

Technical Report
LAX Master Plan EIS/EIR

8. Energy Supply Technical Report

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Prepared by:

Camp Dresser & McKee Inc.

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1. INTRODUCTION

This Technical Report presents detailed information on baseline conditions related to energy consumption associated with implementation of the Los Angeles Airport (LAX) Master Plan. This report supports the Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) for the LAX Master Plan Project prepared pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

This Technical Report provides factors and equations used to develop projected electricity, natural gas, and transportation-related fuel consumption and contains information pertaining to energy consumption within the Master Plan boundaries that is supplemental to the material presented in Section 4.17.1, *Energy Supply*, of the EIS/EIR. Impacts associated with the information contained in this Technical Report are addressed in Section 4.17.1, *Energy Supply*, of the EIS/EIR.

2. GENERAL APPROACH AND METHODOLOGY

This analysis compares energy consumption projected for the No Action/No Project Alternative and three build alternatives to baseline energy consumption, including electricity and natural gas, as well as transportation-related fuels, such as Jet A, gasoline, diesel, liquefied natural gas (LNG), compressed natural gas (CNG), and liquefied propane gas (LPG), or propane. The analysis characterizes existing energy supply sources as well as infrastructure and methods of transmission. The analysis also estimates baseline on-airport electricity and natural gas consumption, as well as that associated with areas proposed to be acquired as part of the LAX Master Plan and other airport programs--collectively referred to as the Master Plan boundaries, as described below. Fuel consumption associated with airport operations is also estimated.

The acreage and location of land required for the proposed LAX Master Plan improvements are unique to each of the three build alternatives. Consequently, each alternative would result in a different footprint for LAX. In order for baseline conditions, the No Action/No Project Alternative, and the three build alternatives to be compared side by side, a single energy supply study area was used. This composite study area is referred to as the "Master Plan boundaries." Total energy consumption within the Master Plan boundaries was then calculated (as described below) for baseline conditions as well as all alternatives at both the 2005 and 2015 planning horizons.

The energy supply study area encompasses all of the land within the Master Plan boundaries. The Master Plan boundaries include the existing airport, as well as the total (composite) area considered for acquisition under the three build alternatives, the Aircraft Noise Mitigation Program (ANMP) acquisition areas (Manchester Square and Belford) and the LAX Expressway alignments. Under baseline conditions, land within the ANMP acquisition areas is assumed to be in its existing land use; under the No Action/No Project Alternative, it is assumed to be vacant. For each of the build alternatives, it is assumed that all proposed acquisition has been completed and existing land uses demolished. Each alternative proposes a different configuration of land acquisition; thus, not all land within the Master Plan boundaries would be acquired by any one alternative. Land uses within areas not acquired would be unaffected by the Master Plan. The Alternative B off-site fuel farm sites are discussed separately from the Master Plan boundaries.

In order to determine whether the increase in energy consumption associated with the LAX Master Plan would be significant, the total energy consumption associated with each of the three build alternatives and the No Action/No Project alternative was projected. Projected energy demands were compared to the projected supply from local and regional suppliers. For the electricity and natural gas analyses, total energy consumption within the Master Plan boundaries was considered; for transportation-related fuels, fuel consumption associated with airport operations was considered.

The methodologies and factors used to estimate energy consumption for baseline conditions, the No Action/No Project Alternative, and the three build alternatives are presented and discussed below. Supporting information for each category of energy consumption is presented. Where appropriate, example calculations are provided.

2.1 Electricity

Electricity is used for many purposes at LAX, including lighting, air conditioning, operation of airport equipment, and ground transportation-related uses. The methods used to estimate electricity consumption reflect these various uses. The total estimate of electricity consumption for baseline

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conditions, the No Action/No Project Alternative, and the three build alternatives were obtained by adding the amount of electricity consumed for each of the identified sources of electricity consumption: buildings and facilities and airport operations, including the Central Utility Plant (CUP), Automated People Mover (APM), gate electrification, ground support equipment, and on-airport vehicles. The methods employed for estimating electricity consumption are described below.

2.1.1 Electricity Consumption for Buildings and Facilities

Electricity is consumed at airport terminals, buildings, and other facilities for heating, cooling, lighting, and other miscellaneous uses. Electricity consumption for these uses is dependent primarily on building area. Electricity consumption for airport land uses under baseline conditions, the No Action/No Project Alternative, and the three build alternatives was calculated using factors derived from square footage obtained from Psomas and Associates' *Utilities Consumption and Generation at LAX Technical Addendum*.¹ These factors are presented in **Table 1**, Airport Land Use Electricity Consumption Factors. For non-airport land uses, including current and proposed uses within LAX Northside/Westchester Southside, energy consumption factors based on square footage were obtained from the South Coast Air Quality Management District's (SCAQMD) *CEQA Air Quality Handbook*.² These factors are presented in **Table 2**, Non-Airport Land Use Electricity Consumption Factors.

Electricity consumption was projected by multiplying the factor (in kilowatt-hours per square foot per year) by the area of the facility or building (in square feet), as follows:

Equation 1

Annual Facility Electricity Consumption_i = E_i x A_i

Where

E_i = Electricity consumption factor for facility (i), kilowatt-hour per square foot year

A_i = Area of facility or building (i), square feet

Table 1

Airport Land Use Electricity Consumption Factors

Airport Land Use Category	Electricity Consumption Factor (KWH/S.F./Yr)
Terminal ¹	19.05
Cargo	13.40
Maintenance	24.22
Ancillary	14.17

¹ The consumption factor for terminal areas does not include energy consumed by the CUP to service the terminals.

Source: Psomas & Associates, 1996.

¹ Psomas and Associates, *Utilities Consumption and Generation at LAX Technical Addendum*, October 1996.

² SCAQMD, *CEQA Air Quality Handbook*, April 1993.

Table 2

Non-Airport Land Use Electricity Consumption Factors

Non-Airport Land Use Category	Units	Electricity Consumption Factor (KWH/S.F./Yr)
Residential (Single Family)	DU	5,626.50 ¹
Residential (Multi Family)	DU	5,626.50 ¹
Hotel	Sq Ft	9.95
Office	Sq Ft	12.95
Retail	Sq Ft	13.55
Light Industrial	Sq Ft	10.50
Institutional	Sq Ft	9.31
Restaurant	Sq Ft	47.45

¹ KWH/dwelling/unit/Yr

Source: SCAQMD, CEQA Air Quality Handbook, April 1993.

2.1.2 Electricity Consumption for Airport Operations

Sources of electricity demand associated with airport operations include the CUP, gate electrification, APM, ground support equipment (GSE), and on-airport electric vehicles. Each of the sources of electricity demand considered under airport operations was estimated using a different method. Because the sources of electricity demand associated with airport operations are not the same under all alternatives, specific assumptions for baseline conditions, the No Action/No Project Alternative, and the three build alternatives were identified. For example, the APM would only be constructed under the three build alternatives and is not present under baseline conditions or under the No Action/No Project Alternative. The following discussion details the methods used to estimate electricity consumption for each source of electricity demand.

2.1.2.1 Electricity Consumption for the Central Utility Plant

The existing CUP is located within the Central Terminal Area (CTA) and consumes electricity in the generation of steam to provide general heating, ventilation, and air conditioning (HVAC) to the terminals. While the CUP consumes electricity for these purposes, the CUP also generates electricity through co-generation. Electricity produced by the CUP under baseline conditions is transferred to the electrical power grid. Los Angeles World Airports (LAWA) receives a credit from the Los Angeles Department of Water and Power (DWP) for electricity transferred from the CUP to the electrical power grid. Under the three build alternatives, a new west CUP would be constructed to serve the West Terminal/Concourses. The west CUP would not be designed to generate electricity; it would only provide HVAC.

Electricity consumption under baseline conditions was obtained from Psomas and Associates' *Utilities Consumption and Generation at LAX Technical Addendum*. Under the No Action/No Project Alternative, electricity consumption for the CUP was assumed to be identical to baseline conditions because the terminal building areas would not change. Because the terminals would be different under each of the three build alternatives for 2005 and 2015, electricity consumption for the CUP was calculated based on terminal area square footage, using the energy consumption factor determined for baseline conditions of 6.70 kilowatt-hour per square foot per year.

2.1.2.2 Electricity Consumption for Gate Electrification

Gate electrification refers to the electricity, and if necessary conditioned air, provided to airplanes while they are parked at gates between arrival and departure. Under baseline conditions, while most gates have electrical hook-ups, approximately 40 percent of the aircraft operations were provided electrical service/conditioned air.³ When airplanes are not provided electricity and conditioned air at gates, an

³ Los Angeles World Airports, Engineering Division.

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onboard Jet A-powered Auxiliary Power Unit (APU), or stationary ground power unit (GPU) and/or air conditioning unit (ACU) are generally operated to provide electricity and conditioned air for aircraft use.

For the No Action/No Project Alternative and the three build alternatives, it was assumed that all passenger gates (100 percent) would provide electrical power to aircraft. The power required for gate electrification was estimated by identifying the numbers and types of APUs on aircraft in use at these gates. Electricity consumption for gate electrification was calculated using the estimated electricity generated by APUs when gate electrification is not provided. The time at a gate requiring power/AC hookup was assumed to be, on average, about 30 minutes for a small aircraft, 45 minutes for a large aircraft, and 60 minutes for a heavy aircraft.⁴ Small aircraft that do not have APUs (e.g., very small aircraft) were not assumed to use gate power. The gate electrical power requirements were calculated based on the equivalent power derived from the APUs. An 80 percent APU load factor was assumed adequate to meet electrical power and air conditioning needs for parked aircraft.

The equation for estimating electricity generated by APUs if gate electrification was not provided is as follows:

Equation 2

$$\text{Annual Gate Electricity Consumption}_i = \%GE \times HP_i \times LF_i \times T_i \times F_i \times C$$

Where

Annual Gate Electricity Consumption_i = annual electricity consumption at gate by aircraft model (i), MWH

%GE = percent gate electrification, under baseline conditions only 40% of available gates are electrified. By 2005 100% of gates will be electrified.

HP_i = Horsepower rating of APU associated with aircraft model (i), horsepower

LF_i = Load factor associated with APU, dimensionless

T_i = Time at gate in minutes for a aircraft model (i), minutes

F_i = Annual number of flight operations by aircraft model (i)

C = Constant to convert HP-minutes units to MWH, 1.24×10^{-5} MWH per HP-minute

Information and data regarding airplane models, APU horsepower, load factor, time at gate, and annual number of flight operations are provided in the tables in Section 4, *Environmental Consequences*.

2.1.2.3 Electricity Consumption for the Automated People Mover

Under the three build alternatives, a APM would be constructed to transport passengers between the new West Terminal and the CTA. The addition of the APM would improve airport operations by reducing the reliance on other vehicles, especially gasoline and diesel powered vehicles, to transport passengers around the airport. Under the three build alternatives, the APM was assumed to be fully constructed and operational by 2015. While the selection of energy form to power the APM has not been selected, the most likely form of energy to power the APM will be electricity. The length of the APM would vary slightly among the three build alternatives. Because for each alternative, the APM would serve the same length of track and make a similar amount of trips regardless of passenger traffic, the intensification of use by increasing numbers of passengers would not increase the amount of electricity consumption by the APM. Estimated annual electricity consumption for the APM was provided by Lea + Elliott, Inc.⁵

2.1.2.4 Electricity Consumption for GSE

GSE can be powered by a variety of fuels, including gasoline, diesel, liquefied natural gas (LNG), compressed natural gas (CNG), propane, and electricity. GSE perform a wide variety of airside operations from providing short-term power to aircraft to loading and unloading passenger baggage and cargo, including food service for passenger flights. The types and number of GSE in use depends on the number of flight operations and the types of aircraft in service. The GSE types and numbers used in this analysis are provided in the *Technical Report 4, Air Quality*. For each GSE type, annual hours of usage

⁴ Horonjeff, Robert, and Francis X. McKelvey, *Planning and Design of Airports*, 4th Ed., 1994.

⁵ Lea + Elliot, Inc., *Electrical Power Consumption Estimate for PeopleMover Concepts*, February 1998.

were estimated by considering the number of flight operations, types of aircraft, service requirements specific to that aircraft, and anticipated service time for each flight operation. Under baseline conditions, the amount of electrical-powered GSE was not substantial because very few electrical-powered vehicles were in use; therefore, it was assumed that little to no electricity was consumed by GSE under baseline conditions.

For 2005 and 2015, under the No Action/No Project Alternative and the three build alternatives, it was assumed that electrical-powered GSE would be used, in addition to gasoline, diesel, LNG, CNG, and propane. Information and data regarding the types of GSE, the GSE base horsepower, GSE load factor, and the hours of operation, are provided in the tables in Section 4, *Environmental Consequences*.

The energy estimates were calculated as follows:

Equation 3

$$\text{Energy Consumed by GSE Vehicle}_i = \text{BHP}_i \times \text{LF}_i \times \text{Hours}_i \times \frac{1}{[\text{Efficiency}]} \times C$$

Where

BHP_i = Base horsepower rating of GSE vehicle (i), horsepower

LF_i = Load factor rating of GSE vehicle (i), dimensionless

Hours_i = Annual hours of operation of vehicle (i), hours

Efficiency = Motor efficiency for internal combustion engine, 25%

C = Conversion factor from horsepower-hour to million BTUs,⁶ 0.002545 million BTUs per horsepower-hour.

Motor efficiencies for standard gasoline and diesel internal combustion engines are typically 25 percent or less.⁷ A motor efficiency of 25 percent was used for gasoline, diesel, LNG, CNG, and propane internal combustion engines. Fuel conversion factors for various hydrocarbon based fuels were as follows: 114,000 BTUs per gallon for gasoline; 130,000 BTUs per gallon for diesel; 82,450 BTUs per gallon for liquefied petroleum (propane); and 1,050 BTUs per cubic foot of natural gas.^{8,9} For electric vehicles, the estimate of energy consumed was first converted to gasoline assuming 114,000 BTUs per gallon, then a fuel conversion factor of 12 kilowatt-hour (KWH) of electricity per gallon of gasoline was used to estimate electricity consumed.^{10,11}

2.1.2.5 On-Airport Vehicles

On-airport vehicles use a variety of fuels, including gasoline, diesel, LNG, CNG, propane, and electricity. On-airport vehicles are curbside vehicles, rather than airside equipment such as GSE. These curbside activities include transporting passengers, cargo, and airport employees around the airport. Electricity consumed by on-airport vehicles was estimated using on-airport vehicle miles traveled (VMT) and fleet mix assumptions provided by JKH Mobility Services and Barton-Aschman. **Table 3**, On-Airport Vehicle Fleet Mix Assumptions, provides the assumed fleet breakdown for on-airport vehicles under baseline conditions, the No Action/No Project Alternative, and the three build alternatives for 2005 and 2015. **Table 4**, Annual Vehicles Miles Traveled by On-Airport Vehicles, provides the annual miles per year

⁶ A British Thermal Unit (BTU) is equivalent to the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit at 60 degrees Fahrenheit.

⁷ Daniel Sperling, *The Case for Electric Vehicles*, Scientific American, Available: <http://www.sciam.com/1196issue/1196sperling.htm> [June 24, 2000]

⁸ Consumers Corner, *Natural Gas Vehicle Quick Reference Fuel Guide*, Natural Fuels Company, Available: http://www.naturalfuels.com/quick_ref_fuel_guide.htm. [June 5, 2000]

⁹ U.S. Department of Energy (DOE), *Alternative Energy Sources for Non-Highway Transportation*, DOE/CS/05438-T1 Volume 3 of 3, June 1980

¹⁰ California Energy Commission, *Transportation Technology Status Report, I. Alternative Fuel Vehicles, II. Automotive Fuel Economy*, December 1997

¹¹ This is approximately equal to 1.072 KWH per horsepower-hour or a combined electric charger, battery, and motor efficiency of 69.6%.

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traveled by each on-airport vehicle type used in the energy consumption calculations. Energy demand was estimated assuming an equivalent of 18.92 miles per gallon of gasoline for the fleet mix.¹² Conversion to other energy forms was accomplished using conversion factors. For the purpose of estimating electricity consumption, the energy consumed by electric vehicles has been estimated by assuming conversion of gasoline to electric vehicles. For the conversion of gasoline into an equivalent consumption of electricity, a conversion factor of 12 KWH of electricity per gallon of gasoline was used.¹³ The equation for calculating electricity consumption by on-airport vehicles is as follows:

Equation 4

On-Airport Vehicle Energy Consumption_i = VMT_i / MPG_i x Conversion Factor_i

Where

VMT_i = Annual vehicle miles traveled by vehicle (i), miles

MPG_i = Estimated miles per gallon of gasoline (18.92 miles per gallon assumed), miles per gallon

Conversion Factor_i = 12 KWH per gallon of gasoline for electric vehicle_i

¹² California Department of Transportation (Caltrans), California Motor Vehicle Stock, Travel and Fuel Forecast, Transportation System Information Program, November, 1998

¹³ California Energy Commission, Transportation Technology Status Report, I. Alternative Fuel Vehicles; II. Automotive Fuel Economy, December, 1997

Table 3
On-Airport Vehicle Fleet Mix Assumptions

Vehicle Type	Percentage of Fleet																								
	Baseline Conditions								No Action/No Project Alternative 2005								No Action/No Project Alternative 2015								
	Diesel	Gasoline	CNG	LNG	Propane	Battery	Fuel Cell	Hybrid	Diesel	Gasoline	CNG	LNG	Propane	Battery	Fuel Cell	Hybrid	Diesel	Gasoline	CNG	LNG	Propane	Battery	Fuel Cell	Hybrid	
Cargo																									
Light Duty Auto		100.0								99.0	1.0							95.0	5.0						
Pickup	18.0	81.0			1.0				9.0	90.0	1.0						9.0	81.0	1.0				2.0	2.5	4.5
Van	6.0	94.0							22.0	76.0	1.0				1.0		18.5	65.5	1.0				3.0	4.0	8.0
Step Van	22.0	78.0							21.0	78.0	1.0						14.0	70.0	1.0	1.0				5.0	9.0
Cube Van	84.0	16.0							83.0	16.0	1.0						70.5	16.0	1.0	1.0				4.0	7.5
3-Axle	95.0	5.0							95.0	4.0		1.0					89.0	1.0		1.0				3.0	6.0
4/5-Axle	100.0								100.0								95.0							2.0	3.0
LAWA																									
Van					67.0						33.0				67.0				33.0				67.0		
Pickup	11.0	61.0	26.0		2.0				11.0	62.0	26.0				1.0		11.0	62.0	26.0				1.0		
Sedan		80.0	19.0		1.0					80.0	19.0				1.0			80.0	19.0				1.0		
Parking Lot Bus	55.0		5.0	40.0					8.0			92.0								100.0					
Airfield Bus	100.0								100.0									100.0							
Flyaway Bus	100.0								100.0									100.0							
Construction	100.0								100.0									100.0							
Sweeper	75.0		25.0						75.0		25.0							80.0		20.0					
Forklift					100.0										100.0								100.0		
Truck	89.0				11.0				91.0					9.0			90.0						10.0		
Rideshare Van		100.0											100.0					100.0							
On-Road GSE																									
Van	1.0	98.0			1.0				1.0	97.0				2.0			1.0	95.0				3.0	1.0		
Pickup	81.0	18.0			1.0				81.0	17.0				2.0			81.0	15.0				3.0	1.0		
Car		99.0			1.0					98.0				2.0				96.0					4.0		
Truck	53.0	32.0			15.0				53.0	31.0				16.0			53.0	29.0				17.0	1.0		
Bus	90.0	6.0	4.0						90.0	5.0	5.0						90.0	3.0	6.0				1.0		
SUV		100.0								99.0	1.0							97.0	2.0				1.0		
Step Van		78.0			22.0					77.0				23.0				75.0				24.0	1.0		

Vehicle Type	Percentage of Fleet																							
	Baseline Conditions								Alternatives A, B, C - 2005								Alternatives A, B, C - 2015							
	Diesel	Gasoline	CNG	LNG	Propane	Battery	Fuel Cell	Hybrid	Diesel	Gasoline	CNG	LNG	Propane	Battery	Fuel Cell	Hybrid	Diesel	Gasoline	CNG	LNG	Propane	Battery	Fuel Cell	Hybrid
Cargo																								
Light Duty Auto		100.0								49.0	51.0							49.0	29.0				8.0	14.0
Pickup	18.0	81.0			1.0				9.0	41.0	49.0				1.0	9.0	41.0	29.0				8.0	13.0	
Van	6.0	94.0							3.0	47.0	49.0				1.0	3.0	47.0	30.5				8.0	11.5	
Step Van	22.0	78.0							17.0	40.0	43.0					11.0	39.0	35.5				5.5	9.0	
Cube Van	84.0	16.0							48.0	9.0	43.0					42.0	8.0	34.0				6.0	10.0	
3-Axle	95.0	5.0							64.0	3.0		33.0				47.0	2.0		38.0			5.0	8.0	
4/5-Axle	100.0								67.0			33.0				50.0			38.0			5.0	7.0	
LAWA																								
Van					67.0						33.0				67.0							33.3	33.3	33.3
Pickup	11.0	61.0	26.0		2.0					80.0					19.0	1.0			51.0			10.0	15.0	24.0
Sedan		80.0	19.0		1.0					81.0					18.0	1.0			46.0			10.0	17.5	26.5
Parking Lot Bus	55.0		5.0	40.0								100.0								60.0			17.0	23.0
Airfield Bus	100.0											100.0											18.0	23.0
Flyaway Bus	100.0											100.0											15.0	23.0
Construction	100.0											100.0												
Sweeper	75.0		25.0									100.0								100.0				
Forklift					100.0										100.0								100.0	
Truck	89.0				11.0							84.0			16.0							80.0	20.0	
Rideshare Van		100.0										98.0				2.0			37.5				25.0	37.5
On-Road GSE																								
Van	1.0	98.0			1.0					75.0	15.0				10.0			45.0	35.0			10.0		10.0
Pickup	81.0	18.0			1.0				55.0	20.0	15.0				10.0		15.0	50.0	15.0			10.0		10.0
Car		99.0			1.0					75.0	15.0				10.0			65.0	15.0			10.0		10.0
Truck	53.0	32.0			15.0				30.0	25.0	35.0				10.0			45.0	35.0			10.0		10.0
Bus	90.0	6.0	4.0						15.0		75.0				10.0				80.0			10.0		10.0
SUV		100.0								75.0	15.0				10.0			65.0	15.0			10.0		10.0
Step Van		78.0			22.0					50.0	25.0				25.0			30.0	35.0			25.0		10.0

Source: JKH Mobility Services and Barton-Aschman, 2000.

Table 4

Annual Vehicle Miles Traveled by On-Airport Vehicles

Class	Vehicle Type	Miles Traveled Per Year				
		Baseline Conditions ¹	No Action/No Project		Alternatives A, B, C	
			2005	2015	2005	2015
Cargo	Light Duty Auto	1,954,656	3,215,227	3,990,359	2,016,347	2,666,761
	Pickup	291,304	479,168	594,687	300,498	397,430
	Van	673,404	1,107,687	1,374,730	694,657	918,733
	Step Van	246,536	405,530	503,295	254,317	336,353
	Cube Van	1,967,248	3,235,939	4,016,065	2,029,336	2,683,940
	3-Axle	250,319	411,752	511,019	258,220	341,514
LAWA	4/5-Axle	539,732	887,809	1,101,843	556,766	736,363
	Van	21,840	25,986	31,522	25,986	36,656
	Pickup	1,303,120	1,550,492	1,880,796	1,550,492	2,187,122
	Sedan	1,645,280	1,957,604	2,374,637	1,957,604	2,761,394
	Parking Lot Bus	1,055,765	1,256,181	1,523,788	1,256,181	1,771,968
	Airfield Bus	174,720	207,887	252,174	207,887	293,245
	Flyaway Bus	54,990	65,429	79,367	65,429	92,294
	Construction	40,040	47,641	57,790	47,641	67,202
	Sweeper	7,280	8,662	10,507	8,662	12,219
	Forklift	1,820	2,165	2,627	2,165	3,055
	Truck	203,840	242,535	294,203	242,535	342,120
	On-Road GSE	Van	8,594,550	8,687,818	8,792,637	8,687,818
Pickup		4,337,150	4,424,651	4,478,034	4,424,651	5,554,377
Car		4,366,500	4,413,885	4,467,139	4,413,885	5,540,862
Truck		4,057,650	4,101,684	4,151,170	4,101,684	5,148,948
Bus		511,200	516,748	522,982	516,748	648,686
SUV		276,900	279,905	283,282	279,905	351,372
Step Van		244,950	247,608	250,596	247,608	310,829

¹ Cargo VMT under baseline conditions was estimated using the anticipated ratio of cargo tonnage and VMT presented for the 2005 No Action/No Project Alternative.

Source: Calstart, 1999.

2.2 Natural Gas

Natural gas is consumed at airport terminals, buildings, and other facilities for heating, cooking, and other miscellaneous uses. Natural gas consumption for these uses is dependent primarily on building area. Natural gas consumption under baseline conditions, the No Action/No Project Alternative, and the three build alternatives was calculated using factors derived from square footage obtained from Psomas and Associates' *Utilities Consumption and Generation at LAX Technical Addendum*.¹⁴ These factors are presented in **Table 5**, Airport Land Use Natural Gas Consumption Factors. For non-airport land uses, including current and proposed uses within LAX Northside/Westchester Southside, natural gas consumption factors based on square footage were obtained from the South Coast Air Quality Management District's (SCAQMD) *CEQA Air Quality Handbook*.¹⁵ These factors are presented in **Table 6**, Non-Airport Land Use Natural Gas Consumption Factors.

Natural gas consumption was projected by multiplying the factor (in cubic feet per square foot per year) by the area of the facility or building (in square feet), as follows:

Equation 5

$$\text{Annual Natural Gas Consumption}_i = \text{NG}_i \times A_i$$

Where

NG_i = Natural gas consumption factor for facility (i), cubic feet per square foot per year

¹⁴ Psomas and Associates, *Utilities Consumption and Generation at LAX Technical Addendum*, October 1996.

¹⁵ SCAQMD, *CEQA Air Quality Handbook*, April 1993.

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A_i = Area of facility or building (i), square feet

Table 5

Airport Land Use Natural Gas Consumption Factors

Airport Land Use Category	Natural Gas Consumption Factor (CF/S.F./Yr)
Terminal ¹	15.18
Cargo	9.84
Maintenance	24.59
Ancillary	142.60

¹ The consumption factor for terminal areas does not include energy consumed by the CUP to service the terminals.

Source: Camp Dresser & McKee Inc., 2000.

Table 6

Non-Airport Land Use Natural Gas Consumption Factors

Non-Airport Land Use Category	Units	Natural Gas Use Factor (CF/S.F./Yr)
Residential (Single Family)	DU	79,908 ¹
Residential (Multi Family)	DU	48,144 ²
Hotel	Sq. Ft.	57.60
Office	Sq. Ft.	24.00
Retail	Sq. Ft.	34.80
Light Industrial	Meter	2,939,600 ²
Institutional	Sq. Ft.	24.00
Restaurant	Sq. Ft.	38.40

¹ CF/dwelling unit/Yr

² CF/meter/Yr

Source: SCAQMD, CEQA Air Quality Handbook, April 1993.

In addition to the natural gas consumed at airport buildings and facilities, natural gas is consumed at the CUP to provide hot water and HVAC for the airport terminals,¹⁶ and to generate electricity through co-generation with a gas turbine. The gas turbine is normally fueled by natural gas, but also has the capability to use distillate oil as a back-up fuel. Under the three build alternatives, additional CUP capacity would be added by constructing a second CUP near the West Terminal/Concourses. The west CUP would provide HVAC and hot water to the West Terminal/Concourses, but would not be used to generate electricity through co-generation. Under the three build alternatives, the natural gas consumption by the CUP was assumed to be proportional to the square footage of terminal area, with an adjustment for the west CUP that would not generate electricity through co-generation. Natural gas consumption for electricity generation by the existing CUP was estimated using data presented in Psomas and Associates' *Utilities Consumption and Generation at LAX Technical Addendum*¹⁷ and the LAWA Green Power Agreement.¹⁸ Using these data sources, a factor for natural gas consumption was developed based on terminal areas in square feet.

¹⁶ Steam generated by natural gas combustion by the CUP is used to power a steam turbine in one of the five CUP chillers, and is also used in the heat cycle of the two lithium bromide absorption coolers that are used to provide chilled water for air conditioning.

¹⁷ Psomas and Associates, Utilities Consumption and Generation at LAX Technical Addendum, October 1996.

¹⁸ LAWA, Resolution No. 20821, Board File No. LAA-7858, October 21, 1999.

2.3 LNG, CNG, and Propane

LNG, CNG, and propane are consumed by GSE and on-airport vehicles as an alternative fuel to gasoline and diesel. The methods used to estimate LNG, CNG, and propane are similar to those described for estimating electricity consumption discussed previously. The methods for estimating LNG, CNG, and propane consumption are provided below.

2.3.1 CNG and Propane Consumption for GSE

The consumption of CNG, and propane by GSE was estimated using the same approach as for electricity consumption for GSE. Energy consumption for GSE was calculated using the number of flight operations and the types of aircraft in service. The GSE types and numbers used in this analysis are provided in the *Technical Report 4, Air Quality*. For each GSE vehicle type, annual hours of usage were estimated by considering the number of flight operations, types of aircraft, service requirements specific to that aircraft, and anticipated service time for each flight operation. Data and information presented in Section 4, *Environmental Consequences*, provides the types of GSE vehicles, the GSE vehicle base horsepower, vehicle load factor, the annual hours of operation, and the CNG and propane consumed expressed in million BTUs. The calculation method for estimating the energy consumed by GSE is provided in Equation 3, above. Annual CNG and propane consumption was obtained by converting the consumption values expressed in million BTUs to Therms by multiplying the reported million BTUs by a conversion factor of 0.1 therm¹⁹ per million BTUs.

2.3.2 LNG, CNG, and Propane Consumption for On-Airport Vehicles

LNG, CNG, and propane consumption for on-airport vehicles was estimated using on-airport VMT and fleet mix assumptions provided by JKH Mobility Services and Barton-Aschman.²⁰ **Table 3**, On-Airport Vehicle Fleet Mix Assumptions, provides the assumed fleet breakdown for on-airport vehicles under baseline conditions, the No Action/No Project Alternative, and the three build alternatives for 2005 and 2015. **Table 4**, Annual Vehicles Miles Traveled by On-Airport Vehicles, provides the annual miles per year traveled by each on-airport vehicle type. Energy consumption was estimated by assuming an equivalent of 18.92 miles per gallon of gasoline for the fleet mix. Conversion to other energy forms was accomplished using Equation 4 with the conversion factor adjusted to 1.14 Therms per gallon of gasoline.

2.4 Gasoline and Diesel

Gasoline and diesel fuels are used to power a variety of equipment including GSE, on-airport vehicles, off-airport vehicles, and stationary sources. The methods used to estimate gasoline and diesel consumption were based primarily on distance traveled by vehicles or time in operation. A discussion of the methods for estimating gasoline and diesel consumption for each application is provided below.

2.4.1 Gasoline and Diesel Consumption for GSE

The consumption of gasoline and diesel by GSE was estimated using the same approach as for consumption of electricity for GSE. Energy consumption for GSE was calculated using the number of flight operations and the types of aircraft in service. The GSE types and numbers used in this analysis are provided *Technical Report 4, Air Quality*. For each GSE vehicle type, annual hours of usage were estimated by considering the number of flight operations, types of aircraft, service requirements specific to that aircraft, and anticipated service time for each flight operation. Data and information presented in Section 4, *Environmental Consequences*, provides the types of GSE vehicles, the GSE vehicle base horsepower, vehicle load factor, the annual hours of operation and the gasoline and diesel consumption expressed in million BTUs. The calculation method for estimating the energy consumed by GSE is provided in Equation 3, above. Annual gasoline and diesel consumption was obtained by converting the consumption values expressed in million BTUs to gallons of gasoline and diesel by multiplying the

¹⁹ A therm is defined as 100,000 BTUs.

²⁰ Rod Swindler, et al, JKH, Personal Communication, 1999 - 2000; Larry Wesseman, et al, Barton-Aschman, Personal Communication, 1999 - 2000.

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reported million BTUs by a conversion factor of 8.77 gallons per million BTUs for gasoline and 7.69 gallons per million BTUs for diesel.

2.4.2 Gasoline and Diesel Consumption for On-Airport Vehicles

Gasoline and diesel consumption for on-airport vehicles was estimated using on-airport VMT and fleet mix assumptions provided by JKH Mobility Services and Barton-Aschman. **Table 3**, On-Airport Vehicle Fleet Mix Assumptions, provides the breakdown of fleet mix for on-airport vehicles under baseline conditions, the No Action/No Project Alternative, and the three build alternatives for 2005 and 2015. **Table 4**, Annual Vehicles Miles Traveled by On-Airport Vehicles, provides the annual miles traveled by each on-airport vehicle type. Energy demand was estimated assuming an equivalent of 18.92 miles per gallon for combined gasoline and diesel vehicles.²¹ The proportion assigned to gasoline or diesel consumption was estimated using fleet mix assumptions presented in **Table 3**, On-Airport Vehicle Fleet Mix Assumptions. Total gasoline and diesel consumption was estimated using Equation 4 with the conversion factor adjusted to one.

2.4.3 Gasoline and Diesel Consumption for Off-Airport Vehicles

Off-airport vehicles considered in this analysis include vehicles that arrive and depart from LAX to transport passengers, employees, and cargo to or from a ground destination within the Los Angeles region, and vehicles coming and going from non-airport areas within the Master Plan boundaries (e.g., acquisition area land uses under baseline conditions, LAX Northside and Continental City under the No Action/No Project Alternative, and Westchester Southside under the build alternatives) to destinations outside of the Master Plan boundaries. Gasoline and diesel consumption by off-airport vehicles was estimated using off-airport VMT similar to the approach used to estimate consumption for on-airport vehicles.

Off-airport VMT and estimated gasoline and diesel consumption is presented in the tables provided in Section 4, *Environmental Consequences*. Gasoline and diesel consumption were estimated assuming an equivalent of 18.92 miles per gallon of fuel.²²

2.4.4 Gasoline and Diesel Consumption for Stationary Sources

Stationary sources that consume gasoline and diesel include ground power units (GPUs), air start units (ASUs), air conditioning units (ACUs), and emergency generators for lights and fire protection water pumps. Emergency power generators are typically tested periodically to assure functionality and operability of emergency back-up equipment. In 2005 and 2015 under the No Action/No Project Alternative and the three build alternatives, gasoline and diesel powered GPUs, ASUs, and ACUs would be phased out. However, use of gasoline or diesel powered emergency power back-up systems is anticipated to continue.

The consumption of gasoline and diesel fuels by stationary sources under baseline conditions was obtained from data collected for the Air Quality Baseline Inventory, provided in *Technical Report 4, Air Quality*.²³ Stationary source gasoline and diesel consumption in 2005 and 2015 was estimated by eliminating GPUs, ASUs, and ACUs while maintaining the other engine types detailed in the Air Quality Baseline Inventory.

2.4.5 Gasoline and Diesel Consumption for Construction-Related Activities

A construction energy consumption estimate for Alternative C was prepared by Bechtel Infrastructure Corporation.²⁴ Construction related VMT were estimated based on the information in the Bechtel report. These estimates were based on the likely construction equipment mix and associated manpower

²¹ California Department of Transportation (Caltrans), California Motor Vehicle Stock, Travel and Fuel Forecast, Transportation System Information Program, November, 1998

²² California Department of Transportation (Caltrans), California Motor Vehicle Stock, Travel and Fuel Forecast, Transportation System Information Program, November, 1998

²³ Camp Dresser & McKee Inc./Planning Consultants Research, Air Quality Baseline Inventory, March 6, 1998.

²⁴ Bechtel Infrastructure Corporation, Interim Year Construction Inputs to Environmental Analysis for LAX Master Plan, 3rd Iteration Alternatives, February 4, 1998.

requirements, and include fuel consumption for construction equipment, haul vehicle travel, and construction worker travel. It was assumed that Alternatives A and B would consume energy in proportion to the amount of facility square footage demolished and constructed as compared to Alternative C. Therefore, using the estimates for gasoline and diesel consumption for Alternative C provided by the Bechtel Corporation, estimates for Alternatives A and B were developed based on the ratios of square feet of total square footage demolished and new construction. As there would be very limited construction activity associated with the No Action/No Project Alternative, it was assumed that construction-related fuel consumption would be negligible. The area of facilities demolished and constructed in 2005 and 2015 that were used to estimate construction-related fuel consumption for the three build alternatives is provided in the data tables presented in Section 4, *Environmental Consequences*.

3. AFFECTED ENVIRONMENT/ENVIRONMENTAL BASELINE

3.1 Electricity

Electric power within the City of Los Angeles is supplied by Los Angeles Department of Water and Power (DWP) to over 1.3 million customers. DWP maintains facilities for both generation and distribution. Electricity provided by DWP is generated by DWP and other utilities with power generating facilities located both within the Los Angeles Basin and in outlying areas. These sources include natural gas-fired, coal-fired, and hydroelectric plants. Approximately 23 percent of the electricity is generated within DWP's service area by four generating stations: Haynes Generating Station near Seal Beach; Scattergood Generating Station, located approximately one mile south of LAX; Valley Generating Station in the San Fernando Valley, and Harbor Generating Station at Los Angeles Harbor. All four stations are steam-generating, and are fired by either natural gas or fuel oil, with natural gas being the primary fuel. The remainder of the electricity is generated outside of DWP's service area. Approximately 57 percent is generated by coal-fired plants, including Navajo Generating Station in Arizona, Mojave Generating Station in Nevada, and Intermountain Generating Station in Utah. Approximately 7.5 percent is generated at the Palo Verde Nuclear Generating Station in Arizona. Less than five percent is provided by hydroelectric plants located at Hoover Dam, Owens Gorge, Castaic Lake, and along the Los Angeles Aqueduct. The remainder of the power transmitted by the DWP (approximately 8.5 percent) is purchased from other generating sources.²⁵ The current DWP electric capacity has been developed to provide for a reasonable reserve. DWP's extensive transmission system allows the city to access surplus electricity generated throughout the Pacific Northwest and Southwest to meet all of the city's needs through the year 2015.^{26, 27, 28}

LAX is located in DWP's Receiving Station N (RS-N) service area. RS-N is located in the community of Westchester, near Manchester Avenue and Interstate 405 (I-405). The capacity of RS-N is 300,000 kVA. It is served by four 138-kilovolt (kV) underground transmission lines: two from Fairfax Receiving Station to the north, and two from Scattergood Generating Station to the south. A 230-kV underground transmission line runs north from Scattergood, traveling along Pershing Drive in the vicinity of LAX, and serves Receiving Station K in the City of Santa Monica.²⁹ The location of RS-N, and other distribution facilities, is illustrated in **Figure 1**, Location of Electrical Power Lines and Distribution Facilities at LAX.

From RS-N, power is stepped down to 34.5 kV and distributed to six Distribution Stations (DS) in the airport area. The locations and capacities of the distributing stations are summarized in **Table 7**, Location and Capacity of Distribution Stations Serving LAX. Each station has 34.5 kV and 4.8 kV circuit switching facilities and transformers for stepping down the incoming 34.5 kV voltage to 4.8 kV for further distribution.³⁰ In addition to these facilities, 12 customer stations, referred to as Industrial Stations (IS), serve LAX. An industrial station is similar to a distribution station with circuit switching and a transformer

²⁵ City of Los Angeles, Department of Water and Power, Statistics, Fiscal Year 1993-1994, 1994.

²⁶ City of Los Angeles, Department of Water and Power.

²⁷ California Energy Commission, Electricity Report, November 1997.

²⁸ City of Los Angeles, Department of Water and Power, 2000 Integrated Resource Plan, August 15, 2000.

²⁹ City of Los Angeles, Department of Water and Power, Power System Diagram, August, 1994.

³⁰ City of Los Angeles, Department of Water and Power.

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and is fed by 34.5 kV lines. The purpose of the IS is to step down the electricity coming from the distribution facility so the end user can access it. **Table 8**, Location and Capacity of Industrial Stations Serving LAX, summarizes the location and capacities of the 12 customer stations located at LAX.

Table 7

Location and Capacity of Distribution Stations Serving LAX

Distribution Station	Capacity (kVA)	Location
DS-47	20,000	West Imperial Highway
DS-58	30,000	La Tijera Boulevard
DS-111	20,000	South Vicksburg Avenue
DS-137	48,000	Talbert Street
DS-139	11,250	West Imperial Highway
DS-225	N/A	World Way West

Source: DWP, 1995.

Table 8

Location and Capacity of Industrial Stations Serving LAX

Industrial Station	Capacity (kVA)	Location
IS-71	1,500	Administration Bldg. / Control Tower
IS-686	10,000	Central Complex West
IS-695	1,500	Central Complex East
IS-696	5,000	Terminal 2
IS-697	3,000	Terminal 3
IS-698	3,000	Terminal 4
IS-699	5,000	Terminal 5
IS-700	3,000	Terminal 6
IS-701	5,000	Terminal 7
IS-702	5,000	Terminal 8
IS-2248	11,500	Tom Bradley International Terminal
IS-2260	15,000	Terminal 1

Source: DWP, 1995.

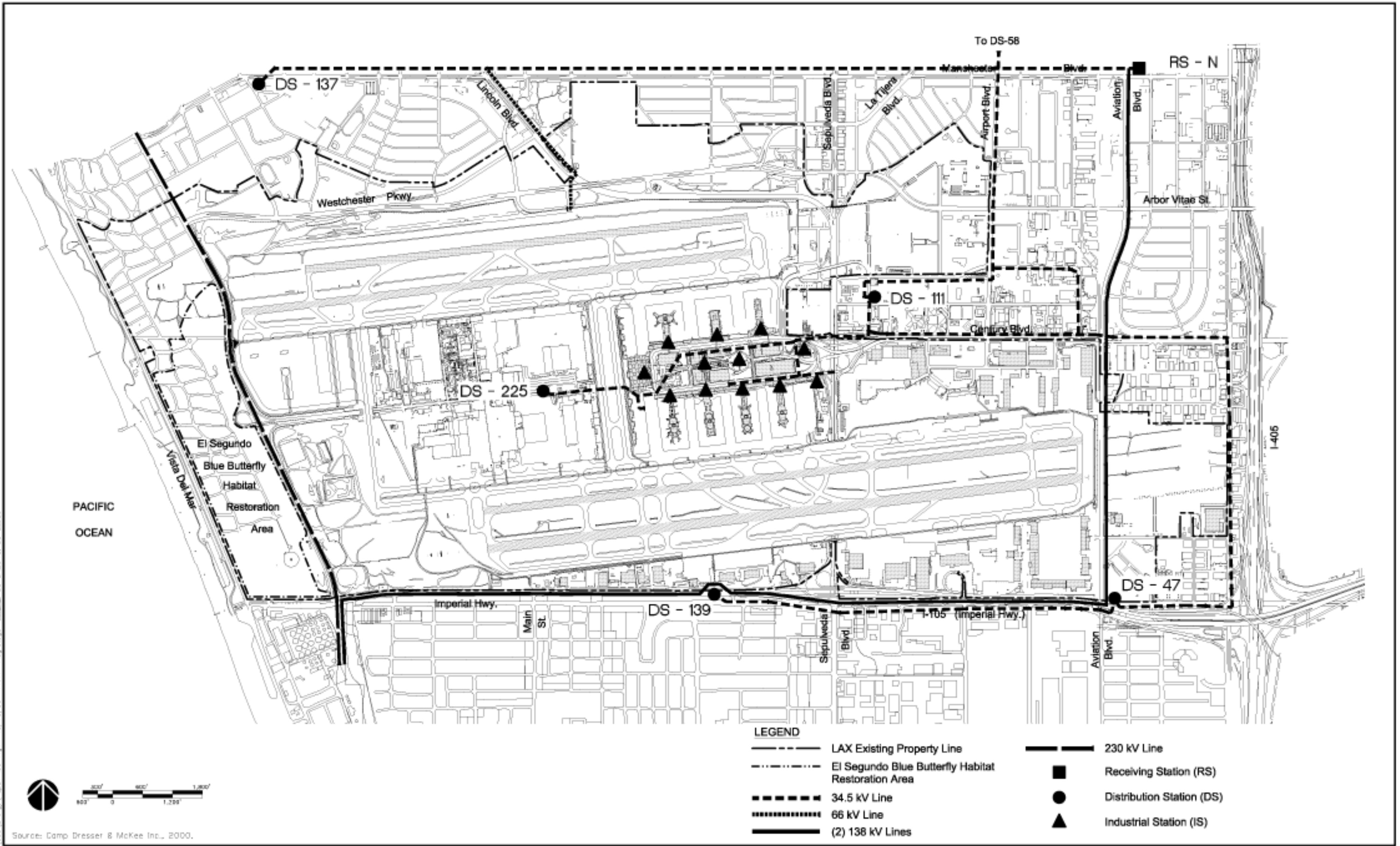
3.2 Natural Gas

The Southern California Gas Company (The Gas Company) supplies natural gas to nearly all of Southern and Central California, including the City of Los Angeles. In 1996, approximately 2,443 million cubic feet of gas a day was supplied to the Los Angeles region.³¹ The Gas Company obtains the majority of its natural gas from out-of-state sources. The Gas Company's sources include interstate suppliers (36 percent), natural gas transportation companies (56 percent), California producers (7 percent), and offshore supplies (0.3 percent).³²

The gas is transported from suppliers to The Gas Company's transmission facilities for distribution to their service areas by a network of high-pressure transmission lines. Interconnected with the transmission facilities are five underground storage fields in the Los Angeles region. The storage fields act as reservoirs to hold gas which is used to supplement in-line gas storage, primarily to meet peak demands during the winter season. From the transmission facilities, gas is distributed on a local level to customers

³¹ The California Gas and Electric Utilities, The California Gas Report, 1997 Supplement, 1997.

³² Envicom Corporation, et al., Draft Environmental Impact Report for the Los Angeles Citywide General Plan Framework, January, 1995.



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Source: Camp Dresser & McKee Inc., 2000.

through an extensive pipeline network of underground high-pressure (greater than 60 psi), standard pressure (less than 60 psi), and neighborhood (less than 6-inch diameter) gas mains.³³

Natural gas is supplied to LAX by several natural gas distribution lines. Service to individual tenants is provided through connections to these distribution lines. The distribution lines are illustrated in **Figure 2**, Natural Gas Distribution Lines Serving LAX, and include the following:

- ◆ Airport tenants located in the southern portion of LAX are served by a gas line in Imperial Highway that varies from 2- to 8-inches in diameter.
- ◆ The Central Terminal Area is served by two gas lines: a 4-inch line along World Way North, and a 2-inch line along World Way South. Both of these lines connect to a larger 6-inch distribution line in Century Boulevard.
- ◆ Airline facilities along Century Boulevard, east of Sepulveda Boulevard, are served by a 3-inch line in Avion Drive, which is connected to the 6-inch distribution line on Century Boulevard.
- ◆ Facilities located along Aviation Boulevard are served by either a 6- or 12-inch diameter line. Also located along Aviation Boulevard are two 30-inch high-pressure lines.
- ◆ Maintenance facilities located on World Way West are served by a 6-inch diameter line. This line winds through the airport to 96th Street, and then to Sepulveda Boulevard, where it connects to a 6-inch distribution line.³⁴

3.3 Baseline Energy Consumption

Table 9, Electricity Consumption Based on Facility Areas Under Baseline Conditions, through **Table 11**, Baseline Conditions Energy Consumption Estimate for GSE, provide the electricity, natural gas, and fuel consumption factors, facility areas, and other information used to estimate energy consumption for baseline conditions. Baseline energy consumption for the CUP, gate electrification, and transportation is incorporated into in subsequent tables addressing future conditions.

³³ Sal Zamora, Southern California Gas Company, Personal Communication, July 13, August 7, 1995

³⁴ Sal Zamora, Southern California Gas Company, Personal Communication, July 13, August 7, 1995

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Table 9

Electricity Consumption Based on Facility Areas Under Baseline Conditions

Land Use	Usage Factor	Unit Type	Building S.F. or Units	Total Consumption (MWH/Yr)
LAX¹				
Airport Land Uses				
Terminal (S.F.)	19.05	KWH/S.F./Yr	3,997,000	76,143
Cargo (S.F.)	13.40	KWH/S.F./Yr	1,900,000	25,460
Maintenance (S.F.)	24.22	KWH/S.F./Yr	1,440,000	34,877
Ancillary (S.F.)	14.17	KWH/S.F./Yr	1,294,000	18,336
Subtotal Airport Uses				154,816
Non-Airport Land Uses				
Belford				
Residential (Multi Family DUs)	5,626.50	KWH/Unit/Yr	583	3,280
Subtotal Belford				3,280
SUBTOTAL AIRPORT AND NON-AIRPORT USES				158,096
Non-Project Uses Within Master Plan Boundaries²				
Manchester Square				
Residential (Single Family DUs)	5,626.50	KWH/Unit/Yr	280	1,575
Residential (Multi Family DUs)	5,626.50	KWH/Unit/Yr	1,706	9,599
Subtotal Manchester Square				11,174
Land Within Acquisition Areas				
Residential (Single Family DUs)	5,626.50	KWH/Unit/Yr	57	321
Residential (Multi Family DUs)	5,626.50	KWH/Unit/Yr	69	388
Hotel (S.F.)	9.95	KWH/S.F./Yr	1,404,993	13,980
Office (S.F.)	12.95	KWH/S.F./Yr	1,108,312	14,353
Retail (S.F.)	13.55	KWH/S.F./Yr	148,219	2,008
Light Industrial (S.F.)	10.50	KWH/S.F./Yr	3,789,292	39,788
Institutional ³ (S.F.)	9.31	KWH/S.F./Yr	156,178	1,454
Subtotal Acquisition				72,292
SUBTOTAL NON-PROJECT USES				83,466
TOTAL MASTER PLAN BOUNDARIES				241,562

S.F. = Square Feet
MWH = megawatt-hour
KWH = kilowatt-hour

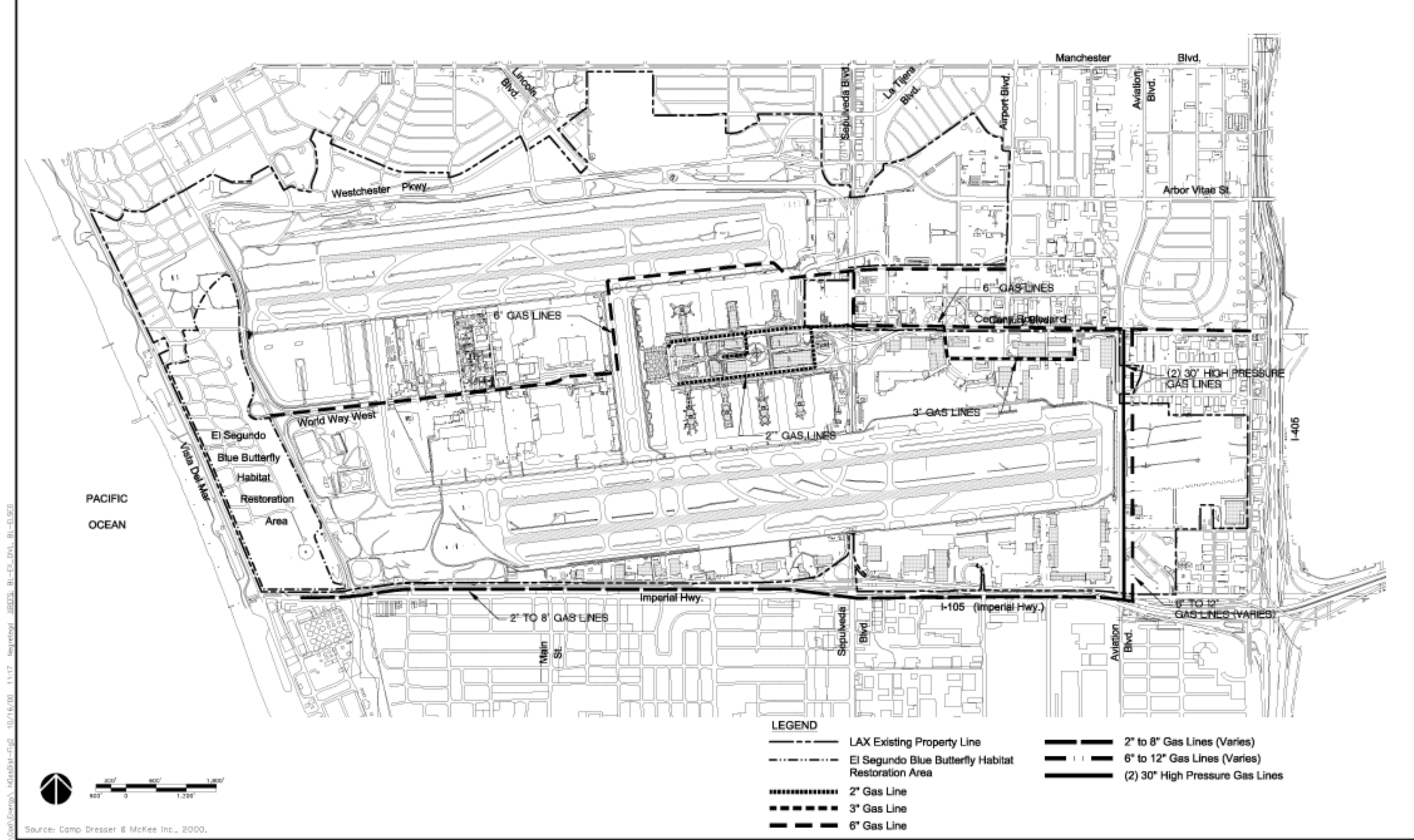
¹ Electricity consumption for airport facilities based on square footage only. Electricity consumed by airport operations including CUP, gate electrification, and electric GSE and on-airport vehicles are not included.

² For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

³ Based on office land use type from SCAQMD, CEQA Air Quality Handbook, 2000, Table A9-12-A.

Notes: Information in table may not always total, due to rounding.
There is no baseline electricity consumption associated with Continental City or LAX Northside.

Source: Camp Dresser & McKee Inc., 2000.



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Source: Camp Dresser & McKee Inc., 2000.

Table 10

Natural Gas Consumption Based on Facility Areas Under Baseline Conditions

Land Use	Usage Factor	Unit Type	Building S.F. or Units	Total Consumption (MCF/Yr)
LAX¹				
Airport Land Uses				
Terminal (S.F.)	15.18	CF/S.F./Yr	3,997,000	60,674
Cargo (S.F.)	9.84	CF/S.F./Yr	1,900,000	18,696
Maintenance (S.F.)	24.59	CF/S.F./Yr	1,440,000	35,410
Ancillary (S.F.)	142.60	CF/S.F./Yr	1,294,000	184,524
Subtotal Airport Uses				299,304
Non-Airport Land Uses				
Belford				
Residential (Multi Family DUs)	48,144	CF/Unit/Yr	583	28,068
Subtotal Non-Airport Use				28,068
SUBTOTAL AIRPORT AND NON-AIRPORT USES				327,372
Non-Project Uses Within Master Plan Boundaries²				
Manchester Square				
Residential (Single Family DUs)	79,980	CF/Unit/Yr	280	22,394
Residential (Multi Family DUs)	48,144	CF/Unit/Yr	1,706	82,134
Subtotal Non-Project Uses				104,528
Land Within Acquisition Areas				
Residential (Single Family DUs)	79,980	CF/Unit/Yr	57	4,559
Residential (Multi Family DUs)	48,144	CF/Unit/Yr	69	3,322
Hotel (S.F.)	57.60	CF/S.F./Yr	1,404,993	80,928
Office (S.F.)	24.00	CF/S.F./Yr	1,108,312	26,599
Retail (S.F.)	34.80	CF/S.F./Yr	148,219	5,158
Light Industrial (meters)	2,939,600	CF/Meter/Yr	140	412,556
Institutional ³ (S.F.)	24.00	CF/S.F./Yr	156,178	3,748
Subtotal Acquisition Areas				536,870
SUBTOTAL NON-PROJECT USES				641,398
TOTAL MASTER PLAN BOUNDARIES				968,770

S.F. = Square Feet

MCF = thousand cubic feet of natural gas

¹ Electricity consumption for airport facilities based on square footage only. Electricity consumed by airport operations including CUP, gate electrification, APM, and electric GSE and on-airport vehicles are not included.

² For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

³ Based on office land use type from SCAQMD, CEQA Air Quality Handbook, 2000, Table A9-12-A.

Source: Camp Dresser & McKee Inc., 2000

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Table 11

Baseline Conditions Energy Consumption Estimate for GSE

	Equipment List ¹	Less Forklift & Cart	Net	Percent	Million BTUs
Electric	222	154	68	3.6%	26,116
Diesel	540	5	535	28.0%	205,471
Gasoline	1134	36	1098	57.4%	421,695
LNG, CNG, and Propane	292	81	211	11.0%	81,036
Total					734,318²

¹ Source: 1995 list from Aviation Systems, Inc.

² The total million BTUs under baseline conditions was estimated using GSE energy consumption for 2005 under the No Action/No Project Alternative. The baseline GSE energy consumption was obtained by multiplying the GSE energy consumption for 2005 by a ratio of aircraft operations.

Source: Camp Dresser & McKee Inc., 2000.

4. ENVIRONMENTAL CONSEQUENCES

To determine projected energy consumption under each of the alternatives, the methodologies described in Section 2, *General Approach and Methodology*, were used. **Table 12**, Land Uses Included in the Alternatives, presents a comparison of the land use types included in the alternatives; **Table 13**, Electricity Consumption Based on Facility Areas Under the No Action/No Project Alternative, through **Table 26**, Construction Related Consumption of Gasoline and Diesel, present energy consumption information for all the alternatives. A discussion of the environmental consequences of the energy consumption projected for each alternative is included in Section 4.17.1, *Energy Supply*, of the EIS/EIR.

Under the build alternatives, the proposed APM would not be in operation by 2005. Therefore, electricity consumption by the APM has not been included within the electricity consumption by airport operations in 2005. By 2015, the proposed APM would be in operation under each of the build alternatives. Lea + Elliott, Inc. estimated the annual electricity consumption by the APM and ancillary facilities to be as follows:

- ◆ Under Alternative A³⁵ - 93,200 MWH/Yr.
- ◆ Under Alternative B³⁶ - 174,500 MWH/Yr.
- ◆ Under Alternative C³⁷ - 62,000 MWH/Yr.

Table 27, Electricity Consumption by Airport Operations, provides a summary of the contribution electricity consumption values added together to obtain the airport operations consumption estimate presented in Table 4.17.1-2, Energy Consumption within Master Plan boundaries.

³⁵ Lea + Elliott, Inc., Electrical Power Consumption Estimate for People Mover Concepts, January 2000.

³⁶ Lea + Elliott, Inc., Electrical Power Consumption Estimate for People Mover Concepts, January 2000.

³⁷ Lea + Elliott, Inc., Electrical Power Consumption Estimate for LAX Alternative C APM Concepts, December 1999.

Table 12

Land Uses Included in the Alternatives

Land Use	Baseline Conditions	Alternative							
		No Action/No Project		A		B		C	
		2005	2015	2005	2015	2005	2015	2005	2015
LAX									
Airport Land Uses									
Terminal (S.F.)	3,997,000	3,997,000	3,997,000	8,311,000	10,419,000	8,333,000	9,712,000	6,654,000	7,319,000
Cargo (S.F.)	1,900,000	2,328,064	2,328,064	3,694,000	4,518,000	4,192,000	4,871,000	3,664,000	5,075,000
Maintenance (S.F.)	1,440,000	1,440,000	1,440,000	584,000	841,000	889,000	859,000	1,011,000	834,000
Ancillary (S.F.)	1,294,000	1,294,000	1,294,000	1,987,000	2,260,000	2,389,000	1,720,000	2,499,000	3,198,000
Belford									
Residential (Multi Family DUs)	583								
Manchester Square¹									
Residential (Multi/Single Family DUs)	1,986								
Office (S.F.)				50,000	50,000				
Hotel (S.F.)				250,000	500,000				
Industrial (S.F.)				860,000	1,720,000				
LAX Northside									
Office (S.F.)		632,000	1,580,000						
Hotel (S.F.)		390,000	870,000						
Retail (S.F.)		24,000	60,000						
Airport Related (S.F.)		300,000	750,000						
R/D Business Park (S.F.)		470,000	1,170,000						
Restaurant (S.F.)		28,000	70,000						
Continental City									
Office (S.F.)		1,200,000	3,000,000						
Retail (S.F.)		40,000	100,000						
Westchester Southside									
Hotel (S.F.)				340,000	850,000	340,000	850,000	340,000	850,000
Office (S.F.)				260,000	650,000	260,000	650,000	260,000	650,000
Retail (S.F.)				44,000	110,000	44,000	110,000	44,000	110,000
R/D Business Park (S.F.)				388,000	970,000	388,000	970,000	388,000	970,000
Restaurant (S.F.)				16,000	40,000	16,000	40,000	16,000	40,000
Land Within Acquisition Areas²									
Residential (Single Family DUs)	57	57	57						
Residential (Multi Family DUs)	69	69	69		42		42		
Hotel (S.F.)	1,404,993	1,404,993	1,404,993	63,595	63,595			1,030,340	1,030,340
Office (S.F.)	1,108,312	1,108,312	1,108,312	142,064	142,064			509,218	509,218
Retail (S.F.)	148,219	148,219	148,219	45,737	45,737	60,221	60,221	73,002	73,002
Light Industrial (S.F.)	3,789,292	3,789,292	3,789,292	1,196,544	1,196,544	83,329	83,329	1,958,314	1,958,314
Light Industrial (S.F.) (Gas Meters) ³	140	140	140	44	44	3	3	73	73
Institutional (S.F.) ⁴	156,178	156,178	156,178	85,902	85,902	85,902	85,902		

¹ Under the No Action/No Project Alternative, existing uses would be demolished. For purposes of this EIS/EIR, no development is assumed. Under Alternative A, Manchester Square would be redeveloped with commercial/light industrial uses independent of the Master Plan. Under Alternatives B and C, existing uses would be demolished, and the area would be incorporated into the overall Master Plan development.

² Only a portion of the land within the acquisition areas would be acquired for each individual build alternative. No land within the acquisition areas would be acquired under the No Action/No Project Alternative. The land within the Master Plan boundaries that would not be acquired under a particular alternative would be unaffected by the Master Plan.

³ Conversion of Light Industrial areas from square feet to numbers of gas meters was based on approximately 27,000 square feet per gas meter derived from the baseline data collected by Psomas and Associates.

⁴ Includes college, high school, elementary school and library land use.

Source: Landrum & Brown, 2000.

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Table 13

Electricity Consumption Based on Facility Areas Under the No Action/No Project Alternative

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MWH/Yr)	Building S.F. or Units	Total Consumption (MWH/Yr)
LAX¹						
Airport Land Uses						
Terminal (S.F.)	19.05	KWH/S.F./Yr	3,997,000	76,143	3,997,000	76,143
Cargo (S.F.)	13.40	KWH/S.F./Yr	2,328,064	31,196	2,328,064	31,196
Maintenance (S.F.)	24.22	KWH/S.F./Yr	1,440,000	34,877	1,440,000	34,877
Ancillary (S.F.)	14.17	KWH/S.F./Yr	1,294,000	18,336	1,294,000	18,336
Subtotal Airport Uses				160,552		160,552
Non-Airport Land Uses						
LAX Northside						
Office (S.F.)	12.95	KWH/S.F./Yr	632,000	8,184	1,580,000	20,461
Hotel (S.F.)	9.95	KWH/S.F./Yr	390,000	3,881	870,000	8,657
Retail (S.F.)	13.55	KWH/S.F./Yr	24,000	325	60,000	813
Airport-Related ² (S.F.)	24.00	KWH/S.F./Yr	300,000	7,200	750,000	18,000
R/D Business Park (S.F.)	12.95	KWH/S.F./Yr	470,000	6,087	1,170,000	15,152
Restaurant (S.F.)	47.45	KWH/S.F./Yr	28,000	1,329	70,000	3,322
Subtotal LAX Northside				27,006		66,405
Continental City						
Office (S.F.)	12.95	KWH/S.F./Yr	1,200,000	15,540	3,000,000	38,850
Retail (S.F.)	13.55	KWH/S.F./Yr	40,000	542	100,000	1,355
Subtotal Continental City				16,082		40,205
SUBTOTAL AIRPORT AND NON-AIRPORT USES				203,640		267,162
Non-Project Uses Within Master Plan Boundaries³						
Land Within Acquisition Areas						
Residential (Single Family DUs)	5,626.50	KWH/UNIT/Yr	57	321	57	321
Residential (Multi Family DUs)	5,626.50	KWH/UNIT/Yr	69	388	69	388
Hotel (S.F.)	9.95	KWH/S.F./Yr	1,404,993	13,980	1,404,993	13,980
Office (S.F.)	12.95	KWH/S.F./Yr	1,108,312	14,353	1,108,312	14,353
Retail (S.F.)	13.55	KWH/S.F./Yr	148,219	2,016	148,219	2,016
Light Industrial (S.F.)	10.50	KWH/S.F./Yr	3,789,292	39,788	3,789,292	39,788
Institutional (S.F.)	9.31	KWH/S.F./Yr	156,178	1,454	156,178	1,454
Subtotal Acquisition Areas				72,300		72,300
SUBTOTAL NON-PROJECT USES				72,300		72,300
TOTAL MASTER PLAN BOUNDARIES				275,940		339,462

S.F. = Square Feet
MWH = megawatt- hour

¹ Electricity consumption for airport facilities based on square footage only. Electricity consumed by airport facilities operations including CUP, gate electrification, and electric GSE and on-airport vehicles are not included.

² Usage rate averaged from SCAQMD, *CEQA Air Quality Handbook, 2000*, Table A9-11-A (Includes restaurant, office and miscellaneous land use)

³ For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

Source: Camp Dresser & McKee Inc., 2000.

Table 14

Electricity Consumption Based on Facility Areas Under Alternative A

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MWH/Yr)	Building S.F. or Units	Total Consumption (MWH/Yr)
LAX¹						
Airport Land Uses						
Terminal (S.F.)	19.05	KWH/S.F./Yr	8,311,000	158,325	10,419,000	198,482
Cargo (S.F.)	13.40	KWH/S.F./Yr	3,694,000	49,500	4,518,000	60,541
Maintenance (S.F.)	24.22	KWH/S.F./Yr	584,000	14,144	841,000	20,369
Ancillary (S.F.)	14.17	KWH/S.F./Yr	1,987,000	28,156	2,260,000	32,024
Subtotal Airport Uses				250,124		311,416
Non-Airport Land Uses						
Westchester Southside						
Hotel (S.F.)	9.95	KWH/S.F./Yr	340,000	3,383	850,000	8,458
Office (S.F.)	12.95	KWH/S.F./Yr	260,000	3,367	650,000	8,418
Retail (S.F.)	13.55	KWH/S.F./Yr	44,000	596	110,000	1,491
R/D Business Park (S.F.)	12.95	KWH/S.F./Yr	388,000	5,025	970,000	12,562
Restaurant (S.F.)	47.45	KWH/S.F./Yr	16,000	759	40,000	1,898
Subtotal Westchester Southside				13,130		32,827
SUBTOTAL AIRPORT AND NON-AIRPORT USES				263,254		344,243
Non-Project Uses Within Master Plan Boundaries²						
Manchester Square						
Office (S.F.)	12.95	KWH/S.F./Yr	50,000	648	50,000	648
Hotel (S.F.)	9.95	KWH/S.F./Yr	250,000	2,488	500,000	4,975
Industrial (S.F.)	10.50	KWH/S.F./Yr	860,000	9,030	1,720,000	18,060
Subtotal Manchester Square				12,166		23,683
Land Within Acquisition Areas						
Residential (Multi Family DUs)	5,626.50	KWH/UNIT/Yr	42	236	42	236
Hotel (S.F.)	9.95	KWH/S.F./Yr	63,595	633	63,595	633
Office (S.F.)	12.95	KWH/S.F./Yr	142,064	1,840	142,064	1,840
Retail (S.F.)	13.55	KWH/S.F./Yr	45,737	620	45,737	620
Light Industrial (S.F.)	10.50	KWH/S.F./Yr	1,196,544	12,564	1,196,544	12,564
Institutional (S.F.)	9.31	KWH/S.F./Yr	85,902	800	85,902	800
Subtotal Acquisition Areas				16,693		16,693
SUBTOTAL NON-PROJECT USES				28,589		40,376
TOTAL MASTER PLAN BOUNDARIES				292,113		384,619

S.F. = Square Feet
MWH = megawatt-hour

¹ Electricity consumption for airport facilities based on square footage only. Electricity consumed by airport facilities operations including CUP, gate electrification, and electric GSE and on-airport vehicles are not included.

² For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

Source: Camp Dresser & McKee Inc., 2000.

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Table 15

Electricity Consumption Based on Facility Areas Under Alternative B

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MWH/Yr)	Building S.F. or Units	Total Consumption (MWH/Yr)
LAX¹						
Airport Land Uses						
Terminal (S.F.)	19.05	KWH/S.F./Yr	8,333,000	158,744	9,712,000	185,014
Cargo (S.F.)	13.40	KWH/S.F./Yr	4,192,000	56,173	4,871,000	65,271
Maintenance (S.F.)	24.22	KWH/S.F./Yr	889,000	21,532	859,000	20,805
Ancillary (S.F.)	14.17	KWH/S.F./Yr	2,389,000	33,852	1,720,000	24,372
Subtotal Airport Uses				270,301		295,462
Non-Airport Land Uses						
Westchester Southside						
Hotel (S.F.)	9.95	KWH/S.F./Yr	340,000	3,383	850,000	8,458
Office (S.F.)	12.95	KWH/S.F./Yr	260,000	3,367	650,000	8,418
Retail (S.F.)	13.55	KWH/S.F./Yr	44,000	596	110,000	1,491
R/D Business Park, Educational Facilities (S.F.)	12.95	KWH/S.F./Yr	388,000	5,025	970,000	12,562
Restaurant (S.F.)	47.45	KWH/S.F./Yr	16,000	759	40,000	1,898
Subtotal Westchester Southside				13,130		32,827
SUBTOTAL AIRPORT AND NON-AIRPORT USES				283,430		328,289
Non-Project Uses Within Master Plan Boundaries²						
Land Within Acquisition Areas						
Residential (Multi Family DUs)	5,626.50	KWH/Unit/Yr	42	236	42	236
Hotel (S.F.)	9.95	KWH/S.F./Yr	0	0	0	0
Office (S.F.)	12.95	KWH/S.F./Yr	0	0	0	0
Retail (S.F.)	13.55	KWH/S.F./Yr	60,221	816	60,221	816
Light Industrial (S.F.)	10.50	KWH/S.F./Yr	83,329	875	83,329	875
Institutional (S.F.)	9.31	KWH/S.F./Yr	85,902	800	85,902	800
Subtotal Acquisition Areas				2,727		2,727
SUBTOTAL NON-PROJECT USES				2,727		2,727
TOTAL MASTER PLAN BOUNDARIES				286,157		331,016

S.F. = Square Feet
MWH = megawatt- hour

- ¹ Electricity consumption for airport facilities based on square footage only. Electricity consumed by airport operations including CUP, gate electrification, and electric GSE and on-airport vehicles are not included.
- ² For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

Source: Camp Dresser & McKee Inc., 2000.

Table 16

Electricity Consumption Based on Facility Areas Under Alternative C

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MWH/Yr)	Building S.F. or Units	Total Consumption (MWH/Yr)
LAX¹						
Airport Land Uses						
Terminal (S.F.)	19.05	KWH/S.F./Yr	6,654,000	126,759	7,319,000	139,427
Cargo (S.F.)	13.40	KWH/S.F./Yr	3,664,000	49,098	5,075,000	68,005
Maintenance (S.F.)	24.22	KWH/S.F./Yr	1,011,000	24,486	834,000	20,199
Ancillary (S.F.)	14.17	KWH/S.F./Yr	2,499,000	35,411	3,198,000	45,316
Subtotal Airport Uses				235,754		272,947
Non-Airport Land Uses						
Westchester Southside						
Hotel (S.F.)	9.95	KWH/S.F./Yr	340,000	3,383	850,000	8,458
Office (S.F.)	12.95	KWH/S.F./Yr	260,000	3,367	650,000	8,418
Retail (S.F.)	13.55	KWH/S.F./Yr	44,000	596	110,000	1,491
R/D Business Park, Educational Facilities (S.F.)	12.95	KWH/S.F./Yr	388,000	5,025	970,000	12,562
Restaurant (S.F.)	47.45	KWH/S.F./Yr	16,000	759	40,000	1,898
Subtotal Westchester Southside				13,130		32,827
SUBTOTAL AIRPORT AND NON-AIRPORT USES				248,884		305,774
Non-Project Uses Within Master Plan Boundaries²						
Land Within Acquisition Areas						
Residential	5,626.50	KWH/Unit/Yr	0	0	0	0
Hotel (S.F.)	9.95	KWH/S.F./Yr	1,030,340	10,252	1,030,340	10,252
Office (S.F.)	12.95	KWH/S.F./Yr	509,218	6,594	509,218	6,594
Retail (S.F.)	13.55	KWH/S.F./Yr	73,002	989	73,002	989
Light Industrial (S.F.)	10.50	KWH/S.F./Yr	1,958,314	20,562	1,958,314	20,562
Institutional (S.F.)	9.31	KWH/S.F./Yr	0	0	0	0
Subtotal Acquisition Areas				38,397		38,397
SUBTOTAL NON-PROJECT USES				38,397		38,397
TOTAL MASTER PLAN BOUNDARIES				287,281		344,171

S.F. = Square Feet
MWH = Megawatt-hour

¹ Electricity consumption for airport facilities based on square footage only. Electricity consumed by airport operations including CUP, gate electrification, and electric GSE and on-airport vehicles are not included.

² For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

Source: Camp Dresser & McKee Inc., 2000.

Table 17

Estimated Electricity Consumption at the Central Utility Plant

	Baseline Conditions	2005				2015			
		Alternative				Alternative			
		NA/NP ²	A	B	C	NA/NP ²	A	B	C
Terminal Area (S.F.)	3,997,000	3,997,000	8,311,000	8,333,000	6,654,000	3,997,000	10,419,000	9,712,000	7,319,000
Electrical Power Consumption ¹ (MWH)	26,780	26,780	55,684	55,831	44,582	26,780	69,807	65,070	49,037

¹ Psomas and Associates, Utilities Consumption and Generation at LAX, October, 1996

² No Action/No Project Alternative

Source: Camp Dresser & McKee Inc., 2000.

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Table 19
GSE Energy Consumption

Energy Form/ GSE Vehicle Type	BHP	Load Factor	Annual Hours of Operation						Annual Energy Consumed (Million BTUs)					
			2005		2015				2005		2015			
			No Action/ No Project	Alternative C	No Action/ No Project	Alternative A	Alternative B	Alternative C	No Action/ No Project	Alternative C	No Action/ No Project	Alternative A	Alternative B	Alternative C
Electric Powered GSE														
Electric Aircraft Tug Wide	500	0.8	869	1,327	1,190	19,763	19,763	18,345	3,539	5,402	4,844	80,474	80,474	74,699
Electric Airstart Unit Tra	180	0.5			51					47				
Electric Cabin Service	180	0.2		20,844	858	35,596	35,854	30,021		7,639	314	13,045	13,140	11,002
Electric Water Truck	150	0.2		1,578	274	5,352	5,009	5,215		482	84	1,635	1,530	1,593
Electric Aircraft Tug Narrow	130	0.8	2,230	2,779	2,550	30,159	29,781	24,257	2,361	2,942	2,700	31,930	31,530	25,682
Electric Airstart Unit	130	0.9			51						61			
Electric Food Truck	130	0.25		48,635	2,802	83,058	82,858	70,050		16,091	927	27,480	27,414	23,176
Electric Fuel Truck	130	0.25		600		2,802		600		199		927		199
Electric Hydrant Truck	130	0.25	2,001	20,615	5,605	24,819	25,018	21,416	662	6,820	1,854	8,211	8,277	7,085
Electric Lavatory Truck	130	0.25		11,780	1,144	28,477	28,592	24,474		3,897	378	9,422	9,460	8,097
Electric Baggage Tug	100	0.55	92,354	94,784	114,224	287,260	292,607	243,514	51,709	53,069	63,954	160,837	163,831	136,343
Electric Cargo Loader	70	0.5		2,104		35,248	35,247	35,248		750		12,559	12,558	12,559
Electric Container Loader	70	0.5		15,257	1,578	227,272	225,167	210,962		5,436	562	80,977	80,227	75,166
Electric Belt Loader	60	0.5	40,074	40,350	51,328	162,218	162,218	137,514	12,239	12,323	15,676	49,541	49,541	41,997
Subtotal									70,510	115,050	91,402	477,038	477,981	417,598
Diesel Powered GSE														
Diesel Airstart Unit	600	0.9	721		686				3,961		3,772			
Diesel Aircraft Tug Wide	500	0.8	10,888	7,365	13,450				44,336	29,991	54,768			
Diesel Air Conditioning Unit	300	0.75	20,243		17,327				46,367		39,687			
Diesel Bus	180	0.25	44,946		55,805				20,590		25,564			
Diesel Fuel Truck	180	0.25	10,407	8,606	10,007				4,768	3,942	4,584			
Diesel Aircraft Tug Narrow	175	0.8	22,438	15,165	20,827				31,979	21,613	29,682			
Diesel Airstart Transporter	170	0.5	721		686				624		594			
Diesel Cabin Service	170	0.2		172						59				
Diesel Transporter	170	0.5			858						742			
Diesel Water Truck	150	0.2	14,342		17,292	4,666	4,666	4,323	4,380		5,281	1,425	1,425	1,320
Diesel Hydrant Truck	130	0.25	117,283	71,850	120,888				38,803	23,772	39,996			
Diesel Shuttle	130	0.25	76,855		74,340				25,428		24,595			
Diesel GPU Transporter	130	0.5	6,748		5,776				4,465		3,822			
Diesel Lavatory Truck	130	0.25	95,838		94,354	21,501	21,501	18,298	31,708		31,217	7,114	7,114	6,054
Diesel Baggage Tug	78	0.55	91,861		94,299				40,118		41,182			
Diesel Cargo Loader	76	0.5	19,995		21,045				7,735		8,141			
Diesel Container Loader	76	0.5	129,947		160,460				50,269		62,072			
Diesel Belt Loader	45	0.5	83,990	26,625	86,738				19,238	6,098	19,867			
Subtotal									374,766	85,475	395,569	8,539	8,539	7,374
Gasoline Powered GSE														
Gasoline Aircraft Tug Wide	500	0.8	915	1,372	869				3,726	5,588	3,539			
Gasoline Airstart Transporter	180	0.5	103		86				94		79			
Gasoline Water Truck	150	0.2	1,304	10,019	3,568	11,665	12,626	11,803	398	3,060	1,090	3,563	3,856	3,605
Gasoline Hydrant Truck	130	0.25	84,660	30,822	81,059	37,826	37,627	32,022	28,010	10,198	26,818	12,515	12,449	10,595
Gasoline Aircraft Tug Narrow	130	0.8	1,887	2,745	1,235				1,998	2,906	1,308			
Gasoline Airstart Unit	130	0.9	103		86				123		102			
Gasoline Cabin Service	130	0.2	64,159	41,429	63,475	30,364	30,450	25,904	16,982	10,965	16,801	8,037	8,060	6,856
Gasoline Food Truck	130	0.25	149,704	97,068	148,108	68,248	71,050	60,243	49,530	32,115	49,002	22,580	23,507	19,931
Gasoline Fuel Truck	130	0.25	3,002	3,002		4,403	2,802	1,801	993	993		1,457	927	596
Gasoline Lavatory Truck	130	0.25	19,900	64,503	17,842	73,538	71,479	61,186	6,584	21,341	5,903	24,330	23,649	20,243
Gasoline Baggage Tug	100	0.55	132,209	23,816	91,381	28,678	28,678	24,790	74,024	13,334	51,164	16,057	16,057	13,880
Gasoline Cargo Loader	70	0.5	3,682	17,357	2,631				1,312	6,184	937			
Gasoline Container Loader	70	0.5	18,414	90,487	18,414				6,561	32,240	6,561			
Gasoline Belt Loader	60	0.5	109,242	66,423	84,541	16,194	16,194	13,999	33,363	20,286	25,819	4,964	4,946	4,275
Subtotal									223,696	159,211	189,122	93,483	93,450	79,981
Propane and CNG Powered GSE														
Propane Wide Tug	500	0.8	412		778				1,677		3,166			
Propane Cabin Service	180	0.2	19,128		20,501				7,010		7,513			
Propane Water Truck	150	0.2	2,058	2,608	1,029				629	796	314			
Propane Food Truck	130	0.25	44,633		47,034				14,767		15,561			
Propane Fuel Truck	130	0.25	600		600				199		199			
Propane Lavatory Truck	130	0.25	1,601	17,611	3,546				530	5,827	1,173			
Propane Narrow Tug	130	0.8	824		858				872		908			

Table 19
GSE Energy Consumption

Energy Form/ GSE Vehicle Type	BHP	Load Factor	Annual Hours of Operation						Annual Energy Consumed (Million BTUs)							
			2005		2015				2005		2015					
			No Action/ No Project	Alternative C	No Action/ No Project	Alternative A	Alternative B	Alternative C	No Action/ No Project	Alternative C	No Action/ No Project	Alternative A	Alternative B	Alternative C		
Propane Transporter	130	0.5	343							227						
Propane Baggage Tug	100	0.55	150,678	141,443	180,818					84,365	79,194	101,240				
Propane Cargo Loader	70	0.5	1,578	4,735	1,578					562	1,687	562				
Propane Container Loader	70	0.5	4,735	23,147	6,840					1,687	8,247	2,437				
Propane Belt Loader	60	0.5	33,213	26,350	48,859					10,143	8,047	14,922				
CNG Aircraft Tug Wide	500	0.8		3,339							13,598					
CNG Bus	180	0.25		162,285							74,343					
CNG Water Truck	150	0.2		3,500		3,843	4,186	3,019			1,069		1,174	1,278	922	
CNG Aircraft Tug Narrow	130	0.8		6,862							7,265					
CNG Food Truck	130	0.25		48,634		82,861	82,860	70,249			16,091		27,414	27,414	23,242	
CNG Fuel Truck	130	0.25		1,801		5,004	9,407	5,405			596		1,656	3,112	1,788	
CNG Hydrant Truck	130	0.25		82,056		187,534	187,532	160,514			27,148		62,045	62,045	53,106	
CNG Lavatory Truck	130	0.25		11,723		11,265	10,693	9,150			3,878		3,727	3,538	3,027	
CNG Shuttle	130	0.25		15,324							5,070					
CNG Baggage Tug	100	0.55	4,859	211,921		259,072	259,072	218,726	2,721	118,654		145,054	145,054	122,465		
CNG Cargo Loader	70	0.5		4,735							1,687					
CNG Belt Loader	60	0.5		106,773		146,299	146,299	123,516			32,608		44,680	44,680	37,722	
CNG Cabin Service	50	0.2		20,843		35,512	35,512	30,021			2,122		3,615	3,615	3,056	
CNG Container Loader	50	0.5		25,777							6,560					
Subtotal										125,387	414,489	147,996	289,365	290,737	245,328	
Total										794,360	774,225	824,089	868,425	870,706	750,281	

Source: Camp Dresser & McKee Inc., 2000.

Table 20

Natural Gas Consumption Based on Facility Areas Under No Action/No Project Alternative

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MCF/Yr)	Building S.F. or Units	Total Consumption (MCF/Yr)
LAX						
Airport Land Uses						
Terminal (S.F.)	15.18	CF/S.F./Yr	3,997,000	60,674	3,997,000	60,674
Cargo (S.F.)	9.84	CF/S.F./Yr	2,328,064	22,908	2,328,064	22,908
Maintenance (S.F.)	24.59	CF/S.F./Yr	1,440,000	35,410	1,440,000	35,410
Ancillary (S.F.)	142.60	CF/S.F./Yr	1,294,000	184,524	1,294,000	184,524
Subtotal Airport Uses				303,517		303,517
Non-Airport Land Uses						
LAX Northside						
Office (S.F.)	24.00	CF/S.F./Yr	632,000	15,168	1,580,000	37,920
Hotel (S.F.)	57.60	CF/S.F./Yr	390,000	22,464	870,000	50,112
Retail (S.F.)	34.80	CF/S.F./Yr	24,000	835	60,000	2,088
Airport Related ¹ (S.F.)	23.63	CF/S.F./Yr	300,000	7,089	750,000	17,723
R/D Business Park (S.F.)	24.00	CF/S.F./Yr	470,000	11,280	1,170,000	28,080
Restaurant (S.F.)	38.40	CF/S.F./Yr	28,000	1,075	70,000	2,688
Subtotal LAX Northside				57,911		138,611
Continental City						
Office (S.F.)	24.00	CF/S.F./Yr	1,200,000	28,800	3,000,000	72,000
Retail (S.F.)	34.80	CF/S.F./Yr	40,000	1,392	100,000	3,480
Subtotal Continental City				30,192		75,480
SUBTOTAL AIRPORT AND NON-AIRPORT USES				391,620		517,608
Non-Project Uses Within Master Plan Boundaries						
Land Within Acquisition Areas						
Residential (Single Family DUs)	79,980	CF/Unit/Yr	57	4,559	57	4,559
Residential (Multi Family DUs)	48,144	CF/Unit/Yr	69	3,322	69	3,322
Hotel (S.F.)	57.60	CF/S.F./Yr	1,404,993	80,928	1,404,993	80,928
Office (S.F.)	24.00	CF/S.F./Yr	1,108,312	26,599	1,108,312	26,599
Retail (S.F.)	34.80	CF/S.F./Yr	148,219	5,158	148,219	5,158
Light Industrial ³ (number of meters)	2,939,600	CF/Meter/Yr	140	412,556	140	412,556
Institutional (S.F.)	24.00	CF/S.F./Yr	156,178	3,748	156,178	3,748
Subtotal Acquisition Areas				536,870		536,870
SUBTOTAL NON-PROJECT USES				536,870		536,870
TOTAL MASTER PLAN BOUNDARIES				928,490		1,054,477

S.F. = Square Feet

MCF = thousand cubic feet of natural gas

- ¹ Usage rate average from SCAQMD, CEQA Air Quality Handbook, Table A9-11-A (Includes restaurant, office, and miscellaneous land use).
- ² For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.
- ³ Data collected during the baseline survey (Psomas and Associates) indicated that each gas meter serviced approximately 27,000 square feet of light industrial areas on average.

Source: Camp Dresser & McKee Inc., 2000.

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Table 21

Natural Gas Consumption Based on Facility Areas Under Alternative A

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MCF/Yr)	Building S.F. or Units	Total Consumption (MCF/Yr)
LAX						
Airport Land Uses						
Terminal (S.F.)	15.18	CF/S.F./Yr	8,311,000	126,160	10,419,000	158,160
Cargo (S.F.)	9.84	CF/S.F./Yr	3,694,000	36,345	4,518,000	44,457
Maintenance (S.F.)	24.59	CF/S.F./Yr	584,000	14,361	841,000	20,680
Ancillary (S.F.)	142.60	CF/S.F./Yr	1,987,000	283,346	2,260,000	322,276
Subtotal Airport Uses				460,216		545,574
Non-Airport Land Uses						
Westchester Southside						
Hotel (S.F.)	57.60	CF/S.F./Yr	340,000	19,584	850,000	48,960
Office (S.F.)	24.00	CF/S.F./Yr	260,000	6,240	650,000	15,600
Retail (S.F.)	34.80	CF/S.F./Yr	44,000	1,531	110,000	3,828
R/D Business Park (S.F.)	24.00	CF/S.F./Yr	388,000	9,312	970,000	23,280
Restaurant (S.F.)	38.40	CF/S.F./Yr	16,000	614	40,000	1,536
Subtotal Westchester Southside				37,281		93,204
SUBTOTAL AIRPORT AND NON-AIRPORT USES				497,497		638,778
Non-Project Uses Within Master Plan Boundaries¹						
Manchester Square						
Office (S.F.)	24.00	CF/S.F./Yr	50,000	1,200	50,000	1,200
Hotel (S.F.)	57.60	CF/S.F./Yr	250,000	14,400	500,000	28,800
Industrial (S.F.)	2,939,600	CF/Meter/Yr	32	94,048	64	188,096
Subtotal Manchester Square				109,648		218,096
Land Within Acquisition Areas						
Residential (Single Family DUs)	79,980	CF/Unit/Yr	0	0	0	0
Residential (Multi Family DUs)	48,144	CF/Unit/Yr	42	2,022	42	2,022
Hotel (S.F.)	57.60	CF/S.F./Yr	63,595	3,663	63,595	3,663
Office (S.F.)	24.00	CF/S.F./Yr	142,064	3,410	142,064	3,410
Retail (S.F.)	34.80	CF/S.F./Yr	45,737	1,592	45,737	1,592
Light Industrial (number of meters) ²	2,939,600	CF/Meter/Yr	44	129,342	44	129,342
Institutional (S.F.)	24.00	CF/S.F./Yr	85,902	2,062	85,902	2,062
Subtotal Acquisition Areas				142,091		142,091
SUBTOTAL NON-PROJECT USES				251,739		360,187
TOTAL MASTER PLAN BOUNDARIES				749,236		998,965

S.F. = Square Feet

MCF = thousand cubic feet of natural gas

¹ For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

² Data collected during the baseline survey (Psomas and Associates) indicated that each gas meter serviced approximately 27,000 square feet of light industrial areas on average.

Source: Camp Dresser & McKee Inc., 2000.

Table 22

Natural Gas Consumption Based on Facility Areas Under Alternative B

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MCF/Yr)	Building S.F. or Units	Total Consumption (MCF/Yr)
LAX						
Airport Land Uses						
Terminal (S.F.)	15.18	CF/S.F./Yr	8,333,000	126,495	9,712,000	147,428
Cargo (S.F.)	9.84	CF/S.F./Yr	4,192,000	41,249	4,871,000	47,931
Maintenance (S.F.)	24.59	CF/S.F./Yr	889,000	21,861	859,000	21,123
Ancillary (S.F.)	142.60	CF/S.F./Yr	2,389,000	340,671	1,720,000	245,272
Subtotal Airport Uses				530,276		461,754
Non-Airport Land Uses						
Westchester Southside						
Hotel (S.F.)	57.60	CF/S.F./Yr	340,000	19,584	850,000	48,960
Office (S.F.)	24.00	CF/S.F./Yr	260,000	6,240	650,000	15,600
Retail (S.F.)	34.80	CF/S.F./Yr	44,000	1,531	110,000	3,828
R/D Business Park (S.F.)	24.00	CF/S.F./Yr	388,000	9,312	970,000	23,280
Restaurant (S.F.)	38.40	CF/S.F./Yr	16,000	614	40,000	1,536
Conference Center (S.F.)		CF/S.F./Yr				
Subtotal Westchester Southside				37,281		93,204
SUBTOTAL AIRPORT AND NON-AIRPORT USES				567,557		554,958
Non-Project Uses Within Master Plan Boundaries¹						
Land Within Acquisition Areas						
Residential (Single Family DUs)	79,980	CF/Unit/Yr	0	0	0	0
Residential (Multi Family DUs)	48,144	CF/Unit/Yr	42	2,022	42	2,022
Hotel (S.F.)	57.60	CF/S.F./Yr	0	0	0	0
Office (S.F.)	24.00	CF/S.F./Yr	0	0	0	0
Retail (S.F.)	34.80	CF/S.F./Yr	60,221	2,096	60,221	2,096
Light Industrial (number of meters) ²	2,939,600	CF/Meter/Yr	3	8,819	3	8,819
Institutional (S.F.)	24.00	CF/S.F./Yr	85,902	2,062	85,902	2,062
Subtotal Acquisitions Areas				14,999		14,999
SUBTOTAL NON-PROJECT USES				14,999		14,999
TOTAL MASTER PLAN BOUNDARIES				582,556		569,957

S.F. = Square Feet

MCF = thousand cubic feet of natural gas

¹ For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

² Data collected during the baseline survey (Psomas and Associates) indicated that each gas meter serviced approximately 27,000 square feet of light industrial areas on average.

Source: Camp Dresser & McKee Inc., 2000

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Table 23

Natural Gas Consumption Based on Facility Areas Under Alternative C

Land Use	Usage Factor	Unit Type	2005		2015	
			Building S.F. or Units	Total Consumption (MCF/Yr)	Building S.F. or Units	Total Consumption (MCF/Yr)
LAX						
Airport Land Uses						
Terminal (S.F.)	15.18	CF/S.F./Yr	6,654,000	101,008	7,319,000	111,102
Cargo (S.F.)	9.84	CF/S.F./Yr	3,664,000	36,054	5,075,000	49,938
Maintenance (S.F.)	24.59	CF/S.F./Yr	1,011,000	24,860	834,000	20,508
Ancillary (S.F.)	142.60	CF/S.F./Yr	2,499,000	356,357	3,198,000	456,035
Subtotal Airport Uses				518,279		637,583
Non-Airport Land Uses						
Westchester Southside						
Hotel (S.F.)	57.60	CF/S.F./Yr	340,000	19,584	850,000	48,960
Office (S.F.)	24.00	CF/S.F./Yr	260,000	6,240	650,000	15,600
Retail (S.F.)	34.80	CF/S.F./Yr	44,000	1,531	110,000	3,828
R/D Business Park (S.F.)	24.00	CF/S.F./Yr	388,000	9,312	970,000	23,280
Restaurant (S.F.)	38.40	CF/S.F./Yr	16,000	614	40,000	1,536
Subtotal Westchester Southside				37,281		93,204
SUBTOTAL AIRPORT AND NON-AIRPORT USES				555,560		730,787
Non-Project Uses Within Master Plan Boundaries¹						
Land Within Acquisition Areas						
Residential (Single Family DUs)	79,980	CF/Unit/Yr	0	0	0	0
Residential (Multi Family DUs)	48,144	CF/Unit/Yr	0	0	0	0
Hotel (S.F.)	57.60	CF/S.F./Yr	1,030,340	59,348	1,030,340	59,348
Office (S.F.)	24.00	CF/S.F./Yr	509,218	12,221	509,218	12,221
Retail (S.F.)	34.80	CF/S.F./Yr	73,002	2,540	73,002	2,540
Light Industrial (number of meters) ²	2,939,600	CF/Meter/Yr	73	214,591	73	214,591
Institutional (S.F.)	24.00	CF/S.F./Yr	0	0	0	0
Subtotal Acquisition Areas				288,700		288,700
SUBTOTAL NON-PROJECT USES				288,700		288,700
TOTAL MASTER PLAN BOUNDARIES				844,260		1,019,487

S.F. = Square Feet

MCF = thousand cubic feet of natural gas

¹ For the purposes of this analysis, a single composite study area was established, referred to as the "Master Plan boundaries." However, for each alternative, a portion of the study area would not be incorporated into the Master Plan development.

² Data collected during the baseline survey (Psomas and Associates) indicated that each gas meter serviced approximately 27,000 square feet of light industrial areas on average.

Source: Camp Dresser & McKee Inc., 2000.

Table 24

Estimated Natural Gas Consumption at the Central Utility Plant

	Baseline Conditions	Planning Horizon 2005				Planning Horizon 2015			
		Alternative				Alternative			
		NA/NP ²	A	B	C	NA/NP ²	A	B	C
Terminal Area (S.F.)	3,997,000	3,997,000	8,311,000	8,333,000	6,654,000	3,997,000	10,419,000	9,712,000	7,319,000
Electrical Power Consumption ¹ (MWH)	820	820	1,281	1,283	1,104	820	1,506	1,430	1,175

¹ Natural gas consumption includes natural gas consumed to produce electrical power (derived from Psomas and Associates, Utilities Consumption and Generation at LAX, October, 1996):
106.81 CF/S.F./Yr - factor applied to terminal area

393 MMCF/Yr – used for electrical power generation

² No Action/No Project Alternative

Assumptions:

A. Credit from DWP to LAWA = \$3,581,000 (1998 per Green Power Agreement)

B. Unit cost of Electricity = \$0.0898 per kWh

C. Power generated = 39,862,864 kWh

D. Efficiency of Generation = 34% per GE description of single cycle gas turbine.

E. Natural Gas used per year to generate electricity = 393 MMCF

Source: Camp Dresser & McKee Inc., 2000. Psomas and Associates, Utilities Consumption and Generation at LAX, October, 1996

Table 25

Daily Vehicle Miles Traveled and Gasoline and Diesel Consumption For Off-Airport Vehicles

Item	Baseline Conditions	Alternative							
		No Action/No Project		A		B		C	
		2005	2015	2005	2015	2005	2015	2005	2015
VMT Data ¹ (miles per day)	8,522,324	10,780,115	12,061,915	10,981,934	14,716,721	11,040,923	13,457,963	10,755,921	12,833,543
Fuel Factor (Gallons per Total VMT by Fuel)²									
Gasoline	0.0432	0.0403	0.0389	0.0403	0.0389	0.0403	0.0389	0.0403	0.0389
Diesel	0.0074	0.0069	0.0070	0.0069	0.0070	0.0069	0.0070	0.0069	0.0070
Estimated Gasoline Consumption (millions of gallons per year)		158.7	171.3	161.5	209.0	162.4	191.2	158.2	182.2
Estimated Diesel Consumption (millions of gallons per year)		27.2	30.8	27.7	37.6	27.8	34.4	27.1	32.8

¹ Total Daily VMT data provided by PCR Services Corp., miles/day

² CARB, Predicted California Vehicle Emissions Ozone Planning Inventory, 1998 (July 28)

³ Baseline estimated using No Action/No Project Alternative, 2005 ratioed by MAP (58/68.5)

Source: Camp Dresser & McKee Inc., 2000.

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Table 26

Construction Related Consumption of Gasoline and Diesel

Fuel Consumption (million gallons)	Total Through 2005			Total Through 2015		
	A	B	C	A	B	C
Diesel ¹	17.6	9.3	17.6	31.6	34.1	32.0
Gasoline ²	0.4	0.4	0.4	3.1	3.1	3.1

¹ Derived from data provided by Bechtel Corporation presented in Table 4.20-3, Projected Brake Horsepower and Fuel Consumption, presented in Section 4.20, *Construction Impacts*, of the Draft EIS/EIR.

² Derived from data provided by PCR Services Corp. for Alternative C. Gasoline consumption associated with construction-related activities for Alternatives A and B assumed to be similar to Alternative C.

Source: Camp Dresser McKee Inc., 2000

Table 27

Electricity Consumption by Airport Operations

Airport Operations (MWH/Yr)	Baseline Conditions	NA/NP	Total Through 2005			NA/NP	Total Through 2015		
			A	B	C		A	B	C
CUP	26,780	26,780	55,684	55,831	44,582	26,780	69,807	65,070	49,037
Gate Electrification	11,908	36,194	36,480	36,480	36,480	39,010	46,882	46,882	42,754
APM	0	0	0	0	0	0	93,200	174,500	62,000
GSE ¹	7,647	7,422	12,111	12,111	12,111	9,621	50,215	50,314	43,958
On Airport Vehicles	0	112	1,937	1,937	1,937	858	6,808	6,808	6,808
Total Airport Operations	46,335	70,507	106,212	106,359	95,110	76,269	266,912	343,574	204,557

¹ As discussed in Section 2.1.24, *Electricity Consumption for GSE*, of the Draft EIS/EIR the estimates for electricity consumption were obtained by estimating energy consumed by gasoline, then converting to electricity assuming an equivalent electricity consumption of 12 kilowatt-hour (KWH) of electricity per gallon of gasoline. The estimated amount of energy consumed as gasoline by GSE is presented in Table 20, GSE Energy Consumption. A gallon of gasoline is equivalent to 114,000 BTUs.

Source: Camp Dresser & McKee Inc., 2000.