with the hazard footprints for each alternative is included in Section 4.24.3, *Safety,* of the EIS/EIR.



Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

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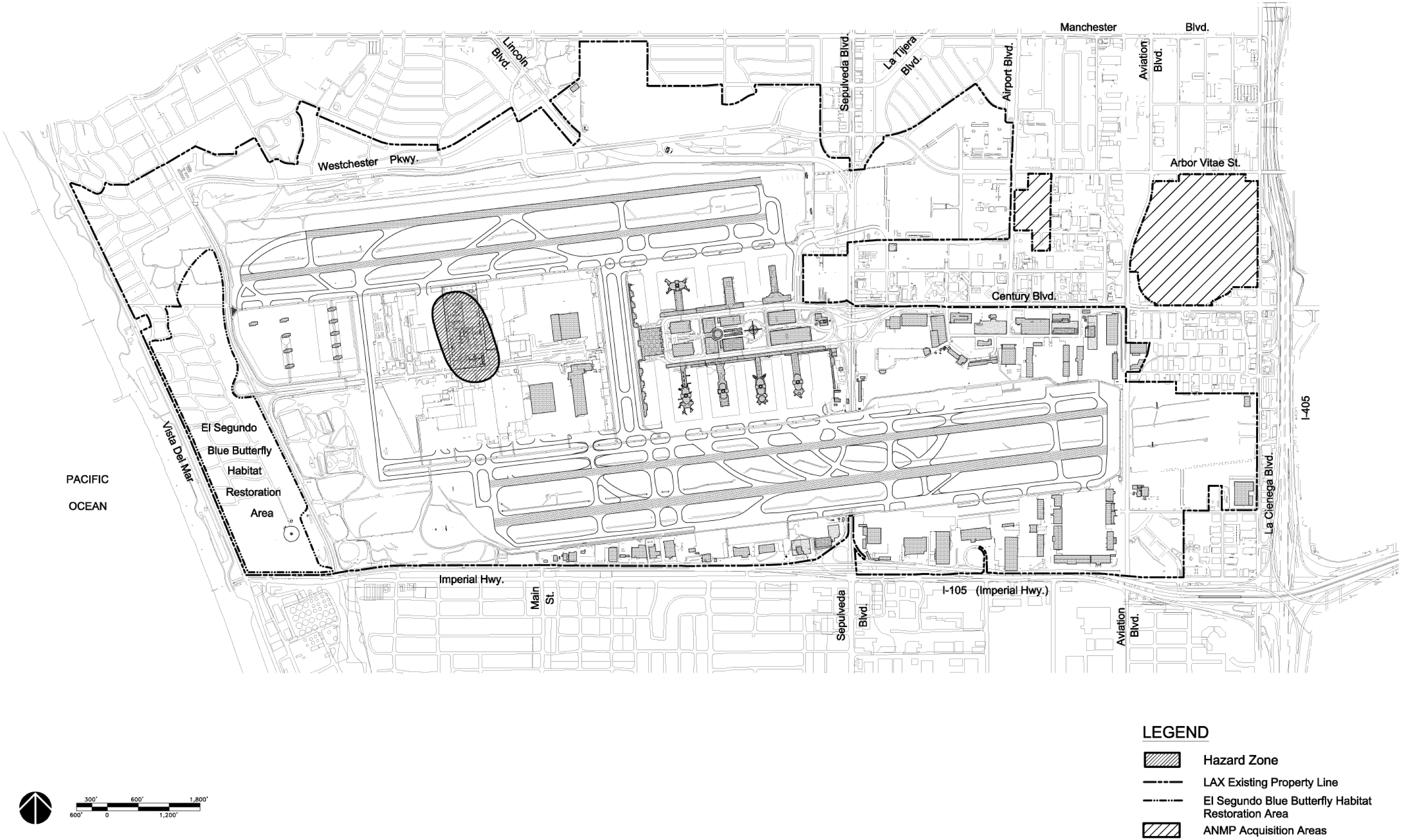
Los Angeles International Airport Master Plan	**Hazard Footprint for the CUP No Action/No Project Alternative (2005/2015)**	Figure **5**



Source: Camp Dresser & McKee Inc., 2000.

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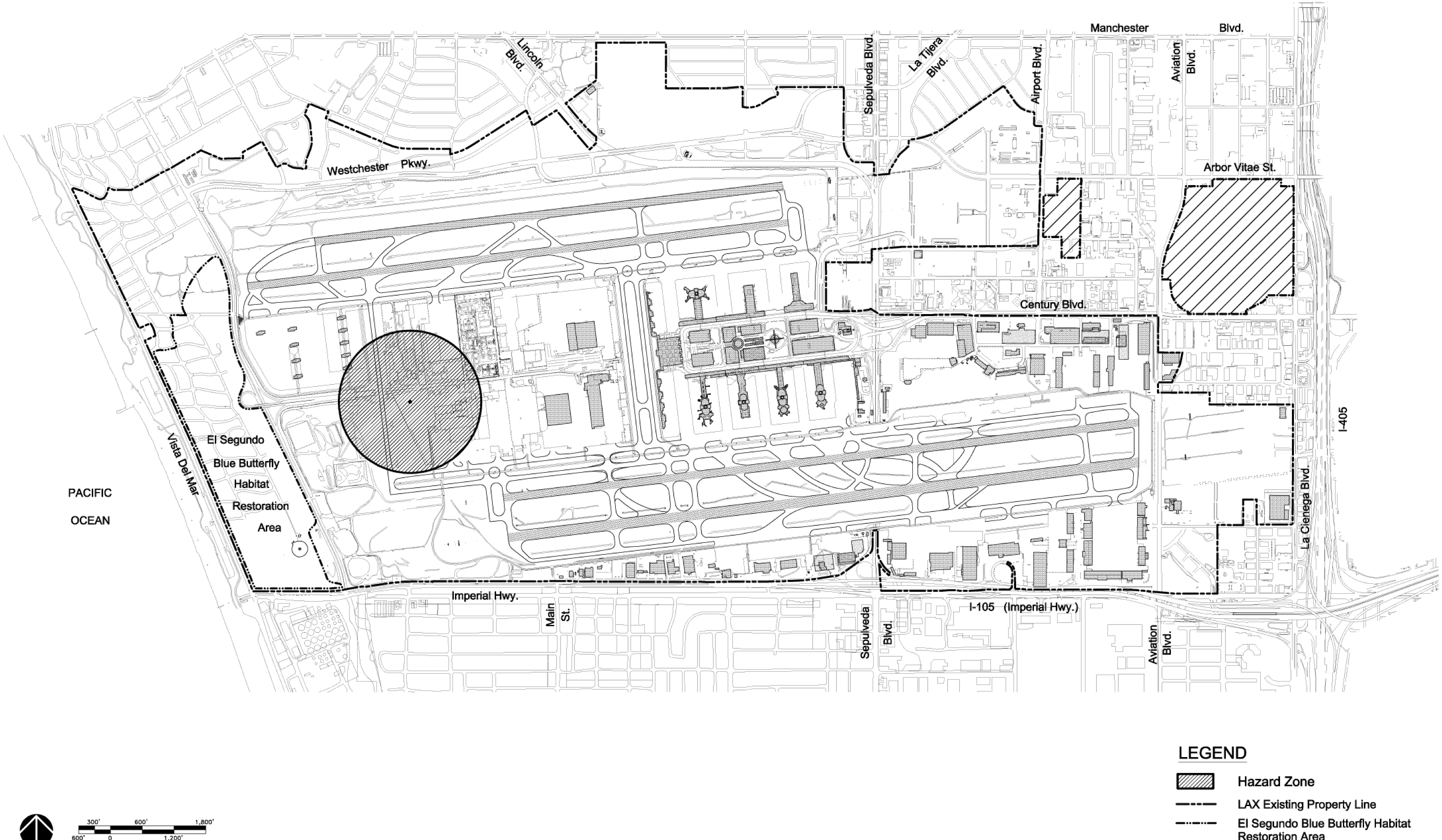
Los Angeles International Airport Master Plan

Hazard Footprint for LAXFUEL Fuel Farm
No Action/No Project Alternative (2005/2015)

Figure
6



LEGEND

- Hazard Zone
- LAX Existing Property Line
- El Segundo Blue Butterfly Habitat Restoration Area
- ANMP Acquisition Areas

Source: Camp Dresser & McKee Inc., 1998, 2000.

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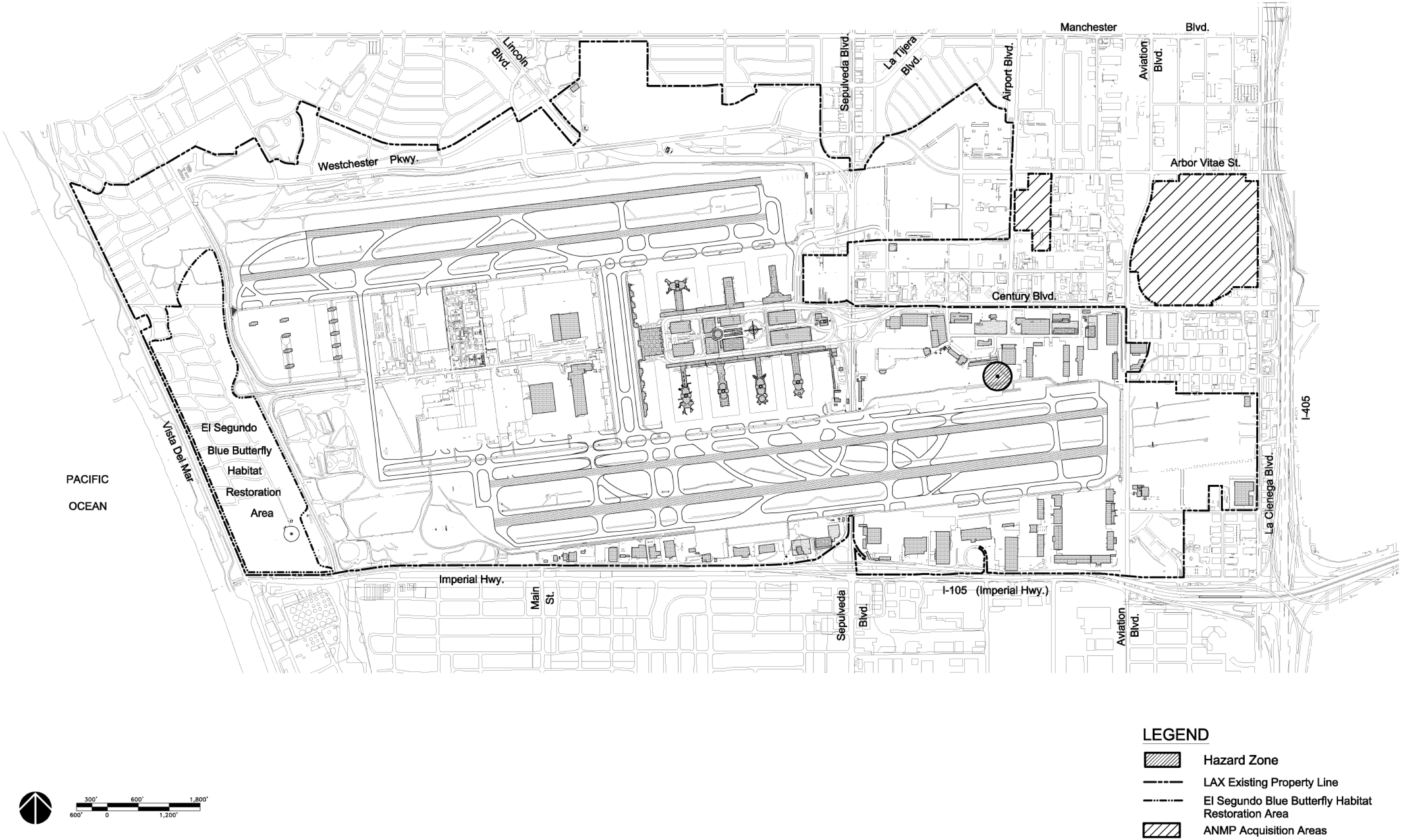
Los Angeles International Airport Master Plan

Hazard Footprint for LNG/CNG Facility
No Action/No Project Alternative (2005/2015)

Figure
7



Source: Camp Dresser & McKee Inc., 1998, 2000.

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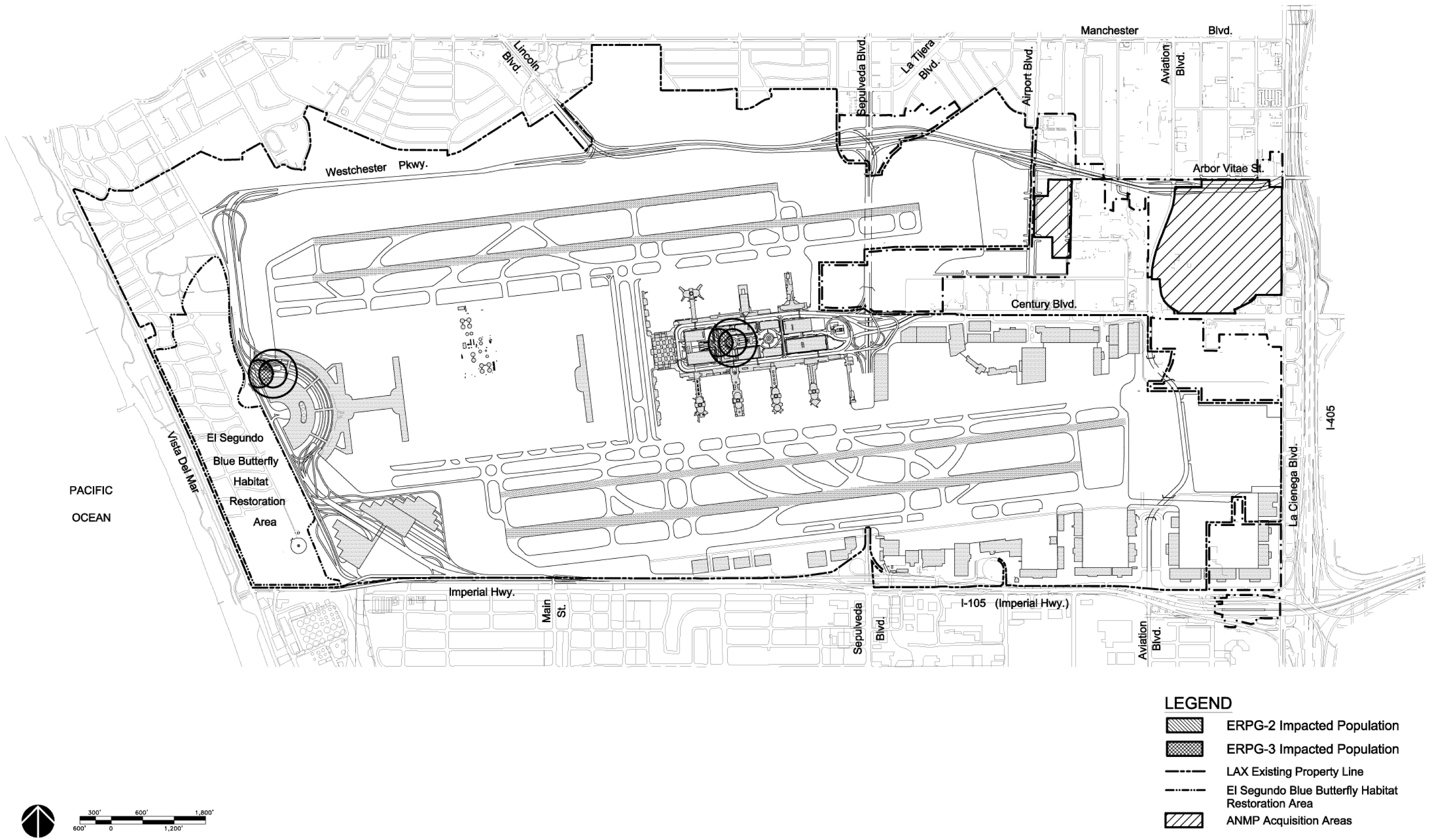
Los Angeles International Airport Master Plan

Hazard Footprint for CNG Station
No Action/No Project Alternative (2005/2015)

Figure
8



Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

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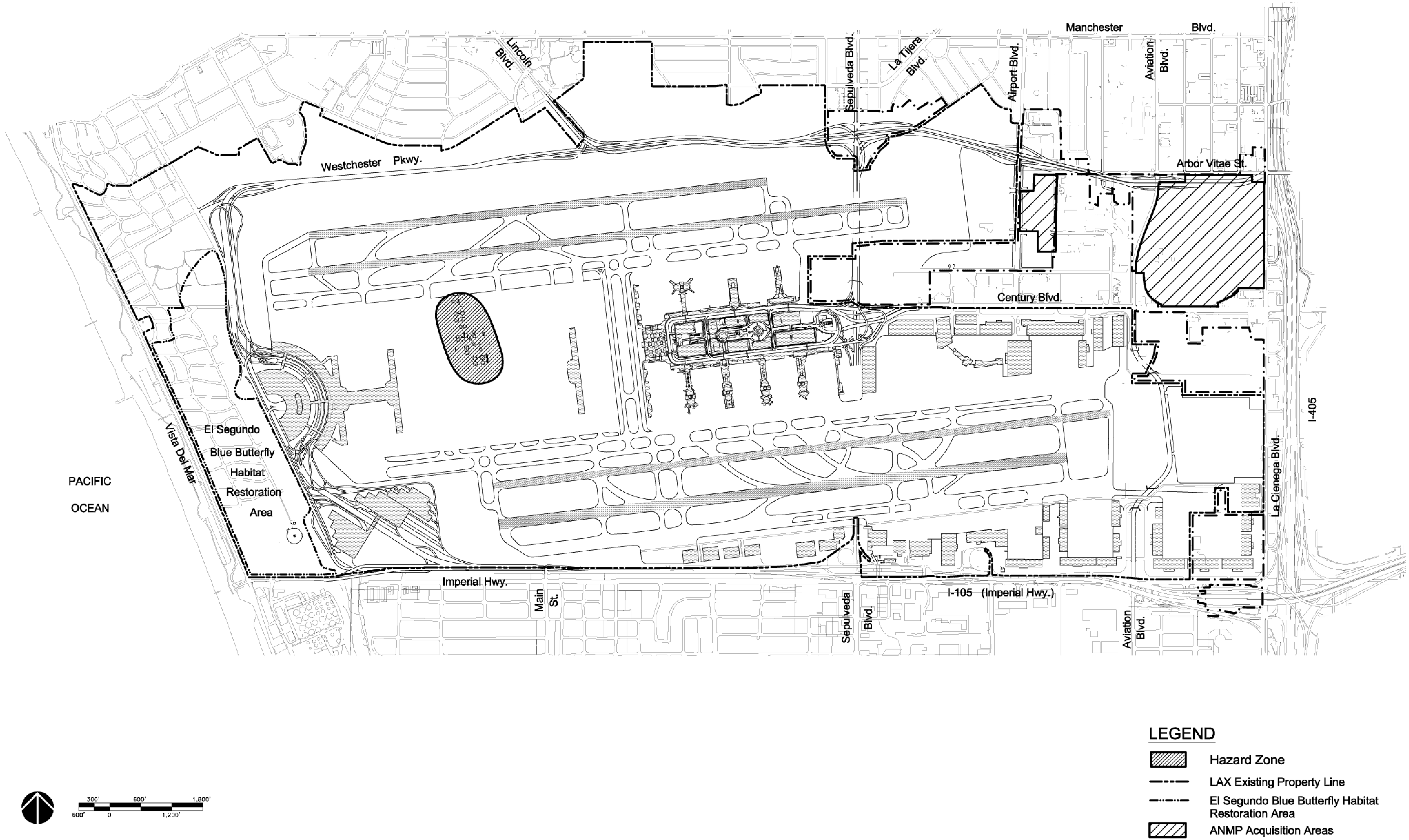
Los Angeles International Airport Master Plan

Hazard Footprints for CUPs
Alternative A (2005)

Figure
9



Source: Camp Dresser & McKee Inc., 2000.

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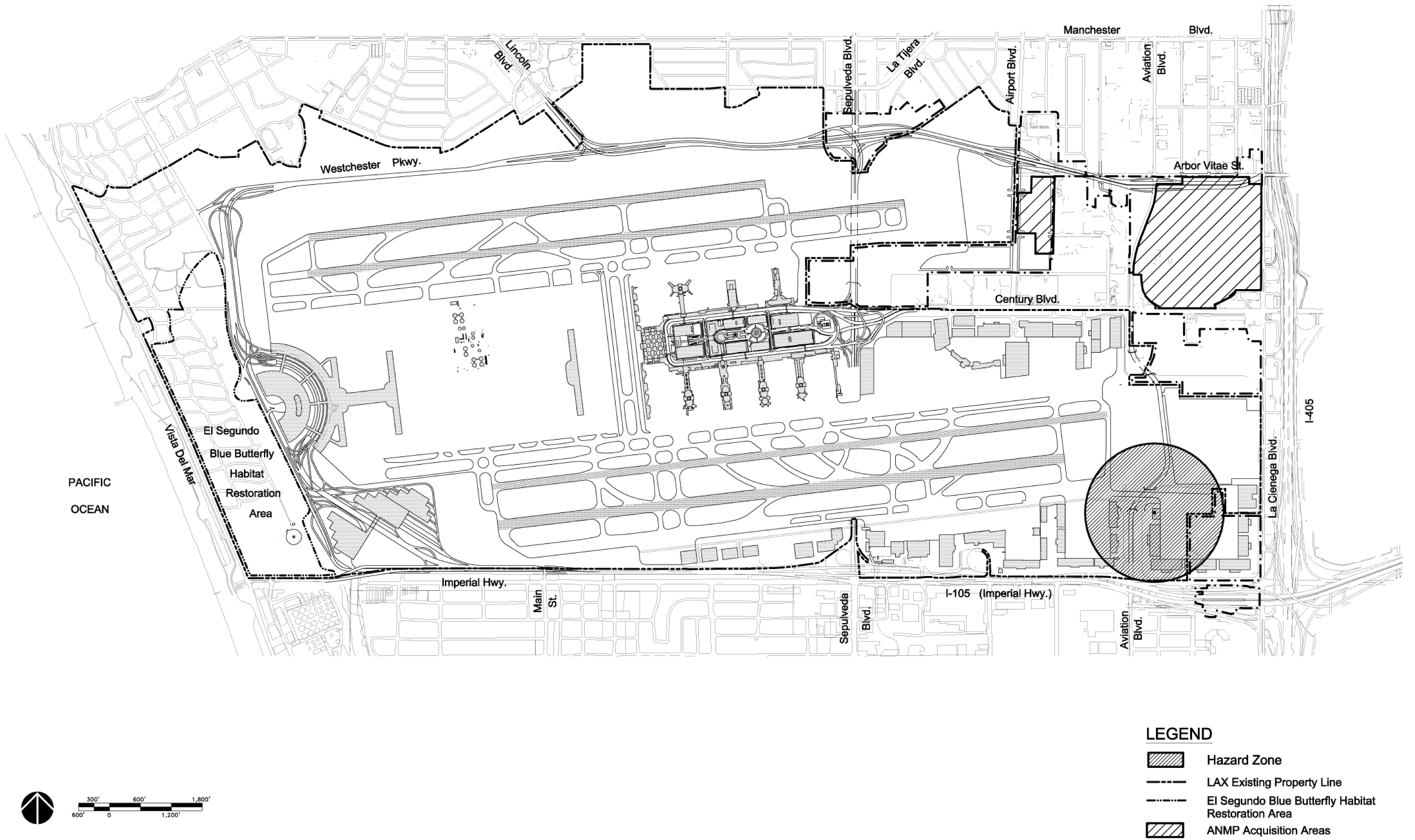
Los Angeles International Airport Master Plan

Hazard Footprints for LAXFUEL Fuel Farm Alternative A (2005)

Figure **10**



Source: Camp Dresser & McKee Inc., 1998, 2000.

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Los Angeles International Airport Master Plan	**Hazard Footprint for LNG/CNG Facility Alternative A (2005)**	Figure **11**

Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

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Los Angeles International Airport Master Plan

Hazard Footprints for CUPs Alternative A (2015)

Figure 12

Source: Camp Dresser & McKee Inc., 2000.

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Los Angeles International Airport Master Plan

Hazard Footprint for On-Site Fuel Farm Alternative A (2015)

Figure 13

LEGEND

- Hazard Zone
- LAX Existing Property Line
- El Segundo Blue Butterfly Habitat Restoration Area
- Proposed Light Rail Transit
- ANMP Acquisition Areas
- PeopleMover

Source: Camp Dresser & McKee Inc., 1998, 2000.

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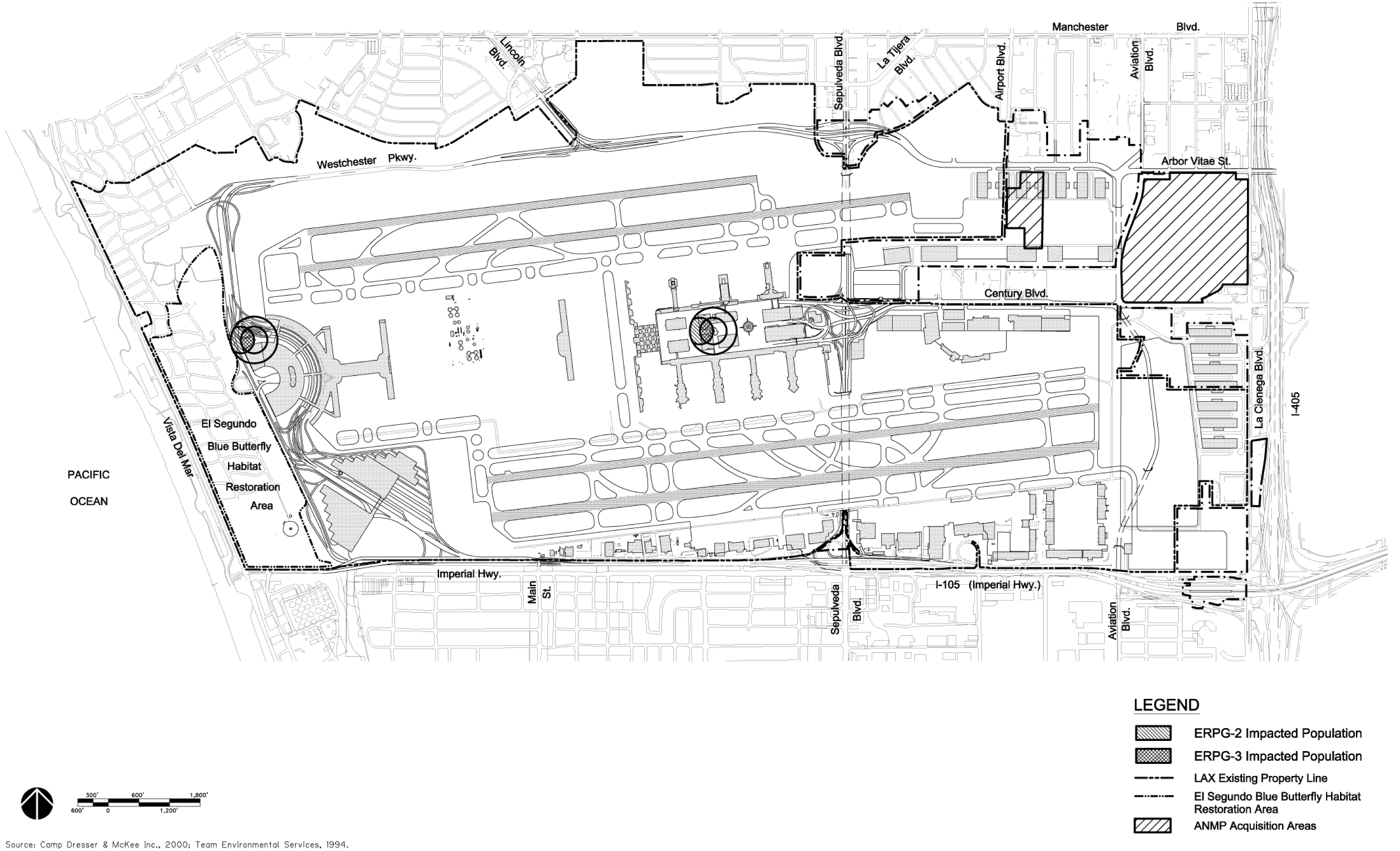
Los Angeles International Airport Master Plan	**Hazard Footprint for LNG/CNG Facility Alternative A (2015)**	Figure **14**



Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

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Los Angeles International Airport Master Plan	**Hazard Footprint for CUPs** **Alternative B (2005)**	Figure **15**

Source: Camp Dresser & McKee Inc., 2000.

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Los Angeles International Airport Master Plan

Hazard Footprint for Scattergood Fuel Farm Alternative B (2015)

Figure **16**

Source: Camp Dresser & McKee Inc., 2000.

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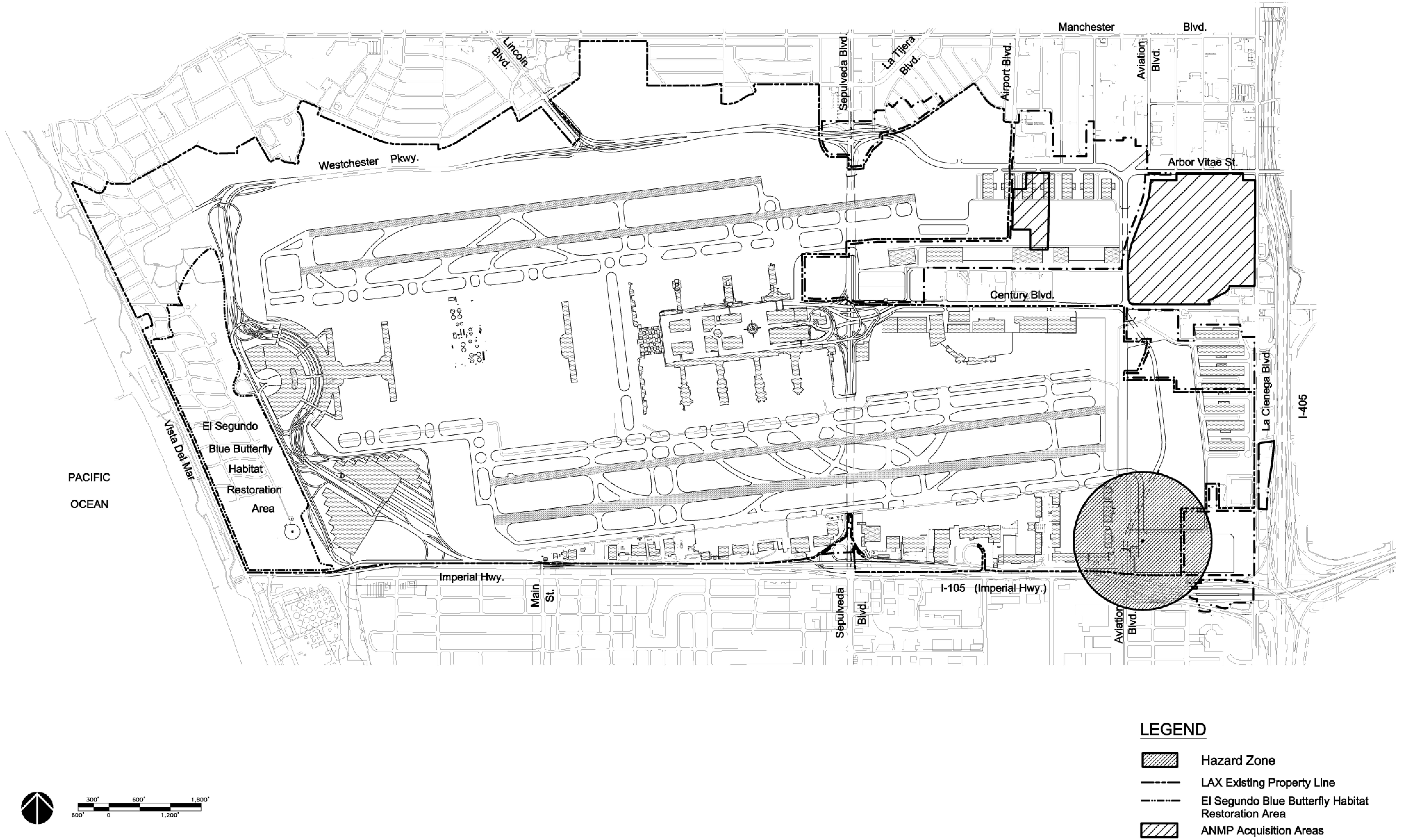
Los Angeles International Airport Master Plan	**Hazard Footprint for the Oil Refinery Fuel Farm Site Alternative B (2015)**	Figure 17



Source: Camp Dresser & McKee Inc., 1998, 2000.

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Los Angeles International Airport Master Plan

Hazard Footprint for LNG/CNG Facility
Alternative B (2005)

Figure
18

Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

Los Angeles International Airport Master Plan

Hazard Footprints for CUPs
Alternative B (2015)

Figure
19

Source: Camp Dresser & McKee Inc., 1998, 2000.

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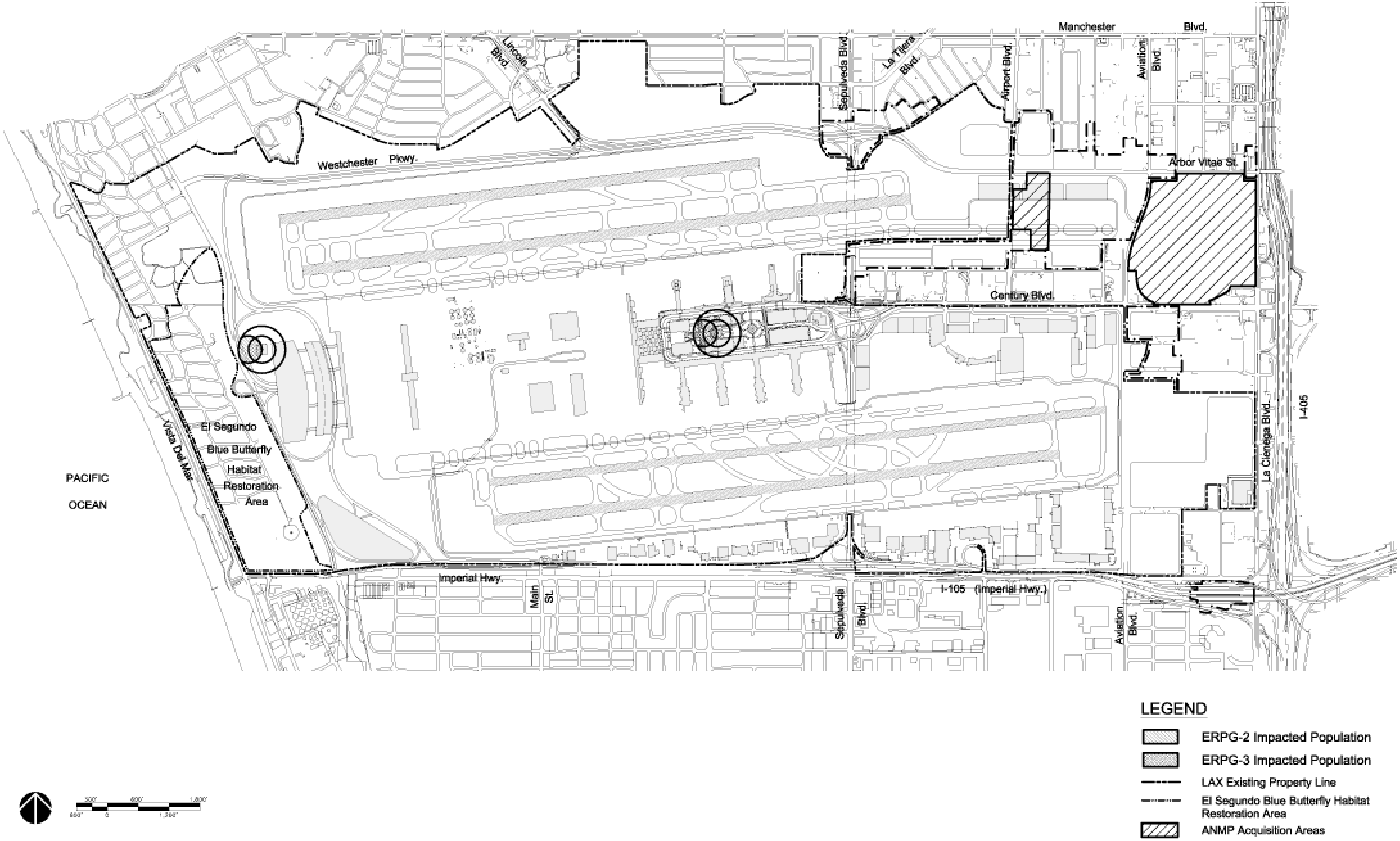
Los Angeles International Airport Master Plan

Hazard Footprint for LNG/CNG Facility
Alternative B (2015)

Figure
20

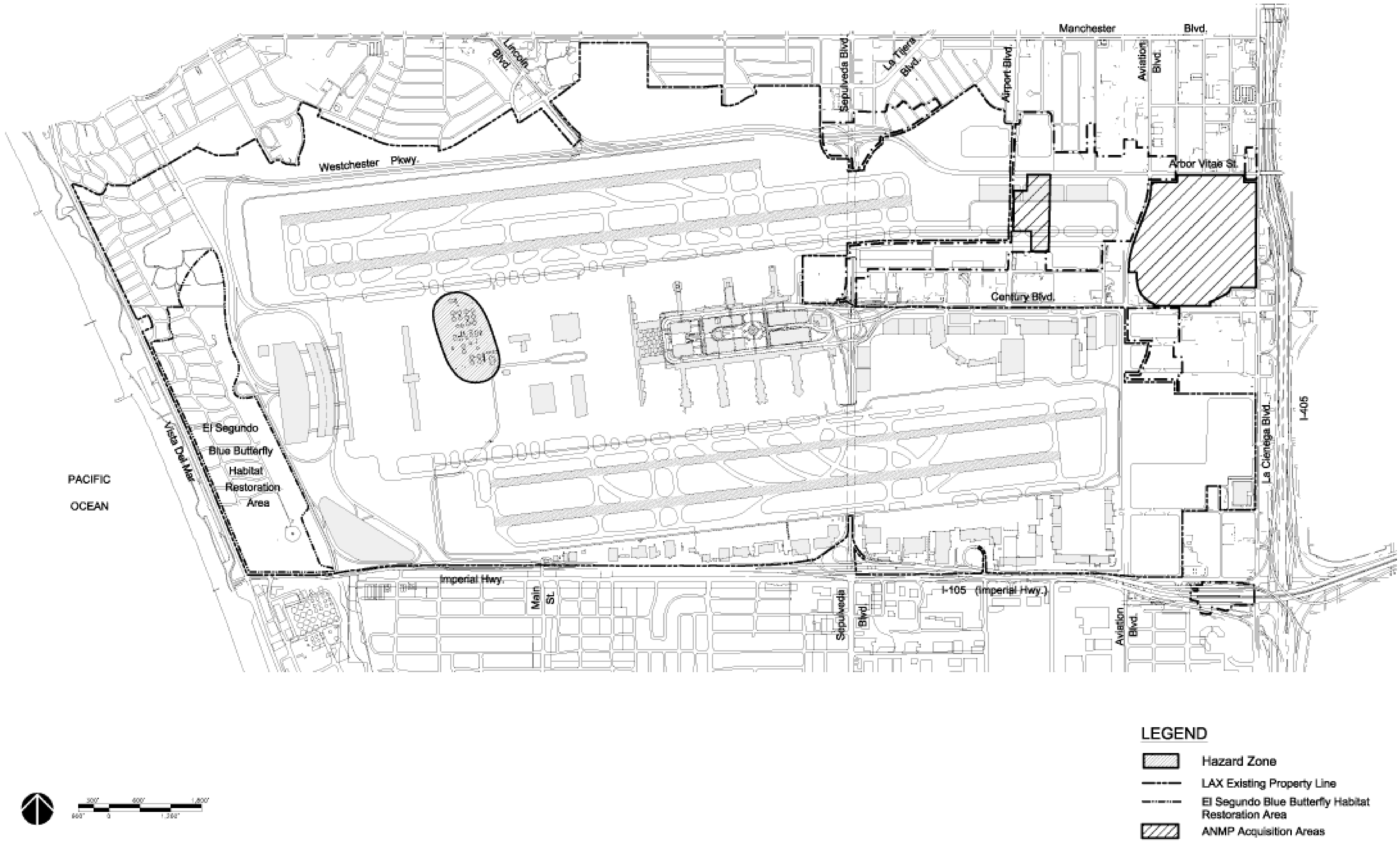


Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

Los Angeles International Airport Master Plan

Hazard Footprints for CUPs
Alternative C (2005)

Figure
21

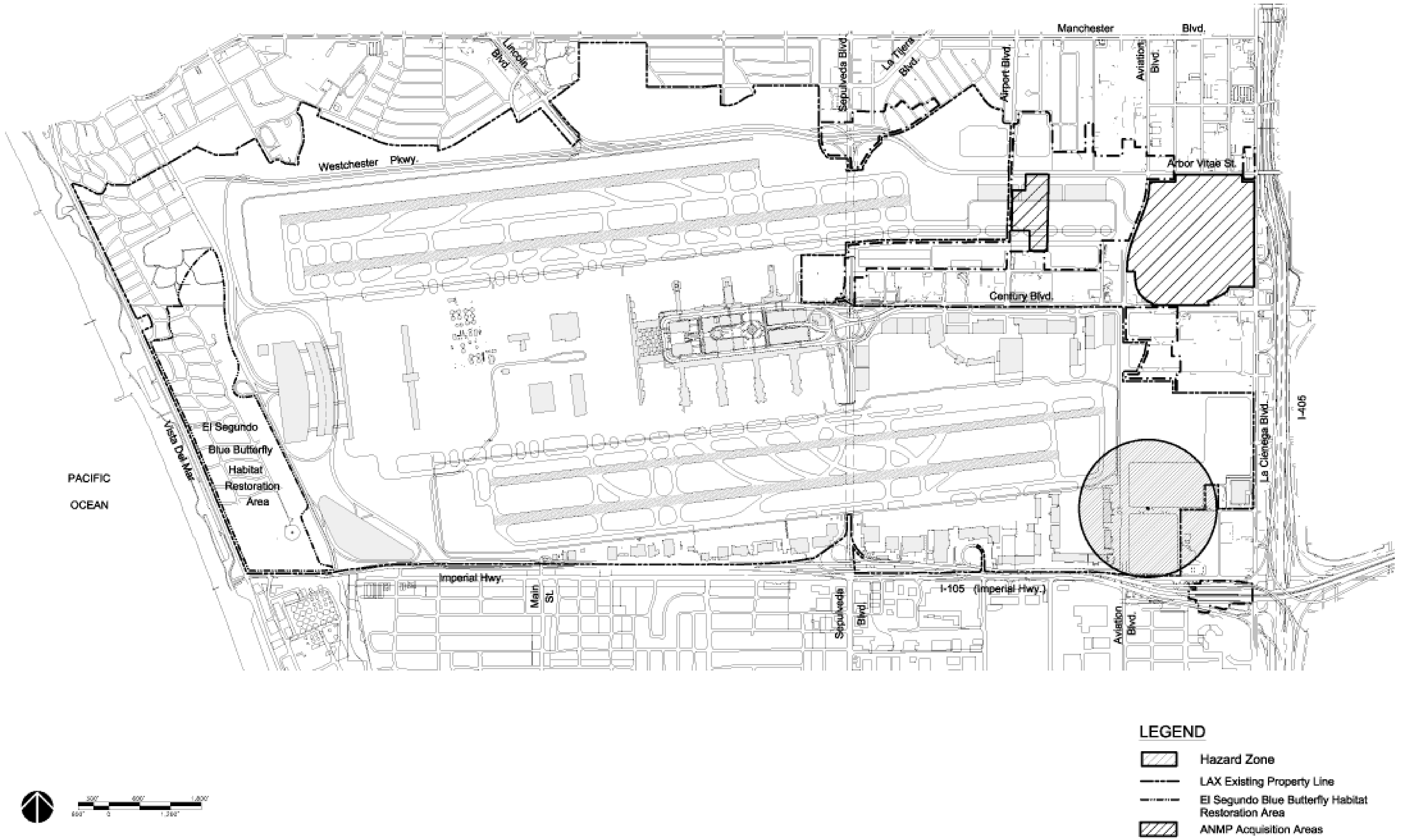


Source: Camp Dresser & McKee Inc., 2000.

Los Angeles International Airport Master Plan

Hazard Footprints for On-Site Fuel Farm Alternative C (2005)

Figure 22

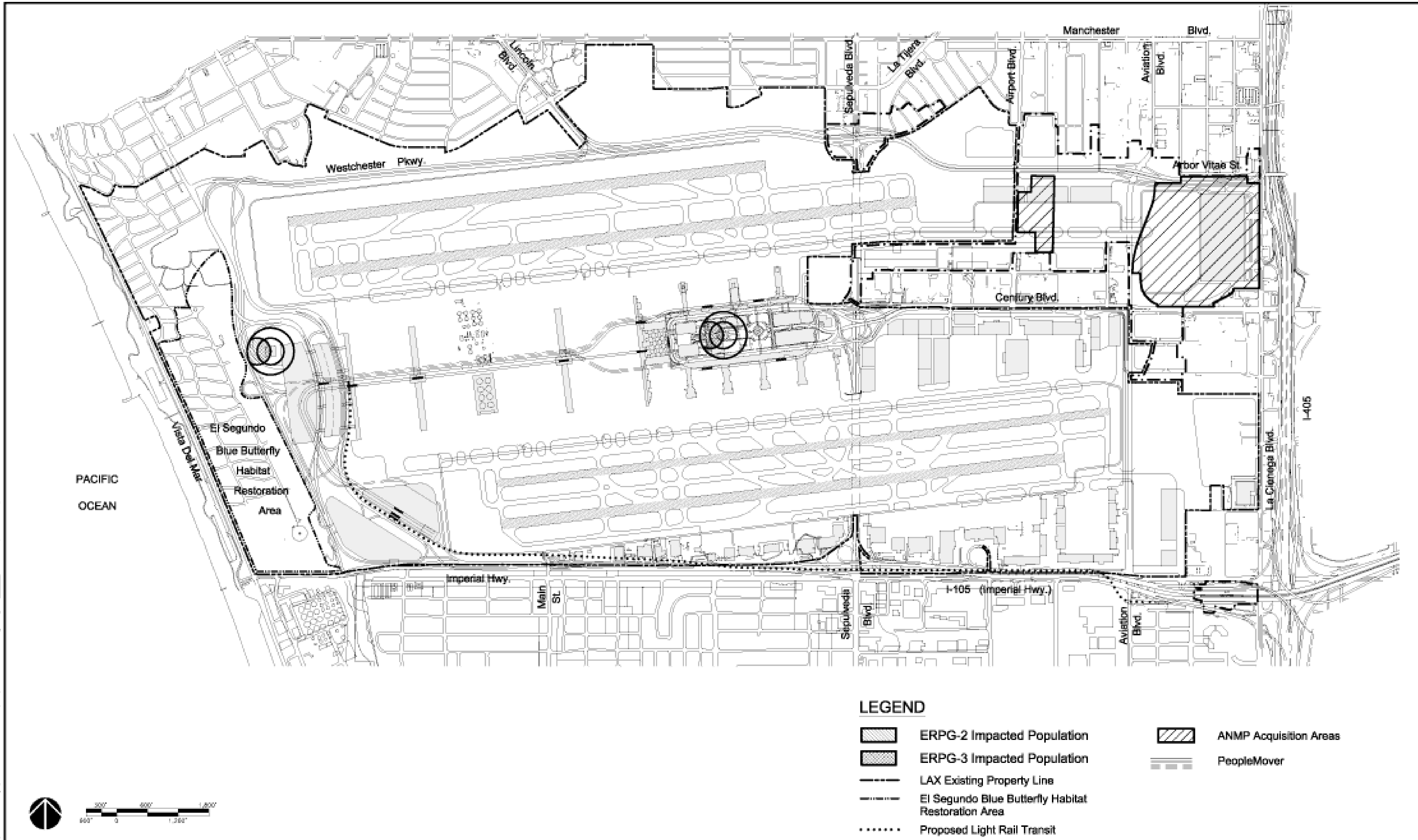


Source: Camp Dresser & McKee Inc., 1998, 2000.

Los Angeles International Airport Master Plan

Hazard Footprint for LNG/CNG Facility
Alternative C (2005)

Figure
23

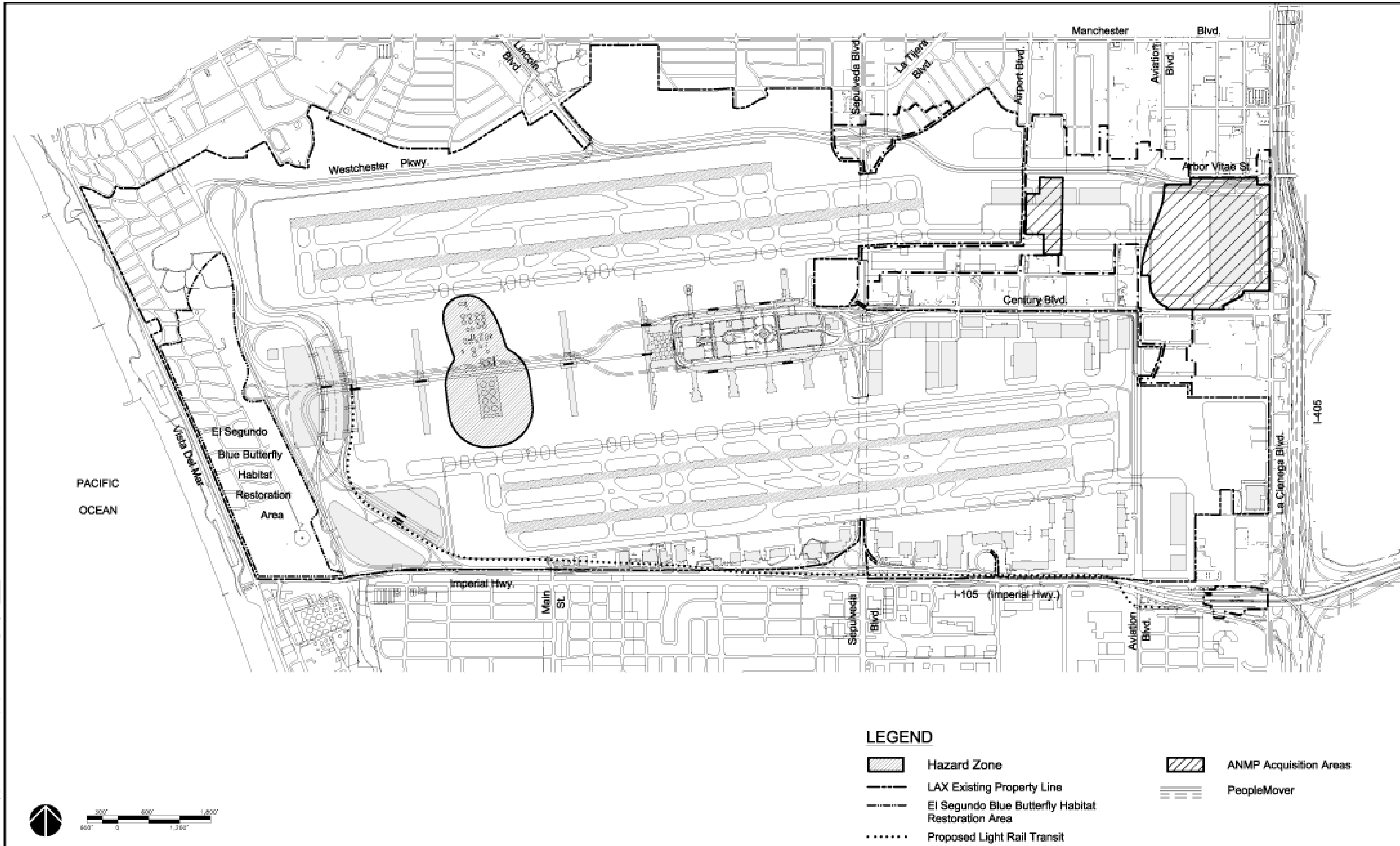


Source: Camp Dresser & McKee Inc., 2000; Team Environmental Services, 1994.

Los Angeles International Airport Master Plan

Hazard Footprints for CUPs
Alternative C (2015)

Figure
24

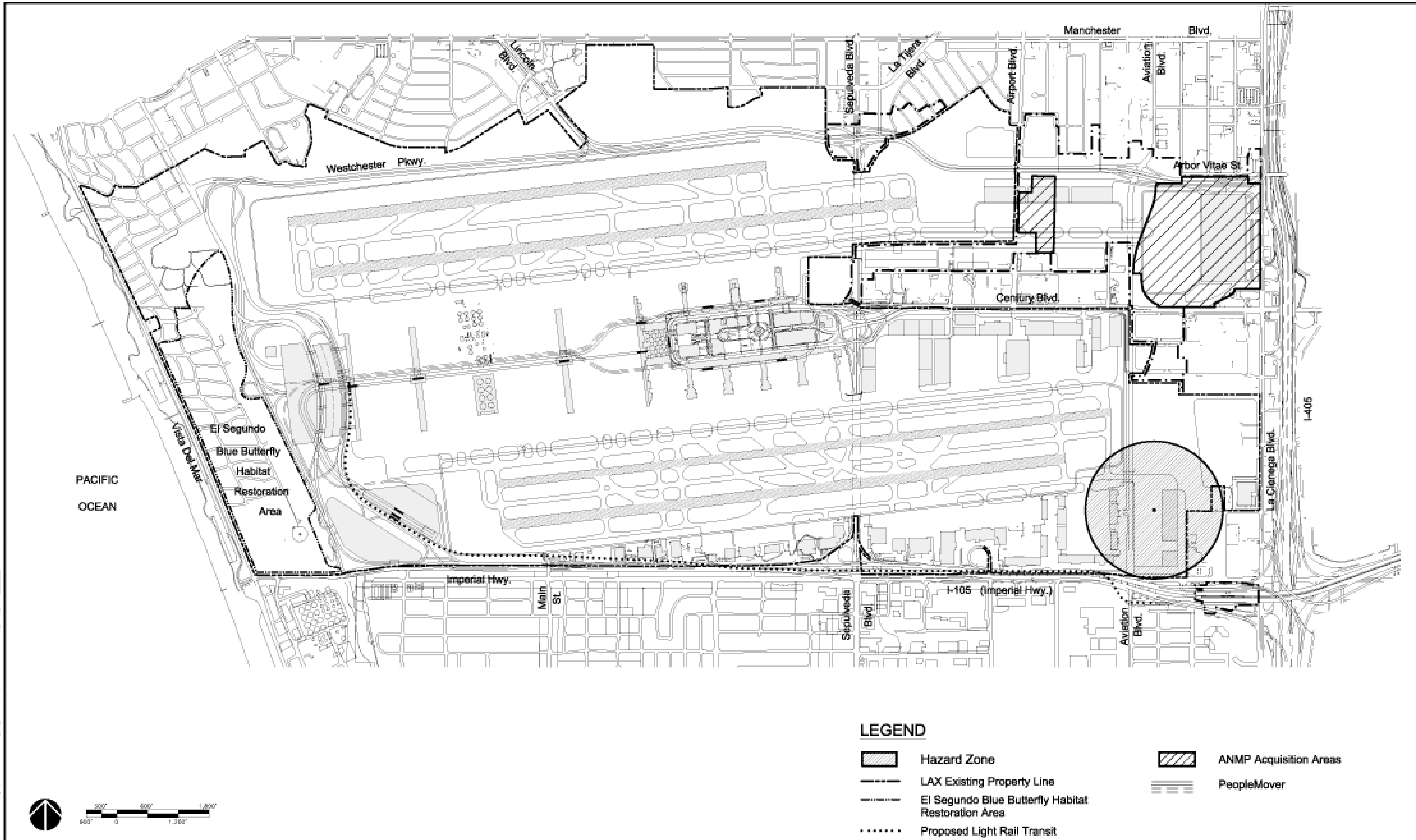


Source: Camp Dresser & McKee Inc., 2000.

Los Angeles International Airport Master Plan

Hazard Footprint for On-Site Fuel Farm Alternative C (2015)

Figure 25



Source: Camp Dresser & McKee Inc., 1998, 2000.

Los Angeles International Airport Master Plan

Hazard Footprint for LNG/CNG Facility Alternative C (2015)

Figure 26

Attachment A
Aviation Incidents and Accidents

Table of Contents

List of Tables

1. INTRODUCTION

This Attachment presents detailed information on baseline conditions related to aviation accidents and incidents associated with implementation of the Los Angeles International Airport (LAX) Master Plan. This report provides data and analysis in support of the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the LAX Master Plan prepared pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

This Attachment provides information regarding the existing regulatory and operational safeguards and incident and accident history at LAX that is supplemental to the material presented in Section 4.24.3, *Safety* of the EIS/EIR. Impacts associated with the information contained in this Attachment are addressed in the Section 4.24.3, *Safety* of the EIS/EIR.

2. AFFECTED ENVIRONMENT/ENVIRONMENTAL BASELINE

2.1 Aviation Safety Guidelines and Standards

Several agencies have developed airport-related land use planning guidelines and standards, including the Federal Aviation Administration (FAA), California Department of Transportation (Caltrans), the Los Angeles County Airport Land Use Commission, and the City of Los Angeles. These guidelines and standards are discussed below.

2.1.1 Federal Aviation Administration

One of the FAA's primary roles is to develop and enforce the civil air regulations for safety standards, including those associated with airfield layout and operations, aircraft operations, and examination and inspection of facilities and personnel. To protect human health and welfare from the risk of aircraft accidents and incidents, the FAA has established extensive safety regulations governing the flight of aircraft as well as the design of airports. These safety regulations are incorporated into FAA's Airport Design Standards.[1] The requirements contained in the Airport Design Standards, such as Part 150 (Airport Noise Compatibility Planning), are based on the requirements for safe aircraft take off, landing, and ground movement. They have evolved as experience and research have enhanced FAA's understanding of what is necessary to enhance aviation safety. Changes have been derived from commission reports, National Transportation Safety Board (NTSB) accident reports, and other sources.

All development carried out on federally-regulated airports, such as LAX, must be conducted in accordance with an approved Airport Layout Plan (ALP). Before any major changes are undertaken in airport facilities involving the runways and taxiways, FAA must approve the ALP. FAA evaluates the safety of the plan and its compliance with FAA regulations. The ALP should, to the extent practicable, conform to FAA Airport Design Standards, with exceptions due to local conditions approved on a case-by-case basis.

It is common at airports throughout the country to have modifications to Airport Design Standards. These departures from standards are granted in order to meet local site conditions and constraints, but do not compromise safety. All modifications to Airport Design Standards require a case-by-case analysis by FAA. According to FAA, a request for a departure from the standard must show an acceptable level of safety. Often, operational changes are made to compensate for the departure while preserving an acceptable level of safety.

FAA Airport Design Standards include safety compatibility criteria to which airports must conform. The basic objective of safety compatibility criteria is to minimize the risk associated with potential aircraft accidents. The primary strategy is to limit the intensity of use in locations most susceptible to an off-airport aircraft accident through density limitations, open space requirements, and the restriction of certain sensitive types of land uses from the runway area. The Airport Design Standards establish minimum land use related guidelines to protect people and property on the ground. Three zones of increasing area are defined in proximity to runways:

[1] Federal Aviation Administration, FAA Advisory Circular 150/5300-13, Change 5, Appendix 8, February 14, 1997.

- **Runway Object Free Area (OFA):** a two-dimensional ground clearance area surrounding the runway end. Within the OFA, parked aircraft and natural or manmade objects are prohibited, except aviation objects that are fixed by function.
- **Runway Safety Area (RSA):** a defined surface surrounding the runway end prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or veer off the runway…[that] provides greater accessibility for firefighting and rescue equipment during such incidents." Based on FAA statistical data, the RSA should capture 90 percent of undershoots and overruns. In addition to the two-dimensional standards, FAA has longitudinal and transverse gradient standards for RSAs. The RSA should be cleared, drained, and graded, and is usually turfed. Under dry conditions, this area should be capable of supporting occasional aircraft that could overrun the runway without causing structural damage, as well as fire fighting and snow removal equipment (in cold climates).
- **Runway Protection Zones (RPZs):** trapezoidal-shaped areas located at ground level beyond each end of a runway. The dimensions of the RPZs vary in size depending upon the type of landing approach available at the airport and the characteristics of the critical aircraft operating at the airport. RPZs are divided into "object free" and "controlled activity" areas. FAA guidelines state that "it is desirable to clear the entire RPZ of all above-ground objects." The FAA recommends that airport operators control the land within the RPZ. A maximum density of 10 people per acre is normally judged acceptable. New residential development and special function land uses, that encourage the gathering of large groups of people, are prohibited within RPZs.

In addition to designation of the above safety areas, FAA provides standards for runway, taxiway, and taxilane design, including width, length, separation, radius of turns, layout, and pavement material composition.

Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*,[2] also serves as a means of monitoring and protecting the airspace required for safe operation of aircraft at or near an airport. This regulation establishes imaginary surfaces extending outward from the runways in which it is required that the FAA be notified of any proposed development or structural changes that would obstruct the path of operating aircraft. These standards are used to guide the construction of airports and to require notice to the administrator of the construction or alteration of any structure affecting air safety. The public hearing and approval process set forth by Part 77 provides a basis for the FAA to evaluate the effect of construction or alteration on operational procedures, and to determine the possible hazardous effect of the proposed construction or alteration on air navigation. Part 77 applies to the change of height (including appurtenances), or lateral dimensions of any object of natural growth, terrain, or permanent or temporary construction or alteration.

2.1.2 California Department of Transportation

The Caltrans Division of Aeronautics, is responsible for funding, licensing, and permitting programs for airports and heliports in California. The Caltrans *Airport Land Use Planning Handbook*[3] does not establish regulations, policies, or standards; rather, it includes recommendations and suggestions for consideration by individual airport land use commissions, counties, and cities. These recommendations include the establishment of up to five separate land use compatibility zones, as follows:

- **Inner Safety Zone:** This zone normally coincides with the RPZ (clear zone) or a rectangular area encompassing it. The guidelines recommend that the shape of the zone be modified to reflect close-in arrival and departure path turns. No structures and few, if any, people (a maximum of 10 per acre at any one time) are to be permitted.
- **Outer Safety Zone:** An extension of the inner safety zone, this zone should consist of either the FAR Part 77 approach zone or an equivalent rectangular area, modified as necessary to follow major flight tracks. The outer end of the zone should be located at a specified distance from the runway primary surface, depending upon the type of aircraft utilizing the runway. The recommended development criteria include the following:
  - For uses in structures, no more than 25 people per acre at any time and no more than 150 people in any one building.

[2] Federal Aviation Administration, FAA Part 77 Objects Affecting Navigable Airspace, January 1, 1998.

[3] California Department of Transportation, Division of Aeronautics, Airport Land Use Planning Handbook, December 1993.

  - For uses not in structures, no more than 50 people per acre at any time.
  - Open areas large enough and properly shaped and oriented to accommodate a forced, but controlled, aircraft landing, should comprise 50 percent of the total zone. Streets and parking areas should be considered open areas for the purposes of this computation.

- **Emergency Touchdown Zone:** This zone consists of a 500-foot-wide strip running the length of both the inner and outer safety zones. It should be free of all obstructions so as to allow for the emergency landing of aircraft.
- **Traffic Pattern/Overflight Zone:** This zone encompasses the common flight tracks to and from an airport and the limits of this zone are generally defined by the FAR Part 77 horizontal surface. Large assemblages of people should be excluded and the lot coverages for commercial uses should not exceed 40 to 50 percent.
- **Extended Runway Centerline:** This zone, applicable only to precision and nonprecision instrument runways, is comprised of a 1,000-foot-wide corridor extending 10,000 feet from the runway threshold. Uses involving large concentrations of people should be discouraged in this area.

2.1.3 Los Angeles County Airport Land Use Commission

The Los Angeles County Regional Planning Commission acts as the Airport Land Use Commission (ALUC) for all airports in Los Angeles County. The purpose of the ALUC is to protect public health, safety, and welfare by ensuring the orderly expansion of airports. The ALUC promotes the adoption of land use measures that minimize the public's exposure to excessive noise and safety hazards within areas around public use airports. Although the ALUC does not have jurisdiction over airport operations, it is concerned with airport activities that may adversely affect adjacent areas. The ALUC also reviews surrounding land use projects that may interfere with airport operations.

The ALUC produced the *Los Angeles County Airport Land Use Plan* (ALUP) in 1991.[4] This plan has served as an advisory document to guide jurisdictions in developing noise elements of their general plans. The ALUP is currently being revised to reflect recent airport expansion plans throughout Los Angeles County and the guidelines in the Caltrans *Airport Land Use Planning Handbook*. In formulating the plan, the ALUC established provisions for safety, noise insulation, and the regulation of building heights within areas adjacent to each of the county's public airports. The land use recommendations made by the ALUC are advisory to local jurisdictions, not mandatory, and the ALUC does not have authority to zone property or to apply other land use controls normally exercised by local public agencies. Another check on ALUC power comes from the ability of the local agency to overrule the ALUC. If a local agency disagrees with an ALUC recommendation, a hearing can be held in which the local agency can vote to overrule the ALUC by a two-thirds vote of its governing body. In this event, findings must be made that the proposed action is consistent with the purposes of the ALUP.

The ALUP states that the ALUC "has the responsibility to set uniform policies and standards to prohibit development of incompatible uses, but it is the responsibility of the cities and the county, through planning and zoning powers, to specify which compatible uses are appropriate within their jurisdictions. These land use designations may be based on a wider consideration of a wider range of factors than just compatibility with airport operations."

Under the ALUP, before the adoption or modification of an airport master plan, the airport operator must submit the appropriate documents to the ALUC for a determination of consistency. Amendments to the ALUP would be required for changes in airport size, changes in the number and type of aircraft, or lengthening of runways.

The ALUC has also established numerous policies related to safety in the ALUP,[5] including the following:

- S-1: Establish "runway protection zones" contiguous to the ends of each runway. These runway protection zones shall be identical to the FAA's RPZ (formally called "clear zone").
- S-2: Prohibit aboveground storage of more than 100 gallons of flammable liquids or toxic materials on any one net acre in a designated RPZ. It is recommended that these materials be stored underground.

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4 Los Angeles County Airport Land Use Commission, Los Angeles County Airport Land Use Plan, December 19, 1991.

5 Los Angeles County Airport Land Use Commission, Los Angeles County Airport Land Use Plan, December 19, 1991.

- S-3: Prohibit, within an RPZ, any use which would direct a steady light or flashing light of red, white, green, or amber colors associated with airport operations toward an aircraft engaged in a final approach toward landing at an airport.
- S-4: Prohibit, within a designated RPZ, the erection or growth of objects which rise above an approach surface unless supported by evidence that it does not create a safety hazard and is approved by the FAA.
- S-5: Prohibit uses which would attract large concentrations of birds, emit smoke, or which may otherwise affect safe air navigation.
- S-6: Prohibit uses which would generate electrical interference that may be detrimental to the operation of aircraft and/or aircraft instrumentation.
- S-7: Comply with the height restriction standards and procedures set forth in FAR Part 77.

2.1.4 City of Los Angeles

The City of Los Angeles has adopted FAR Part 77 criteria in the City Planning and Zoning Code, Section 12.50, *Airport Approach and Zoning Regulation*. This code section establishes land use restrictions within the delineated airport hazard area and provides for transitional surface height limits. Under the Zoning Code, restrictions are placed on the height and mass of structures within specified distances of the airport runways.

In Los Angeles, a clear zone is established, parallel to the centerline of the north runway, of 500 feet and a transition slope of 7 to 1 (horizontal to vertical), which defines the maximum height of objects (buildings, landscape, etc.) relative to the elevation of the runway. This slope prevails until a height of 150 feet above the runway is reached. Buildings beyond this transition slope are limited to 150 feet in height, relative to the base of the runway.

Also parallel to the runway is a building setback line 750 feet from the runway centerline. Between 500 feet and 750 feet, parking and landscape may be permitted, if they do not penetrate the transition slope, but no structures are permitted.

2.2 Incident and Accident History at LAX

2.2.1 Incident and Accident Data

Data on accident location are available from the NTSB and the FAA. For each accident/incident[6] investigated by the NTSB, a factual report is completed. Detailed information on the accident and incident history in Los Angeles between 1962 and 1999 is provided in **Table 1**, Accidents/Incidents at Los Angeles, California 1962-1999. These data were evaluated to determine if there was a correlation between the number of operations and accidents and incidents in Los Angeles. As indicated below, no such correlation was found.

2.2.2 Factors Involved in Accidents

As discussed in Section 4.24.3, *Safety*, the accident history at LAX in the period 1983 through 1996 shows that there is no statistical correlation between accidents and incidents and the number of aircraft operations at LAX. For example, even though the number of aircraft operations at LAX in 1987, 1988, and 1989 were similar, there were ten accidents in 1987, none in 1988, and three in 1989. Although the number of operations does contribute to the number of accidents, the rate of accidents and incidents is mainly dependent on numerous other factors, including aircraft maintenance; experience of aircraft crews and service personnel; experience of air traffic control personnel; age of aircraft and maintenance history; mechanical failure; weather; and pilot and air traffic controller fatigue.

[6] According to NTSB Regulation Part 830, “aircraft accident” means an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. “Incident” means an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations.

Table 1

Incidents/Accidents at Los Angeles, California 1962-1999

Date	Location	Aircraft Type	Aircraft Damage	Injuries Aboard: Fatal	Serious	Minor	None	Phase of Flight
12/10/62	Los Angeles	Douglas DC-6	Substantial	0	0	0	9	Landing: Roll
7/15/63	Los Angeles	Sikorski S-61L	Substantial	0	0	0	3	Landing: Roll-On/Run-On
9/10/63	Los Angeles	Boeing 707	Substantial	0	0	0	81	Taxi: To Takeoff
9/28/63	Los Angeles	Boeing 707	Substantial	0	0	0	102	Taxi: To Takeoff
12/17/63	Los Angeles	Douglas DC-6B	Substantial	0	0	0	46	Landing: Go Around & Landing: Go Around
3/16/64	Los Angeles	Bell 47J2	Substantial	0	0	0	3	Takeoff: Aborted
3/16/64	Los Angeles	Cessna 172S	Substantial	0	0	0	2	Taxi: From Landing
6/19/64	Los Angeles	Cessna 172D	Substantial	0	0	0	1	Taxi: To Takeoff & Taxi: To Takeoff
8/28/64	Los Angeles	Piper PA24	Substantial	0	0	0	2	Landing: Level Off/Touchdown
9/16/64	Los Angeles	Cessna 172B	Destroyed	4	0	0	0	In Flight: Normal Cruise
11/27/64	Los Angeles	Bell 47J2	Destroyed	1	1	0	0	Takeoff: Initial Climb & Landing Autorotative Landing
2/17/65	Los Angeles	Boeing 707 131B	Minor	0	0	0	14	Taxi: From Landing
3/29/65	Los Angeles	Lake La-4	Substantial	0	0	0	1	Landing: Roll & Landing: Roll
5/3/65	Los Angeles	Boeing B-720B	Substantial	0	0	0	22	Takeoff: Initial Climb
9/9/65	Los Angeles	Hughes 269B	Substantial	2	0	0	0	In Flight: Normal Cruise & Landing: Power-off Autorotative Landing
10/9/65	Los Angeles	Douglas DC-8	None	0	1	0	44	In Flight: Climb to Cruise
11/26/65	Los Angeles	Beechcraft C45G	Substantial	0	0	0	6	Taxi: From Landing
1/22/66	W Los Angeles	Cessna 150F	Substantial	0	0	0	1	In Flight: Normal Cruise & Landing: Roll
1/30/66	Los Angeles	Boeing 707 123	None	0	1	0	74	In Flight: Descending
2/12/66	Los Angeles	Piper PA23	Substantial	0	0	0	3	Taxi: From Landing
3/15/66	Los Angeles	Sikorsky S-61L	Substantial	0	0	0	3	Static: Engine Runup & Static: Engine Runup
4/29/66	Los Angeles	Sikorsky S-61L	Substantial	0	0	0	2	Landing: Power-On Landing
5/23/66	Los Angeles	Piper PA24	Substantial	0	0	0	2	Landing: Level Off/Touchdown
6/6/66	Los Angeles	Hiller Uh-12A	Substantial	0	0	0	2	Landing: Power Off Autorotative Landing
8/30/66	Los Angeles	Bell 47G-4	Destroyed	3	0	0	0	In Flight: Normal Cruise
8/30/66	Los Angeles	Bell 47G-4	Destroyed	2	0	0	0	In Flight: Normal Cruise
9/26/66	Los Angeles	Cessna 182	Substantial	0	0	0	1	Taxi: From Landing
10/18/66	Los Angeles	Boeing 707 131	Substantial	0	0	8	51	Landing: Level Off/Touchdown & Landing: Roll
11/14/66	Los Angeles	Douglas DC-3	Substantial	0	0	0	3	Taxi: From Landing
1/12/67	E Los Angeles	Bell 47G-5	Substantial	0	0	2	0	Landing: Power-On Landing
3/7/67	Los Angeles	Cessna 150	Substantial	0	0	0	2	Taxi: From Landing
7/26/67	Los Angeles	Beech N35	Destroyed	3	0	0	0	Takeoff: Initial Climb & Landing: Final Approach
10/18/67	W Los Angeles	Piper PA-28	Destroyed	3	0	0	0	Landing: Final Approach
10/18/67	W Los Angeles	Cessna 150G	Destroyed	1	0	0	0	Landing: Final Approach
1/3/68	Los Angeles	Bell 47G-4A	Destroyed	0	1	0	1	In Flight: Normal Cruise & Landing: Power-off Autorotative Landing
8/12/68	Los Angeles	Bell 47J-2	Substantial	0	0	0	2	Taxi: Aerial Taxi To/From Landing
10/2/68	Los Angeles	Beech F35	Destroyed	1	0	0	0	In Flight: Other
12/20/68	Los Angeles	Beech E18S	Substantial	0	0	0	7	Landing Roll & Landing: Roll
1/18/69	Los Angeles	Boeing 727	Destroyed	38	0	0	0	In Flight: Other
3/31/69	Los Angeles	Bell 47J-2A	Substantial	0	0	1	0	In Flight: Normal Cruise & Landing: Power-off Autorotative Landing
5/10/69	Los Angeles	Douglas B026B	Destroyed	4	0	0	0	Takeoff Initial Climb & Takeoff: Initial Climb
8/10/69	Los Angeles	Piper PA-28	Destroyed	1	2	0	0	In Flight: Normal Cruise & Landing: Final Approach
8/24/69	Los Angeles	Cessna 172D	Substantial	0	0	1	1	Static: Parked-Engines Not Operating & Static: Parked-Engines Not Operating
1/2/70	Los Angeles	Mooney M20E	Substantial	0	0	1	0	Landing: Traffic Pattern-Circling & Landing: Level Off/Touchdown
1/12/70	Los Angeles	Dehavilland DHC-6	Substantial	0	0	0	136	Static: Idling Engine(s)
6/20/70	Los Angeles	Piper PA24	Substantial	0	0	0	4	Landing: Level Off/Touchdown
9/9/71	Los Angeles	Piper PA22	Destroyed	1	0	0	0	Cruise: Normal
9/9/71	Los Angeles	Cessna 150	Destroyed	2	0	0	0	Traffic Pattern: Circling (VFR)
1/24/72	Los Angeles	Dehavilland DH114	Substantial	0	0	0	18	Landing: Roll & Taxi: Other
3/28/72	Los Angeles	Cessna 182	None	0	0	0	2	Taxi: From Landing

Table 1

Incidents/Accidents at Los Angeles, California 1962-1999

Date	Location	Aircraft Type	Aircraft Damage	Injuries Aboard: Fatal	Serious	Minor	None	Phase of Flight
4/6/73	Los Angeles	Piper PA-23	Substantial	0	0	0	80	Taxi: To Takeoff
6/9/73	Los Angeles	Cessna 210C	Destroyed	0	1	1	0	Landing: Final Approach & In Flight: Uncontrolled Descent
8/17/73	Los Angeles	Beech C-45H	Substantial	0	0	0	2	Landing: Roll & Landing: Roll
8/21/73	Los Angeles	Cessna 150L	Substantial	0	0	1	0	Landing: Final Approach & Landing: Level Off/Touchdown
8/28/73	Los Angeles	Boeing 707	None	1	3	1	147	In Flight: Descending
1/16/74	Los Angeles	Boeing 707	Destroyed	0	2	6	57	Landing: Level Off/Touchdown & Landing: Roll
2/22/74	Los Angeles	Piper PA28R	Substantial	0	0	0	3	Taxi: From Landing
6/14/75	Los Angeles	Lockheed 1011	None	0	1	2	240	Static: Starting Engine(s)
1/17/76	Los Angeles	Boeing 727	Minor	0	2	1	53	Static: Parked-Engines Not Operating
6/11/76	Los Angeles	Bell 47G-5	Destroyed	1	1	0	0	Landing: Power-On Landing
10/21/76	Los Angeles	Beech 35-C33	Destroyed	1	0	0	0	In Flight: Descending
10/21/76	Los Angeles	Aero Comdr 690	Destroyed	1	0	0	0	Landing: Traffic Pattern-Circling
12/29/76	Los Angeles	Dehavilland DHC-6	Substantial	0	0	0	1	Taxi: Other
12/29/76	Los Angeles	Dehavilland DHC-6	Substantial	0	0	0	12	Takeoff: Run
7/6/77	Los Angeles	Douglas DC10	None	0	1	0	75	In Flight: Descending
8/20/77	Los Angeles	Piper PA28R	Substantial	0	0	2	0	Takeoff: Initial Climb & Landing: Final Approach
12/15/77	Los Angeles	Hughes 369D	Substantial	0	0	0	2	Landing: Power-off Autorotative Landing
2/3/78	Los Angeles	Cessna 182A	Substantial	0	0	1	0	In Flight: Normal Cruise
2/3/78	Los Angeles	Cessna 337G	Destroyed	1	0	0	0	In Flight: Normal Cruise
3/1/78	Los Angeles	Douglas DC10	Destroyed	2	31	54	113	Takeoff: Run & Takeoff: Aborted
5/30/78	Los Angeles	Piper PA31	Destroyed	0	1	1	0	Landing: Final Approach & Landing Final Approach
8/30/78	Los Angeles	Mooney M20	Destroyed	2	0	0	0	In Flight: Normal Cruise & Landing: Final Approach
12/20/78	Los Angeles	Piper PA32	Destroyed	0	1	1	0	Landing: Final Approach & In Flight: Uncontrolled Descent
3/17/79	Los Angeles	Beech D35	Destroyed	3	0	0	0	In Flight: Acrobatics
12/12/79	Los Angeles	Cessna 441	Substantial	0	0	0	3	Landing: Roll & Landing: Roll
2/6/80	Los Angeles	Piper PA43	Substantial	0	0	0	2	Takeoff: Aborted
5/23/80	Los Angeles	Cessna T206	Substantial	0	0	0	1	Taxi: To Takeoff & Taxi: To Takeoff
7/3/80	Los Angeles	Cessna T210	Substantial	0	0	1	0	In Flight: Descending & Landing: Level Off/Touchdown
8/12/80	Los Angeles	Bell 47G3B1	Destroyed	0	1	0	1	Takeoff: Running & Landing: Power-Off Autorotative Landing
2/7/81	Los Angeles	Lake La-4	Substantial	0	0	1	1	Takeoff: Run
8/2/82	Los Angeles	Cessna 150 M	Substantial	0	0	2	0	Landing: Flare Touchdown
8/22/82	Los Angeles	Piper PA24-250	Destroyed	1	0	0	0	Approach
11/2/82	Los Angeles	Cessna 150B	Substantial	0	0	0	1	Cruise: Normal & Landing: Flare/Touchdown
3/22/85	Los Angeles	Swearingen SA 226TC	Substantial	0	1	1	12	Landing: Flare/Touchdown
5/20/86	Los Angeles	Bell 206B	Substantial	0	0	1	1	Takeoff: Initial Climb
7/2/86	Los Angeles	Cessna 172P	Substantial	0	0	0	3	Taxi: To Takeoff
11/7/86	Los Angeles	McDonnell Dougles DC10-10	None	0	1	3	119	Cruise: Normal
1/31/87	Los Angeles	Sikorsky S-58B	Substantial	0	0	1	1	Maneuvering
2/25/87	Los Angeles	Boeing 727-224	None	0	0	0	91	Takeoff: Initial Climb
2/25/87	Los Angeles	Cessna 310R	Substantial	0	0	0	1	Takeoff: Initial Climb
2/26/87	Los Angeles	Boeing 727-236B	None	0	1	11	375	Cruise
5/31/87	Los Angeles	Boeing 727-264	None	0	2	9	142	Taxi: From Landing
6/22/87	Los Angeles	Boeing 737-277	Substantial	0	0	0	81	Standing
6/22/87	Los Angeles	Boeing 747SP	Substantial	0	0	0	2	Taxi
7/23/87	Los Angeles	Beech A36TC	Substantial	0	0	0	1	Takeoff: Initial Climb
10/4/87	Los Angeles	Boeing 767-201	Substantial	0	0	0	148	Landing: Flare/Touchdown
11/25/87	Los Angeles	Boeing 737-387	None	0	1	1	142	Standing: Engine(s) Not Operating
12/21/87	Los Angeles	Piper PA32R300	Substantial	0	0	0	1	Standing: Engine(s) Operating
12/21/87	Los Angeles	Beech E18S	Minor	0	0	0	1	Taxi: From Landing
6/26/88	Los Angeles	Cessna 172N	Substantial	0	0	0	1	Cruise: Normal
1/17/89	Los Angeles	Fairchild SA227AC	Substantial	0	0	0	8	Taxi: From Landing
4/3/89	Los Angeles	Boeing 767-201	None	0	2	12	208	Standing: Engine(s) Not Operating

Table 1

Incidents/Accidents at Los Angeles, California 1962-1999

Date	Location	Aircraft Type	Aircraft Damage	Injuries Aboard: Fatal	Serious	Minor	None	Phase of Flight
7/9/89	Los Angeles	Cessna P210N	Destroyed	0	1	1	0	Cruise: Normal
9/6/89	Los Angeles	Fairchild SA227AC	Substantial	0	0	0	11	Taxi: To Takeoff
9/16/89	Los Angeles	Rockwell 112B	Destroyed	2	0	0	0	Cruise
10/26/89	W Los Angeles	Wheeler Express 100	Destroyed	0	0	0	2	Cruise: Normal
4/18/90	Los Angeles	McDonnell Douglas DC-10-10F	Substantial	0	0	0	6	Landing: Flare/Touchdown
2/1/91	Los Angeles	Boeing 737-300	Destroyed	22	13	17	37	Landing: Roll
2/1/91	Los Angeles	Fairchild SA227AC	Destroyed	12	0	0	0	Standing
2/24/91	Los Angeles	Piper PA46-310P	Substantial	0	0	0	4	Approach
6/13/91	Los Angeles	Aerospatiale AS350	Destroyed	2	0	0	0	No Narrative Entered
8/28/93	Los Angeles	Cessna 209B	Substantial	0	0	0	1	Taxi
3/11/94	Los Angeles	Piper PA28-180	Destroyed	1	1	0	0	Takeoff: Initial Climb
1/14/95	Los Angeles	Bell 206B	Destroyed	2	2	0	0	Cruise
5/7/95	Los Angeles	Davenport LongEZ	Destroyed	0	1	0	0	Maneuvering
7/17/95	Los Angeles	Embraer Emb-120 RT	Substantial	0	0	0	6	Taxi: To Takeoff
7/28/95	Los Angeles	Rockwell International 112TC	Destroyed	2	0	0	0	Landing: Roll
5/3/96	Los Angeles	Cessna 310D	Destroyed	4	0	0	0	Go-Around (VFR)
5/18/96	Los Angeles	Beech 58	Substantial	0	0	0	3	Takeoff: Initial Climb
5/25/96	Los Angeles	McDonnell Douglas MD11	Substantial	0	0	0	2	Landing: Flare Touchdown
6/19/96	Los Angeles	Beech C23	Destroyed	3	0	0	0	Climb
2/7/97	Los Angeles	Cessna 310Q	Substantial	0	0	2	0	Approach: VFR Pattern-Downwind
4/7/97	Los Angeles	Aerospatiale As350D	Substantial	0	0	0	2	Standing: Engines(s) Operating
11/8/97	Los Angeles	Globe GC1B	Substantial	0	0	0	2	Landing: Roll
3/23/98	Los Angeles	Bell 205A1	Destroyed	4	2	0	0	Cruise
4/20/98	Los Angeles	Bell 206L1	Substantial	0	0	0	2	Approach
5/21/98	Los Angeles	McDonnell Douglas DC1010	None	0	3	5	290	Climb: To Cruise
8/16/98	Los Angeles	Cessna 177	Destroyed	0	2	2	0	Approach: FAF/Outer Marker To Threshold (IFR)
12/17/98	Los Angeles	Learjet 55B	Substantial	0	0	0	7	Cruise
6/6/99	Los Angeles	Boeing 747-400	Minor	0	0	0	425	Taxi: To Takeoff
6/6/99	Los Angeles	Boeing 747 SP	Substantial	0	0	0	274	Taxi: From Landing
9/12/99	Los Angeles	Boeing 737-300	Substantial	0	0	0	91	Taxi: Pushback/Tow
10/14/99	Los Angeles	Bell 206B	Substantial	0	3	0	0	Approach
Aircraft Incidents								
6/9/64	Los Angeles	Aero Comm 560 F	Minor	0	0	0	1	Static: Parked Engines Not Operating
6/9/64	Los Angeles	Boeing 707	Minor	0	0	0	85	Taxi: From Landing
7/23/64	Los Angeles	Douglas DC8	Minor	0	0	0	27	Taxi: To Takeoff
8/21/64	Los Angeles	Boeing 707	Minor	0	0	0	75	Landing: Level Off/Touchdown
11/10/64	Los Angeles	Boeing 707 321C	None	0	0	0	102	In Flight: Normal Cruise
11/18/65	Los Angeles	Convair CV-880	Minor	0	0	0	65	In Flight: Climb to Cruise & In Flight: Climb to Cruise
12/2/66	Los Angeles	Boeing 720B	Substantial	0	0	0	0	Static: Parked Engines Not Operating
6/23/68	Los Angeles	Boeing 727	Minor	0	0	0	84	Takeoff: Initial Climb
6/25/68	Los Angeles	Sikorsky S61L	None	0	0	0	4	In Flight: Normal Cruise
1/4/69	Los Angeles	Boeing 737	None	0	0	2	65	In Flight: Normal Cruise
3/22/69	Los Angeles	Douglas DC8	None	0	1	2	70	Static: Parked Engines Not Operating
10/16/69	Los Angeles	Douglas DC8	Minor	0	0	0	96	In Flight: Climb To Cruise
10/17/69	Los Angeles	Douglas DC9	Minor	0	0	0	2	In Flight: Normal Cruise
10/8/70	Los Angeles	Boeing 747	None	0	0	0	3	In Flight: Normal Cruise
11/8/70	Los Angeles	Boeing 727	Minor	0	0	0	46	Landing: Final Approach
12/12/70	Los Angeles	Boeing 747	Minor	0	0	0	5	Unknown
12/29/70	Los Angeles	Boeing 747	Minor	0	0	0	5	Landing: Final Approach
7/21/71	Los Angeles	Boeing 747	Minor	0	0	0	178	Taxi: Other
8/17/71	Los Angeles	Douglas DC10	Minor	0	0	0	181	In Flight: Climb to Cruise
8/24/71	Los Angeles	Boeing 747	Minor	0	0	0	158	Takeoff: Initial Climb & Takeoff: Initial Climb
7/27/72	Los Angeles	Douglas DC10	Minor	0	0	0	1	In Flight: Climb to Cruise
5/4/74	Los Angeles	Boeing 747	Minor	0	0	0	197	In Flight: Climb to Cruise
2/28/75	Los Angeles	Douglas DC10	None	0	0	0	142	Initial Climb
7/24/75	Los Angeles	Boeing 727	Minor	0	0	0	56	Takeoff: Run
6/27/78	Los Angeles	Boeing 727	None	0	0	1	6	Taxi: From Landing
6/27/78	Los Angeles	Boeing 727	None	0	0	0	6	Takeoff: Run
10/26/78	Los Angeles	Saberliner NA265	Minor	0	0	0	3	In Flight: Low Pass

Table 1

Incidents/Accidents at Los Angeles, California 1962-1999

Date	Location	Aircraft Type	Aircraft Damage	Injuries Aboard Fatal	Serious	Minor	None	Phase of Flight
10/26/78	Los Angeles	Douglas DC8	None	0	0	0	3	Taxi: From Landing
1/8/79	Los Angeles	Boeing 727	Minor	0	0	0	121	Takeoff: Run
9/9/79	Los Angeles	Boeing 747	Minor	0	0	0	3	Takeoff: Aborted
8/16/80	Los Angeles	Unknown	unknown	0	0	0	1	Landing: Level Off/Touchdown
10/17/81	Los Angeles	Douglas DC10	None	0	0	0	128	In Flight: Climb to Cruise
1/16/83	Los Angeles	Boeing 747-123	Minor	0	0	0	412	Taxi: To Takeoff
3/18/83	Los Angeles	Boeing 747	Minor	0	0	0	375	Taxi: From Landing
3/18/83	Los Angeles	Lockheed L-1011	Minor	0	0	0	213	Standing
7/2/83	Los Angeles	Boeing 727-200	Minor	0	0	1	133	Taxi: From Landing
1/10/84	Los Angeles	McDonnell Douglas DC9-30	None	0	0	4	29	Approach: IAF to FAF/Outer Marker
5/11/84	Los Angeles	Boeing 747	Minor	0	0	0	1	Takeoff: Initial Climb
6/10/84	Los Angeles	McDonnell Douglas DC1010	None	0	0	0	212	Takeoff: Initial Climb
6/11/84	Los Angeles	Lockheed L-1011-385-3	Substantial	0	0	0	157	Takeoff: Initial Climb
11/1/84	Los Angeles	Boeing 747-131	Minor	0	0	0	367	Taxi: To Takeoff
6/27/85	Los Angeles	Boeing 737-247	Minor	0	0	0	96	Cruise: Normal
10/29/86	Los Angeles	Boeing 727-222	None	0	0	0	71	Approach: IAF to FAF/Outer Marker
10/29/86	Los Angeles	Hughes 369D	None	0	0	0	2	Hover
6/6/87	Los Angeles	McDonnell Douglas DC1010	Minor	0	0	0	234	Approach: IAF to FAF/Outer Marker
8/7/87	Los Angeles	Boeing 747-300	None	0	0	0	363	Approach: VFR Pattern Final Approach
9/7/87	Los Angeles	Mooney M20C	Minor	0	0	0	1	Landing: Flare/Touchdown
12/1/87	Los Angeles	Boeing 737-300	None	0	0	0	87	Taxi: From Landing
5/7/89	Los Angeles	Boeing 747	None	0	0	3	383	Cruise
8/10/89	Los Angeles	Boeing 727-224	Minor	0	0	0	148	Cruise: Normal
2/18/90	Los Angeles	Lockheed L-1011-385-1	Minor	0	0	1	192	Takeoff: Aborted
8/21/90	Los Angeles	Boeing 737-322	Minor	0	0	0	133	Approach: FAF/Outer Marker To Threshold (IFR)
8/27/90	Los Angeles	Boeing 747-422	Minor	0	0	23	322	Landing: Roll
7/13/91	Los Angeles	McDonnell Douglas DC1010	None	0	0	12	215	Climb: To Cruise
8/12/91	Los Angeles	Boeing 747-200	None	0	0	0	300	Takeoff: Roll/Run
8/29/91	Los Angeles	Boeing 767-232	Minor	0	0	0	120	Takeoff: Roll/Run
5/13/92	Los Angeles	Boeing 767-222	Minor	0	0	3	81	Takeoff: Roll/Run
7/17/92	Los Angeles	Lockheed L1011-385-1	None	0	0	0	304	Taxi
7/17/92	Los Angeles	Fairchild SA227AC	Minor	0	0	0	11	Taxi
8/2/92	Los Angeles	McDonnell Douglas MD11	Minor	0	0	0	149	Landing: Roll
4/30/93	Los Angeles	McDonnell Douglas MD11	Minor	0	0	0	277	Landing: Flare/Touchdown
6/8/93	Los Angeles	Boeing 757-222	Minor	0	0	0	197	Climb: To Cruise
10/19/93	Los Angeles	Airbus A300-605R	Minor	0	0	0	86	Climb
3/17/95	Los Angeles	Beech 1900C	Minor	0	0	0	19	Approach: VFR Pattern Final Approach
1/5/96	Los Angeles	Boeing 747-251B	Minor	0	0	0	385	Climb: To Cruise
5/19/96	Los Angeles	Boeing 747-273C	Minor	0	0	0	3	Climb: To Cruise
11/29/96	Los Angeles	Embraer EMB-120ER	None	0	0	1	17	Approach: VFR Pattern Leg/Base To Final
8/24/97	Los Angeles	Airbus A300 B4-203	Minor	0	0	0	265	Takeoff: Roll/Run
1/3/99	Los Angeles	Boeing 757	None	0	0	0	1	No Phase Recorded

Note: Injuries recorded include crew, passenger, and other. "Other" meaning injuries aboard other aircraft or on the ground.

Source: FAA/NTSB Databases, 2000.