

# **The Long Beach—Los Angeles Rail Transit Project**

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## **O & M Cost Estimate**



LOS ANGELES COUNTY  
TRANSPORTATION  
COMMISSION



**Southern California Rail Consultants**

A Joint Venture of  
• Parsons Brinckerhoff Quade & Douglas, Inc. • Kaiser Engineers (California) Corporation  
• Daniel, Mann, Johnson, & Mendenhall

**LONG BEACH - LOS ANGELES  
RAIL TRANSIT PROJECT  
O & M COST ESTIMATE  
JULY 1986**

**Prepared for the  
LOS ANGELES COUNTY TRANSPORTATION COMMISSION  
by  
SOUTHERN CALIFORNIA RAIL CONSULTANTS  
PROJECT INTEGRATION DIVISION  
WBS Number L010**

**LONG BEACH - LOS ANGELES  
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## 1. INTRODUCTION

The purpose of this report is to present the estimated annual operating and maintenance (O&M) costs for the design year operation of the Long Beach - Los Angeles (LB-LA) light rail transit (LRT) Line and of the combined LB-LA and Century LRT Lines.

The O&M cost estimate is submitted in accordance with SCRC's second annual work plan, Task L010 (Operations and Maintenance Planning), Subtask L010.2 as follows:

### L010.2 Update O&M Cost Estimates

Update the O&M cost estimates prepared during previous fiscal year, based on design evolution or revised cost information. Provide as input to others for engineering cost trade-off studies and also to Commission's financial planners. Incorporate the updated O&M cost estimates in the O&M plan (see L010.4), in accordance with established procedures for changes to controlled documents (E040).

It should be noted that while the original scope was for LB-LA cost estimates, it was subsequently requested (April 17, 1986 letter from Mr. J. Adams to Mr. S. Zweighaft) that cost estimates for the Century Line also be included in order to represent the light rail system in the year 2000.

Operating and maintenance costs are recurring costs which are normally budgeted on an annual basis. O&M costs include the labor (wages, salaries, and fringe benefits) and nonlabor (parts, materials, supplies, utilities, services, etc.) expenses required to operate, maintain, and manage the LB-LA and Century LRT Lines on a day-to-day basis. For the purpose of this report, O&M costs for the mature, design year system are presented in 1986 dollars and do not include any

amortization of major capital cost items. Amortization of major capital cost items would amount to approximately 2% of the capital cost of facilities per year and 3% of the capital cost of equipment per year.

O&M costs are organized according to functional categories commonly associated with transit systems. The major functional categories are as follows:

- o Transportation
- o Vehicle Maintenance
- o Maintenance-of-Way
- o Security.

No organization chart is included in this report as it is assumed that the LRT O&M functions will be allocated to the appropriate responsibilities within the SCRTD organizational structure.

The O&M costs contained in this report are based upon the activities and requirements established in the LB-LA Project O&M Plan and upon information and data from various sources, including the following:

- o San Diego Trolley, Inc. Fiscal Year 1986 Budget
- o SCRTD Metro Rail Operating and Maintenance Cost Estimate, MOS-1, March 1985
- o SCRTD Proposed Annual Budget, Fiscal Year 1986
- o Contract between the SCRTD and the United Transportation Union, effective February 1, 1985
- o Agreement between the SCRTD and the Amalgamated Transit Union, Division 1277, effective April 1, 1985
- o San Francisco Municipal Railway Operating Budget, Fiscal Year 1985/1986
- o Urban Rail In America by Boris S. Pushkarev, Indiana University Press, 1982

- o Technical Memorandum, LB-LA Rail Transit Project Estimated Maintenance Costs (project files, 1983)
- o Fixed Guideway Rapid Transit Mode Analysis, 1983, submitted to City of Dallas, Texas by Lea, Elliott, McGean/DeLeuw Cather, as joint venture.
- o National Urban Mass Transportation Statistics, 1983, Section 15 Annual Report, prepared by Transportation Systems Center, December 1984 (UMTA-MA-06-0107-85-1).

It should be noted that the staffing levels presented in this report differ from the staffing levels contained in the O&M Plan. The staffing levels presented in this report reflect revised staffing for the LB-LA Line or the combined LB-LA and Century Lines only, while the staffing contained in the O&M Plan reflects facility design requirements based upon other proposed LRT lines (Pasadena and Coast) as well as the LB-LA and Century Lines.

The cost estimates for the Century Line are based upon marginal increases to the LB-LA cost estimate for vehicle miles, shift coverage, route miles, stations, fare collection equipment, and increases in all other applicable systems and facilities. In some instances, staffing increased very little, but costs for contract or SCRTD interdepartmental work increased significantly. Data for the Century Line was provided by the appropriate LACTC staff. Methodology for allocating O&M costs between the LB-LA and Century Lines is presented in Section 5 of this report.

The O&M cost estimates presented in this report are considered to be dynamic in nature and will be refined as system design progresses. Startup costs prior to revenue service are already contained in line item 9 of the Program Plan. O&M cost estimates for the initial year of operation for the LB-LA Line will be developed in conjunction with the system startup plan under a future O&M work task. O&M costs between the initial year and the design year will be developed after completion of final design and will be incorporated into a future update of these estimates.



## 2. ASSUMPTIONS

This section contains the design year (year 2000) assumptions used in the development of the O&M cost estimates. Some of the assumptions presented below are in addition to those contained in the O&M Plan.

### 2.1 LB-LA LINE ASSUMPTIONS

#### 1. System data:

- o 21 route miles, 46 track miles including yards
- o 21 passenger stations
- o Daily ridership of 54,700
- o System operation of 20 hours per day, seven days per week
- o 19 traction power substations.

#### 2. O&M data:

- o Design year fleet of 54 vehicles
- o Estimated revenue car miles per year of 3,480,000

### 2.2 CENTURY LINE ASSUMPTIONS

#### 1. System data:

- o 16 route miles, 34 track miles
- o 10 passenger stations
- o Daily ridership of 97,300
- o System operation of 20 hours per day, seven days per week
- o 17 traction power substations

## 2. O&M data:

- o Design year fleet of 42 vehicles (results in 96 vehicles total for LB-LA and Century Lines)
- o Estimated revenue car miles per year of 2,420,000
- o Maintenance of the Century vehicle fleet will be performed at the LB-LA main yard and shop.

## 2.3 OTHER ASSUMPTIONS

### 1. Labor:

- o 1810 productive hours per year per employee per SCRTD figures (allows for 104 rest days and 35 holidays, vacation days, and sick days)
- o All labor costs stated in 1986 dollars
- o Fringe benefit rate of 37% for salaried and hourly personnel per current SCRTD costs (includes uniform allowance)
- o Labor rates and fringes based upon current SCRTD costs
- o 0.5% general and administrative cost (based upon direct labor costs) for administrative functions associated with overall SCRTD administration (e.g., accounting, personnel, purchasing, marketing, safety, etc.)
- o Overtime allowances equivalent to 2% of the total hourly employee labor cost.

### 2. Non-Labor

- o All non-labor costs stated in 1986 dollars
- o O&M non-labor costs exclude amortization of major capital cost items.

3. Other

- o 310 weekday equivalents per year allowing for weekend and holiday schedules
- o Contingency amount of \$500,000.

### 3. O&M COST ELEMENTS

This section contains an itemized description of the labor and non-labor cost elements. The basis for major cost elements is also included.

#### 3.1 LABOR COST ELEMENTS

O&M labor costs are based upon the assumptions presented in this report and the operations and maintenance philosophies, activities, and requirements contained in the O&M Plan. O&M labor cost elements are presented by major functional categories as follows:

- o Transportation
- o Vehicle Maintenance
- o Maintenance-of-Way
- o Security.

It should be noted that the staffing levels contained in this report have been endorsed by SCRTD and are assumed to be required beyond the present or planned SCRTD forces in order to adequately support the LB-LA and Century LRT Lines. The labor cost elements for vehicle maintenance and maintenance-of-way also assume that major component rebuilding, seasonal work, major projects, landscaping, facilities, janitorial, elevator/escalator maintenance, and other such activities described under the nonlabor cost elements are either contracted to outside vendors or are performed by other SCRTD organizations under interdepartmental work orders. Allowances for overtime (at a rate of 2% of the direct labor cost) and for general and administrative costs (at rate of 0.5% of the total labor cost) are also included as a labor cost element.

### 3.1.1 Transportation

The LRT transportation organization includes the functions of train operations, yard operations, and central control operations. LRT transportation staffing levels and shift coverage are shown for the LB-LA Line in Table 1A and for the combined LB-LA and Century Lines in Table 1B.

A transportation superintendent (shared with Metro Rail) will be responsible for LRT operations. Secretarial and clerical support are also provided for LRT operations.

#### A. Train and Yard Operations

LRT train and yard operations include line supervision, operator training, yard dispatching, and train operations personnel.

Transportation supervisors provide line supervision for train operators and assist with operator training. The supervisors travel throughout the system to direct and monitor train operations and operators, including terminal operations at the 7th/Flower Station during peak periods and operator reporting at the Satellite Yard.

Yard operations and crew dispatching will be directed and monitored by the division dispatcher.

The number of train operators was based upon the number of daily jobs, determined from the design year train schedule contained in the O&M Plan. Consideration was given to the number of trains in service for the various operating periods, yard requirements, and operator relief requirements. The use of part-time train operators has not been precluded in the estimates. Note that no distinction has been made between mainline and yard operators.

TABLE 1A

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA TRANSPORTATION STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT:			TOT. LAB	TOTAL HRS	TOTAL STAFF	EQUIV STAFF
			DAY	P. M.	GRAVE				
ADMINISTRATION:									
SUPERINTENDENT /PT	1810	5	0.5	0	0	1040	0.6	0.5	
SECRETARY/ PT	1810	5	0.5	0	0	1040	0.6	0.5	
MANAGER	1810	5	1	0	0	2080	1.1	1	
SCTY/CLERK	1810	5	1	0	0	2080	1.1	1	
TRAIN OPERATIONS:									
T.O. SUPERVISOR I	1810	7	2	2	1	14560	8.0	8	
T.O.S. TRAINING INSTR	1810	5	2	0	0	4160	2.3	2	
T.O.S. DIV DISPATCHER	1810	7	1	1	1	8736	4.8	5	
TRAIN OPERATORS	1810	5	22	12	10	91520	50.6	51	
TRAIN OPERATORS	1810	2	8	8	6	18304	10.1	10	
CENTRAL CONTROL:									
SUPERVISOR	1810	7	1	1	0	5824	3.2	3	
CENTRAL DISPATCHER	1810	7	2.5	2.5	2	20384	11.3	11	
CCTV OBSERVER	1810	7	2	2	1	14560	8.0	8	
SCTY/CLERK	1810	5	1	0	0	2080	1.1	1	

TOTAL:

102

TABLE 1B

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA &amp; CENTURY TRANSPORTATION STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT:		TOT. GRAVE	TOTAL LAB HRS	TOTAL STAFF	EQUIV STAFF
			DAY	P.M.				
<b>ADMINISTRATION:</b>								
SUPERINTENDENT /PT	1810	5	0.5	0	0	1040	0.6	0.5
SECRETARY/ PT	1810	5	0.5	0	0	1040	0.6	0.5
MANAGER	1810	5	1	0	0	2080	1.1	1
SCTY/CLERK	1810	5	1	0	0	2080	1.1	1
<b>TRAIN OPERATIONS:</b>								
T.O. SUPERVISOR I	1810	7	4	4	2	29120	16.1	16
T.O.S. TRAINING INSTR	1810	5	2	0	0	4160	2.3	2
T.O.S. DIV DISPATCHER	1810	7	1	1	1	8736	4.8	5
TRAIN OPERATORS	1810	5	30	19	13	128960	71.2	71
TRAIN OPERATORS	1810	2	14	12	9	29120	16.1	16
<b>CENTRAL CONTROL:</b>								
SUPERVISOR	1810	7	1	1	0	5824	3.2	3
CENTRAL DISPATCHER	1810	7	3	3	2	23296	12.9	13
CCTV OBSERVER	1810	7	4	4	3	32032	17.7	18
SCTY/CLERK	1810	5	1	0	0	2080	1.1	1

TOTAL:

148

It should also be noted that ticket exchange personnel who exchange LRT tickets for magnetically encoded Metro Rail tickets for passengers transferring from LRT to Metro Rail are not included in the LRT O&M cost estimate as these positions are included in Metro Rail costs.

#### B. Central Control Operations

LRT central control will be the hub for mainline operations including train operations, station CCTV monitoring, traction power, and communications.

A supervisor will be responsible for the operation of central control. Mainline train, traction power, and communication dispatching will be performed by central dispatchers. Other central control personnel will monitor the CCTV cameras for stations. CCTV monitoring personnel are based upon 24 to 25 monitors per person and a total of 96 monitors (53 for LB-LA and 43 for Century).

#### 3.1.2 Vehicle Maintenance

The LRT vehicle maintenance organization includes the activities of service and inspection (S&I), heavy repair, vehicle interior and exterior cleaning, and component repair and overhaul. Component repair includes the repair and overhaul of vehicle components as well as the repair and overhaul of wayside electronic components. Vehicle maintenance staffing levels and shift coverage are shown in Table 2A for the LB-LA Line and in Table 2B for the combined LB-LA and Century Lines.

A superintendent (shared with Metro Rail) will be responsible for the overall LRT vehicle maintenance function with senior supervisors for S&I/cleaning and for heavy/component repair. The senior supervisors also assist the training instructors in the training of vehicle maintenance personnel. Engineering, quality inspection, maintenance



TABLE 2A

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA VEHICLE MAINTENANCE STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT: DAY	P. M.	TOT. GRAVE LAB	TOTAL HRS STAFF	EQUIV. STAFF
SUPERINTENDENT /PT	1810	5	0.5	0	0	1040	0.6
SECRETARY /PT	1810	5	0.5	0	0	1040	0.6
MANAGER	1810	5	1	0	0	2080	1.1
SCTY/CLERK	1810	7	1	1	1	8736	4.8
SCTY/CLERK	1810	5	1	0	0	2080	1.1
VEHICLE ENGINEER	1810	5	1	0	0	2080	1.1
QUALITY INSPECTOR	1810	5	2	1	0	6240	3.4
INSTRUCTOR, MAINT	1810	5	1	0	0	2080	1.1
MAINT PLANNER	1810	5	1	0	0	2080	1.1
WTY/FAIL ANALYST	1810	5	1	0	0	2080	1.1
STOCK SHOP CLERK	1810	7	1	1	1	8736	4.8
STOCK SHOP CLERK	1810	5	1	0	0	2080	1.1
SENIOR SUPERVISOR	1810	5	1	0	0	2080	1.1
SUPERVISOR, S&I	1810	7	1	1	1	8736	4.8
SUPERVISOR, HVY/COMP	1810	5	1	0	0	2080	1.1
VEHICLE MAINT, S&I	1810	7	2	2	2	17472	9.7
VEHICLE MAINT, HEAVY	1810	5	2	3	0	10400	5.7
VEHICLE MAINT, COMP	1810	5	6	0	0	12480	6.9
VEHICLE TECH, S&I	1810	7	2	2	2	17472	9.7
VEHICLE TECH, HEAVY	1810	5	2	2	0	8320	4.6
VEHICLE TECH, COMP	1810	5	5	0	0	10400	5.7
VEHICLE CLEANER	1810	5	3	3	6	24960	13.8
VEHICLE CLEANER	1810	2	2	2	4	6656	3.7

TOTAL:

90

TABLE 2B

OPERATIONS AND MAINTENANCE COST ESTIMATE

LB-LA & CENTURY VEHICLE MAINTENANCE STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT: DAY	P.M.	TOT. GRAVE	TOTAL LAB HRS	TOTAL STAFF	EQUIV STAFF
SUPERINTENDENT /PT	1810	5	0.5	0	0	1040	0.6	0.5
SECRETARY /PT	1810	5	0.5	0	0	1040	0.6	0.5
MANAGER	1810	5	1	0	0	2080	1.1	1
SCTY/CLERK	1810	7	1	1	1	8736	4.8	5
SCTY/CLERK	1810	5	1	0	0	2080	1.1	1
VEHICLE ENGINEER	1810	5	1	0	0	2080	1.1	1
QUALITY INSPECTOR	1810	5	2	1	0	6240	3.4	3
INSTRUCTOR, MAINT	1810	5	1	0	0	2080	1.1	1
MAINTENANCE PLANNER	1810	5	1	0	0	2080	1.1	1
WTY/FAIL ANALYST	1810	5	1	0	0	2080	1.1	1
STOCK SHOP CLERK	1810	7	1	1	1	8736	4.8	5
STOCK SHOP CLERK	1810	5	1	0	0	2080	1.1	1
SENIOR SUPERVISOR	1810	5	1	0	0	2080	1.1	1
SUPERVISOR, S&I	1810	7	1	1	2	11648	6.4	6
SUPERVISOR, HVY/COMP	1810	5	1	0	0	2080	1.1	1
VEHICLE MAINT, S&I	1810	7	3	3	4	29120	16.1	16
VEHICLE MAINT, HEAVY	1810	5	3	4	0	14560	8.0	8
VEHICLE MAINT, COMP	1810	5	6	0	0	12480	6.9	7
VEHICLE TECH, S&I	1810	7	2	2	4	23296	12.9	13
VEHICLE TECH, HEAVY	1810	5	2	2	0	8320	4.6	5
VEHICLE TECH, COMP	1810	5	6	0	0	12480	6.9	7
VEHICLE CLEANER	1810	5	3	3	8	29120	16.1	16
VEHICLE CLEANER	1810	2	3	3	4	8320	4.6	5

TOTAL:

106

planning, warranty/failure analysis, and storekeeping personnel provide direct support to vehicle maintenance. Secretarial/clerical support is also provided for vehicle maintenance.

Supervisors provide first line supervision of vehicle and component mechanics, technicians, and cleaners. Staffing for vehicle maintenance mechanics and technicians is based upon projected shop workloads for preventive maintenance, daily inspection, corrective repair, heavy repair, and major repair and overhaul activities. Component repair personnel will perform electronic, electrical, and mechanical repairs of vehicle components and repairs of wayside electronic components. Vehicle cleaners perform interior cleaning (including vehicles at the satellite yard), exterior washing, blowdown, and general shop cleaning.

### 3.1.3 Maintenance-of-Way

The LRT maintenance-of-way organization includes maintenance and repair activities for trackwork, signaling, communications, fare collection, traction power and overhead contact system, and buildings and maintenance equipment. Staffing levels and shift coverage for maintenance-of-way are shown in Table 3A for the LB-LA Line and in Table 3B for the combined LB-LA and Century Lines.

A superintendent (shared with Metro Rail) will be responsible for the overall LRT maintenance-of-way function. Secretarial and clerical support is also provided for maintenance-of-way.

A senior supervisor and supervisors are responsible for maintenance-of-way activities. Senior supervisors also assist in the training of maintenance-of-way personnel. Engineering, maintenance planning, and storekeeping personnel provide direct support to maintenance-of-way.

TABLE 3A

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA MAINTENANCE-OF-WAY STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT:		TOT. GRAVE	TOT. LAB HRS	TOTAL STAFF	EQUIV STAFF
			DAY	P. M.				
SUPT /PT	1810	5	0.5	0	0	1040	0.6	0.5
SECRETARY /PT	1810	5	0.5	0	0	1040	0.6	0.5
MANAGER	1810	5	1	0	0	2080	1.1	1
SCTY/CLERK	1810	5	2	1	0	6240	3.4	3
ENGINEER/ MECH-ELECT	1810	5	0.5	0	0	1040	0.6	0.5
ENGINEER CIVIL	1810	5	0.5	0	0	1040	0.6	0.5
MAINT PLANNER	1810	5	1	0	0	2080	1.1	1
STOCK SHOP CLERK	1810	5	1	0	0	2080	1.1	1
SENIOR SUPERVISOR	1810	5	1	0	0	2080	1.1	1
SUPERVISOR	1810	5	2	2	0	8320	4.6	5
TRACK WORKER	1810	5	5	4	0	18720	10.3	10
COMM TECH	1810	5	4	3	0	14560	8.0	8
COMM TECH	1810	2	1	1	0	1664	0.9	1
SIGNAL TECH	1810	5	2	2	0	8320	4.6	5
TPSS ELECT	1810	5	3	4	0	14560	8.0	8
FARE COLL TECH	1810	5	2	2	0	8320	4.6	5
BLDG & EQUIP MAINT	1810	5	2	0	0	4160	2.3	2
MOW SHOP REPAIR	1810	5	3	0	0	6240	3.4	3

TOTAL:

56

TABLE 3B

OPERATIONS AND MAINTENANCE COST ESTIMATE

LB-LA & CENTURY MAINTENANCE-OF-WAY STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT: DAY	P.M.	TOT. GRAVE	TOTAL LAB HRS	TOTAL STAFF	EQUIV STAFF
SUPT /PT	1810	5	0.5	0	0	1040	0.6	0.5
SECRETARY /PT	1810	5	0.5	0	0	1040	0.6	0.5
MANAGER	1810	5	1	0	0	2080	1.1	1
SCTY/CLERK	1810	5	2	1	0	6240	3.4	3
ENGINEER/ MECH-ELECT	1810	5	0.5	0	0	1040	0.6	0.5
ENGINEER CIVIL	1810	5	0.5	0	0	1040	0.6	0.5
MAINT PLANNER	1810	5	1	1	0	4160	2.3	2
STOCK SHOP CLERK	1810	5	1	0	0	2080	1.1	1
SENIOR SUPERVISOR	1810	5	1	0	0	2080	1.1	1
SUPERVISOR	1810	5	2	2	0	8320	4.6	5
TRACK WORKER	1810	5	6	4	0	20800	11.5	11
COMM TECH	1810	5	4	3	0	14560	8.0	8
COMM TECH	1810	2	1	1	0	1664	0.9	1
SIGNAL TECH	1810	5	2	2	0	8320	4.6	5
TPSS ELECT	1810	5	4	5	0	18720	10.3	10
FARE COLL TECH	1810	5	3	3	0	12480	6.9	7
BLDG & EQUIP MAINT	1810	5	3	0	0	6240	3.4	3
MOW SHOP REPAIR	1810	5	3	0	0	6240	3.4	3

TOTAL:

62

Staffing levels for maintenance and repair of track, signals, communications (including central control), fare collection, traction power, and overhead catenary are based upon minimum crew size and shift coverage necessary to support LRT system operations. The concept of "on-call" crews will be utilized to handle emergency or other abnormal conditions.

Buildings/maintenance equipment personnel will perform routine inspection and servicing items such as HVAC, lighting, drainage, doors, locks, fixed and portable shop equipment, and maintenance equipment. Buildings/maintenance equipment personnel will also monitor the performance of vendors performing work under contract (i.e. elevators/escalators, station janitorial, landscaping, maintenance vehicle and equipment servicing, etc.).

Personnel assigned to the maintenance-of-way shop will perform repair and fabrication work for track and signal components and other secondary maintenance activities as required. They also provide support for material handling tasks and when necessary, provide a source of additional labor for major tasks.

#### 3.1.4 Security

The requirements for the LRT security function include transit police, fare inspection, revenue collection and fare equipment servicing, and main yard security activities. Staffing levels and shift coverage for the security function are shown in Table 4A for the LB-LA Line and in Table 4B for the combined LB-LA and Century Lines. Note that CCTV monitoring positions are included within Transportation. Close coordination between CCTV monitoring and security personnel will be maintained.

Most of the LRT security activities for the LB-LA LRT Lines will be conducted out of the Central Control Facility which will serve as a substation for LRT and bus security personnel. LRT security

TABLE 4A

OPERATIONS AND MAINTAINENCE COST ESTIMATE

LB-LA SECURITY STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT: DAY	P.M.	TOT. GRAVE	TOTAL LAB HRS	TOTAL STAFF	EQUIV STAFF
LIEUTENANT	1810	5	1	0	0	2080	1.1	1
SARGENT	1810	7	1	1	1	8736	4.8	5
CLERK	1810	7	1	1	1	8736	4.8	5
FARE INSPECTOR	1810	5	4	4	2	20800	11.5	11
FARE INSPECTOR	1810	2	2	2	0	3328	1.8	2
TRANSIT POLICE	1810	7	6	6	6	52416	29.0	29
REVENUE AGENT	1810	7	0	0	4	11648	6.4	6
SECURITY GUARD	1810	7	4	4	6	40768	22.5	23
COURT LIAISON	1810	5	1	0	0	2080	1.1	1

TOTAL:

82

TABLE 4B

## OPERATIONS AND MAINTAINENCE COST ESTIMATE

## LB-LA &amp; CENTURY SECURITY STAFFING

DESIGN YEAR 2000

JOB CLASS	PROD. HRS/YR	DAYS WEEK	SHIFT: DAY	P.M.	TOT. GRAVE	TOTAL LAB HRS	TOTAL STAFF	EQUIV STAFF
LIEUTANANT	1810	5	1	0	0	2080	1.1	1
SARGENT	1810	7	2	2	1	14560	8.0	8
CLERK	1810	7	1	1	1	8736	4.8	5
FARE INSPECTOR	1810	5	6	6	4	33280	18.4	18
FARE INSPECTOR	1810	2	4	4	0	6656	3.7	4
TRANSIT POLICE	1810	7	10	10	10	87360	48.3	48
REVENUE AGENT	1810	7	0	0	6	17472	9.7	10
SECURITY GUARD	1810	7	4	4	7	43680	24.1	24
COURT LIAISON	1810	5	1	0	0	2080	1.1	1

TOTAL:

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activities will be supervised by lieutenant or sergeant level positions. Clerical support as well as court liaison support are provided.

Roving transit police officers will provide security on-board trains, at stations, and for other LRT facilities. Fare inspectors will conduct inspections for proof-of-payment on-board trains and at designated station areas. Revenue agents will perform cash collection and fare equipment replenishment activities on a daily basis. Security for the main yard and for revenue agents will be provided by security guards.

### 3.2 NON-LABOR COST ELEMENTS

O&M nonlabor costs are based upon the assumptions presented in this report and the philosophies, activities, and requirements contained in the O&M Plan. O&M nonlabor cost elements are presented by major functional categories as follows:

- o Transportation
- o Vehicle Maintenance
- o Maintenance-of-Way
- o Security
- o Utilities.

It should be noted that amortization of major capital cost items is not included in the nonlabor cost elements. Note also, that contract work can include interdepartmental work within SCRTD.

#### 3.2.1 Transportation

TR1. Miscellaneous Supplies and Services: includes such items as flashlights, batteries, printing of transportation forms, and other transportation-related supplies.

### 3.2.2 Vehicle Maintenance

- VM1. Vehicle Parts and Material: normal parts, tools, and material required for daily cleaning and servicing, washing, preventive maintenance, corrective repair, and overhaul of LRT vehicles. Based upon annual cost per vehicle.
- VM2. Component Repair Contract: major repair and overhaul of vehicle components under outside contracts or SCRTD interdepartmental work orders. Components include, but are not limited to: traction motors, compressors, evaporators, condensers, M-A sets, wheels (mounting), bearings (mountings), brake discs, door operator motors, and radios. Based upon annual cost per vehicle.
- VM3. Miscellaneous Supplies and Services: supplies and services associated with management and administration activities of the vehicle maintenance function.

### 3.2.3 Maintenance-of-Way

- MW1. Track Material: track materials and tools associated with routine inspection, maintenance, and repair of LRT trackwork. Material includes ballast, cross ties, rail, switch points, frogs, joint bars, anchors, fasteners, etc.
- MW2. Rail Grinding Contract: annual grinding of running rails by outside contract.
- MW3. Rail Inspection Contract: annual ultrasonic inspection of running rail by outside contract.
- MW4. Other Track Contract: repair or replacement of grade crossing surfaces, ballast cleaning, out-of-face renewal, and other trackwork requiring specialized skills and/or equipment. Based upon annual cost per track mile.

- MW5. **Signal Material:** material and tools necessary for routine inspection, maintenance, and repair of switch machines, signals, crossing gates, trip stops, and other components of the signal system.
- MW6. **Communications Material:** normal material and tools associated with the inspection, maintenance, and repair of the communications system including radios, telephones, public address, CCTV, cable transmission, supervisory control and data acquisition, and detection and monitoring. Based upon annual cost per route mile.
- MW7. **Computer Maintenance Contract:** maintenance of computer hardware and software associated with the Supervisory Control and Data Acquisition System (SCADA) by outside contract. Based upon estimate provided by communications consultant.
- MW8. **Other Communications Equipment Contract:** maintenance and repair of communications system equipment other than SCADA under outside contracts or SCRTD interdepartmental work orders.
- MW9. **Fare Equipment Material:** material and tools necessary for routine inspection, maintenance, and repair of fare collection equipment including ticket vending machines (TVMs), money carts, data collection and monitoring devices, TVM cashboxes, and TVM bill stackers.
- MW10. **Traction Power Material:** material and tools associated with routine inspection, maintenance, and repair of the traction power system including switchgear assemblies, circuit breakers, transformers, rectifiers, batteries and chargers, buses, and cables.
- MW11. **Overhead Contact System Material:** material and tools necessary for routine inspection, maintenance, and repair of the overhead contact system including catenary, supports, and feeders.

- MW12. Traction Power/Overhead Contact System Contract: repair and overhaul of major traction power and overhead contact components (i.e., transformers, rectifiers, circuit breakers, contact wire, etc.) under outside contracts.
- MW13. Building/Facility Material: material and tools associated with routine inspection, maintenance, and repair of stations, maintenance facilities (excluding shop equipment) central control facility, and other LRT structures including HVAC, electrical, mechanical, structural, irrigation, and drainage.
- MW14. Elevator/Escalator Contract: inspection, maintenance, and repairs of all LRT elevators and escalators under outside contracts.
- MW15. Station/Building Janitorial Contract: janitorial services for stations, administrative offices, shops, and the Central Control Facility.
- MW16. Landscaping/Grounds Contract: contract services for the maintenance of landscaping at stations, central control, maintenance facilities, and along the right-of-way as well as restriping and sweeping of station parking lots.
- MW17. Building Maintenance Contract: maintenance and repair of stations, maintenance facilities, Central Control Facility, and other LRT structures under outside contracts or SCRTD interdepartmental work orders. Included in this cost element are HVAC, relamping, painting, redecorating, paving, plumbing, fire protection equipment servicing, and pest control activities.
- MW18. Maintenance Vehicle Material: material and tools utilized for inspection and minor maintenance and repair of nonrevenue maintenance vehicles including pickups, vans, specialized vehicles and rail-borne equipment.

- MW19. **Maintenance Vehicle Contract:** outside contract or SCRTD interdepartmental work order services for routine servicing, maintenance, and repair of nonrevenue automotive and maintenance vehicles. Services include tune-up, brake, air conditioning, tires, exhaust, motor overhaul, body repair, specialized equipment (hi-rail, utility bodies, cranes, etc.), and other such components.
- MW20. **Shop Equipment Material:** material, parts, and tools necessary for inspection, servicing and minor maintenance and repair of shop equipment including cranes, hoists, wheel truing machine, vehicle washer, compressors, test equipment, and other fixed and portable equipment.
- MW21. **Shop Equipment Contract:** outside contract services for maintenance and repair of fixed and portable shop equipment including equipment calibration and certification.
- MW22. **Corrosion Control Contract:** outside contract services for monitoring and testing associated with corrosion control.
- MW23. **Miscellaneous Supplies and Services:** supplies and services associated with management and administration activities for the maintenance-of-way function.

### 3.2.5 Security

- SE1. **Miscellaneous Supplies and Services:** supplies and services associated with security and fare inspection activities.

### 3.2.6 Utilities

- UT1. **Light, Heat and Power:** electricity and gas associated with the operation of stations, maintenance facilities, Central Control Facility, and other LRT facilities exclusive of traction power.

- UT2. Water: Water and sewer services necessary for LRT operations and facilities.
- UT3. Trash Removal: services associated with the removal and disposal of trash and scrap resulting from LRT operations and maintenance.
- UT4. Telephone: telephone service provided by local telephone companies necessary for LRT operations and maintenance exclusive of the LRT communications system.
- UT5. Waste Disposal: services associated with the collection and proper disposal of contaminants generated from maintenance activities.

3.2.7 Other

- OT1. Fare media: purchase of various fare media for LRT system operations.
- OT2. Fuel and Lubricants: diesel fuel, unleaded gasoline, oils, greases, etc. necessary for LRT operations and maintenance activities.
- OT3. Miscellaneous Supplies and Services: general supplies and services for overall LRT administration of operations, maintenance, and security. Includes such items as office machines and supplies, drafting supplies, graphics and printing, fees, rentals, training materials, travel, postage, etc.
- OT4. Claims/Legal Expense: legal fees, claim settlements, and other such expenses. Based upon 25% of train operator labor cost as derived from SCRTD statistics.
- TP1. Traction Power: vehicle traction power for train operations.

#### 4. O&M COST ESTIMATE

This section presents the annual O&M cost estimates for the design year LB-LA LRT system and for the combined LB-LA and Century LRT Lines.

##### 4.1 LB-LA LINE

The annual O&M costs for the design year LB-LA LRT system are estimated to be \$20.07 million including personnel requirements totaling 330 positions.

A summary of the O&M cost estimate for the LB-LA Line is shown in Table 5A. Detailed labor costs for each of the four major functions are shown in Tables 6A through 9A. Detailed nonlabor costs for the LB-LA Line are shown in Table 10A, sheets 1 and 2. The LB-LA Line O&M costs are also shown graphically on Figures 1A through 3A.

##### 4.2 LB-LA AND CENTURY LINES

The annual O&M costs for the design year combined LB-LA and Century Lines are estimated to be \$28.09 million including personnel requirements totaling 434 positions.

A summary of the O&M cost estimate for the LB-LA and Century Lines is shown in Table 5B. Detailed labor costs for each of the four major functions for both lines are shown in Tables 6B through 9B. Detailed nonlabor costs for the combined LB-LA and Century Lines are shown in Table 10B, sheets 1 and 2. The combined O&M costs are also shown graphically on Figures 1B through 3B.

TABLE 5A

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA O &amp; M COST ESTIMATE SUMMARY

DESIGN YEAR 2000

	PERSONNEL COUNT	ANNUAL COST (INCL FRINGE)	PER CENT DISTRIB	LABORX DIST
DIRECT LABOR				
TRANSPORTATION	102	\$4,174,863	20.80	30.60
VEHICLE MAINTENANCE	90	\$3,747,879	18.67	27.47
MAINTENANCE OF WAY	56	\$2,391,156	11.91	17.53
SECURITY	82	\$3,061,268	15.25	22.44
SUB TOTAL	330	\$13,375,168	66.64	
OVERTIME ALLOWANCE		267,503	1.33	1.96
GENERAL & ADMIN	%= 0.005	66,876	0.33	
NON LABOR		\$2,360,229	11.76	
TRACTION POWER		\$3,500,000	17.44	
CONTINGENCY		500,000	2.49	
GRAND TOTAL		\$20,069,775	100.00	100.00



TABLE 5B

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA &amp; CENTURY O &amp; M COST ESTIMATE SUMMARY

DESIGN YEAR 2000

	PERSONNEL COUNT	ANNUAL COST (INCL FRINGE)	PER CENT DISTRIB	LABORX DIST
DIRECT LABOR				
TRANSPORTATION	148	\$5,993,820	21.34	33.37
VEHICLE MAINTENANCE	106	\$4,431,213	15.77	24.67
MAINTENANCE OF WAY	62	\$2,696,719	9.60	15.01
SECURITY	118	\$4,490,058	15.98	24.99
SUB TOTAL	434	\$17,611,810	62.69	
OVERTIME ALLOWANCE		352,236	1.25	1.96
GENERAL & ADMIN	X= 0.005	88,059	0.31	
NON LABOR		\$3,639,887	12.96	
TRACTION POWER		\$5,900,000	21.00	
CONTINGENCY		500,000	1.78	
GRAND TOTAL		\$28,091,993	100.00	100.00

TABLE 6A

OPERATIONS AND MAINTENANCE COST ESTIMATE  
 LB-LA TRANSPORTATION LABOR COSTS  
 DESIGN YEAR 2000

JOB CLASS	EQUIV STAFF	HOUR RATE	ANNUAL COST
<b>ADMINISTRATION:</b>			
SUPERINTENDENT /PT	0.5	27.50	28,600
SECRETARY/ PT	0.5	10.00	10,400
MANAGER	1	25.00	52,000
SCTY/CLERK	1	10.00	20,800
<b>TRAIN OPERATIONS:</b>			
T.O.SUPERVISOR I	8	18.00	299,520
T.O.S. TRAINING INSTR	2	18.00	74,880
T.O.S.DIV DISPATCHER	5	18.00	187,200
TRAIN OPERATORS	51	13.07	1,386,466
TRAIN OPERATORS	10	13.07	271,856
<b>CENTRAL CONTROL:</b>			
SUPERVISOR	3	20.00	124,800
CENTRAL DISPATCHER	11	18.00	411,840
CCTV OBSERVER	8	11.85	197,184
SCTY/CLERK	1	10.00	20,800

SUBTOTAL: \$3,047,346

FRINGE: \$1,127,518

TOTAL: 102 \$4,174,863

TABLE 6B

OPERATIONS AND MAINTENANCE COST ESTIMATE  
 LB-LA & CENTURY TRANSPORTATION LABOR COSTS  
 DESIGN YEAR 2000

JOB CLASS	EQUIV STAFF	HOUR RATE	ANNUAL COST
<b>ADMINISTRATION:</b>			
SUPERINTENDENT /PT	0.5	27.50	28,600
SECRETARY/ PT	0.5	10.00	10,400
MANAGER	1	25.00	52,000
SCTY/CLERK	1	10.00	20,800
<b>TRAIN OPERATIONS:</b>			
T.O. SUPERVISOR I	16	18.00	599,040
T.O.S. TRAINING INSTR	2	18.00	74,880
T.O.S. DIV DISPATCHER	5	18.00	187,200
TRAIN OPERATORS	71	13.07	1,930,178
TRAIN OPERATORS	16	13.07	434,970
<b>CENTRAL CONTROL:</b>			
SUPERVISOR	3	20.00	124,800
CENTRAL DISPATCHER	13	18.00	486,720
CCTV OBSERVER	18	11.85	443,664
SCTY/CLERK	1	10.00	20,800
<b>SUBTOTAL:</b>			<b>\$4,375,051</b>
<b>FRINGE:</b>			<b>\$1,618,769</b>
<b>TOTAL:</b>	<b>148</b>		<b>\$5,993,820</b>

TABLE 7A

OPERATIONS AND MAINTENANCE COST ESTIMATE

LB-LA VEHICLE MAINTENANCE LABOR COSTS

DESIGN YEAR 2000

JOB CLASS	EQUIV. STAFF	HOUR RATE	ANNUAL COST
SUPERINTENDENT /PT	0.5	27.50	28,600
SECRETARY /PT	0.5	10.00	10,400
MANAGER	1	25.00	52,000
SCTY/CLERK	5	10.00	104,000
SCTY/CLERK	1	10.00	20,800
VEHICLE ENGINEER	1	20.00	41,600
QUALITY INSPECTOR	3	16.60	103,584
INSTRUCTOR, MAINT	1	16.00	33,280
MAINT PLANNER	1	15.77	32,802
WTY/FAIL ANALYST	1	15.77	32,802
STOCK SHOP CLERK	5	13.00	135,200
STOCK SHOP CLERK	1	13.00	27,040
SENIOR SUPERVISOR	1	18.00	37,440
SUPERVISOR, S&I	5	16.00	166,400
SUPERVISOR, HVY/COMP	1	16.00	33,280
VEHICLE MAINT, S&I	10	15.77	328,016
VEHICLE MAINT, HEAVY	6	15.77	196,810
VEHICLE MAINT, COMP	7	15.77	229,611
VEHICLE TECH, S&I	10	15.47	321,776
VEHICLE TECH, HEAVY	5	15.47	160,888
VEHICLE TECH, COMP	6	15.47	193,066
VEHICLE CLEANER	14	11.92	347,110
VEHICLE CLEANER	4	11.92	99,174

SUBTOTAL:			\$2,735,678
FRINGE:			\$1,012,201
TOTAL:	90		\$3,747,879

TABLE 7B

OPERATIONS AND MAINTENANCE COST ESTIMATE  
 LB-LA & CENTURY VEHICLE MAINTENANCE LABOR COSTS  
 DESIGN YEAR 2000

JOB CLASS	EQUIV STAFF	HOUR RATE	ANNUAL COST
SUPERINTENDENT /PT	0.5	27.50	28,600
SECRETARY /PT	0.5	10.00	10,400
MANAGER	1	25.00	52,000
SCTY/CLERK	5	10.00	104,000
SCTY/CLERK	1	10.00	20,800
VEHICLE ENGINEER	1	20.00	41,600
QUALITY INSPECTOR	3	16.60	103,584
INSTRUCTOR, MAINT	1	16.00	33,280
MAINTENANCE PLANNER	1	15.77	32,802
WTY/FAIL ANALYST	1	15.77	32,802
STOCK SHOP CLERK	5	13.00	135,200
STOCK SHOP CLERK	1	13.00	27,040
SENIOR SUPERVISOR	1	18.00	37,440
SUPERVISOR, S&I	6	16.00	199,680
SUPERVISOR, HVY/COMP	1	16.00	33,280
VEHICLE MAINT, S&I	16	15.77	524,826
VEHICLE MAINT, HEAVY	8	15.77	262,413
VEHICLE MAINT, COMP	7	15.77	229,611
VEHICLE TECH, S&I	13	15.47	418,309
VEHICLE TECH, HEAVY	5	15.47	160,888
VEHICLE TECH, COMP	7	15.47	225,243
VEHICLE CLEANER	16	11.92	396,698
VEHICLE CLEANER	5	11.92	123,968
			\$3,234,462
SUBTOTAL:			\$1,196,751
FRINGE:			
TOTAL:	106		\$4,431,213

TABLE 8A

OPERATIONS AND MAINTENANCE COST ESTIMATE

LB-LA MAINTENANCE-OF-WAY LABOR COSTS

DESIGN YEAR 2000

JOB CLASS	EQUIV STAFF	HOUR RATE	ANNUAL COST
SUPT /PT	0.5	27.50	28,600
SECRETARY /PT	0.5	10.00	10,400
MANAGER	1	25.00	52,000
SCTY/CLERK	3	10.00	62,400
ENGINEER/ MECH-ELECT	0.5	20.00	20,800
ENGINEER CIVIL	0.5	20.00	20,800
MAINT PLANNER	1	15.77	32,802
STOCK SHOP CLERK	1	13.00	27,040
SENIOR SUPERVISOR	1	18.00	37,440
SUPERVISOR	5	16.00	166,400
TRACK WORKER	10	14.79	307,632
COMM TECH	8	15.47	257,421
COMM TECH	1	15.47	32,178
SIGNAL TECH	5	15.47	160,888
TPSS ELECT	8	15.47	257,421
FARE COLL TECH	5	15.47	160,888
BLDG & EQUIP MAINT	2	14.79	61,526
MOW SHOP REPAIR	3	14.06	87,734

SUBTOTAL: \$1,745,370

FRINGE: \$645,787

TOTAL: 56 \$2,391,156

TABLE 8B

OPERATIONS AND MAINTENANCE COST ESTIMATE  
 LB-LA & CENTURY MAINTENANCE-OF-WAY LABOR COSTS  
 DESIGN YEAR 2000

JOB CLASS	EQUIV STAFF	HOUR RATE	ANNUAL COST
SUPT /PT	0.5	27.50	28,600
SECRETARY /PT	0.5	10.00	10,400
MANAGER	1	25.00	52,000
SCTY/CLERK	3	10.00	62,400
ENGINEER/ MECH-ELECT	0.5	20.00	20,800
ENGINEER CIVIL	0.5	20.00	20,800
MAINT PLANNER	2	15.77	65,603
STOCK SHOP CLERK	1	13.00	27,040
SENIOR SUPERVISOR	1	18.00	37,440
SUPERVISOR	5	16.00	166,400
TRACK WORKER	11	14.79	338,395
COMM TECH	8	15.47	257,421
COMM TECH	1	15.47	32,178
SIGNAL TECH	5	15.47	160,888
TPSS ELECT	10	15.47	321,776
FARE COLL TECH	7	15.47	225,243
BLDG & EQUIP MAINT	3	14.79	92,290
HOW SHOP REPAIR	3	14.06	87,734

SUBTOTAL: \$1,968,408

FRINGE: \$728,311

TOTAL: 62 \$2,696,719

TABLE 9A

OPERATIONS AND MAINTAINENCE COST ESTIMATE

LB-LA SECURITY LABOR COSTS

DESIGN YEAR 2000

JOB CLASS	EQUIV STAFF	HOUR RATE	ANNUAL COST
LIEUTENANT	1	24.27	50,482
SARGENT	5	19.60	203,840
CLERK	5	10.00	104,000
FARE INSPECTOR	11	11.44	261,747
FARE INSPECTOR	2	11.44	47,590
TRANSIT POLICE	29	14.76	890,323
REVENUE AGENT	6	11.94	149,011
SECURITY GUARD	23	11.44	547,290
COURT LIAISON	1	14.76	30,701

SUBTOTAL:			\$2,234,502
FRINGE:			\$826,766
TOTAL:	82		\$3,061,268



TABLE 9B

OPERATIONS AND MAINTAINENCE COST ESTIMATE  
 LB-LA & CENTURY SECURITY LABOR COSTS  
 DESIGN YEAR 2000

JOB CLASS	EQUIV STAFF	HOUR RATE	ANNUAL COST
LIEUTANANT	1	24.27	50,482
SARGENT	8	19.60	326,144
CLERK	5	10.00	104,000
FARE INSPECTOR	18	11.44	428,314
FARE INSPECTOR	4	11.44	95,181
TRANSIT POLICE	48	14.76	1,473,638
REVENUE AGENT	10	11.94	248,352
SECURITY GUARD	24	11.44	571,085
COURT LIAISON	1	14.76	30,701

SUBTOTAL:			\$3,277,414
FRINGE:			\$1,212,643
TOTAL:	118		\$4,490,058

TABLE 10A

## OPERATIONS AND MAINTENANCE COST ESTIMATE

LB-LA NON LABOR COSTS

DESIGN YEAR 2000

REF.	DIVISION	COST
<b>TRANSPORTATION</b>		
TR1	MISC. SUPPLIES & SERVICES	20,874
	<b>SUBTOTAL:</b>	<b>\$20,874</b>
<b>VEHICLE MAINTENANCE</b>		
VH1	VEHICLE PARTS & MATERIAL	378,000
VH2	COMPONENT REPAIR CONTRACT	324,000
VH3	MISC. SUPPLIES & SERVICES	18,882
	<b>SUBTOTAL:</b>	<b>\$720,882</b>
<b>MAINTENANCE-OF-WAY</b>		
MW1	TRACK MATERIAL	34,500
MW2	RAIL GRINDING CONTRACT	23,100
MW3	RAIL INSPECTION CONTRACT	10,500
MW4	OTHER TRACK CONTRACT	138,000
MW5	SIGNAL MATERIAL	42,000
MW6	COMMUNICATIONS MATERIAL	136,500
MW7	COMPUTER MAINT. CONTRACT	112,000
MW8	OTHER COMM. EQUIP. CONTRACT	15,000
MW9	FARE EQUIP. MATERIAL	26,180
MW10	TRACTION POWER MATERIAL	10,450
MW11	OCS MATERIAL	21,000
MW12	TRACTION POWER/OCS CONTRACT	21,000
MW13	BLDG/FACILITY MATERIAL	13,000
MW14	ELEVATOR CONTRACT	29,400
MW14	ESCALATOR CONTRACT	57,600
MW15	STA/BLDG JANITORIAL CONTRACT	18,400
MW16	LANDSCAPING/GROUNDS CONTRACT	18,900
MW17	BUILDING MAINTENANCE CONTRACT	28,600
MW18	MAINT VEHICLE MATERIAL	22,200
MW19	MAINT VEHICLE CONTRACT	44,400
MW20	SHOP EQUIPMENT MATERIAL	25,500
MW21	SHOP EQUIPMENT CONTRACT	40,800
MW22	CORROSION CONTROL CONTRACT	18,900
MW23	MISC. SUPPLIES/SERVICES	11,956

TABLE 10A

	SUBTOTAL:		\$919,886
	SECURITY		
	-----		
SE1	MISC. SUPPLIES & SERVICES	15,306	
	SUBTOTAL:		\$15,306
	UTILITIES		
	-----		
UT1	LIGHT, HEAT & POWER	50,000	
UT2	WATER	12,000	
UT3	TRASH REMOVAL	10,400	
UT4	TELEPHONE	40,000	
UT5	WASTE DISPOSAL	10,000	
	SUBTOTAL:		\$122,400
	OTHER		
	-----		
OT1	FARE MEDIA	30,800	
OT2	FUEL & LUBRICANTS	55,500	
OT3	MISC. SUPPLIES & SERVICES	60,000	
OT4	CLAIMS/LEGAL EXPENSE	414,580	
	SUBTOTAL:		\$560,880
	TOTAL	\$2,360,229	\$2,360,229
	-----		
TP1	TRACTION POWER	3,500,000	
	TOTAL		\$3,500,000
	-----		

02-Jul-86 NONLAB

TABLE 10B

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA &amp; CENTURY NON LABOR COSTS

DESIGN YEAR 2000

REF.	DIVISION	COST
<b>TRANSPORTATION</b>		
TR1	MISC. SUPPLIES & SERVICES	29,969
	<b>SUBTOTAL:</b>	<b>\$29,969</b>
<b>VEHICLE MAINTENANCE</b>		
VH1	VEHICLE PARTS & MATERIAL	672,000
VH2	COMPONENT REPAIR CONTRACT	576,000
VH3	MISC. SUPPLIES & SERVICES	22,156
	<b>SUBTOTAL:</b>	<b>\$1,270,156</b>
<b>MAINTENANCE-OF-WAY</b>		
MW1	TRACK MATERIAL	60,000
MW2	RAIL GRINDING CONTRACT	41,800
MW3	RAIL INSPECTION CONTRACT	19,000
MW4	OTHER TRACK CONTRACT	240,000
MW5	SIGNAL MATERIAL	76,000
MW6	COMMUNICATIONS MATERIAL	240,500
MW7	COMPUTER MAINT. CONTRACT	112,000
MW8	OTHER COMM. EQUIP. CONTRACT	30,000
MW9	FARE EQUIP. MATERIAL	38,420
MW10	TRACTION POWER MATERIAL	19,800
MW11	OCS MATERIAL	37,000
MW12	TRACTION POWER/OCS CONTRACT	37,000
MW13	BLDG/FACILITY MATERIAL	18,000
MW14	ELEVATOR CONTRACT	71,400
MW14	ESCALATOR CONTRACT	72,000
MW15	STA/BLDG JANITORIAL CONTRACT	26,400
MW16	LANDSCAPING/GROUNDS CONTRACT	27,900
MW17	BUILDING MAINTENANCE CONTRACT	39,600
MW18	MAINT VEHICLE MATERIAL	25,800
MW19	MAINT VEHICLE CONTRACT	51,600
MW20	SHOP EQUIPMENT MATERIAL	25,500
MW21	SHOP EQUIPMENT CONTRACT	40,800
MW22	CORROSION CONTROL CONTRACT	33,300
MW23	MISC. SUPPLIES/SERVICES	13,484

TABLE 10B

	SUBTOTAL:		\$1,397,304
	SECURITY		
	-----		
SE1	MISC. SUPPLIES & SERVICES	22,450	
	SUBTOTAL:		\$22,450
	UTILITIES		
	-----		
UT1	LIGHT, HEAT & POWER	100,000	
UT2	WATER	24,000	
UT3	TRASH REMOVAL	20,800	
UT4	TELEPHONE	40,000	
UT5	WASTE DISPOSAL	15,000	
	SUBTOTAL:		\$199,800
	OTHER		
	-----		
OT1	FARE MEDIA	45,200	
OT2	FUEL & LUBRICANTS	64,500	
OT3	MISC. SUPPLIES & SERVICES	60,000	
OT4	CLAIMS/LEGAL EXPENSE	550,508	
	SUBTOTAL:		\$720,208
	TOTAL	\$3,639,887	\$3,639,887
	-----		
TP1	TRACTION POWER	5,900,000	
	TOTAL		\$5,900,000
	-----		

FIGURE 1A  
LB-LA  
LABOR & NON-LABOR DISTRIBUTION

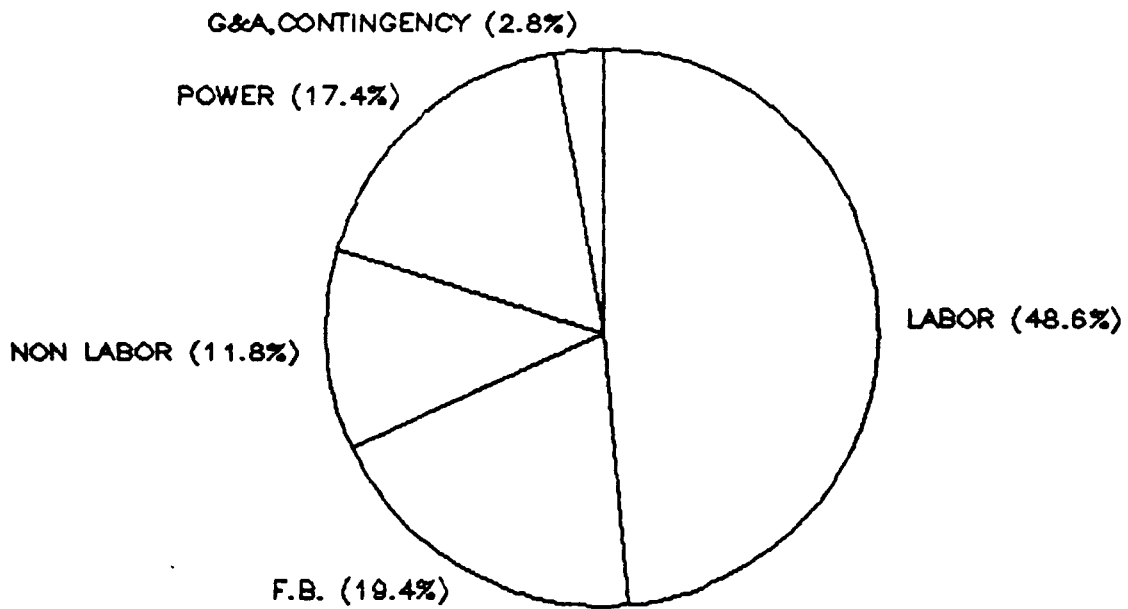


FIGURE 1B  
LB-LA & CENTURY  
LABOR & NON-LABOR DISTRIBUTION

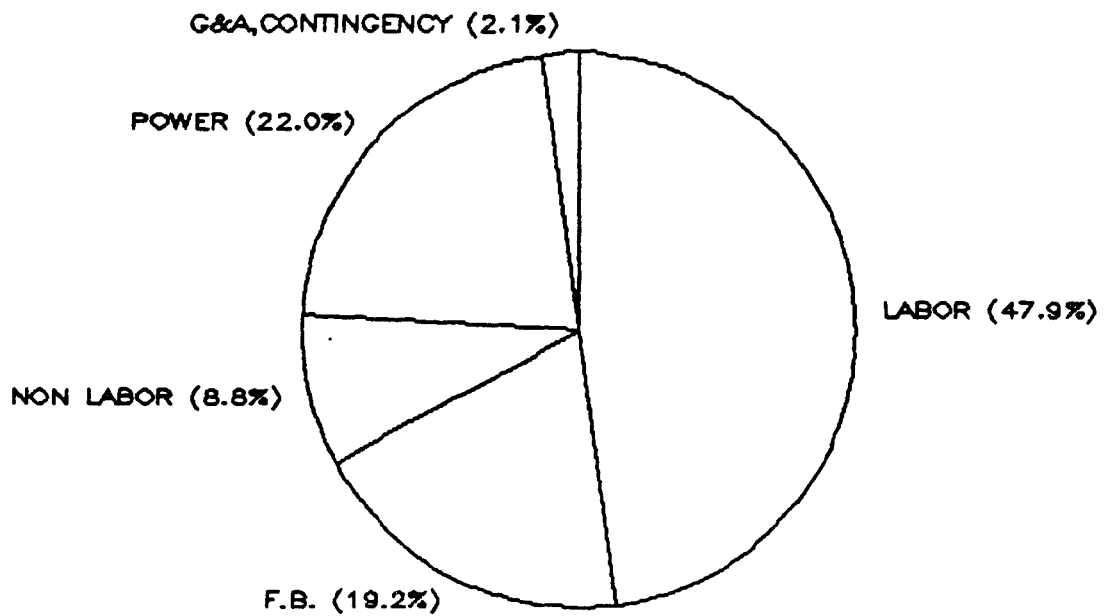


FIGURE 2A  
LB-LA  
LABOR COST BY FUNCTION

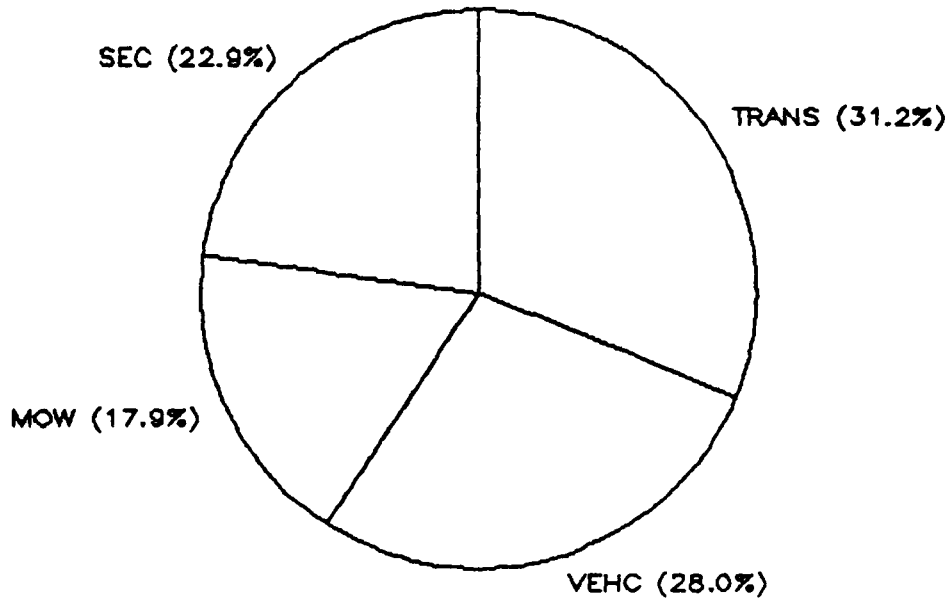


FIGURE 2B  
LB-LA & CENTURY  
LABOR COST BY FUNCTION

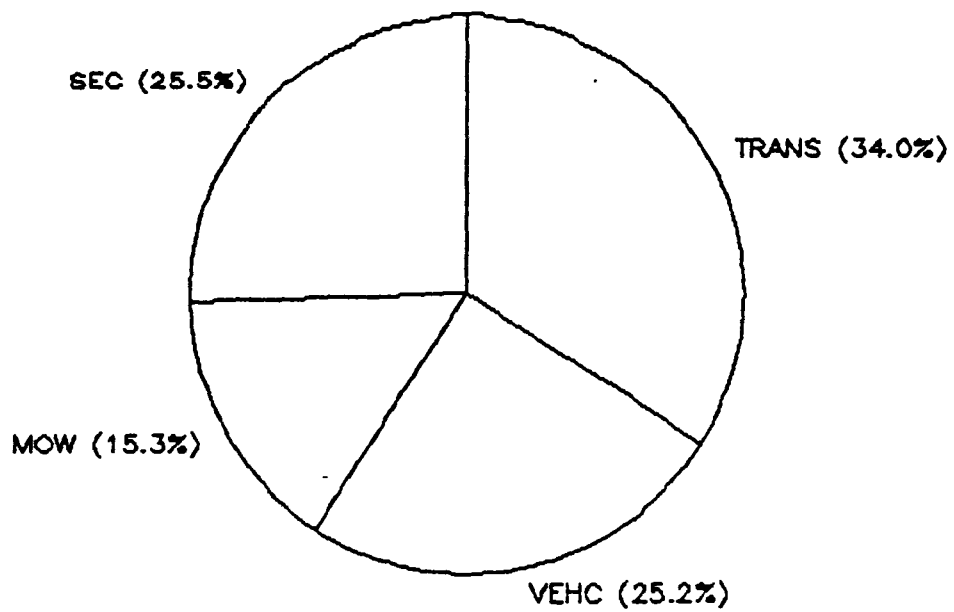


FIGURE 3A  
LB-LA  
NON-LABOR COST BY FUNCTION

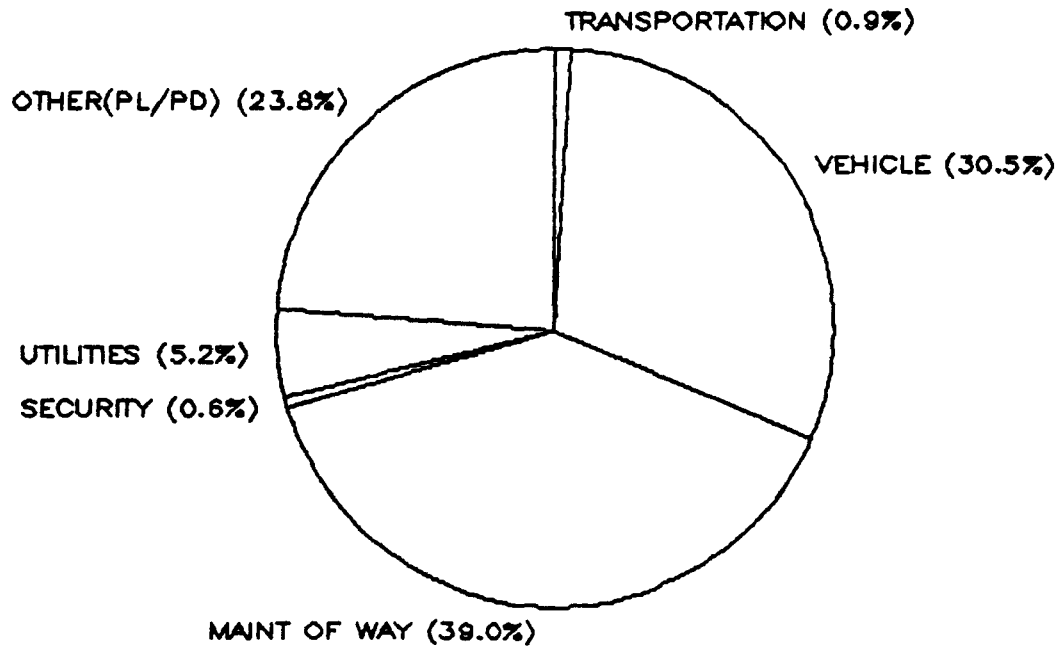
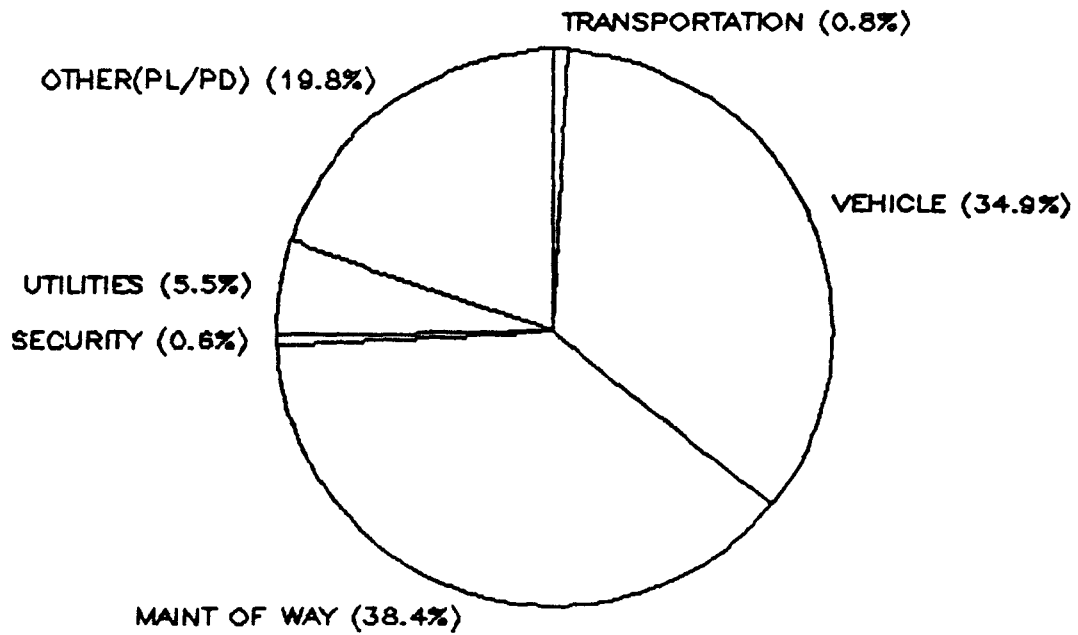


FIGURE 3B  
LB-LA & CENTURY  
NON-LABOR COST BY FUNCTION





## 5. LB-LA/CENTURY O&M COST ALLOCATION

This section presents a comparison of O&M costs between the LB-LA Line and the combined LB-LA and Century Lines, an allocation of total O&M costs between the two lines, and a statistical comparison of the combined LB-LA and Century Lines with other properties and industry aggregate statistics.

### 5.1 LB-LA AND COMBINED LB-LA AND CENTURY COMPARISON

A comparison of staffing and O&M costs between the LB-LA Line and the combined LB-LA and Century Lines is shown in Table 11. With the inclusion of the Century Line, the marginal increase in staffing is 104 positions (46 transportation, 36 security, and 22 maintenance). The marginal increase in total O&M costs is \$8.02 million, which includes \$4.32 million for labor, \$2.40 million for traction power and \$1.28 million for nonlabor. The marginal increase with Century is shown graphically for O&M costs on Figure 4 and for staffing on Figure 5.

### 5.2 LB-LA/CENTURY O&M COST ALLOCATION

The total O&M costs and staffing are allocated to each line based upon scheduled annual vehicle revenue miles. This method results in an allocation of 59% to the LB-LA Line and 41% to the Century Line. Scheduled annual vehicle revenue miles are utilized for cost and staff allocation because this statistic reflects the actual operating characteristics of each line relative to the basic factors of fleet size, headway, service hours, patronage, route miles, and trip time. A comparison of the scheduled annual vehicle revenue miles and other basic characteristics is as follows:

TABLE 11

## OPERATIONS AND MAINTENANCE COST ESTIMATE

## LB-LA AND LB-LA/CENTURY COST COMPARISON

DESIGN YEAR 2000

	STAFF	ANNUAL COST LB-LA	STAFF	ANNUAL COST LB-LA & CENT	STAFF DIFF	COST INCREASE	PER CENT INCREASE
<b>DIRECT LABOR</b>							
TRANSPORTATION	102	\$4,174,863	148	\$5,993,820	46	1,818,957	43.57
VEHICLE MAINTENANCE	90	\$3,747,879	106	\$4,431,213	16	683,334	18.23
MAINTENANCE OF WAY	56	\$2,391,156	62	\$2,696,719	6	305,563	12.78
SECURITY	82	\$3,061,268	118	\$4,490,058	36	1,428,789	46.67
<b>SUB TOTAL</b>	<b>330</b>	<b>\$13,375,168</b>	<b>434</b>	<b>\$17,611,810</b>	<b>104</b>	<b>4,236,643</b>	<b>31.68</b>
<b>OVERTIME ALLOWANCE</b>		<b>267,503</b>		<b>352,236</b>		<b>84,733</b>	<b>31.68</b>
<b>GENERAL &amp; ADMIN</b>	<b>0.005</b>	<b>66,876</b>	<b>0.005</b>	<b>88,059</b>		<b>21,183</b>	<b>31.68</b>
<b>NON LABOR</b>		<b>\$2,360,229</b>		<b>\$3,639,887</b>		<b>1,279,659</b>	<b>54.22</b>
<b>TRACTION POWER</b>		<b>\$3,500,000</b>		<b>\$5,900,000</b>		<b>2,400,000</b>	<b>68.57</b>
<b>CONTINGENCY</b>		<b>500,000</b>		<b>500,000</b>		<b>0</b>	<b>0.00</b>
<b>GRAND TOTAL</b>		<b>\$20,069,775</b>		<b>\$28,091,993</b>		<b>8,022,218</b>	<b>39.97</b>

FIGURE 4

### LB-LA & CENTURY MARGINAL COST

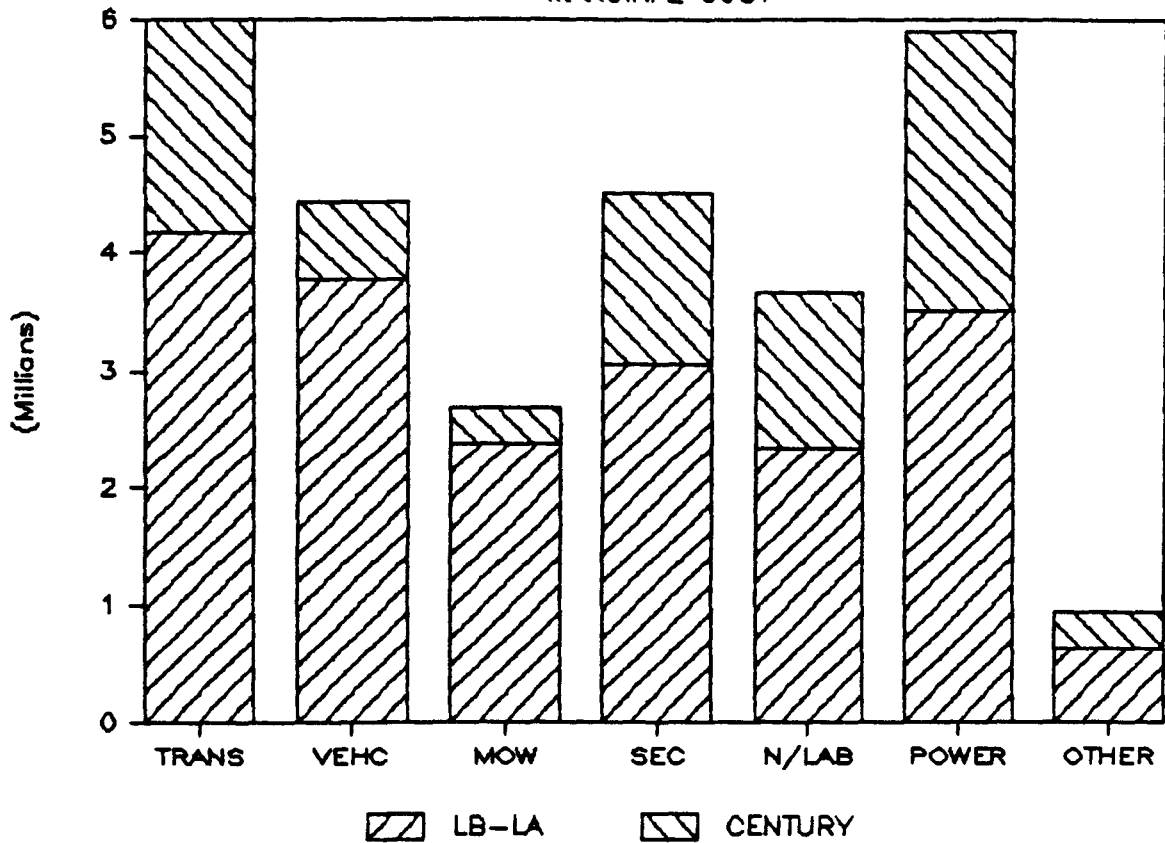


FIGURE 5

### LB-LA & CENTURY MARGINAL STAFFING

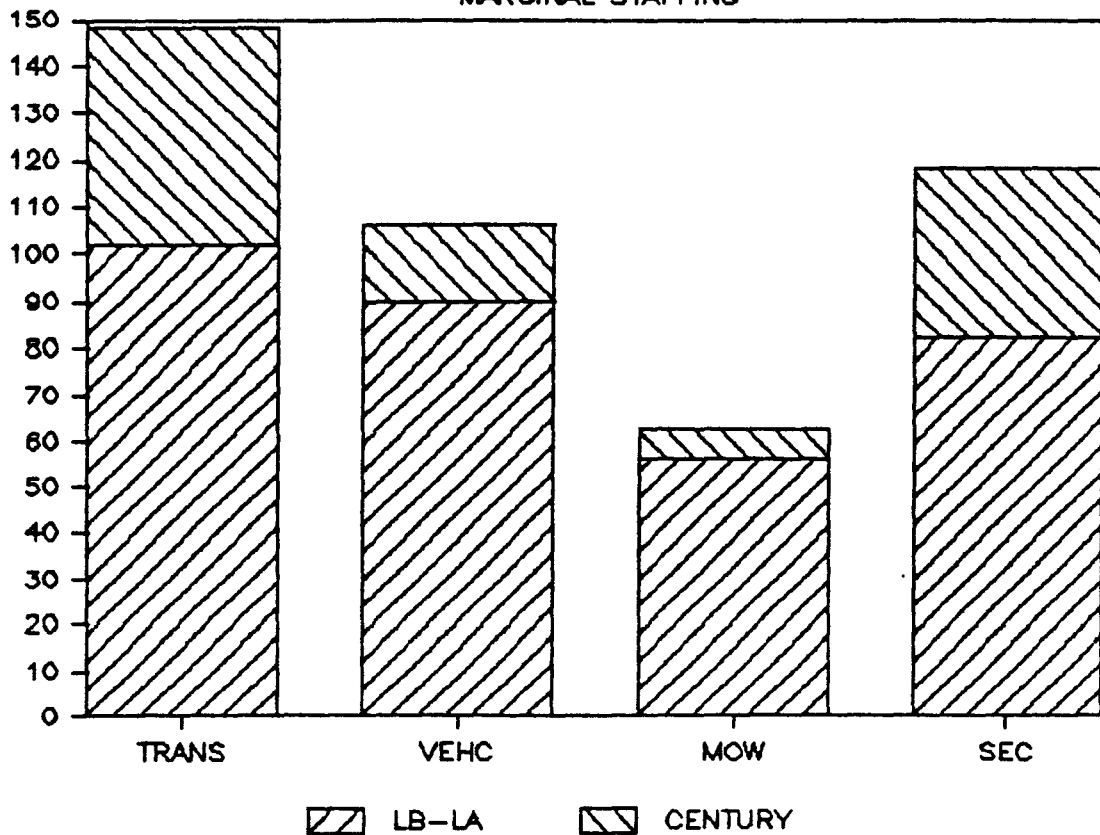


FIGURE 6

# LB-LA & CENTURY COST ALLOCATION

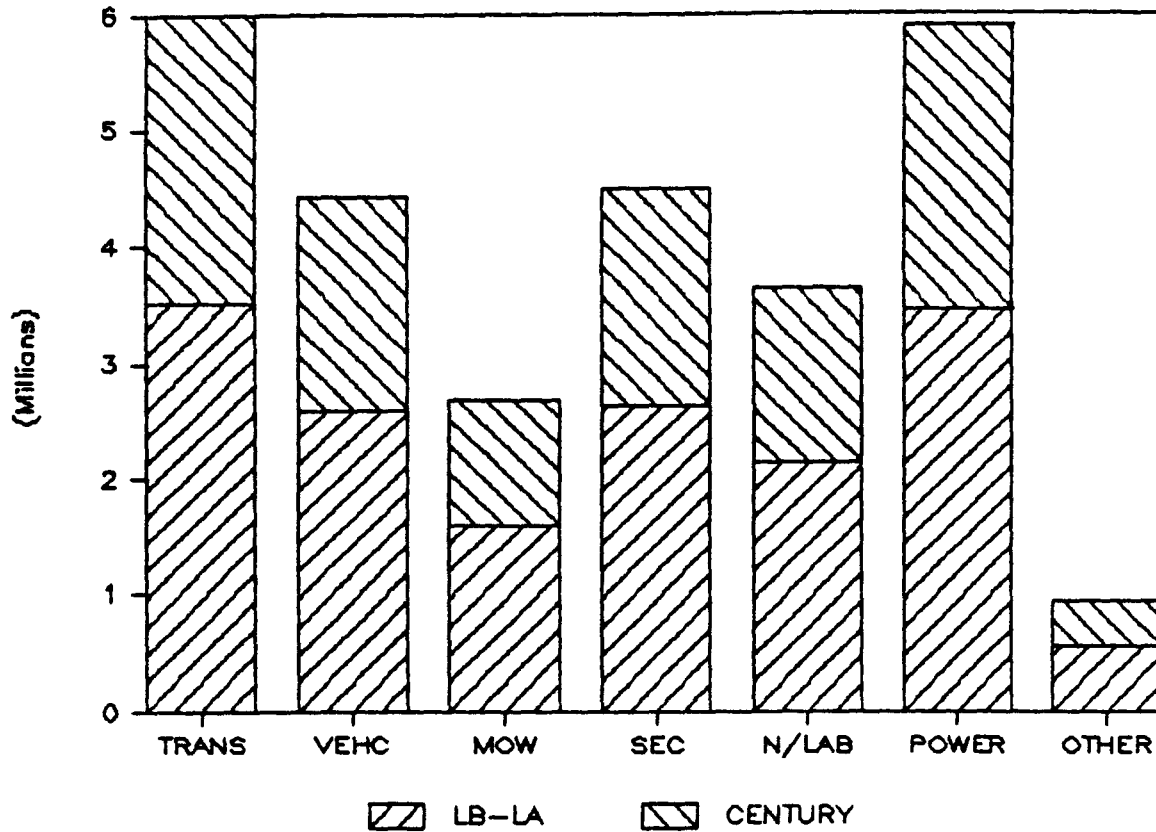
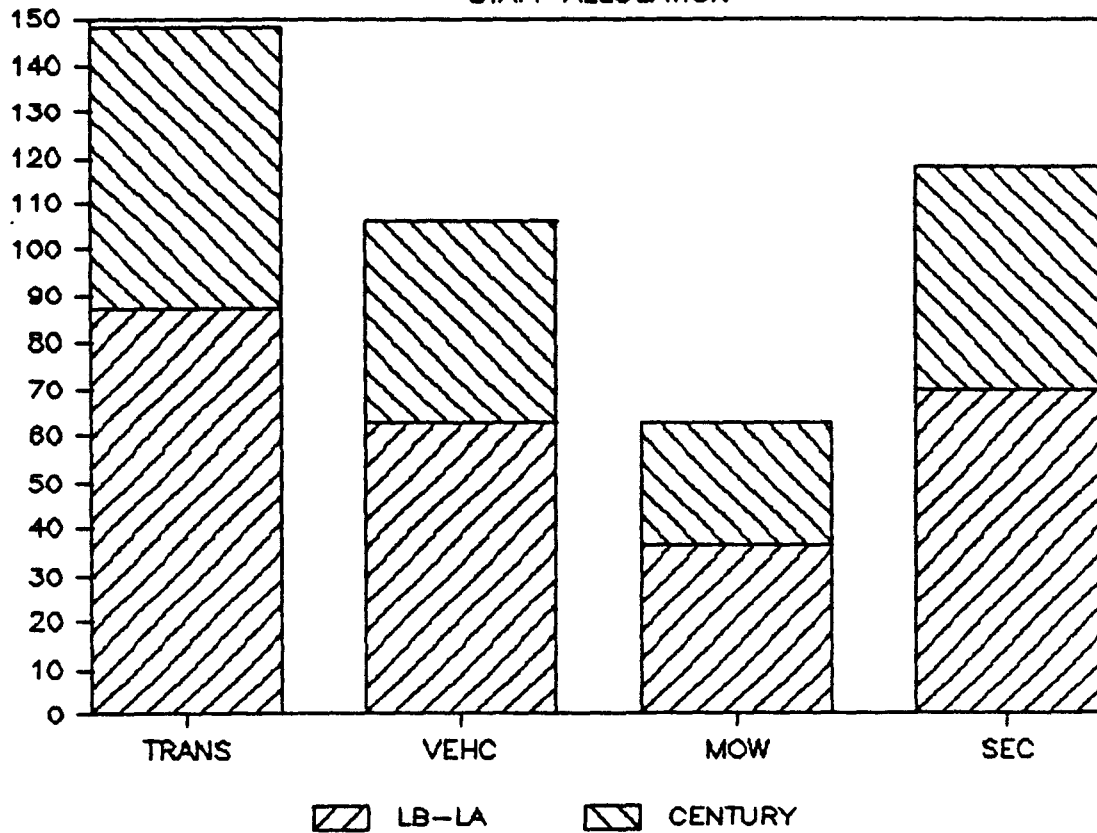


FIGURE 7

# LB-LA & CENTURY STAFF ALLOCATION



<u>Characteristic</u>	<u>LB-LA/Cent.</u>		<u>% of</u>		<u>% of</u>
	<u>Total</u>	<u>LB-LA</u>	<u>Total</u>	<u>Century</u>	
1. Scheduled Annual Vehicle Revenue Miles	5,900,000	3,480,000	59	2,420,000	41
2. Route Miles	37	21	57	16	43
3. Fleet Size	96	54	56	42	44
4. Passenger Stations	31	21	68	10	32
5. Traction Power Substations	36	19	53	17	47
6. Daily Patronage	152,000	54,700	36	97,300	64

The 59% allocation to LB-LA and the 41% allocation to Century results in the distribution of total O&M costs and staffing as follows:

	<u>LB-LA/Cent.</u>		
	<u>Total</u>	<u>LB-LA</u>	<u>Century</u>
Total Costs	\$28.09 million	\$16.57 million	\$11.52 million
Total Staffing	434	256	178

The allocation is shown graphically by major category, for total costs on Figure 6 and for total staffing on Figure 7.

### 5.3 STATISTICAL COMPARISON

The combined LB-LA and Century LRT system (with and without security personnel) is statistically compared with other appropriate properties in Table 12 and in Figures 8 and 9. While this comparison serves as a means of validating the LB-LA/Century estimates, it must be remembered that each system has unique characteristics or methodologies which make absolute comparisons impossible.

Table 12

STATISTICAL COMPARISON

LRT PROPERTY	TOTAL OPERATING EXPENSE (000)	PEAK SERVICE FLEET	ANNUAL REV VEH MILES (000)	ROUTE MILES	STAFF PER PEAK VEHICLE	COST PER REV VEH MILE (\$)
SAN FRANCISCO	29.815	82	3.941	50	11.0	7.57
BOSTON	17.564	85	1.544	59.3	8.0	11.38
CLEVELAND	7.103	28	1.054	26.2	9.4	6.74
PHILADELPHIA	37.960	163	5.559	175.9	8.0	6.83
PITTSBURGH	15.358	44	1.088	51.7	8.2	14.12
SAN DIEGO	5.928	22	1.831	21.9	5.5	3.24
LB-LA & CENTURY	28.091	64	5.900	37.3	6.8	4.76
LB-LA & CENTURY (WITHOUT SECURITY)	25.308	64	5.900	37.3	5.6	4.29

NOTE: EXCEPT FOR LB-LA & CENTURY AND SAN DIEGO, DATA DERIVED FROM NATIONAL URBAN MASS TRANSPORTATION STATISTICS, 1983 SECTION 15 ANNUAL REPORT

FIGURE 8

### COST PER REVENUE VEHICLE MILE

PROPERTY COMPARISON

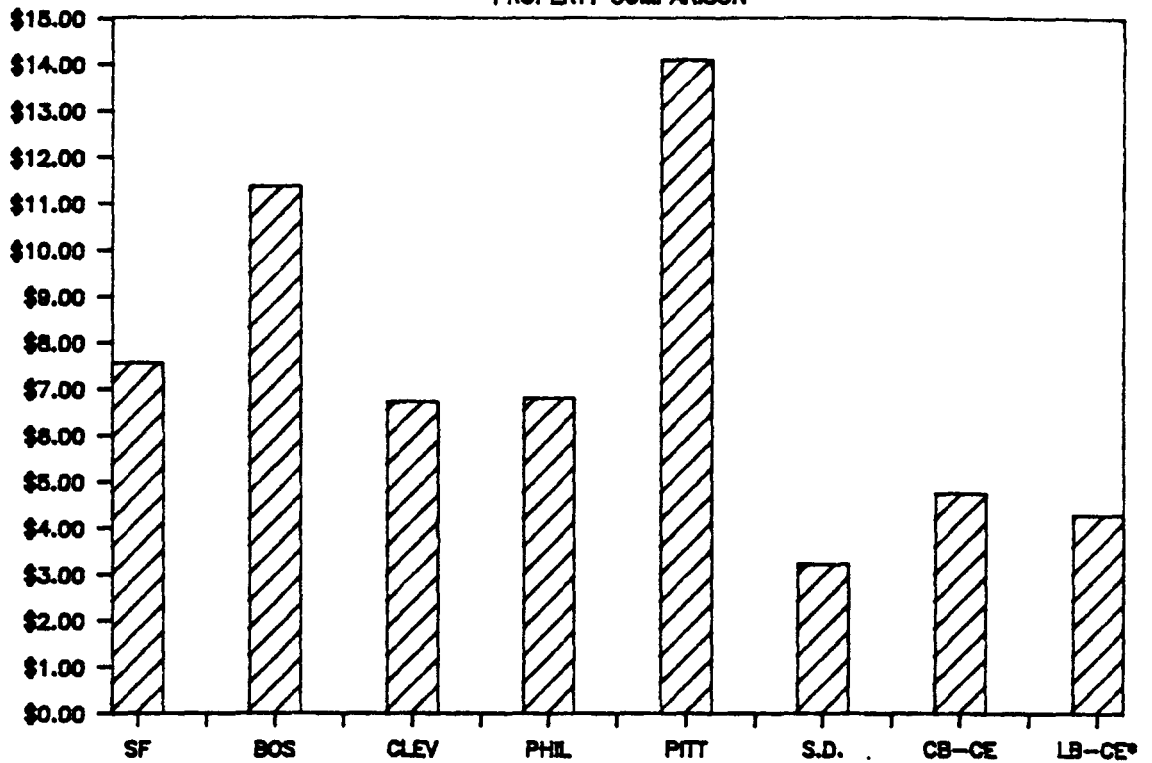
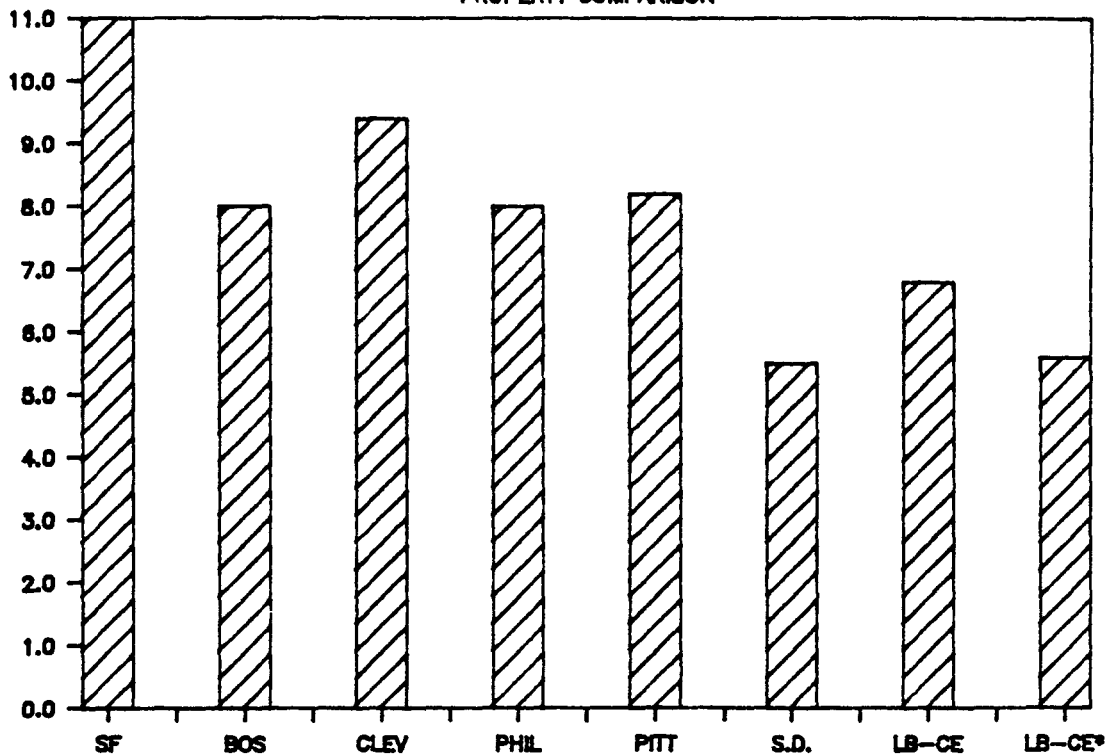


FIGURE 9

### STAFF PER PEAK SERVICE VEHICLE

PROPERTY COMPARISON



## 6. FAREBOX RECOVERY POTENTIAL

This section summarizes the design year O&M cost estimate with consideration for potential farebox recovery ratios.

### 6.1 LB-LA LINE

The Draft Environmental Impact Report (DEIR), May 1984 contained an annual O&M cost estimate of \$12.54 million in 1984 dollars for the Flower Street Subway Alternative for the LB-LA LRT Project. The percentage of farebox recovery was estimated to be 67% and was based upon a total weekday ridership of 54,700, an average fare of \$1.02 undiscounted and \$.51 discounted, and an annual revenue of \$8.37 million.

Assuming the DEIR revenue of \$8.37 million and the \$20.07 million O&M costs contained in this report, then the farebox recovery rate would be 42% rather than the 67% contained in the DEIR. The 67% farebox recovery rate would be achieved if the average discounted fare was \$.79 which would result in an annual revenue of \$13.40 million.

If the LB-LA portion of the allocated O&M costs (59% per Section 5.2) is assumed, then the allocated O&M cost of \$16.57 million would result in a farebox recovery rate of 51%. The 67% DEIR farebox recovery rate would be achieved if the average discounted fare was \$.65 which would result in an annual revenue of \$11.02 million.

The difference between the current O&M cost estimate and the previous DEIR estimate is primarily attributable to design decisions, changes which have occurred with respect to the system configuration, and increased staffing due to shift coverage requirements and inflation in labor rates and material costs including electrical power costs. Recent information from SCR TD identifies a fringe benefit rate of 37% for all personnel and an annual productive hours per employee factor of 1810. A comparison of the two estimates is presented below.



A. STAFFING:

<u>LABOR CATEGORY</u>	<u>DEIR STAFFING</u>	<u>CURRENT STAFFING</u>	<u>INCREASE</u>
Transportation	115	102	(13)
Vehicle maintenance	47	90	43
Maintenance-of-way	35	56	21
Security	<u>22</u>	<u>82</u>	<u>60</u>
Total Staffing	219	330	111

B. COSTS:

<u>ESTIMATE COST CATEGORY</u>	<u>DEIR (millions)</u>	<u>CURRENT (millions)</u>	<u>ESTIMATE INCREASE (millions)</u>
Labor cost	\$ 9.41	\$13.64	\$ 4.23
Traction power cost	\$ 1.41	\$ 3.50	\$ 2.09
Other nonlabor cost	\$ 1.72	\$ 2.36	\$ .64
General & Administrative	\$ .00	\$ .07	\$ .07
Contingency	<u>\$ .00</u>	<u>\$ .50</u>	<u>\$ .50</u>
Total	\$12.54	\$20.07	\$ 7.53

6.2 LB-LA AND CENTURY LINES

Given an estimated daily ridership of 97,300 passengers for the Century Line and an average discounted fare of \$.51, the estimated annual revenue would be \$15.38 million.

The combined LB-LA and Century LRT lines would have an estimated annual revenue of \$23.75 million and an estimated annual O&M cost of \$28.09 million. The farebox recovery rate would then be 85%.

