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Transportation Authority

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Office of
New Systems Development

9

Woodward Corridor Preliminary Engineering

FINAL SUBTASK REPORT NO'S. 84024-LRT-0303
84024-LRT-0304

BASIC RIDERSHIP/SIMULATIONS/
FEEDER BUS ANALYSIS

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Preparation of this document was financed in part through Grant Number MI-03-0086 from the U.S. Department of Transportation, Urban Mass Transportation Act of 1964, as amended, and through Grant Number G80-0842 from the Michigan Department of Transportation, Bureau of Urban and Public Transportation. The opinions, findings and conclusions expressed in this report are those of the authors and not necessarily those of the U.S. Department of Transportation, Urban Mass Transportation Administration.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

PAGE

EXECUTIVE SUMMARY

Ridership projections for Preliminary Engineering of the Woodward Linehaul Component (WLC) were developed using a modified version of the travel modelling procedures developed by SEMCOG. Two transit networks were developed and modelled:

- The Initial network which includes the WLC from Lafayette to Royal Oak stations, the Downtown People Mover (DPM) and bus and commuter rail service improvements; and

- The Baseline network which includes the DPM, bus and commuter rail service improvements.

The results of these simulations indicate the following:

- Daily ridership on the WLC in the year 2000 is estimated at 148,800 trips. The maximum load point occurs between the Mack and Grand Circus Park stations where 43,209 daily inbound passengers and 41,505 daily outbound passengers will be on-board.

- Maximum hourly ridership will occur in the afternoon peak. During the PM peak hour 18,602 riders (12.5 percent of daily) will board the WLC. The maximum load point for the PM peak hour occurs between the Mack and Grand Circus Park stations where 2,856 inbound and 7,396 outbound passengers will be on-board.

- The most common mode of arrival at WLC stations is feeder bus (53 percent of WLC passengers). Others will arrive by walking (35 percent) and auto (12 percent).

- The mode share for auto access trips is highest during the AM peak when 19 percent of WLC trips arrive by kiss/ride or park/ride modes.

BASIC RIDERSHIP SIMULATIONS/FEEDER BUS ANALYSIS

1.0 INTRODUCTION

This section describes the purpose and organization of this subtask report that was prepared for Detailed Work Orders (DWO) 3.3 and 3.4 of the Woodward Linehaul Component (WLC) Preliminary Engineering project.

1.1 PURPOSE

The purpose of this report is to provide input into station design and vehicle estimates by providing projected ridership data. This report documents the year 2000 transit ridership estimates for the Initial and Baseline transit networks. The ridership estimates for the Initial network provide design flows for use in preliminary engineering of the WLC. This report also describes the characteristics of the transit and highway networks used in preparing the ridership forecasts as well as the demographic forecasts.

The Initial network includes the WLC, the Downtown People Mover (DPM) system, commuter rail service improvements and bus service improvements within and outside the Woodward Corridor. In addition, DDOT and SEMTA bus operations are assumed to be merged in this network. The Baseline network, on the other hand, excludes the Woodward Line, but includes the DPM, commuter rail service improvements and bus service improvements within and outside the Woodward Corridor (including merged DDOT and SEMTA bus operations). The Baseline network is not an alternative to the Initial network, but is intended to serve as a reference for identifying and estimating impacts related to building the WLC.

1.2 APPROACH

The characteristics of the transit services included in the year 2000 Initial and Baseline networks were developed in conjunction with the service planning staffs of SEMTA and DDOT and were reviewed and approved for analysis purposes by the Design Flow Working Group (DFWG). A description of the DFWG's role in the development of ridership projections is presented in Appendix D. In developing transit service characteristics, emphasis was placed on identifying realistic improvements to existing transit services within and beyond the Woodward Corridor. However, the primary focus was on transit services in the Woodward Corridor.

To facilitate the evaluation of ridership projections, model results are summarized for the Detroit Central Business District (CBD), The Woodward Corridor and the remainder of the region. Figure 1-1 shows the boundaries of the Woodward corridor used in this report.

The primary source of year 2000 estimates of households, household income distributions, and employment was the Southeast Michigan Council of Government's (SEMCOG) 1980 Small Area Forecasts (SAF) as modified for long-range transportation planning.[1/] These estimates included the allocation of employment by zone within the CBD using, as control totals, SEMCOG's district employment estimates. This reallocation was agreed to by the DFWG and carried out by the Detroit Planning Department.

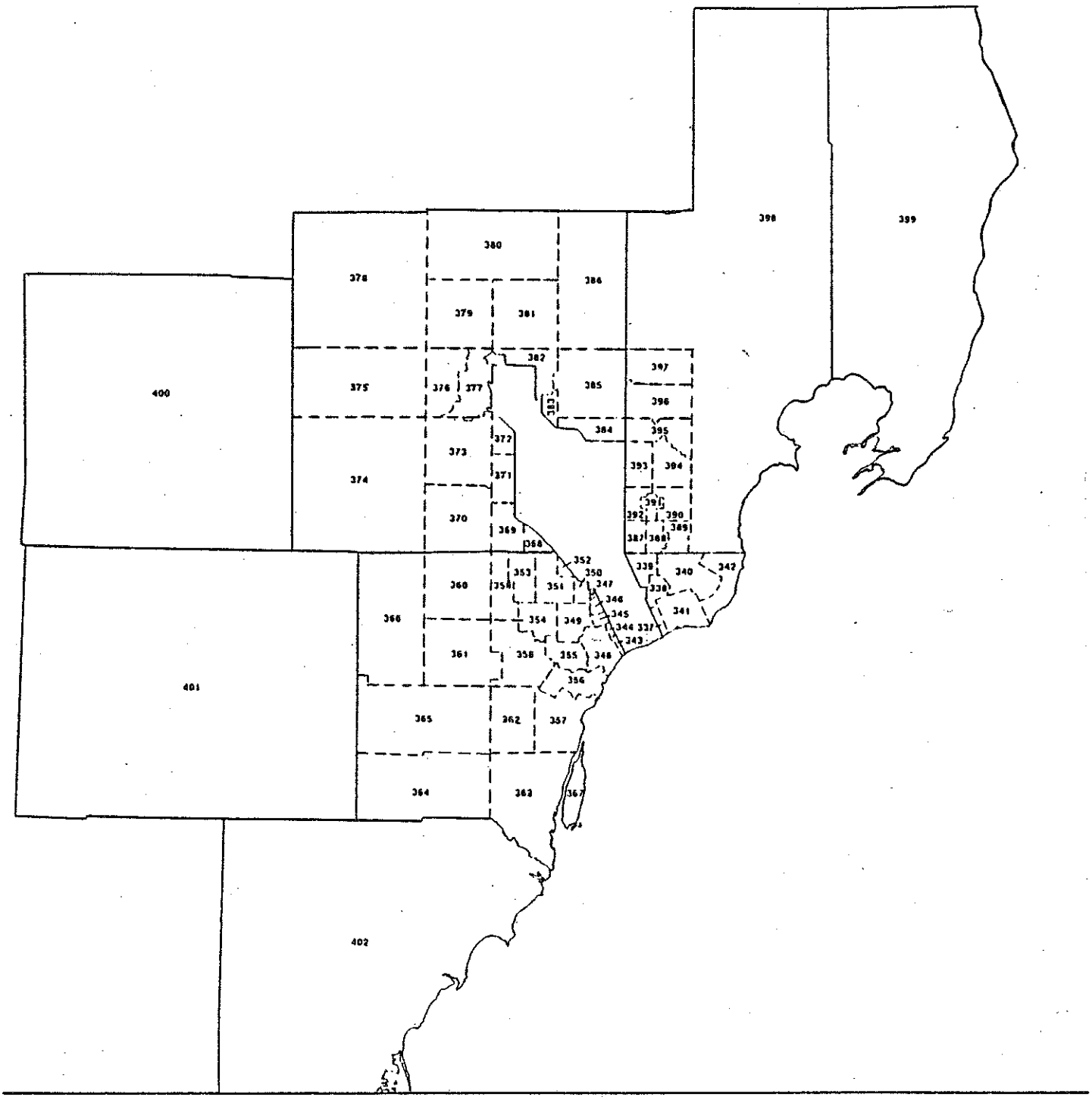
The technique used to estimate transit ridership for Baseline and Initial network simulations was SEMCOG's modal split model which was adapted to meet the analytical requirements of this project.[2/]

1/ SEMTA. Development of Demographic and Travel Data Bases for Estimating Design Flows. Subtask Report No. 82041-WLC-0301. May 1982

2/ SEMTA. Assessment, Adaptation, and Augmentation of SEMCOG Regional Model System for Estimating Design Flows. Draft Subtask Report No. 82045-WLC-0302. April 1982.

Figure 1-1

Hybrid Zone System



Source: Peat Marwick Mitchell & Company

1.3 ORGANIZATION OF REPORT

Following this Introduction, Section 2.0 describes the year 2000 transportation systems and demographic forecasts used in this analysis. The design flow projections for the Initial network, as well as for the Baseline network, are presented in Section 3.0. Finally, Section 4.0 summarizes the findings of the Baseline and Initial network simulations.

2.0 DESCRIPTION OF YEAR 2000 TRANSPORTATION SYSTEMS AND DEMOGRAPHIC FORECASTS

This section describes the characteristics of the year 2000 Initial and Baseline transit networks, the year 2000 highway network, and the year 2000 demographic forecasts used to estimate transit ridership.

2.1 BACKGROUND

This discussion explains the purpose for developing the Initial and Baseline networks and the steps followed to prepare these networks.

2.1.1 Purpose for Developing Initial and Baseline Networks

The Initial transit network represents an initial description of transit services in the southeastern Michigan region in the year 2000 assuming that WLC is implemented. The initial network includes the WLC, the DPM, commuter rail service improvements, and bus service improvements within and outside the corridor, and was developed to estimate design flows on the WLC as input to SEMTA's preliminary engineering project. This network does not include small bus paratransit services or other types of local bus services in areas far removed from the Woodward Corridor.

The Baseline transit network represents a description of transit service in the region in the year 2000 assuming that the WLC is not implemented. This network also includes the DPM, commuter rail service improvements, and bus service improvements within and outside the Woodward Corridor. The Baseline network was developed to provide a reference point for identifying and estimating impacts related to building the Woodward Line and will provide data essential to the preparation of the

environmental impact statement. It should be noted that the Baseline network is not an alternative to the WLC.

2.1.2 Steps Followed to Develop Transit Networks

The development of the transit facilities and services to be included in the Initial and Baseline networks was performed in several steps. First, a review of the existing transit systems and the following studies, plans, and on-going long-range planning efforts was performed to identify potential year 2000 transportation facilities and services for inclusion in this project:

1. Phase II Alternatives Analysis;
2. SEMCOG's long-range planning program;
3. SEMTA's transit service, park and ride, small bus, and commuter rail improvements plans;
4. Downtown People Mover (DPM) study;
5. Analyses developed for other transportation studies (e.g., I-696 study);
6. Detroit CBD parking study; and
7. Transit service changes that occurred over last 5 years.

Second, the findings of this assessment were reviewed with the service planning staffs of SEMTA and DDOT to identify possible future transit facilities and services that should be included in the year 2000 transportation systems under study. In particular, this step focused on identifying bus routings, headways, and fares for inclusion in the Baseline and Initial transit networks.

Third, the transit routes and headways from step 2, were mapped and tabulated for review by the SEMTA and DDOT service planning staff. At this point, additional refinements were made to these

networks to insure that all high priority facility and service improvements were included in the networks.

Finally, the recommendations from step 3 were presented to and approved for analysis by the DFWG.

2.2 CHARACTERISTICS OF INITIAL NETWORK

The transit facilities, services and fare policy included in the Initial network, are documented below.

2.2.1 Woodward Linehaul Components

Figure 2-1 shows the station locations and alignment of the WLC used in the Initial network.

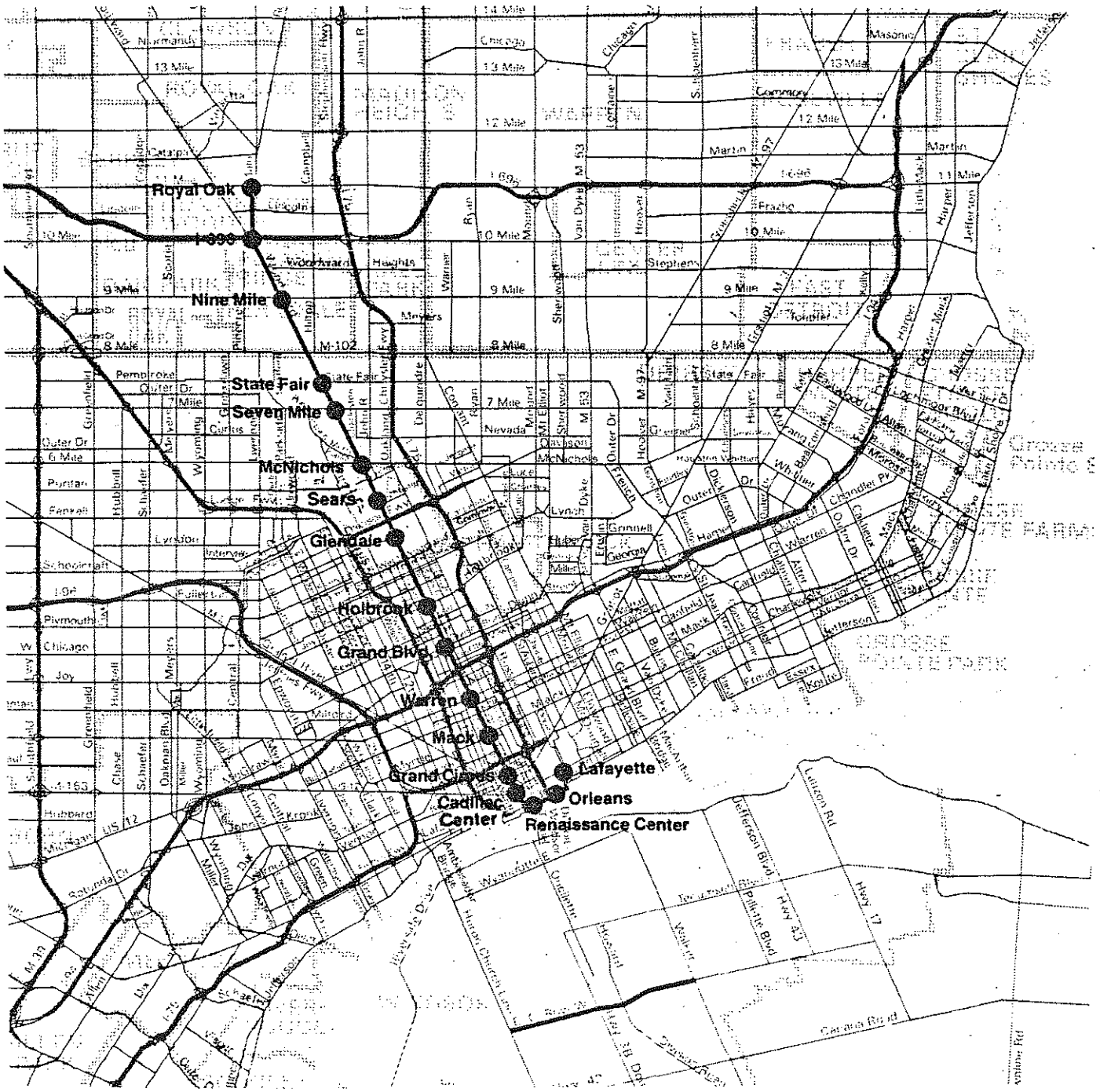
The stations at which park and ride facilities were assumed to be available are:

1. Sears
2. McNichols (Six Mile)
3. Seven Mile
4. State Fair
5. Nine Mile
6. I-696
7. Royal Oak (Eleven Mile)

The station-to-station WLC travel times used in the Initial network are shown in Table 2-1. The headway for inbound and outbound operations for the A.M. peak, off-peak, and P.M. peak periods are presented in Table 2-2. For the A.M. and P.M. peak periods, different headways will be maintained for different segments of line. As illustrated in Figure 2-2, 10 trains per hour will operate in each direction between the Lafayette and Royal Oak stations. Another five trains per hour will operate in

Figure 2-1

SEMTA Woodward Corridor
Light Rail Alignment



Source: SEMTA, 1982

TABLE 2-1
STATION-TO-STATION TRAVEL TIMES ON THE WLC

STATION	LINK TRAVEL TIME[1] (IN MINUTES)
Royal Oak	
	2.90
I-696	
	3.25
Nine Mile	
	3.49
State Fair	
	1.64
Seven Mile	
	2.33
McNichols	
	1.53
Sears	
	2.34
Glendale	
	1.85
Holbrook	
	1.70
Grand Blvd.	
	1.92
Warren	
	1.54
Mack	
	1.92
Grand Circus Park	
	1.15
Cadillac Center	
	1.82
Renaissance Center	
	1.21
Orleans	
	1.18
Lafayette	
TOTAL	31.77

Source: SEMTA
1/Includes 20 seconds of dwell time at each station.

TABLE 2-2

WLC HEADWAYS

Time Period	Line Segment	Headway (minutes) Inbound [1]	Outbound [2]
AM Peak	Royal Oak - State Fair	6	4
	State Fair - 6 Mile	4	4
	6 Mile - Renaissance	3	3
	Renaissance - Lafayette	6	6
Off Peak (9:30 a.m. to 3:30 p.m.)	Royal Oak - State Fair State Fair - 6 Mile 6 Mile - Renaissance Renaissance - Lafayette	6	6
PM Peak	Royal Oak - State Fair	6	6
	State Fair - 6 Mile	4	4
	6 Mile - Renaissance	3	3
	Renaissance - Lafayette	6	6

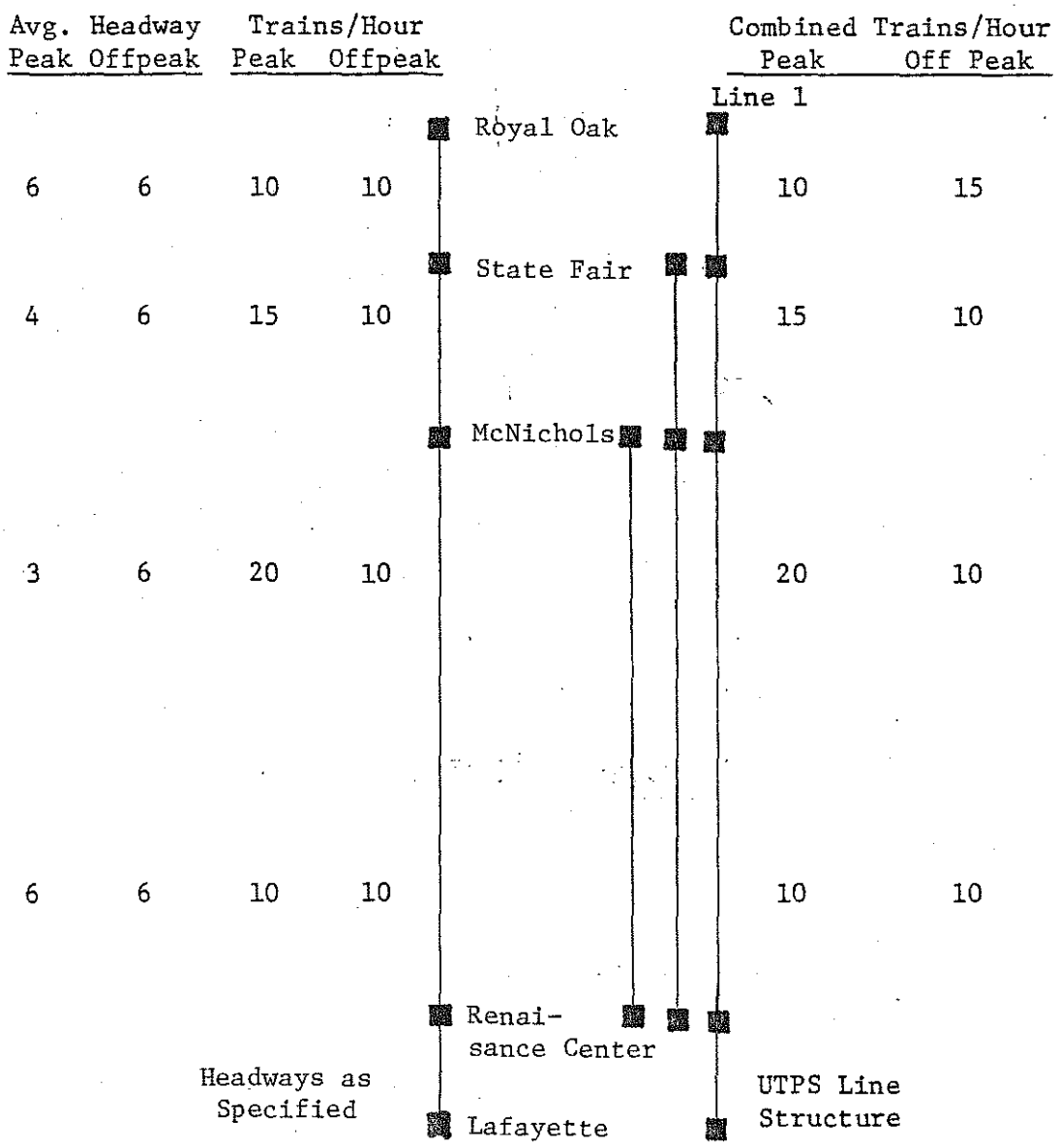
Source: SEMTA

1/ Royal Oak to Lafayette

2/ Lafayette to Royal Oak

FIGURE 2-2

REPRESENTATION OF WLC OPERATION WITH THREE UTPS LINES



Line 1: Peak Headway = 6.0 minutes
Offpeak Headway = 6.0 minutes
Trains per hour = 10

Line 2: Peak Headway = 12.0 minutes
Offpeak Headway = 0
Trains per Hour = 5

Line 3: Peak Headway = 12.0 minutes
Offpeak Headway = 0
Trains per Hour = 5

Source: Peat Marwick Mitchell & Company

each direction between the Renaissance Center and State Fair stations and an additional 5 trains per hour will operate in each direction between the Renaissance Center and 6 Mile stations.

2.2.2 Bus Service

Within the City of Detroit, several types of service changes relative to existing conditions were included in the Initial network for the year 2000:

1. Over time, DDOT plans to improve headways on existing routes to the levels that existed in 1976. Headways on each existing DDOT route in 1976 and 1981 were compared with those used in SEMTA's Phase II Alternatives Analysis. Based on this comparison, the lowest A.M. peak and base headways for each route were assumed to represent year 2000 conditions.

   On Woodward Avenue, headways on existing DDOT (i.e. Route 53) and SEMTA routes (440, 450, 460) were adjusted so that these routes were complimentary rather than competitive with the WLC. These existing routes were planned to offer a 10 minute effective headway along Woodward Avenue from the Detroit CBD to the City of Royal Oak. These routes will provide transit service to development located between stations along the Woodward line. As such, the routes will not duplicate linehaul service offered by the WLC.

2. Routings of several existing DDOT routes were revised to effectively serve WLC stations in addition to providing crosstown or radial service. These changes would not result in a decline of service to existing transit users. In some cases, an existing route would be modified (e.g., extended) to improve service within the City.

3. The routing of bus lines in the Detroit CBD was adjusted to conform to transit recommendations in the CBD Circulation study.

Outside the City of Detroit, the following bus service and related facilities were included in the year 2000 Initial network:

1. Virtually all existing SEMTA routes were included in the network using their 1981 headways for A.M. and base periods. However, the headways on routes 440, 450, and 460, in the Woodward Corridor, were adjusted to provide an effective headway of 15 minutes north of Royal Oak.

2. In the Woodward Avenue corridor, outside Detroit, many existing and proposed bus routes would serve as feeder routes to the WLC. This service strategy provides a high level of service to and from the WLC, but minimizes the operation of competitive/duplicative service.

1/ Detroit Department of Transportation and SEMTA. "Detroit CBD Transportation Analyses and Design." Detroit: September 1980.

3. Outside the corridor, new routes are included in the network to serve growing suburban areas and existing transit markets. These include both local and express routes. Many of the express routes will serve existing and proposed park and ride lots.

2.2.3 Downtown People Mover

Figure 2-3 shows the alignment and station locations of the DPM used in the Initial (and Baseline) network. Table 2-3 presents the station-to-station travel times used for DPM. The headway for DPM operations will be 120 seconds throughout the day.

2.2.4 Commuter Rail Service

Three commuter rail lines are included in the Initial (and Baseline) network: Ann Arbor - Detroit, Pontiac - Detroit and the proposed Mt. Clemens - Detroit line. Figure 2-4 presents the locations of stations on each line. Table 2-4 shows the station-to-station travel times for each line. The headways by time of day for each line are presented in Table 2-5.

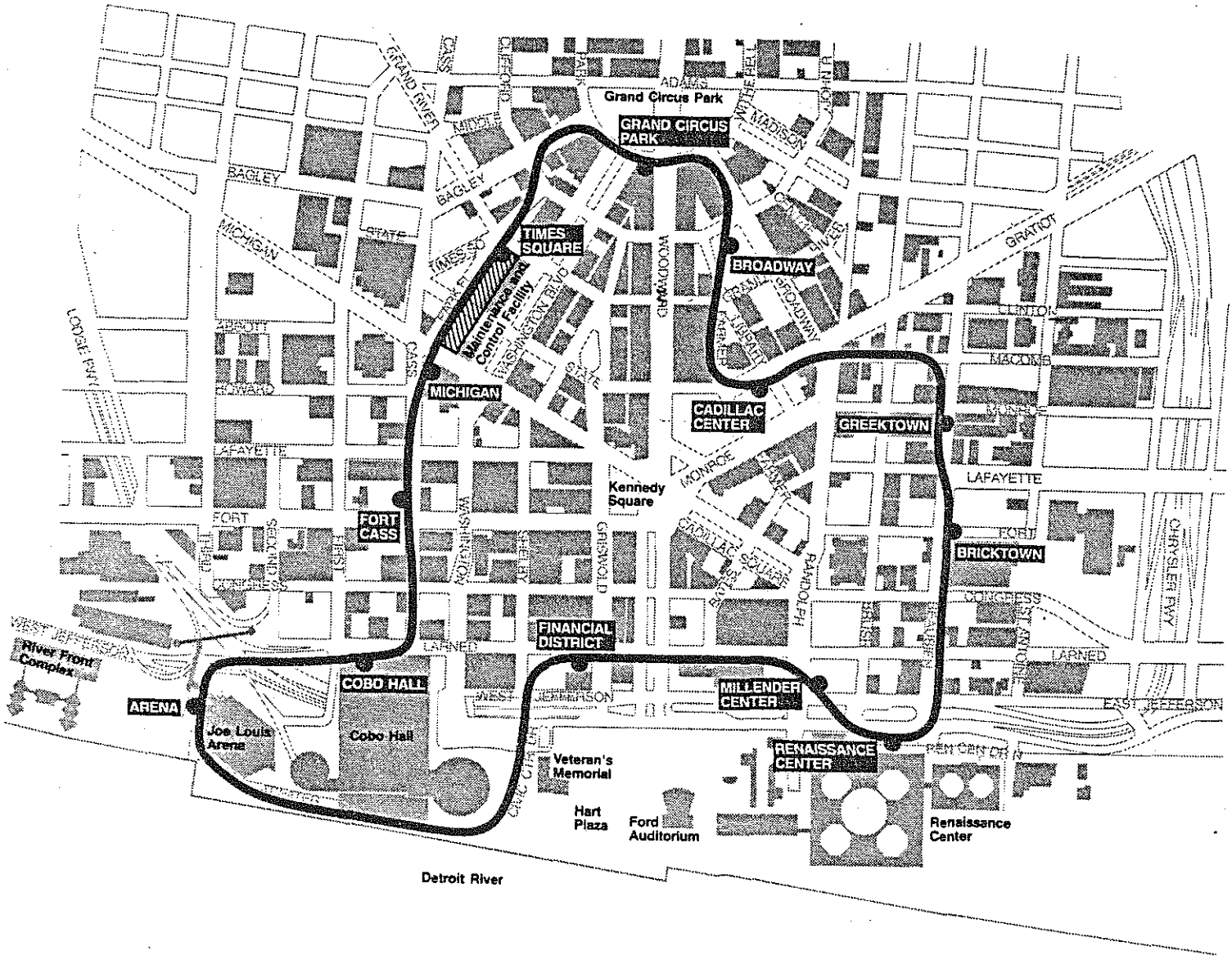
2.2.5 Fare Policy

The fare policy for the Initial network for the year 2000, was developed by SEMTA. This fare policy is summarized below:

1. General Assumptions
   - Modal base fares allow travel in two fare zones
   - Existing zone fare structure (see Figure 2-5)

Figure 2-3

Downtown People Mover Alignment



Source: SEMTA

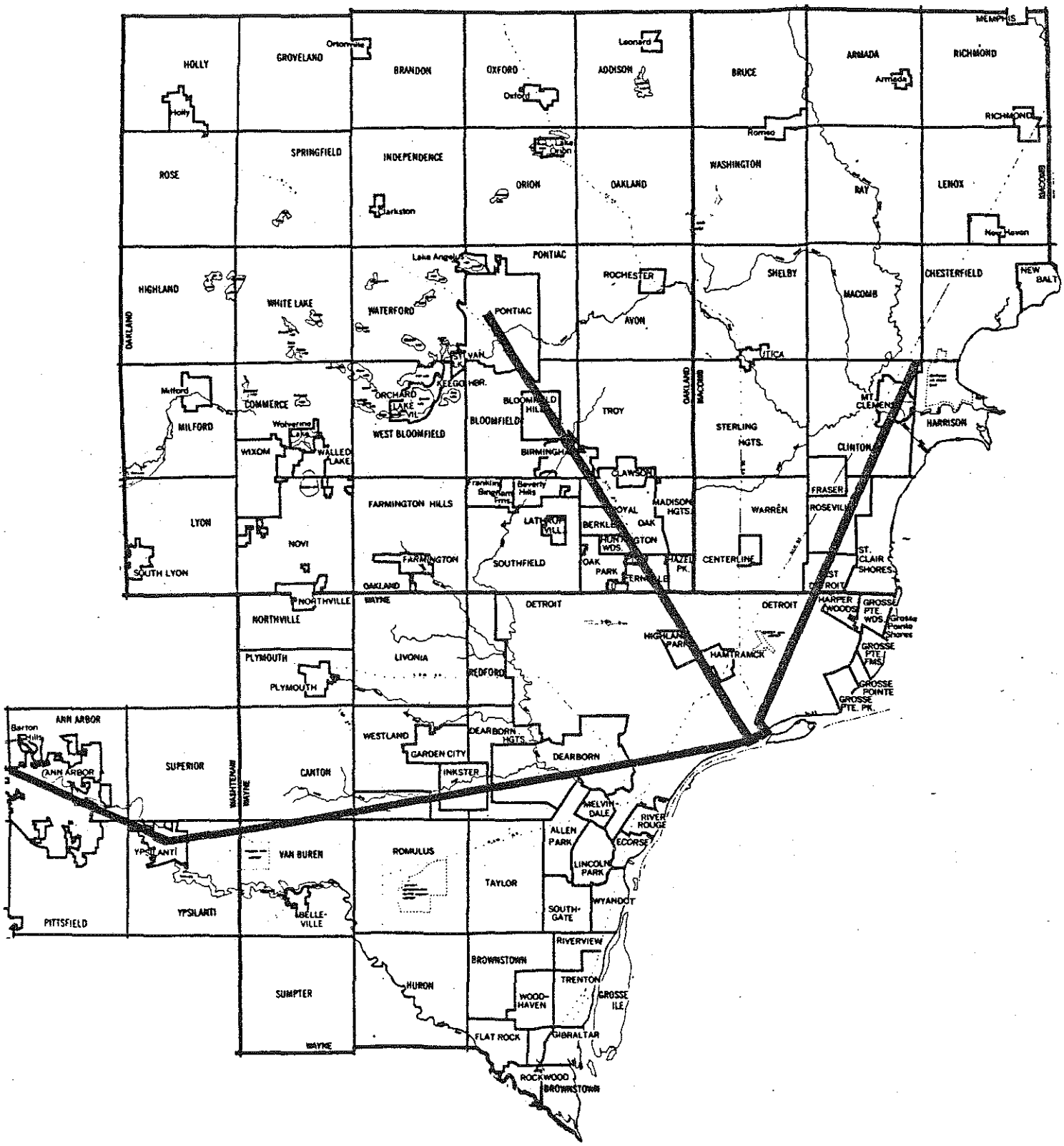
TABLE 2-3
CATS STATION-TO-STATION TRAVEL TIMES

STATION	STATION LINK TRAVEL TIME [1]
Cobo Hall	
	1.1
Arena	
	2.0
Financial District	
	1.2
Millender	
	0.9
Renaissance	
	1.1
Beaubien/Fort	
	0.9
Greektown	
	1.3
Cadillac	
	1.0
Broadway	
	0.9
Grand Circus Park	
	1.2
Times Square	
	1.0
Michigan	
	0.9
Fort/Cass	
	1.0
Cobo Hall	
TOTAL	14.9 minutes

Source: SEMTA
1/ Includes 20 seconds of dwell time at each station.

Figure 2-4

SEMTA Commuter Rail Alignment



N

Source: SEMTA
Scale: .1375" equal one mile

TABLE 2-4
COMMUTER RAIL YEAR 2000 OPERATING CONDITIONS
STATION TO STATION TRAVEL TIMES

Ann Arbor-Detroit		Pontiac-Detroit		Mt. Clemens-Detroit	
Station	Link Travel Time (Minutes)*	Station	Link Travel Time (Minutes)	Station	Link Travel Time (Minutes)
Ann Arbor	-	Pontiac	-	Hall Road	-
Dixboro	6	Bloomfield Hills	6.6	Mt. Clemens	3.8
Ypsilanti	7	Charing Cross	3.2	15 Mile	6.0
Belleville	9	Birmingham	3.9	11 Mile	8.2
Wayne	9	Royal Oak-12 Mile	5.2	8 Mile	12.9
Inkster	6	Royal Oak-11 Mile	2.9	6 Mile	4.6
Telegraph	5	Ferndale	5.0	Milwaukee Junction	11.3
Greenfield	7	Chrysler Center	5.9	Renaissance Center	13.0
Amtrak Terminal	12	Milwaukee Junction	7.5	Total	59.8
Amtrak Terminal	5	Renaissance Center	13.0		
Total	66	Total	53.2		

Source: SEMTA
* Include 1.0 minute of dwell time at each intermediate station.

TABLE 2-5

COMMUTER RAIL YEAR 2000 HEADWAYS (MINUTES)

Time Period	Ann Arbor–Detroit Inbound	Ann Arbor–Detroit Outbound	Pontiac–Detroit Inbound	Pontiac–Detroit Outbound	Mt. Clemens–Detroit Inbound	Mt. Clemens–Detroit Outbound
	[1]	[1]	[4]		[6]	
AM Peak Period	20	90	20	N.A.	20	N.A.
	[2]	[2]				
Midday	105	105	N.A.	N.A.	N.A.	N.A.
	[3]	[3]		[5]		[7]
PM Period	90	20	N.A.	20	N.A.	20

[1] Represents five trains inbound and two trains outbound during the AM peak period (7:00-9:00 AM)

[2] Represents four trains inbound and four trains outbound during the Midday period (9:00 AM-4:30 PM)

[3] Represents two trains inbound and five trains outbound during the PM peak period (4:30-7:00 PM)

[4] Represents five inbound trains per day operating during the AM peak period.

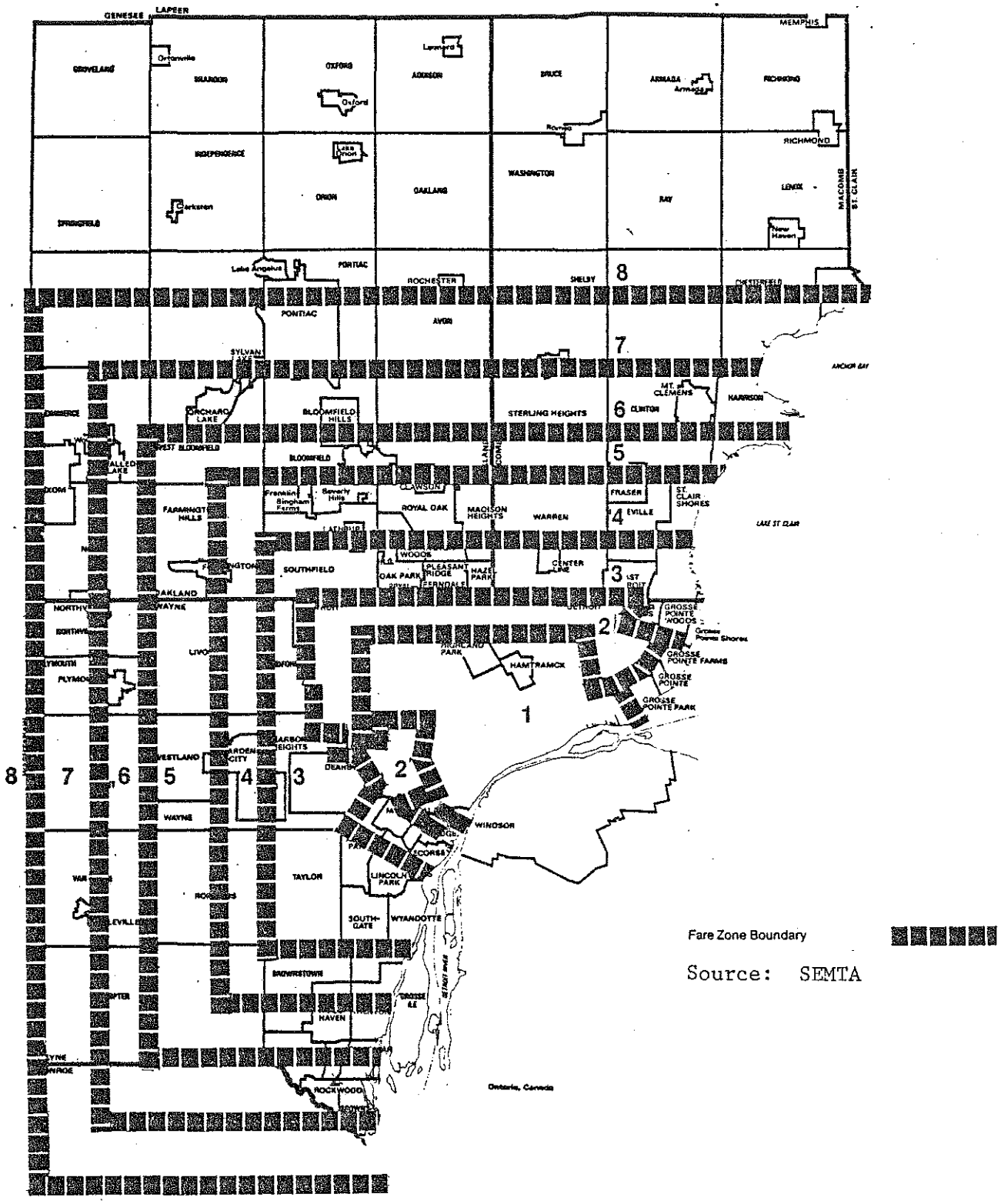
[5] Represents five outbound trains per day operating during the PM peak period.

[6] Represents three inbound trains per day operating during the AM peak period.

[7] Represents three outbound trains per day operating during the PM peak period.

Figure 2-5

SEMTA Fare Zones



percent of operating cost covered by farebox revenue.

4. Transfer Assumptions
   - Large Bus to Large Bus - $0.10 in 1982 dollars. Assumes no increase over existing transfer charge.
   - Large Bus to Light Rail and vice versa - No charge. Intent is to promote bus as feeder mode to light rail.
   - Light Rail to DPM - No charge. Intent is to promote DPM as distributor mode from light rail.
   - DPM to Light Rail - Full light rail fare charged. No discounted transfer fee assumed to travel from DPM to light rail.
   - Commuter Rail to Light Rail and vice-versa - No charge.
   - Large Bus to DPM and vice-versa - Full fare to respective modes.

2.3 CHARACTERISTICS OF BASELINE NETWORK

The transit facilities and services and fare policy included in the Baseline network are documented below.

2.3.1 Bus Service

The bus services included in the Baseline network were based on several factors, including existing DDOT and SEMTA services, planned bus service improvements in the region, and proposed services suggested by DDOT and SEMTA service planning staffs.

Within the City of Detroit, several types of service changes were included in the Baseline network for the year 2000:

1. DDOT plans to improve headways on existing routes to levels that existed in 1976. Headways on each existing DDOT route in 1976 and 1981 were compared with those used in SEMTA's Phase II Alternatives Analysis. Based on this comparison, the lowest A.M. peak and base headways for each route were assumed to represent year 2000 conditions.

2. The routing of bus lines in the Detroit CBD was adjusted to conform to the recommendations in the CBD Circulator Study.

3. Based on recommendations from DDOT service planners, selected minor route adjustments were made to DDOT routes to improve service within Detroit.

Outside the City of Detroit, the following bus service and related facilities were included in the year 2000 Baseline network:

1. Existing SEMTA routes were included in the network using their September, 1981 headways for A.M. and base periods.

2. New routes were included in the network to serve growing suburban areas and existing transit markets. These include both local and express routes. Many of the express routes will serve existing and proposed park and ride lots.

2.3.2 Downtown People Mover

The characteristics of the DPM system included in the Baseline network are the same as those described for the Initial network.

- Discount fares
  - Cost of monthly pass is equal to 32 times one-way fare
  - Can purchase 10 one-way tickets for price of nine
  - E&H patrons pay 1/2 of full fare during off peak
  - School fare will equal full adult fare minus one zone fare
- Small bus operating in fixed route, feeder mode (i.e., same as large bus) is assumed to have same fare assumptions as large bus for purpose of developing fare matrix.
- All fares are shown in constant 1982 dollars. The effect of inflation between now and the year 2000 is not explicitly taken into consideration.
- Merged SEMTA/DDOT system.

2. Base Fare Assumptions
   - Large Bus - $1.00 in 1982 dollars. Assumes an approximate increase in existing base fare of 33% to increase percent of operating cost covered by farebox revenue.
   - Light Rail - $1.00 in 1982 dollars. Same as base bus fare.
   - Commuter Rail - $1.55 in 1982 dollars. Assumes existing commuter rail base fare increased by approximately 33% to increase percent of operating cost covered by farebox revenue.

3. Zone Fare Assumptions
   - All modes - $0.25 in 1982 dollars for each additional zone travelled. Assumes an approximate increase in existing zone charges of 25% to increase

Figure 2-3 and Table 2-3 should be consulted for applicable characteristics.

2.3.3 Commuter Rail Service

The Ann Arbor - Detroit, Pontiac - Detroit, and the proposed Mt. Clemens - Detroit lines included in the Initial network are also included in this network. Figure 2-4 and Tables 2-4 and 2-5 describe the characteristics of these lines for the year 2000.

2.3.4 Fare Policy

The fare policy described in Section 2.2.5, for the Initial network, is the same for the Baseline network with the exception that fares for the WLC are not applicable to the Baseline case.

2.4 CHARACTERISTICS OF YEAR 2000 HIGHWAY NETWORK

This section describes the characteristics of the year 2000 highway network and associated parameters used in this analysis.

2.4.1 Existing and New Facilities

SEMCOG's year 2000 existing plus committed highway network (i.e., Intermediate Benchmark Scenario) was used in this assessment.[1/] This network includes highway projects that have been unconditionally approved for inclusion in the FY 1981 Annual Element of the Transportation Improvement Program (TIP) for either preliminary engineering or construction. The most significant new highway project included in this network is the completion of I-696. Proposed freeway projects, such as M-275, M-53, and M-59 were not included in this network by SEMCOG since they did not have preliminary engineering or construction funds allocated for their implementation in the FY 1981 TIP.

1/ SEMCOG. Year 2000 Transportation Plan Development. Benchmark Transportation System Network. Memo from M.M. Glusec to Executive Committee. April 24, 1981.

2.4.2 Passenger Vehicle Operating Costs

An important input to the design flow analysis is passenger vehicle operating cost per mile in the year 2000. The unit cost used in this analysis is that developed by SEMCOG for its ongoing long-range transportation planning program.[1] Table 2-6 shows SEMCOG's 1965, 1980, and year 2000 per mile operating cost estimates. The year 2000 estimate expressed in 1965 dollars is the input used in this study.

The unit costs in Table 2-6 include the cost of gasoline and oil, maintenance and repair, and tire wear and replacement. SEMCOG based future estimates of gasoline and oil prices on a National Academy of Science (NAS) study that projected an annual real rate of increase in these items of 4.3 percent between 1980 and the year 2010. Their estimate also accounted for inflation trends in other cost components, such as maintenance and tires. The NAS study also projected an average fleet fuel efficiency, in the year 2000, of 30 miles per gallon, which is almost double the 14.44 miles per gallon average fleet fuel efficiency for 1980 cited in the NAS study. This projected doubling in average fleet fuel efficiency results in a $0.447/mile operating cost (in 1965 dollars) for the year 2000, as compared to $0.421/mile (in 1965 dollars) for 1980.

1/ SEMCOG. Council of Regional Development (CORD) Agenda Item #IV-C - Year 2000 Transportation Plan Development - Travel Forecasting Assumptions. CORD Meeting Date: April 8, 1981. Memo dated March 31, 1981. Page 76.

TABLE 2-6

PASSENGER VEHICLE OPERATING COST ASSUMPTIONS

PER-MILE PASSENGER VEHICLE OPERATING COST PROJECTION

	1965 Cost	1980 Cost		Year 2000 Cost Estimate		
	1965 $	1980 $	1965 $	2000 $	1980 $	1965 $
Gas & Oil	$0.0258	$0.0900	$0.0329	$0.4209	$0.1005	$0.0367
Maintenance	0.0068	0.0175	0.0064	0.0751	0.0179	0.0065
Tires	0.0044	0.0078	0.0028	0.0172	0.0041	0.0015
Total	$ 0.0370	$0.1153	$0.0421	$0.5132	$0.1225	$0.0447

Source: SEMCOG.

2.4.3 Parking Costs and Supply

As described in the DWO 3.1 Subtask Report "Development of Demographic and Travel Data for Estimating Design Flows" SEMCOG's Regional Parking Supply Study[1] is the source of regional parking cost input data for this analysis. This study included an inventory of 1980 parking costs and capacities at 55 major activity centers in Southeastern Michgian. This information is used by SEMCOG for its long-range (year 2000) transportation planning effort assuming that the cost of parking will rise at the same rate as inflation.

1/ Southeastern Michigan Council of Governments. "Regional Parking Supply Inventory and Costs." Detroit: June 1980

Appendix A presents the average daily parking cost and average hourly parking cost for 1980 by SEMCOG zone, expressed in dollars.

2.5 DEMOGRAPHIC FORECASTS

As described in the DWO 3.1 final report, SEMCOG's 1980 (Modified) Small Area Forecasts were used for estimating year 2000 design flows. This forecast was selected because:

1. It contains the necessary demographic data.
2. Projections to the year 2000 are available.
3. It is the most recent forecast available for the Southeast Michigan region.
4. It is the forecast used by the MPO for long-range transportation planning.

Table 2-7 summarizes the households and employment for selected subareas in the region for the year 2000.

TABLE 2-7

YEAR 2000 HOUSEHOLDS AND EMPLOYMENT FORECASTS

SUBAREA	HOUSEHOLDS	EMPLOYMENT
Detroit	499,847	633,253
Outer Wayne County	496,201	513,597
Oakland County	469,335	489,866
Macomb County	291,585	314,559
Washtenaw County	132,397	159,616
Monroe County	76,140	57,651
St. Clair County	72,592	63,232
Livingston County	60,499	32,426
REGION TOTAL	2,098,596	2,264,200

Source: SEMCOG

3.0 DESIGN FLOW PROJECTIONS

This section presents an overview of the ridership estimation procedures, regional travel demand projections, and Woodward Corridor travel demand projections for the Initial and Baseline network simulations.

3.1 OVERVIEW OF RIDERSHIP ESTIMATION PROCEDURES

This subsection presents an overview of the travel modelling procedures used to forecast Initial and Baseline network design flows.

The travel modelling procedures used to estimate design flows for WLC Preliminary Engineering are based on the SEMCOG travel demand models calibrated in 1980.[1/] These models were examined and modified as part of subtask 3.2 to improve the predictive capability of the model and to produce estimates of transit mode of arrival. The results of that effort are described in the subtask 3.2 report.[2/]

The task 3.2 review of the modelling chain exposed several conceptual and technical problems with the application of the SEMCOG models for estimating WLC design flows. Modifications were developed as a part of the task 3.2 effort to correct for these deficiencies. However, three additional probelms were found only after running the models for the Initial network simulation. These are:

1/ Southeast Michigan Council of Governments. "Development and Calibration of the Revised Travel Demand Model Set for the Southeast Michigan Region." Detroit: April 1980

2/ SEMTA. Assessment. Adaptation and Augumentation of SEMCOG Regional Model System for Estimating Design Flows Subtask Report No. 82045-WLC-0302. April 1982.

- Trip generation models indicated unreasonably high growth in trip making between 1980 and 2000 when compared to population and employment growth. This problem is not uniform across the region but is concentrated in several county-to-county interchanges.

- The Home-Based-Other trip generation model includes school trips which are input to the mode choice model and allowed to take transit. Although this is appropriate for Detroit, it is not appropriate for suburban jurisdictions.

- Regional temporal factors generated from SEMTA's Transit User's Survey and descriped in the 3.1 Final Report are not sufficiently peaked to reflect anticipated maximum hourly loads on a high speed radial transit line such as the WLC.

These issues were overcome by factoring trip tables and by adopting revised peaking factors for the Initial network simulation. The peaking factors for the Baseline network are based on the original recommended factors presented in the Subtask 3.1 Report.

An 8-step procedure was employed to develop Initial and Baseline network design flows. These steps were:

1. Develop highway network and speeds;
2. Develop transit network and speeds;
3. Generate and distribute person trips;
4. Revise person trip tables;
5. Calculate mode split;
6. Factor out school bus trips;
7. Calculate mode of access; and
8. Assign trips to transit and highway networks.

These models were run using hybrid system of 402 geographic zones and demographic data obtained from the SEMCOG 1980 Small Area Forecast modified for long range planning. Both the zone system and the demographic data are described in the Subtask 3.1 report.[1]

3.1.1 Develop Highway Networks and Speeds

The highway network used in simulating Initial and Baseline flows is based on the SEMCOG year 2000 highway network at 1446 zone (SEMCOG's regional zone structure). This network was adjusted by converting the network to 402 zone system and by establishing modes and connectors for all transit stations (rail stations and bus park and ride lots). Speeds for this network were developed by assigning SEMCOG's year 2000 highway trips to the network, calculating district-level average volume to capacity ratios, and estimating the percentage of speed reduction by district and functional class. The speed reduction is calculated using the Bureau of Public Roads formula[2] and is then applied to free flow speeds on each link to compute peak hour congested speeds. Uncongested (off peak) speeds are assumed equal to the coded free flow speed.

3.1.2 Develop Transit Networks and Speeds

The Baseline and Initial transit networks were coded and processed using the UNET package of UTPS. The networks are based on transit service characteristics described in Section 2.0 of this report and were developed at the hybrid level of 402 zones. The coding and speed determination methodology are described in the Subtask 3.2 report.[3]

1/ SEMTA. Development of Demographic and Travel Data Bases for Estimating Design Flows. Subtask Report No. 82041-WLC-0301. May 1982.

2/ "Traffic Assignment Manual", U.S. Dpeartment of Transportation, Federal Highway Administration, Report No. 5001-00060, 1973.

3/ SEMTA. Assessment, Adaptation and Augmentation of SEMCOG Regional Model System for Estimating Design Flows. Subtask Report No. 82045-WLC-0302. April 1982.

3.1.3 Generate and Distribute Trips

Person trips were generated by SEMCOG at the 1446 zone level using the 1980 (modified) Small Are Forecast, a preliminary version of the Baseline network coded for 1446 zones, and SEMCOG's 1980 trip generation and attraction models. These trips were distributed using SEMCOG's gravity model and then "squeezed" to the hybrid level of 402 zones.

3.1.4 Revise Person Trip Tables

The trip tables developed in the preceding step resulted in unrealistic trip growth for several interchanges in the region. In particular, when existing trips, population and employment growth rates, and forecasted year 2000 trips were compared, the Woodward Corridor was found to be attracting significantly larger numbers of trips than could reasonably be attracted to the corridor. Similar problems existed for productions and attractions in other areas of the region. To correct for this, the trip tables were revised using factors stratified by district of production and by district of attraction. The districts used in this step were:

- Detroit, inside the Woodward Corridor;
- Detroit, outside the Woodward Corridor;
- Wayne County, outside Detroit;
- Oakland County;
- Macomb County; and
- Remaining Region.

The factors were designed so that the new trip tables would correspond to district production and attraction totals from the 1980 home interview survey[1/] adjusted with 1980 to 2000 employment and population growth forecasts from the 1980 Small Area

1/ Schimpeler-Corradino Associates. Southeast Michigan Regional Travel Survey. Louisville, KY: May 1980.

Forecast. The methodology used in refactoring the trip tables is discussed in greater detail in Appendix B.

3.1.5 Calculate Mode Split

The transit mode split by trip purpose was computed using SEMCOG's mode split models with the modifications described in the Subtask 3.2 report.[1] The primary inputs to these models were adjusted trip tables described in the preceding subsection, peak hour highway and transit networks (for Home-Based-Other and Non-Home-Based trips). Other inputs were:

- Average parking cost (obtained from SEMCOG and converted to 402 zone level);
- Zonal terminal time (obtained from SEMCOG and converted to 402 zone level);
- Zonal areas within 0.4 miles of a transit stop; and
- Zonal accessibilities to regional attractions.

The models used these inputs to estimate person trips by three modes (transit, auto driver and auto pasenger) and three purposes (Home-Based-Work, Home-Based-Other and Non-Home-Based).

3.1.6 Adjustment for School Bus Trips

The SEMCOG modelling process includes school trips as a part of Home-Based-Other trips. Inside the City of Detroit, school trips by transit are made on DOT buses and the SEMCOG modelling chain has been calibrated accordingly. Outside the City of Detroit, school trips are either much shorter and destined for neighborhood schools or are made on school buses. The SEMCOG modelling procedures, however, treat these riders as if they ride

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1/ SEMTA. Assessment. Adaptation and Augmentation of SEMCOG Regional Model System for Estimating Design Flows. Subtask Report No. 82045-WLC-0302. April 1982.

regular transit to school. To account for this discrepancy, Home-Based-Other transit trips produced outside the City of Detroit are factored to eliminate post high school trips on transit. This factoring process is described in Appendix C.

3.1.7 Adjustment for the Station Feeder Bus Trips

In October 1983, Peat Marwick Mitchell and Company performed a computer run distinguishing the mode of access for light rail trips which travelled to an immediately adjacent station. It is seen as feasible that person accessing the LRT line by feeder bus north of the Grand Circus Park station may travel only one station due to the greater distance between stations. Whereas, in the Detroit CBD (Grand Circus Park station and south) it was not seen as practical for a person to access the line by feeder bus or auto, make a vertical change to access the LRT and then travel a short distance to an adjacent station. As per the recommendation of the Design Flow Technical Working Group (DFTWG) for stations south of Grand Circus Park those customers accessing the line by feeder bus or auto and travelling to an immediately adjacent station were removed from the projected light rail patronage estimates.

3.1.8 Calculate Mode of Access

The revised Washington mode of access model was used to estimate the arrival mode of all passengers using each transit station in the Initial network. This model is described in the Subtask 3.2 report. Input data to this model were the Initial transit network, the year 2000 highway network, a list of stations (including all WLC stations) and their characteristics, and the transit temporal distribution. The temporal distribution used in the Initial network is not the recommended distribution in the Subtask 3.1 report. Instead, new peak hour control totals were specified by the Design Flows Working Group to reflect increased

peaking caused by the introduction of a rail transit line. These revised control totals were used to factor the subtask 3.1 temporal distribution stratified by purpose and create the input peaking factors. The resulting temporal distribution is shown in Table 3-1.

3.1.9 Assign Trips to the Network

Highway and transit trips were assigned to their respective networks using standard UTPS assignment programs. The highway assignment loaded auto driver trips from the mode split models, auto driver to transit trips from the mode of access model, and truck-taxi trips from the SEMCOG trip distribution model. A 24-hour, one iteration, all-or-nothing assignment technique was used for the highway assignment.

The transit assignment loaded A.M. peak hour and midday hour transit trips generated by the mode of access model to the A.M. peak and off-peak transit networks, respectively. Passenger loadings for other time periods were manually estimated by factoring trips from these hourly loads. This factoring was based on the temporal distributions used for the Baseline and Initial networks. Where appropriate, line loadings were then inverted to reflect input to the mode of access model.

The mode of access model was not run for the Baseline simulation. Instead, all transit trip makers able to walk to a transit stop (within 0.4 miles of the nearest stop) were assumed to walk to transit. All others were assumed to drive. The temporal distribution for the Baseline network is shown in Table 3-2.

TABLE 3-1

REVISED TRANSIT PEAKING FACTORS FOR INITIAL NETWORK SIMULATION

PEAKING FACTOR	HOME TO WORK	WORK TO WORK	HOME TO OTHER	OTHER TO HOME	NON HOME BASED	TOTAL
24 Hours to AM Peak Hour (7:30-8:29)	0.292	0.018	0.175	0.018	0.033	0.110
24 Hours to AM Peak 3 Hours (7:30-10:29)	0.439	0.036	0.443	0.082	0.126	0.269
24 Hours to PM Peak Hour (4:30-5:29)	0.028	0.394	0.052	0.108	0.086	0.125
24 Hours to PM Peak 3 Hours (2:30-5:29)	0.069	0.605	0.097	0.341	0.260	0.296
24 Hours to MIDDAY Hour (11:30-12:29)	0.045	0.018	0.103	0.108	0.159	0.086
AM Peak Hour to AM Peak 15 Min.	0.313	0.313	0.313	0.313	0.313	0.313
PM Peak Hour to PM Peak 15 Min.	0.300	0.300	0.300	0.300	0.300	0.300

Source: Peat Marwick Mitchell & Company

TABLE 3-2

TRANSIT PEAKING FACTORS FOR BASELINE NETWORK SIMULATION

PEAKING FACTOR	HOME TO WORK	WORK TO WORK	HOME TO OTHER	OTHER TO HOME	NON HOME BASED	TOTAL
24 Hours to AM Peak Hour (7:30-8:29)	0.254	0.016	0.152	0.016	0.029	0.104
24 Hours to AM Peak 3 Hours (7:30-10:29)	0.438	0.036	0.442	0.082	0.126	0.259
24 Hours to PM Peak Hour (4:30-5:29)	0.024	0.343	0.045	0.094	0.075	0.103
24 Hours to PM Peak 3 Hours (2:30-5:29)	0.069	0.604	0.097	0.340	0.259	0.246
24 Hours to MIDDAY Hour (11:30-12:29)	0.045	0.018	0.103	0.108	0.158	0.087
AM Peak Hour to AM Peak 15 Min.	0.313	0.313	0.313	0.313	0.313	0.313
PM Peak Hour to PM Peak 15 Min.	0.300	0.300	0.300	0.300	0.300	0.300

Source: Peat Marwick Mitchell & Company

3.2 REGIONAL TRAVEL DEMAND PROJECTIONS

This section documents the characteristics of the person trip tables used for both the Initial and the Baseline network simulations.[1] Tables 3-3 and 3-4 summarize trip productions and attractions by purpose used in the WLC Preliminary Engineering design flows effort. These are compared to trip productions and attractions by purpose observed in the 1980 regional travel survey.[2] An analysis of these trip ends indicates an 11.6 percent increase in Home-Based-Work trips, a 22.6 percent increase in Home-Based-Other trips, and a 24.2 percent increase in Non-Home-Based trips between 1980 and 2000. These projections are consistent with the 12 percent increase in employment and the 27 percent increase in households predicted by SEMCOG's 1980 (modified) Small Area Forecast.

These tables also show that 17 percent of the Home-Based-Work productions are located in the Woodward Corridor while 14.9 percent of the Home-Based-Other and 25 percent of the Non-Home-Based productions occur there. Likewise, 29 percent of the Home-Based-Work attractions, 23 percent of the Home-Based-Other attractions and 24 percent of the Non-Home-Based attractions are located in the Woodward Corridor. This suggests that work trips are more strongly oriented to the corridor than non-work trips and that the non-home end of a trips is more likely to be in the corridor than the home end. These observatiosn are consistent with current trip making patterns.

1/ The trip tables discussed here have been factored as discussed in Subsection 3.1.4.

2/ Schimpeler-Corradino Associates. "Southeast Michigan Regional Travel Survey." Louisville, KY: May, 1980

TABLE 3-3

1980 AND YEAR 2000 DAILY PERSON TRIP PRODUCTIONS BY PURPOSE
(IN THOUSANDS)

Geographic Area	TRIP PRODUCTIONS			
	Home-Based Work	Home-Based Other	Non-Home Based	Total
Woodward Corridor[1] (Year 2000)	498	1,092	890	2,480
CBD (Year 2000)	8	13	99	119
Remainder of Corridor[1]	490	1,079	792	2,361
Outside Corridor[1]	2,490	6,235	2,643	11,278
Regional Total - Year 2000[1]	2,988	7,327	3,533	13,758
Regional Total - Year 1980[2]	2,598	5,977	2,843	11,418

1/ Source: Peat, Marwick, Mitchell & Co. Year 2000 Initial and Baseline simulation factored person trip tables.

2/ Source: Schimpeler-Corradino Associates. "Southeast Michigan Regional Travel Survey." Louisville, KY: May, 1980

TABLE 3-4

1980 AND YEAR 2000 DAILY PERSON TRIP ATTRACTIONS BY PURPOSE
(IN THOUSANDS)

Geographic Area	TRIP ATTRACTIONS			
	Home Based Work	Home Based Other	Non Home Based	Total
Woodward Corridor[1]	835	1,691	864	3,389
CBD	207	263	118	589
Remainder of Corridor	628	1,428	746	2,801
Outside Corridor[1]	2,064	5,636	2,670	10,369
Regional Total - Year 2000[1]	2,899	7,327	3,533	13,758
Regional Total - Year 1980[2]	2,598	5,977	2,843	11,418

1/ Source: Peat, Marwick, Mitchell Co. Initial Baseline Simulation

2/ Source: Schimpeler-Corradino Associates. "Southeast Michigan Regional Travel Survey." Louisville, KY: May, 1980

3.3 PROJECTED RIDERSHIP FOR THE INITIAL NETWORK

This subsection documents the results of the Initial network simulation at the 402 zone level. This network includes the WLC running from the Lafayette station in Detroit to Royal Oak, DPM, and service improvements to commuter rail and bus operations.

3.3.1 Modal Split by Trip Purpose

The year 2000 modal split estimates by purpose are shown in Table 3-5. The mode split models used, estimate that 6.5 percent of the regional Home-Based-Work trips will use transit. Work trips produced in or attracted to the CBD have a much higher mode split at 39.3 and 29.5 percent, respectively.

The regional Home-Based-Other transit mode split is 4.3 percent. Although this is one-third lower than the work mode choice, the mode split of Home-Based-Other trips produced in or attracted to the CBD remain reltively high at 31.8 and 37.9 respectively.

The regional mode split for Non-Home-Based trips is 1.66 percent and the mode split for such trips produced in or attracted to the CBD is 11.2 percent.

These results indicate that of the 13.7 million year 2000 daily person trips generated in the southeast Michigan region, 558,000 trips (or 4.1 percent) will use transit. These trips will be composed of 190,000 Home-Based-Work trips (33.9 percent of the total), 311,000 Home-Based-Other trips (55.8 percent of the total) and 57,530 Non-Home-Based trips (10.3 percent of the total). Transit travel will have a strong CBD orientation with 31 percent of all transit trips attracted to the CBD and another 34 percent attracted to other parts of the Woodward Corridor.

TABLE 3-5
SUMMARY OF INITIAL TRANSIT TRIP ESTIMATES BY TRIP PURPOSE

Trip Productions

Georgraphic Area	Home-Based Work Transit Trips	Home-Based Work Percent Transit	Home-Based[1] Other Transit Trips	Home-Based[1] Other Percent Transit	Non-Home-Based Transit Trips	Non-Home-Based Percent Transit	Total Transit Trips	Total Percent Transit
Woodward Corridor	78,118	15.7%	109,776	10.1%	34,962	3.9%	222,856	9.0%
CBD	3,196	39.3	4,052	31.8	11,219	11.4	18,467	15.0
Remainder of Corridor	74,922	15.3	105,724	9.8	23,743	3.0	204,389	8.7
Outside of Corridor	111,386	4.6	201,631	3.2	22,562	0.9	335,579	3.0
Regional Total	189,504	6.5	311,407	4.3	57,524	1.6	558,435	4.1

Trip Attractions

	Home-Based Work Transit Trips	Home-Based Work Percent Transit	Home-Based Other Transit Trips	Home-Based Other Percent Transit	Non-Home-Based Transit Trips	Non-Home-Based Percent Transit	Total Transit Trips	Total Percent Transit
Woodward Corridor	133,508	16.0%	195,591	11.6%	34,800	4.0%	263,899	10.7%
CBD	61,113	29.5	99,531	37.9	13,150	11.1	173,794	29.5
Remainder of Corridor	72,395	11.5	96,060	14.9	21,650	2.9	190,105	6.8
Outside of Corridor	55,996	2.7	115,816	2.1	22,730	0.9	194,542	1.9
Regional Total	189,504	6.5	311,407	4.3	57,530	1.6	558,441	4.1

1/ Factored to adjust for school trips.

Source: Peat Marwick Mitchell & Company

3.3.2 Transit Trips by Mode

This subsection documents the regional distribution of Initial network transit trips among the five transit modes--local bus, express bus, WLC, DPM, and commuter rail.

Table 3-6 shows unlinked trips, passenger miles, and passenger hours by transit mode for the A.M. peak hour and for the midday hour. The majority of unlinked trips in the a.m. peak hour and the Midday hour (83,357 and 64,392 respectively) are made on local buses. These trips have a relatively short average distance (3.1 to 3.8 miles) when compared to those made on other modes. This reflects the tendency for travelers to prefer high frequency, low speed buses for short trips and lower frequency, high speed services for longer trips.

The light rail captures the second highest number of trips in both the A.M. peak (16,369) and midday (11,838) hours. The average trip length of 4.43 and 4.90 miles is between that for local and express buses. This indicates that light rail attracts both short and long trips from other modes but that average trip characteristics are still quite similar to those for local buses. Express buses capture 14,332 AM peak hour trips. This is nearly as many trips as for the light rail line, but the express trips average nearly twice the distance of trips made by light rail. This difference reflects the long distances traversed by express buses on freeways where no boarding or alighting is possible. Few trips are made on express buses during the Midday hour when express service is scarce.

The remaining transit travel occurs on the DPM and on commuter rail. These modes account for relatively few trips and, as expected, the DPM has the shortest average trip length (0.62-0.74 miles) and commtuer rail has the longest trip length (14.56 - 31.85 miles).

TABLE 3-6

TRANSIT TRAVEL CHARACTERISTICS INITIAL NETWORK SIMULATION[1]

	AM PEAK HOUR				MIDDAY HOUR			
	Unlinked Trips	Pass. Miles	Pass. Hours	Average Trip Distance	Unlinked Trips	Pass. Miles	Pass. Hours	Average Trip Distance
Local Bus	83,357	259,726	16,475	3.12 miles	64,392	246,332	15,943	3.83 miles
Express Bus	14,332	118,798	5,888	8.29 miles	158	2,119	114	13.40 miles
Light Rail	16,369	72,545	2,859	4.43 miles	11,938	58,246	2,282	4.92 miles
CATS	2,512	1,847	146	0.74 miles	1,984	1,226	104	0.62 miles
Commuter Rail	1,310	19,073	651	14.56 miles	151	4,810	146	31.80 miles
TOTAL	117,880	471,989	26,019	4.00 miles	78,523	312,733	18,589	3.98 miles

1/ Based on Revised Temporal Factors.

Source: Peat Marwick Mitchell & Co.

3.3.3 Ridership on the WLC

This section documents the boardings, alightings, and line volumes for each station on the WLC. These results are from the Initial network simulation at the 402-zone level and are displayed in Figures 3-1 through 3-9.

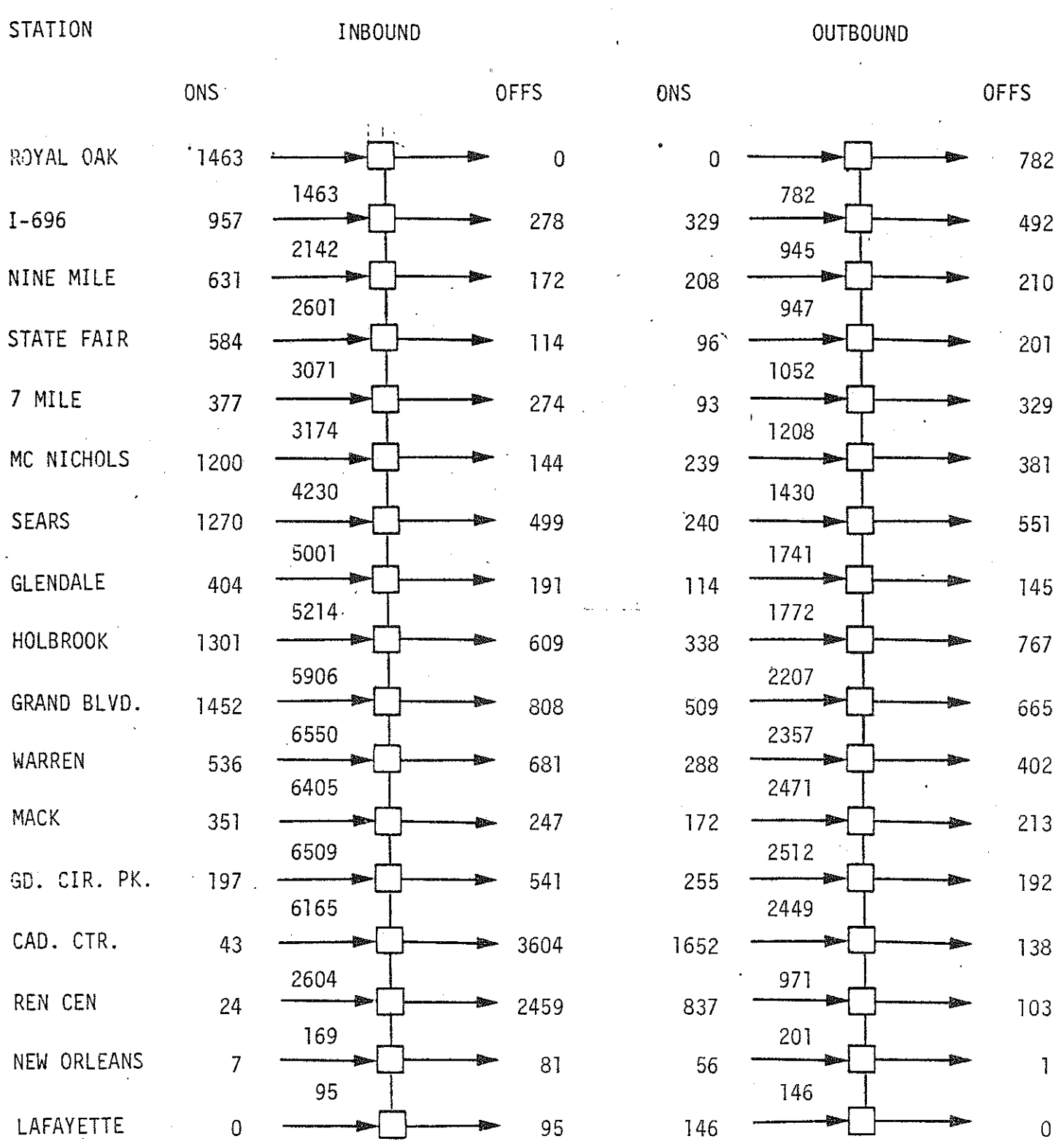
The passenger loadings are output by the UTPS transit assignment program ULOAD. This program assigns trips using an all-or-nothing technique based on minimum impedance paths generated by the UTPS program UPATH. The loadings shown are the sum of the passenger flows for all UTPS lines used to simulate transit service on the WLC.

The AM peak hour load (see Figure 3-1) shows that 16,369 riders board the WLC and that 10,797 of these riders are travelling inbound (towards the Detroit CBD). The remaining 5572 riders are travelling outbound. The maximum inbound load point on the WLC is located between the Grand Boulevard and Warren stations where 6550 passengers are on board. The maximum outbound load point is located between the Grand Circus Park and Mack stations where 2512 passengers are onboard. The maximum load point for both inbound and outbound directions is located between the Mack and Grand Circus Park stations where 9,021 passengers are on board the WLC.

The midday hour load (see Figure 3-3) shows that 11,838 riders board the WLC and that 6,201 of these riders are travelling inbound the remaining 5,639 riders are travelling outbound. The maximum inbound load point is located between the Mack and Grand Circus Park stations where 3,752 passengers are on board the WLC. The maximum outbound midday hour load point is lcoated between the Warren and Grand Boulevard stations where 3,306 passengers are on board. The maximum load point for both the inbound and

Figure 3-1

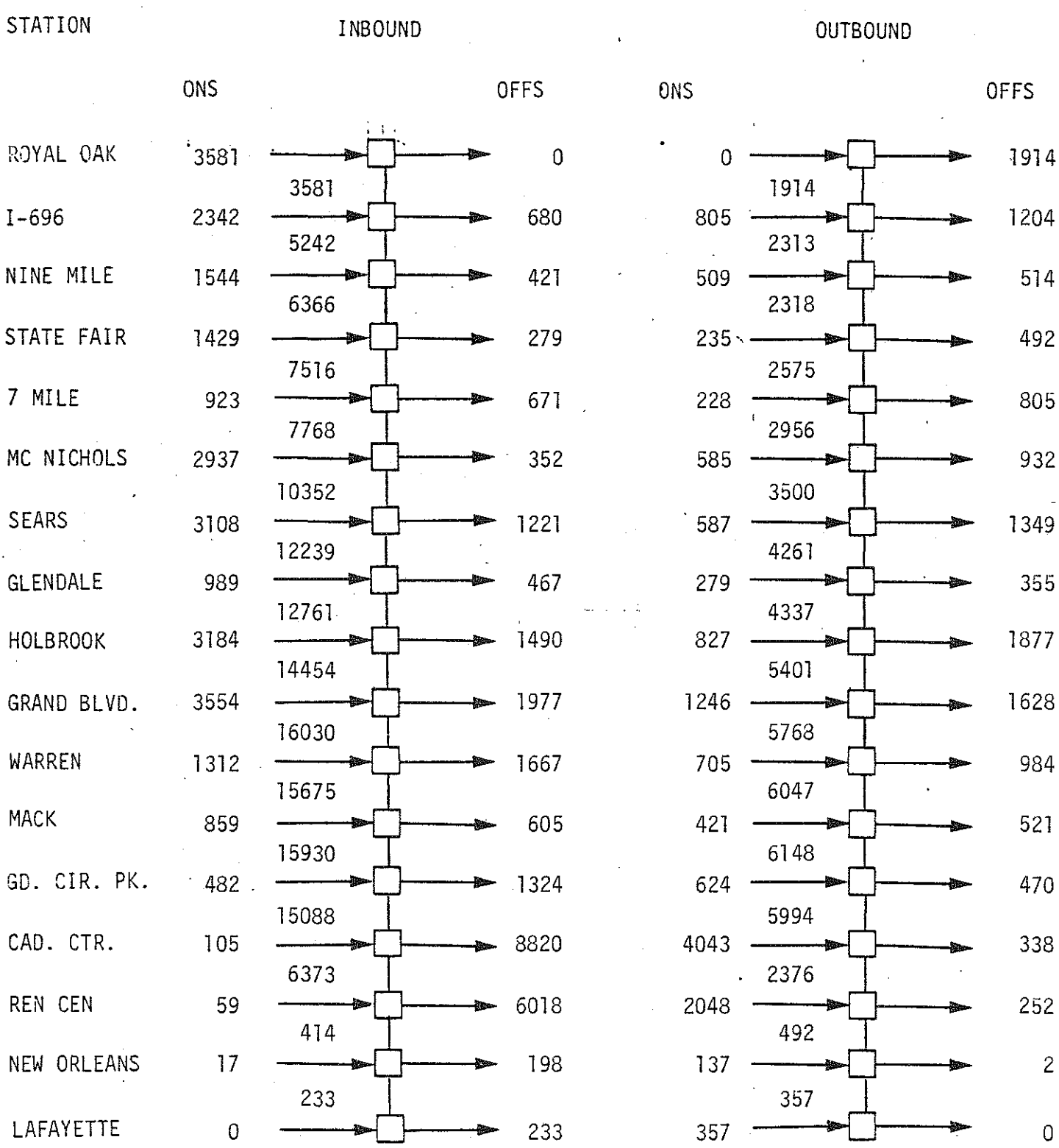
AM Peak Hour
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Company

Figure 3-2

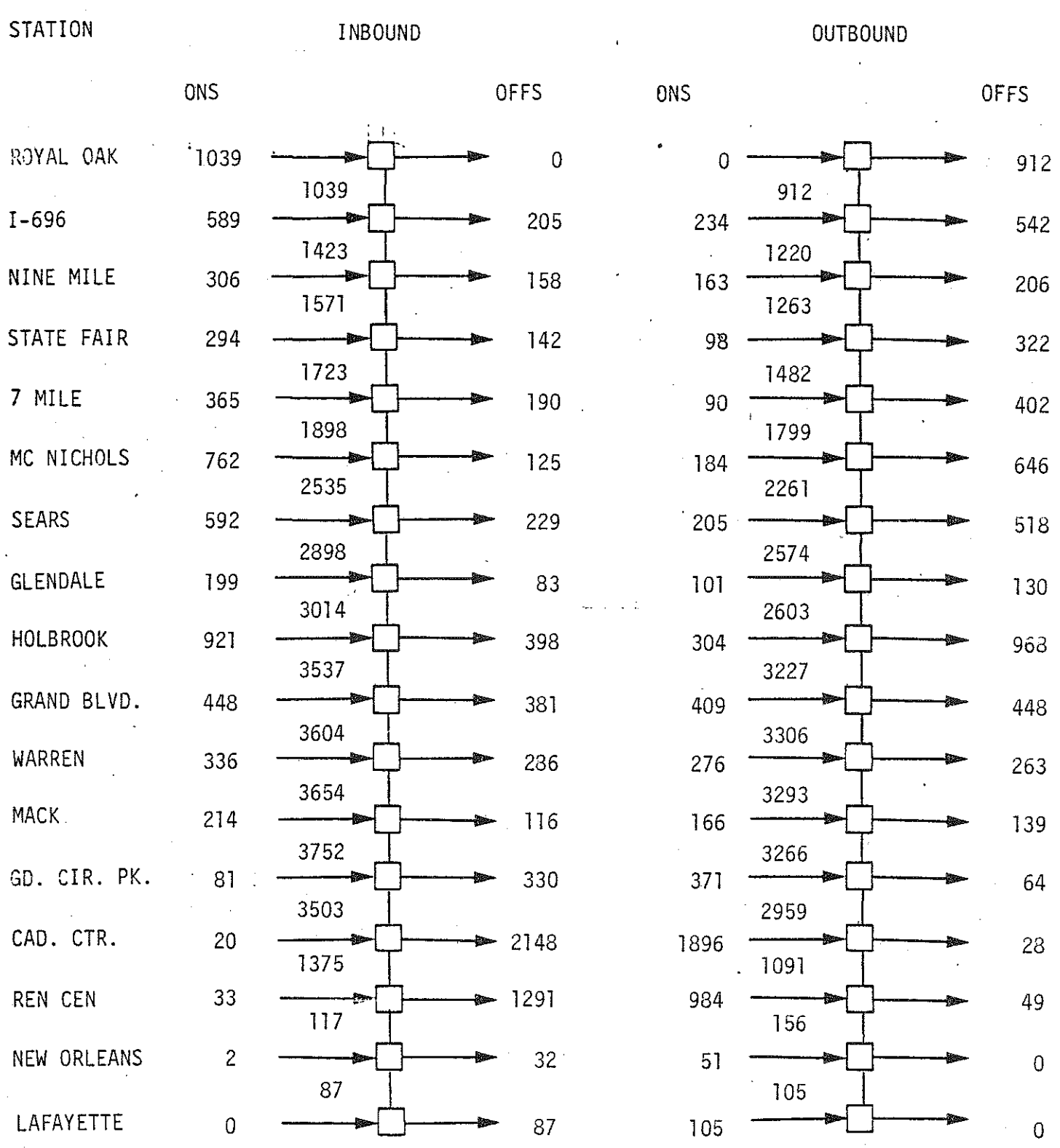
AM Peak Period
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Company

Figure 3-3

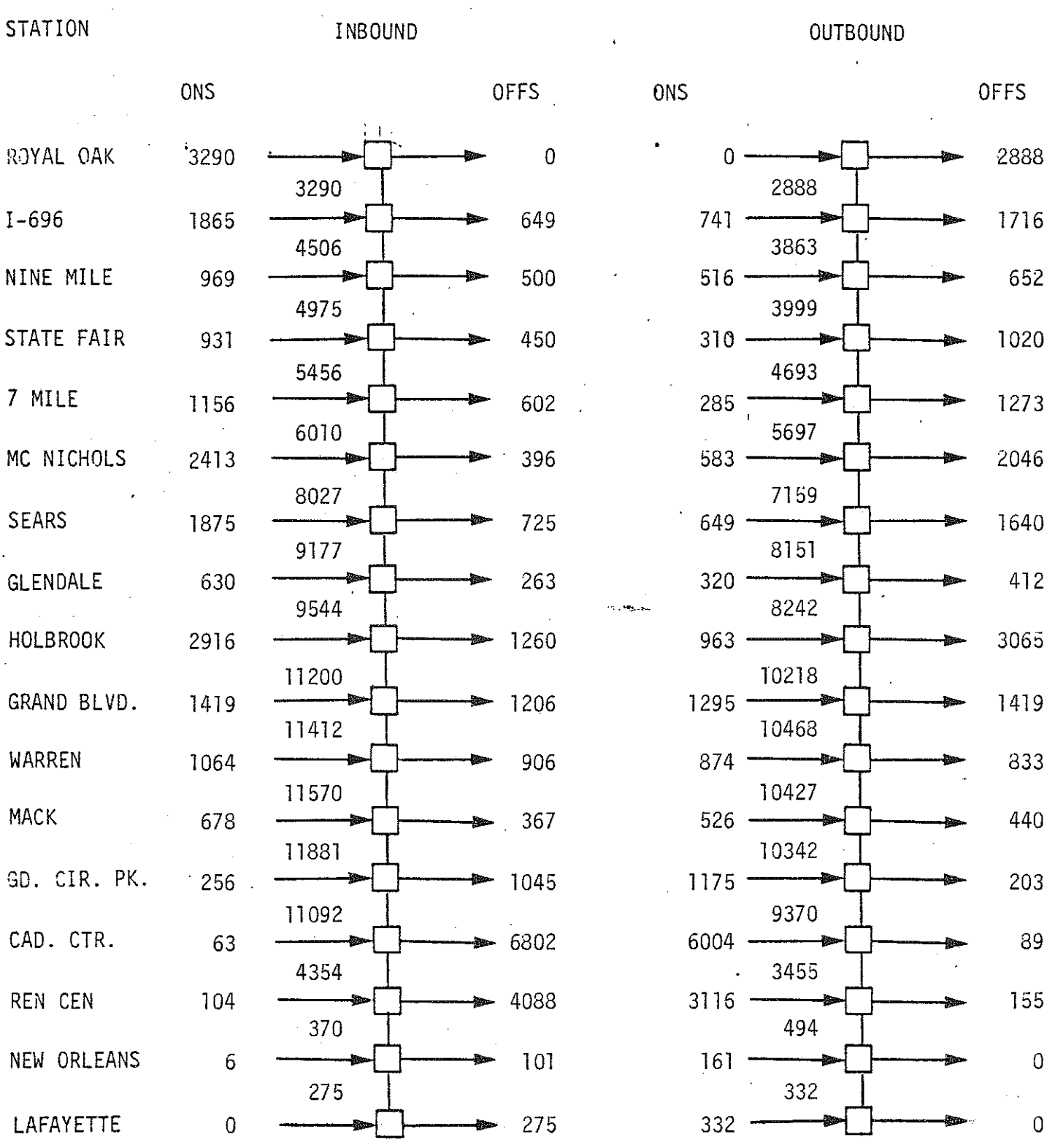
Midday Hour
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Company

Figure 3-4

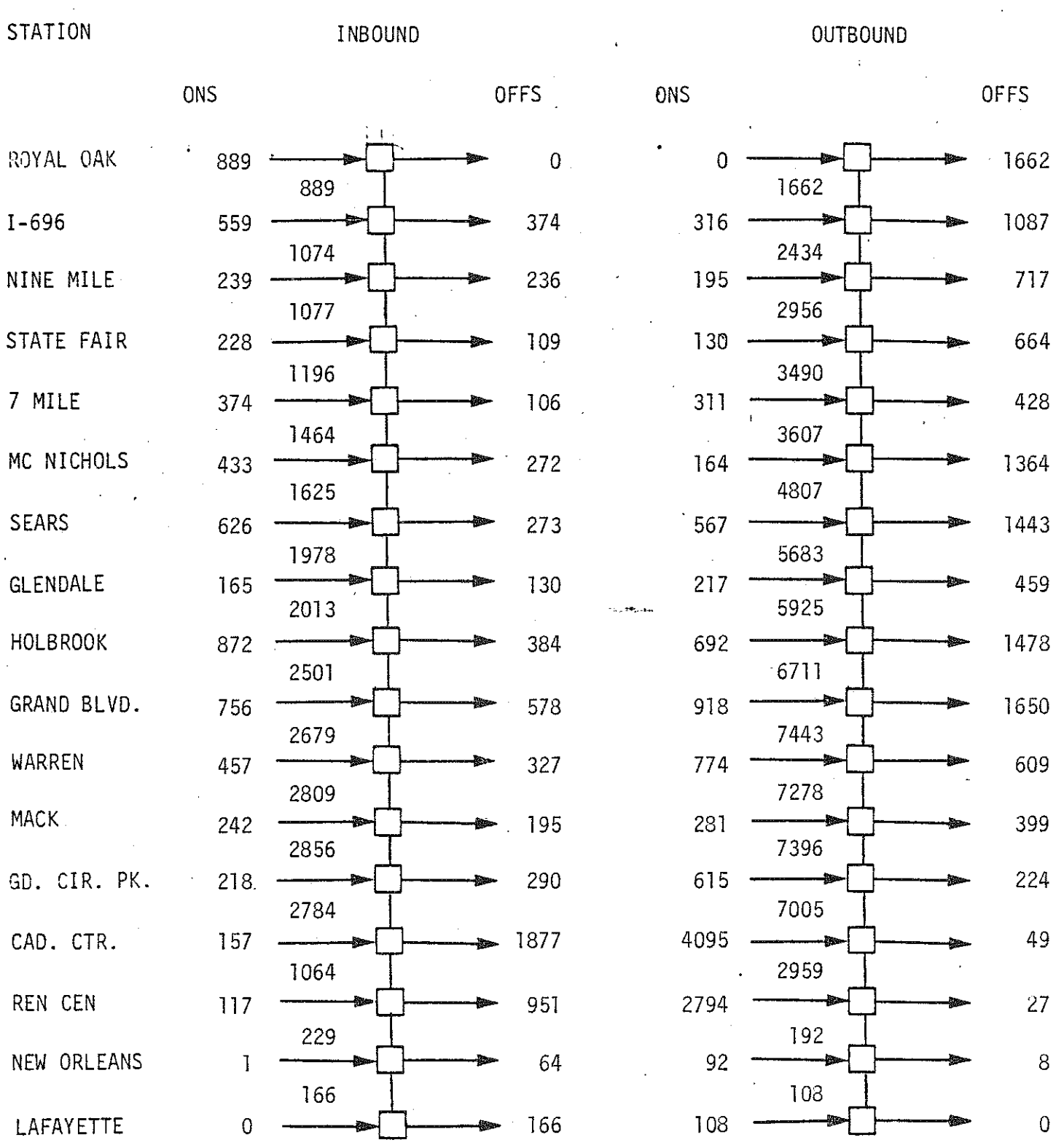
Midday Period
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Company

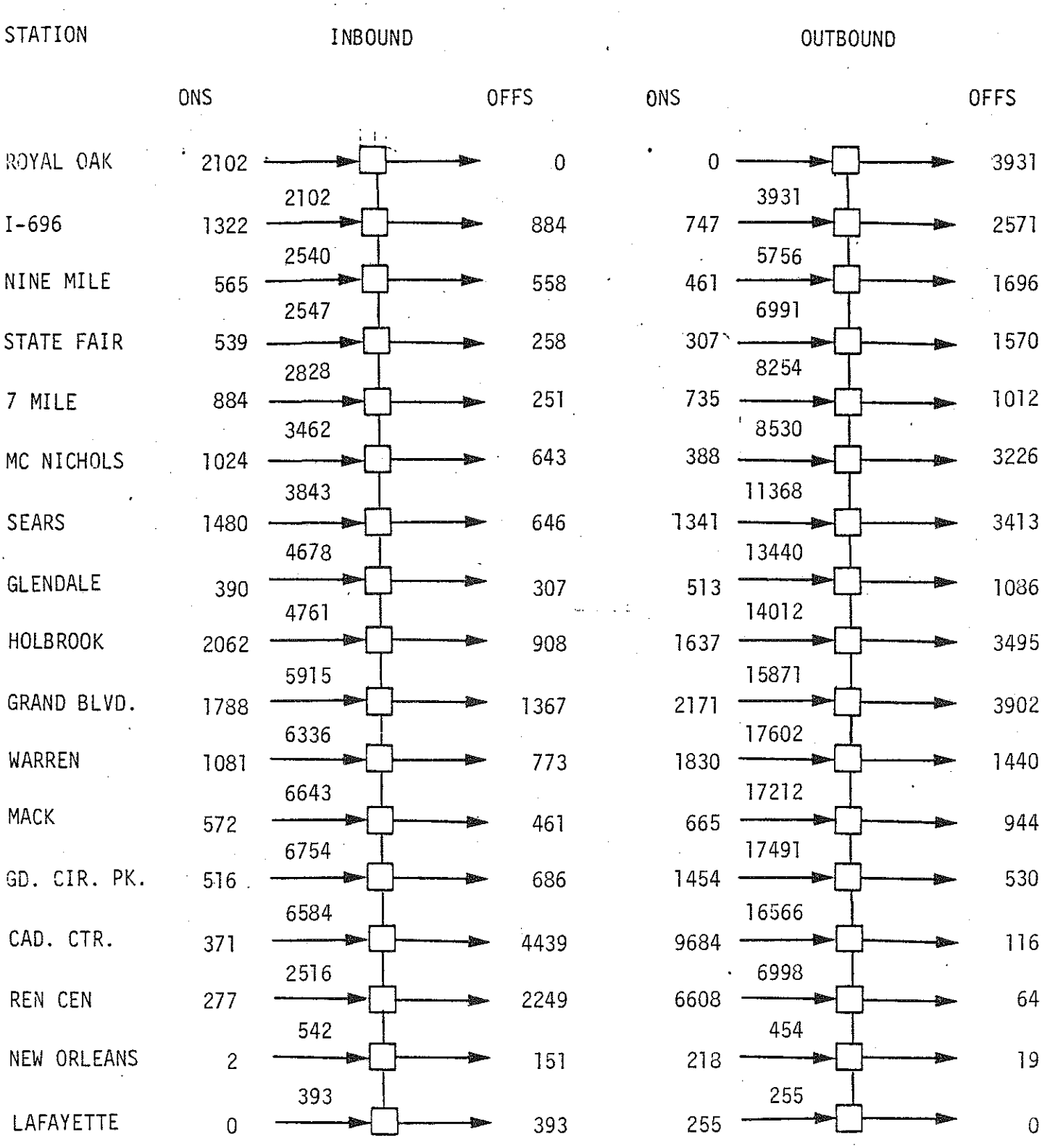
Figure 3-5

PM Peak Hour
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Co.

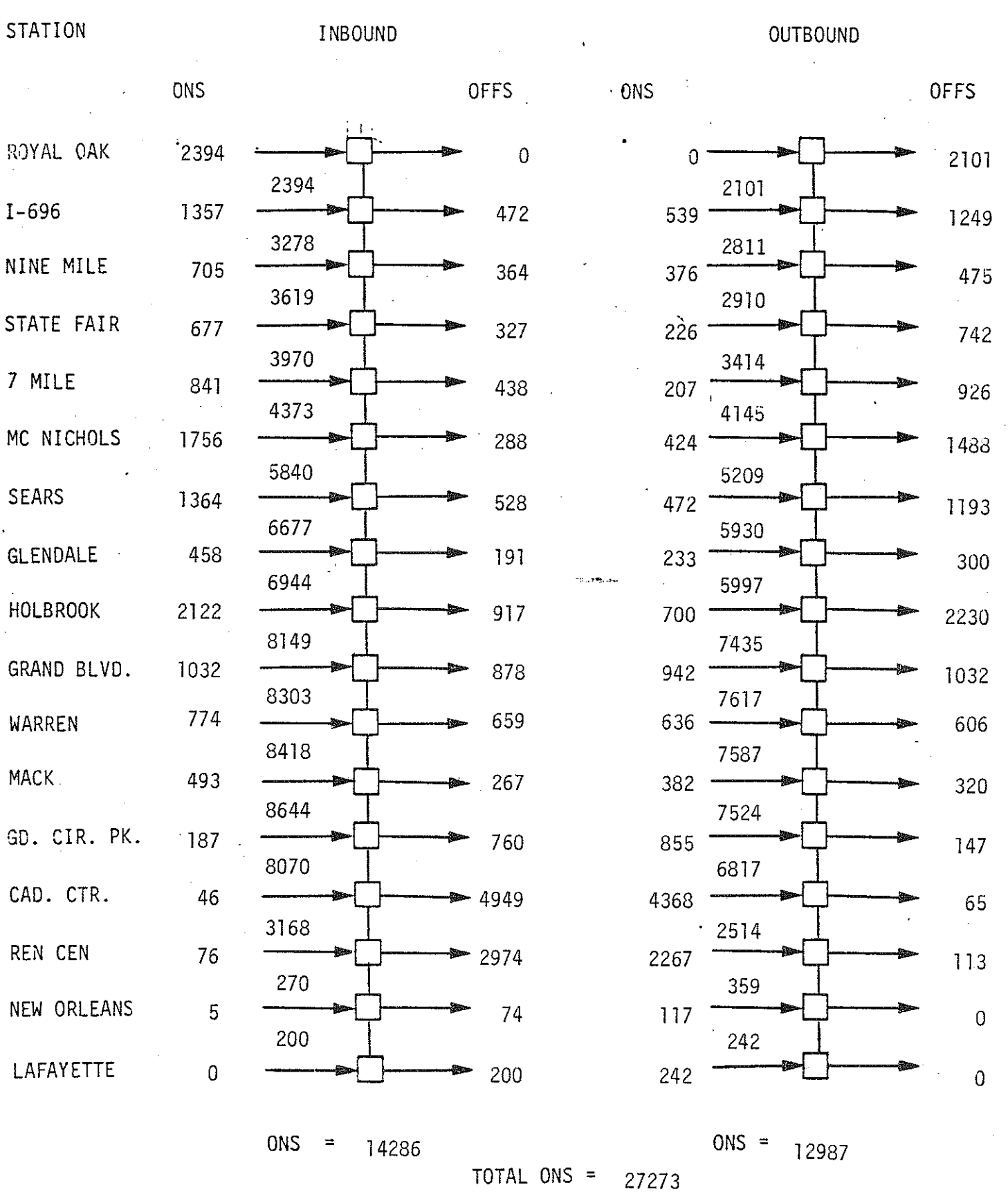
Figure 3-6
PM Peak Period
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Company

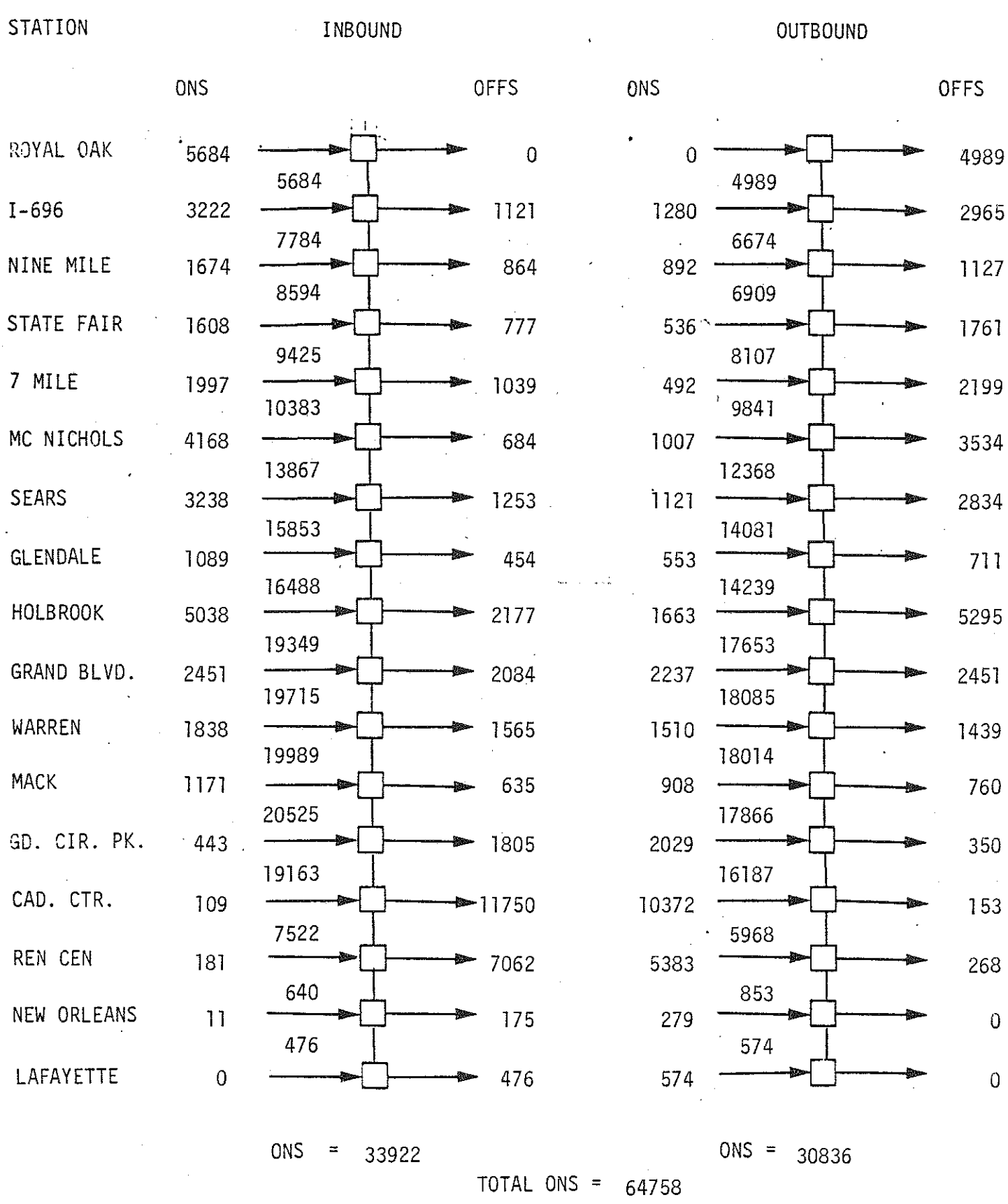
Figure 3-7

Evening Period
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Co.

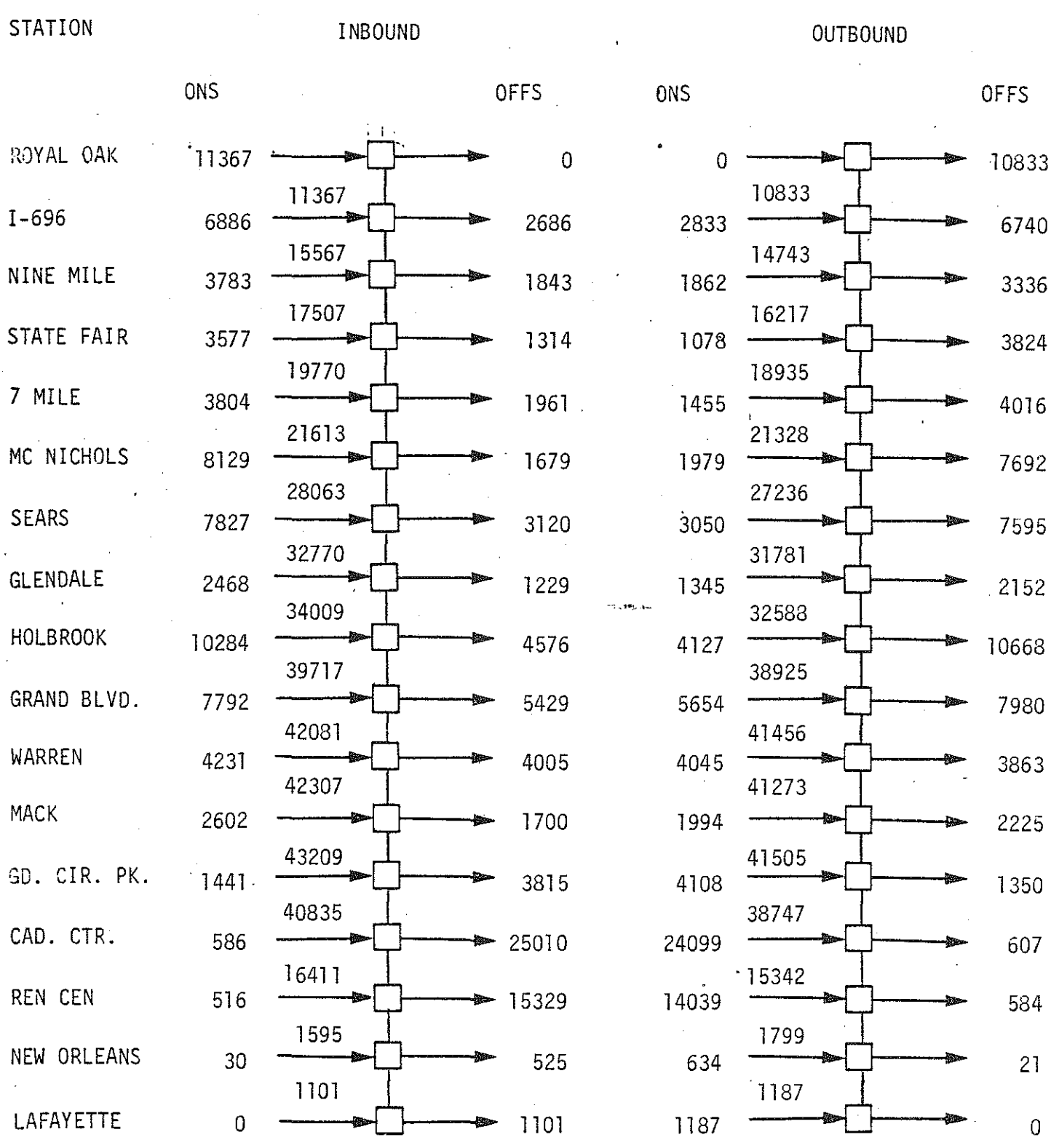
Figure 3-8
Off Peak
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Company

Figure 3-9

Daily
WLC Link Volumes



Source: SEMTA and Peat Marwick Mitchell & Co.

outbound directions is located between the Grand Circus Park and Mack stations where 7,018 passengers are on board the WLC.

The PM peak hour loads are shown in Figure 3-5. These loads were developed by factoring the results of the AM peak hour assignment to represent volume levels associated with the PM peak hour and then inverting boardings and alightings to reverse the primary direction of travel from inbound to outbound. The inversion was performed by assuming that trips boarding the inbound line in the morning will alight from the outbound line in the afternoon. Similarly, trips alighting from the outbound line in the morning will board the inbound line in the afternoon.

The PM peak hour loading shows that the maximum outbound load point is located between the Warren and Grand Boulevard stations where 7,443 passengers are on board. The maximum inbound load point is located between the Mack and Grand Circus Park stations where 2,856 riders are on board the WLC. The maximum load point for both inbound and outbound passengers is located between the Mack and Grand Circus Park stations where 10,252 passengers are on board.

The 24-hour load (see Figure 3-9) is the sum of boardings occurring during the AM peak period, midday period, PM peak period and evening period. This load shows that 149,811 daily riders will use the WLC. The maximum load point is located between the Mack and Grand Circus Park stations where 43,209 inbound and 41,505 outbound passengers are on board.

3.3.4 Mode of Access

This section documents the results of the mode of access analysis performed as a part of the Initial network simulation. The analysis is based on the logit mode of access model described in the subtask 3.2 report. Tables 3-7 through 3-15 present the

arrival modes of passengers for each WLC station for 9 periods of the day. These periods are:

- AM peak hour (7:30 a.m. - 8:30 a.m.);
- AM peak period (7:30 a.m. - 10:30 a.m.);
- Midday hour (11:30 a.m. - 12:30 p.m.);
- Midday period (10:30 a.m. - 2:30 p.m.);
- PM peak hour (4:30 p.m. - 5:30 p.m.);
- PM peak period (2:30 p.m. - 5:30 p.m.);
- Evening period (5:30 p.m. - 7:30 p.m.);
- Off peak
- Daily

The modes of departure for each WLC station for the nine periods of the day are shown in tables 3-16 through 3-24.

The access and departure mode choice model results indicate that 53 percent of daily WLC riders arrive by bus and 35 percent arrive by walking. The three auto modes (kiss and ride, park and ride driver, park and ride passenger) together account for 12 percent of WLC arrivals. When individual periods of the day are considered, however, the fraction of auto access trips changes dramatically. For example, in the AM peak hour, 19 percent of the WLC riders access the line by an auto mode. In the PM peak, only 4 percent of the riders access the line by auto.

The variation in mode of access for different periods of the day occurs because most afternoon WLC trips originate at the non-home end of the trip and do not have a car available for accessing the line. On the other-hand, most morning WLC riders originate at home an are more likely to have an auto available for access to the line. The result is the share of WLC trips arriving by auto is higher in the morning than in the afternoon.

Table 3-7

Woodward Corridor Light Rail
Mode of Access
(AM Peak Hour Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	118	8.09	1036	70.79	102	6.94	198	13.53	9	0.64	1463	8.94
I-696	84	6.54	1080	83.96	29	2.29	88	6.88	4	0.34	1286	7.86
NINE MILE	108	12.83	282	33.62	108	12.83	326	38.85	16	1.87	839	5.13
STATE FAIR	53	7.83	73	10.77	112	16.48	423	62.15	19	2.77	680	4.15
7 MILE	72	15.35	293	62.26	36	7.68	66	14.07	3	0.64	470	2.87
MCNICHOLS	211	14.63	467	32.48	174	12.07	561	38.99	26	1.83	1439	8.79
SEARS	164	10.84	1008	66.78	191	12.64	141	9.32	6	0.41	1510	9.22
GLENDALE	171	32.94	247	47.62	101	19.44	0	0.00	0	0.00	518	3.16
HOLBROOK	293	17.88	1291	78.77	55	3.35	0	0.00	0	0.00	1639	10.01
GRAND BOULEVARD	347	17.70	1556	79.36	58	2.94	0	0.00	0	0.00	1961	11.98
WARREN	361	43.81	346	41.96	117	14.23	0	0.00	0	0.00	824	5.03
MACK	385	73.63	36	6.90	102	19.47	0	0.00	0	0.00	523	3.20
GRAND CIRCUS PK.	190	42.12	262	57.88	0	0.00	0	0.00	0	0.00	452	2.76
CADILLAC CENTER	637	37.58	1058	62.42	0	0.00	0	0.00	0	0.00	1695	10.35
RENAISSANCE CTR.	531	61.67	330	38.33	0	0.00	0	0.00	0	0.00	861	5.26
ORLEANS	63	100.00	0	0.00	0	0.00	0	0.00	0	0.00	63	0.38
LAFAYETTE	39	26.71	76	52.05	31	21.23	0	0.00	0	0.00	146	0.89
TOTAL	3827	23.38	9441	57.67	1215	7.42	1803	11.01	84	0.51	16369	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-8
Woodward Corridor Light Rail
Mode of Access
(AM Peak Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	290	8.09	2535	70.79	249	6.94	485	13.53	23	0.64	3581	8.94
I-696	206	6.54	2642	83.96	72	2.29	217	6.88	11	0.34	3147	7.86
NINE MILE	263	12.83	690	33.62	263	12.83	798	38.85	38	1.87	2053	5.12
STATE FAIR	130	7.83	179	10.77	274	16.48	1034	62.15	46	2.77	1664	4.15
7 MILE	177	15.35	717	62.26	88	7.68	162	14.07	7	0.64	1151	2.87
MCNICHOLS	515	14.63	1144	32.48	425	12.07	1373	38.99	64	1.83	3522	8.79
SEARS	401	10.84	2468	66.78	467	12.64	344	9.32	15	0.41	3695	9.22
GLENDALE	418	32.94	604	47.62	246	19.44	0	0.00	0	0.00	1268	3.17
HOLBROOK	717	17.88	3159	78.77	134	3.35	0	0.00	0	0.00	4011	10.01
GRAND BOULEVARD	850	17.70	3809	79.36	141	2.94	0	0.00	0	0.00	4800	11.98
WARREN	884	43.81	846	41.96	287	14.23	0	0.00	0	0.00	2017	5.03
MACK	942	73.63	88	6.90	249	19.47	0	0.00	0	0.00	1280	3.20
GRAND CIRCUS PK.	466	42.12	640	57.88	0	0.00	0	0.00	0	0.00	1106	2.76
CADILLAC CENTER	1559	37.58	2589	62.42	0	0.00	0	0.00	0	0.00	4148	10.35
RENAISSANCE CTR.	1299	61.67	808	38.33	0	0.00	0	0.00	0	0.00	2107	5.26
ORLEANS	154	100.00	0	0.00	0	0.00	0	0.00	0	0.00	154	0.38
LAFAYETTE	95	26.71	186	52.05	76	21.23	0	0.00	0	0.00	357	0.89
TOTAL	9366	23.38	23105	57.67	2973	7.42	4412	11.01	205	0.51	40061	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-9
Woodward Corridor Light Rail
Mode of Access
(Midday Hour-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	81	7.76	866	83.32	33	3.15	57	5.46	3	0.31	1039	8.78
I-696	45	5.42	734	89.16	12	1.42	31	3.74	2	0.26	823	6.95
NINE MILE	62	13.26	219	46.74	45	9.57	137	29.13	6	1.30	469	3.96
STATE FAIR	52	13.26	123	31.44	46	11.74	163	41.67	7	1.89	392	3.31
7 MILE	47	10.27	349	76.64	19	4.07	39	8.67	2	0.35	455	3.84
MCNICHOLS	151	15.99	357	37.71	99	10.47	324	34.29	15	1.54	946	7.99
SEARS	99	12.42	540	67.71	74	9.28	80	10.07	4	0.52	797	6.73
GLENDALE	99	32.89	152	50.67	49	16.44	0	0.00	0	0.00	300	2.53
HOLBROOK	202	16.53	975	79.59	48	3.88	0	0.00	0	0.00	1225	10.35
GRAND BOULEVARD	214	24.94	598	69.81	45	5.24	0	0.00	0	0.00	857	7.24
WARREN	304	49.75	249	40.72	58	9.52	0	0.00	0	0.00	612	5.17
MACK	309	81.25	28	7.34	43	11.41	0	0.00	0	0.00	380	3.21
GRAND CIRCUS PK.	212	46.89	240	53.11	0	0.00	0	0.00	0	0.00	452	3.82
CADILLAC CENTER	1055	55.05	861	44.95	0	0.00	0	0.00	0	0.00	1916	16.19
RENAISSANCE CTR.	839	82.45	178	17.55	0	0.00	0	0.00	0	0.00	1017	8.59
ORLEANS	53	100.00	0	0.00	0	0.00	0	0.00	0	0.00	53	0.45
LAFAYETTE	30	28.75	56	53.33	19	18.10	0	0.00	0	0.00	105	0.89
TOTAL	3853	32.55	6525	55.12	589	4.98	832	7.02	39	0.33	11838	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-10

Woodward Corridor Light Rail
Mode of Access
(Midday Peak Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	255	7.76	2741	83.32	104	3.15	180	5.46	10	0.31	3290	8.78
I-696	141	5.42	2324	89.16	37	1.42	97	3.74	7	0.26	2606	6.95
NINE MILE	197	13.26	694	46.74	142	9.57	433	29.13	19	1.30	1485	3.96
STATE FAIR	165	13.26	390	31.44	146	11.74	517	41.67	23	1.89	1241	3.31
7 MILE	148	10.27	1104	76.64	59	4.07	125	8.67	5	0.35	1441	3.84
MCNICHOLS	479	15.99	1130	37.71	314	10.47	1027	34.29	46	1.54	2996	7.99
SEARS	313	12.42	1709	67.71	234	9.28	254	10.07	13	0.52	2524	6.73
GLENDALE	312	32.89	481	50.67	156	16.44	0	0.00	0	0.00	950	2.53
HOLBROOK	641	16.53	3087	79.59	151	3.88	0	0.00	0	0.00	3879	10.35
GRAND BOULEVARD	677	24.94	1895	69.81	142	5.24	0	0.00	0	0.00	2714	7.24
WARREN	964	49.75	789	40.72	184	9.52	0	0.00	0	0.00	1938	5.17
MACK	978	81.25	88	7.34	137	11.41	0	0.00	0	0.00	1204	3.21
GRAND CIRCUS PK.	671	46.89	760	53.11	0	0.00	0	0.00	0	0.00	1431	3.82
CADILLAC CENTER	3340	55.05	2727	44.95	0	0.00	0	0.00	0	0.00	6067	16.19
RENAISSANCE CTR.	2655	82.45	565	17.55	0	0.00	0	0.00	0	0.00	3220	8.59
ORLEANS	167	100.00	0	0.00	0	0.00	0	0.00	0	0.00	167	0.45
LAFAYETTE	95	28.75	177	53.33	60	18.10	0	0.00	0	0.00	332	0.89
TOTAL	12200	32.55	20662	55.12	1866	4.98	2633	7.02	124	0.33	37485	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-11

Woodward Corridor Light Rail
Mode of Access
(PM Peak Hour-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	62	6.97	733	82.45	26	2.92	65	7.31	3	0.34	889	4.78
I-696	38	4.34	790	90.29	12	1.37	33	3.77	2	0.23	875	4.70
NINE MILE	57	13.13	288	66.36	21	4.84	65	14.98	3	0.69	434	2.33
STATE FAIR	50	13.97	235	65.64	15	4.19	55	15.36	3	0.84	358	1.92
7 MILE	63	9.20	571	83.36	15	2.19	34	4.96	2	0.29	685	3.68
MCNICHOLS	99	16.58	338	56.62	36	6.03	118	19.77	6	1.01	597	3.21
SEARS	134	11.23	913	76.53	48	4.02	93	7.80	5	0.42	1193	6.41
GLENDALE	65	17.02	298	78.01	19	4.97	0	0.00	0	0.00	382	2.05
HOLBROOK	193	12.34	1340	85.68	31	1.98	0	0.00	0	0.00	1564	8.41
GRAND BOULEVARD	741	44.27	913	54.54	20	1.19	0	0.00	0	0.00	1674	9.00
WARREN	782	63.53	420	34.12	29	2.36	0	0.00	0	0.00	1231	6.62
MACK	442	84.51	61	11.66	20	3.82	0	0.00	0	0.00	523	2.81
GRAND CIRCUS PK.	487	58.46	346	41.54	0	0.00	0	0.00	0	0.00	833	4.48
CADILLAC CENTER	3254	76.53	998	23.47	0	0.00	0	0.00	0	0.00	4252	22.86
RENAISSANCE CTR.	2601	89.35	310	10.65	0	0.00	0	0.00	0	0.00	2911	15.65
ORLEANS	88	94.62	5	5.38	0	0.00	0	0.00	0	0.00	93	0.50
LAFAYETTE	42	38.89	61	56.48	5	4.63	0	0.00	0	0.00	108	0.58
TOTAL	9198	49.45	8620	46.34	297	1.60	463	2.49	24	0.13	18602	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-12

Woodward Corridor Light Rail
Mode of Access
(PM Peak Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	147	6.97	1733	82.45	61	2.92	154	7.31	7	0.34	2102	4.78
I-696	90	4.34	1868	90.29	28	1.37	78	3.77	5	0.23	2069	4.70
NINE MILE	135	13.13	681	66.36	50	4.84	154	14.98	7	0.69	1026	2.33
STATE FAIR	118	13.97	556	65.64	35	4.19	130	15.36	7	0.84	847	1.92
7 MILE	149	9.20	1350	83.36	35	2.19	80	4.96	5	0.29	1620	3.68
MCNICHOLS	234	16.58	799	56.62	85	6.03	279	19.77	14	1.01	1412	3.21
SEARS	317	11.23	2159	76.53	114	4.02	220	7.80	12	0.42	2821	6.41
GLENDALE	154	17.02	705	78.01	45	4.97	0	0.00	0	0.00	903	2.05
HOLBROOK	456	12.34	3169	85.68	73	1.98	0	0.00	0	0.00	3699	8.41
GRAND BOULEVARD	1752	44.27	2159	54.54	47	1.19	0	0.00	0	0.00	3959	9.00
WARREN	1849	63.53	993	34.12	69	2.36	0	0.00	0	0.00	2911	6.62
MACK	1045	84.51	144	11.66	47	3.82	0	0.00	0	0.00	1237	2.81
GRAND CIRCUS PK.	1152	58.46	818	41.54	0	0.00	0	0.00	0	0.00	1970	4.48
CADILLAC CENTER	7695	76.53	2360	23.47	0	0.00	0	0.00	0	0.00	10056	22.86
RENAISSANCE CTR.	6151	89.35	733	10.65	0	0.00	0	0.00	0	0.00	6884	15.65
ORLEANS	208	94.62	12	5.38	0	0.00	0	0.00	0	0.00	220	0.50
LAFAYETTE	99	38.89	144	56.48	12	4.63	0	0.00	0	0.00	255	0.58
TOTAL	21752	49.45	20385	46.34	702	1.60	1095	2.49	57	0.13	43992	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-13

Woodward Corridor Light Rail
Mode of Access
(Evening Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	186	7.76	1995	83.32	75	3.15	131	5.46	7	0.31	2394	8.78
I-696	103	5.42	1690	89.16	27	1.42	71	3.74	5	0.26	1896	6.95
NINE MILE	143	13.26	505	46.74	103	9.57	315	29.13	14	1.30	1081	3.96
STATE FAIR	120	13.26	284	31.44	106	11.74	376	41.67	17	1.89	903	3.31
7 MILE	108	10.27	803	76.64	43	4.07	91	8.67	4	0.35	1048	3.84
MCNICHOLS	348	15.99	822	37.71	228	10.47	747	34.29	34	1.54	2179	7.99
SEARS	228	12.42	1242	67.71	170	9.28	185	10.07	10	0.52	1835	6.73
GLENDALE	228	32.89	351	50.67	114	16.44	0	0.00	0	0.00	692	2.54
HOLBROOK	466	16.53	2246	79.59	109	3.88	0	0.00	0	0.00	2822	10.35
GRAND BOULEVARD	492	24.94	1378	69.81	103	5.24	0	0.00	0	0.00	1974	7.24
WARREN	701	49.75	574	40.72	134	9.52	0	0.00	0	0.00	1410	5.17
MACK	711	81.25	64	7.34	100	11.41	0	0.00	0	0.00	875	3.21
GRAND CIRCUS PK.	488	46.89	553	53.11	0	0.00	0	0.00	0	0.00	1041	3.82
CADILLAC CENTER	2430	55.05	1984	44.95	0	0.00	0	0.00	0	0.00	4414	16.18
RENAISSANCE CTR.	1933	82.45	411	17.55	0	0.00	0	0.00	0	0.00	2344	8.59
ORLEANS	123	100.00	0	0.00	0	0.00	0	0.00	0	0.00	123	0.45
LAFAYETTE	70	28.75	129	53.33	44	18.10	0	0.00	0	0.00	242	0.89
TOTAL	8878	32.55	15032	55.12	1357	4.98	1916	7.02	90	0.33	27273	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-14

Woodward Corridor Light Rail
Mode of Access
(Off Peak-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	441	7.76	4736	83.32	179	3.15	310	5.46	18	0.31	5684	8.78
I-696	244	5.42	4014	89.16	64	1.42	168	3.74	12	0.26	4502	6.95
NINE MILE	340	13.26	1199	46.74	246	9.57	747	29.13	33	1.30	2566	3.96
STATE FAIR	284	13.26	674	31.44	252	11.74	893	41.67	41	1.89	2144	3.31
7 MILE	256	10.27	1908	76.64	101	4.07	216	8.67	9	0.35	2489	3.84
MCNICHOLS	827	15.99	1951	37.71	542	10.47	1775	34.29	80	1.54	5175	7.99
SEARS	541	12.42	2951	67.71	405	9.28	439	10.07	23	0.52	4359	6.73
GLENDALE	540	32.89	832	50.67	270	16.44	0	0.00	0	0.00	1642	2.54
HOLBROOK	1108	16.53	5333	79.59	260	3.88	0	0.00	0	0.00	6701	10.35
GRAND BOULEVARD	1169	24.94	3273	69.81	246	5.24	0	0.00	0	0.00	4688	7.24
WARREN	1666	49.75	1363	40.72	319	9.52	0	0.00	0	0.00	3348	5.17
MACK	1689	81.25	153	7.34	237	11.41	0	0.00	0	0.00	2079	3.21
GRAND CIRCUS PK.	1159	46.89	1313	53.11	0	0.00	0	0.00	0	0.00	2472	3.82
CADILLAC CENTER	5770	55.05	4711	44.95	0	0.00	0	0.00	0	0.00	10481	16.18
RENAISSANCE CTR.	4588	82.45	976	17.55	0	0.00	0	0.00	0	0.00	5564	8.59
ORLEANS	290	100.00	0	0.00	0	0.00	0	0.00	0	0.00	290	0.45
LAFAYETTE	165	28.75	306	53.33	104	18.10	0	0.00	0	0.00	574	0.89
TOTAL	21077	32.55	35694	55.12	3223	4.98	4549	7.02	214	0.33	64758	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-15

Woodward Corridor Light Rail
Mode of Access
(Daily-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	877	7.72	9004	79.21	489	4.30	949	8.34	48	0.42	11367	7.64
I-696	540	5.55	8524	87.72	164	1.69	463	4.76	27	0.28	9718	6.53
NINE MILE	738	13.08	2571	45.54	559	9.90	1699	30.09	79	1.40	5645	3.79
STATE FAIR	533	11.45	1409	30.27	561	12.06	2058	44.21	94	2.01	4655	3.13
7 MILE	581	11.05	3975	75.56	225	4.28	458	8.71	21	0.40	5260	3.53
MCNICHOLS	1577	15.60	3895	38.53	1052	10.41	3427	33.90	158	1.57	10109	6.79
SEARS	1259	11.58	7578	69.68	985	9.06	1003	9.23	50	0.46	10875	7.31
GLENDALE	1111	29.15	2141	56.13	561	14.72	0	0.00	0	0.00	3813	2.56
HOLBROOK	2281	15.83	11662	80.92	468	3.25	0	0.00	0	0.00	14411	9.68
GRAND BOULEVARD	3771	28.05	9241	68.72	434	3.23	0	0.00	0	0.00	13447	9.04
WARREN	4399	53.15	3203	38.70	674	8.15	0	0.00	0	0.00	8276	5.56
MACK	3677	80.01	385	8.38	534	11.61	0	0.00	0	0.00	4596	3.09
GRAND CIRCUS PK.	2777	50.05	2771	49.95	0	0.00	0	0.00	0	0.00	5548	3.73
CADILLAC CENTER	15024	60.86	9661	39.14	0	0.00	0	0.00	0	0.00	24685	16.59
RENAISSANCE CTR.	12038	82.71	2517	17.29	0	0.00	0	0.00	0	0.00	14555	9.78
ORLEANS	652	98.22	12	1.78	0	0.00	0	0.00	0	0.00	664	0.45
LAFAYETTE	360	30.32	636	53.62	192	16.14	0	0.00	0	0.00	1186	0.80
TOTAL	52195	35.07	79185	53.21	6898	4.64	10056	6.76	476	0.32	148811	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-16

Woodward Corridor Light Rail
Mode of Departure
(AM Peak Hour-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	53	6.78	673	86.06	19	2.43	35	4.48	2	0.26	782	4.78
I-696	33	4.29	676	87.79	8	1.04	50	6.49	3	0.39	770	4.70
NINE MILE	52	13.61	263	68.85	16	4.19	48	12.57	3	0.79	382	2.33
STATE FAIR	45	14.29	218	69.21	11	3.49	39	12.38	2	0.63	315	1.92
7 MILE	56	9.29	514	85.24	11	1.82	21	3.48	1	0.17	603	3.68
MCNICHOLS	90	17.14	316	60.19	27	5.14	87	16.57	5	0.95	525	3.21
SEARS	131	12.48	847	80.67	39	3.71	31	2.95	2	0.19	1050	6.41
GLENDALE	63	18.75	257	76.49	16	4.76	0	0.00	0	0.00	336	2.05
HOLBROOK	177	12.86	1177	85.54	22	1.60	0	0.00	0	0.00	1376	8.41
GRAND BOULEVARD	645	43.79	812	55.13	16	1.09	0	0.00	0	0.00	1473	9.00
WARREN	683	63.07	378	34.90	22	2.03	0	0.00	0	0.00	1083	6.62
MACK	395	85.87	50	10.87	15	3.26	0	0.00	0	0.00	460	2.81
GRAND CIRCUS PK.	428	58.39	305	41.61	0	0.00	0	0.00	0	0.00	733	4.48
CADILLAC CENTER	2915	77.90	827	22.10	0	0.00	0	0.00	0	0.00	3742	22.86
RENAISSANCE CTR.	2441	95.28	121	4.72	0	0.00	0	0.00	0	0.00	2562	15.65
ORLEANS	82	100.00	0	0.00	0	0.00	0	0.00	0	0.00	82	0.50
LAFAYETTE	37	38.95	54	56.84	4	4.21	0	0.00	0	0.00	95	0.58
TOTAL	8326	50.86	7488	45.75	226	1.38	311	1.90	18	0.11	16369	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-17

Woodward Corridor Light Rail
Mode of Departure
(AM Peak Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	130	6.78	1647	86.06	47	2.43	86	4.48	5	0.26	1914	4.78
I-696	81	4.29	1654	87.79	20	1.04	122	6.49	7	0.39	1884	4.70
NINE MILE	127	13.61	644	68.85	39	4.19	117	12.57	7	0.79	935	2.33
STATE FAIR	110	14.29	534	69.21	27	3.49	95	12.38	5	0.63	771	1.92
7 MILE	137	9.29	1258	85.24	27	1.82	51	3.48	2	0.17	1476	3.68
MCNICHOLS	220	17.14	773	60.19	66	5.14	213	16.57	12	0.95	1285	3.21
SEARS	321	12.48	2073	80.67	95	3.71	76	2.95	5	0.19	2570	6.41
GLENDALE	154	18.75	629	76.49	39	4.76	0	0.00	0	0.00	822	2.05
HOLBROOK	433	12.86	2881	85.54	54	1.60	0	0.00	0	0.00	3368	8.41
GRAND BOULEVARD	1579	43.79	1987	55.13	39	1.09	0	0.00	0	0.00	3605	9.00
WARREN	1672	63.07	925	34.90	54	2.03	0	0.00	0	0.00	2651	6.62
MACK	967	85.87	122	10.87	37	3.26	0	0.00	0	0.00	1126	2.81
GRAND CIRCUS PK.	1047	58.39	746	41.61	0	0.00	0	0.00	0	0.00	1794	4.48
CADILLAC CENTER	7134	77.90	2024	22.10	0	0.00	0	0.00	0	0.00	9158	22.86
RENAISSANCE CTR.	5974	95.28	296	4.72	0	0.00	0	0.00	0	0.00	6270	15.65
ORLEANS	201	100.00	0	0.00	0	0.00	0	0.00	0	0.00	201	0.50
LAFAYETTE	91	38.95	132	56.84	10	4.21	0	0.00	0	0.00	233	0.58
TOTAL	20377	50.86	18326	45.75	553	1.38	761	1.90	44	0.11	40061	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-18

Woodward Corridor Light Rail
Mode of Departure
(Midday Hour-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	63	6.96	723	79.29	45	4.92	76	8.38	4	0.45	912	7.70
I-696	36	4.82	643	86.13	17	2.24	48	6.47	3	0.34	747	6.31
NINE MILE	48	13.21	187	51.52	31	8.60	92	25.37	5	1.30	363	3.07
STATE FAIR	73	15.71	205	44.22	39	8.50	139	30.00	7	1.56	464	3.92
7 MILE	55	9.28	435	73.44	31	5.28	68	11.41	3	0.59	592	5.00
MCNICHOLS	121	15.72	301	39.07	79	10.20	256	33.25	14	1.76	771	6.51
SEARS	92	12.26	502	67.19	72	9.60	78	10.40	4	0.55	747	6.31
GLENDALE	65	30.47	117	54.88	31	14.64	0	0.00	0	0.00	213	1.80
HOLBROOK	214	15.65	1091	79.91	61	4.44	0	0.00	0	0.00	1366	11.54
GRAND BOULEVARD	246	29.68	546	65.90	37	4.42	0	0.00	0	0.00	829	7.00
WARREN	289	52.62	217	39.45	44	7.94	0	0.00	0	0.00	549	4.64
MACK	207	81.04	20	7.81	28	11.15	0	0.00	0	0.00	255	2.15
GRAND CIRCUS PK.	188	47.63	206	52.37	0	0.00	0	0.00	0	0.00	394	3.33
CADILLAC CENTER	1329	61.08	847	38.92	0	0.00	0	0.00	0	0.00	2176	18.38
RENAISSANCE CTR.	1136	84.75	204	15.25	0	0.00	0	0.00	0	0.00	1340	11.32
ORLEANS	31	96.04	1	3.96	0	0.00	0	0.00	0	0.00	32	0.27
LAFAYETTE	24	27.64	51	58.91	12	13.45	0	0.00	0	0.00	87	0.73
TOTAL	4216	35.61	6298	53.21	526	4.44	758	6.40	40	0.34	11838	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-19

Woodward Corridor Light Rail
Mode of Departure
(Midday Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	201	6.96	2290	79.29	142	4.92	242	8.38	13	0.45	2888	7.70
I-696	114	4.82	2037	86.13	53	2.24	153	6.47	8	0.34	2365	6.31
NINE MILE	152	13.21	593	51.52	99	8.60	292	25.37	15	1.30	1151	3.07
STATE FAIR	231	15.71	650	44.22	125	8.50	441	30.00	23	1.56	1470	3.92
7 MILE	174	9.28	1377	73.44	99	5.28	214	11.41	11	0.59	1875	5.00
MCNICHOLS	384	15.72	954	39.07	249	10.20	812	33.25	43	1.76	2442	6.51
SEARS	290	12.26	1589	67.19	227	9.60	246	10.40	13	0.55	2365	6.31
GLENDALE	206	30.47	371	54.88	99	14.64	0	0.00	0	0.00	676	1.80
HOLBROOK	677	15.65	3456	79.91	192	4.44	0	0.00	0	0.00	4325	11.54
GRAND BOULEVARD	779	29.68	1730	65.90	116	4.42	0	0.00	0	0.00	2625	7.00
WARREN	915	52.62	686	39.45	138	7.94	0	0.00	0	0.00	1739	4.64
MACK	654	81.04	63	7.81	90	11.15	0	0.00	0	0.00	807	2.15
GRAND CIRCUS PK.	594	47.63	653	52.37	0	0.00	0	0.00	0	0.00	1247	3.33
CADILLAC CENTER	4209	61.08	2682	38.92	0	0.00	0	0.00	0	0.00	6891	18.38
RENAISSANCE CTR.	3596	84.75	647	15.25	0	0.00	0	0.00	0	0.00	4243	11.32
ORLEANS	97	96.04	4	3.96	0	0.00	0	0.00	0	0.00	101	0.27
LAFAYETTE	76	27.64	162	58.91	37	13.45	0	0.00	0	0.00	275	0.73
TOTAL	13349	35.61	19944	53.21	1666	4.44	2400	6.40	126	0.34	37485	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-20

Woodward Corridor Light Rail
Mode of Departure
(PM Peak Hour-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	121	7.25	1083	65.15	125	7.53	317	19.08	16	0.99	1662	8.94
I-696	86	5.90	1132	77.48	60	4.08	174	11.90	9	0.64	1461	7.85
NINE MILE	117	12.30	318	33.39	124	13.06	373	39.21	19	2.04	952	5.12
STATE FAIR	71	9.25	221	28.56	97	12.58	364	47.16	19	2.46	773	4.16
7 MILE	59	11.08	302	56.61	51	9.58	115	21.62	6	1.11	534	2.87
MCNICHOLS	230	14.06	529	32.33	200	12.20	644	39.34	34	2.07	1636	8.80
SEARS	156	9.12	956	55.73	204	11.90	380	22.15	19	1.11	1716	9.23
GLENDALE	191	32.38	274	46.59	124	21.03	0	0.00	0	0.00	589	3.17
HOLBROOK	322	17.31	1419	76.22	121	6.47	0	0.00	0	0.00	1862	10.01
GRAND BOULEVARD	393	17.63	1712	76.85	123	5.52	0	0.00	0	0.00	2228	11.98
WARREN	413	44.10	384	40.99	140	14.91	0	0.00	0	0.00	936	5.03
MACK	420	70.75	39	6.55	135	22.70	0	0.00	0	0.00	594	3.19
GRAND CIRCUS PK.	214	41.53	301	58.47	0	0.00	0	0.00	0	0.00	514	2.76
CADILLAC CENTER	570	29.59	1356	70.41	0	0.00	0	0.00	0	0.00	1926	10.36
RENAISSANCE CTR.	601	61.44	377	38.56	0	0.00	0	0.00	0	0.00	978	5.26
ORLEANS	69	96.47	3	3.53	0	0.00	0	0.00	0	0.00	72	0.39
LAFAYETTE	43	25.70	90	53.94	34	20.36	0	0.00	0	0.00	166	0.89
TOTAL	4076	21.92	10496	56.43	1537	8.26	2368	12.73	123	0.66	18600	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-21

Woodward Corridor Light Rail
Mode of Departure
(PM Peak Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	285	7.25	2561	65.15	296	7.53	750	19.08	39	0.99	3931	8.94
I-696	204	5.90	2677	77.48	141	4.08	411	11.90	22	0.64	3455	7.85
NINE MILE	277	12.30	752	33.39	294	13.06	883	39.21	46	2.04	2252	5.12
STATE FAIR	169	9.25	522	28.56	230	12.58	862	47.16	45	2.46	1828	4.16
7 MILE	140	11.08	715	56.61	121	9.58	273	21.62	14	1.11	1263	2.87
MCNICHOLS	544	14.06	1251	32.33	472	12.20	1522	39.34	80	2.07	3869	8.80
SEARS	370	9.12	2262	55.73	483	11.90	899	22.15	45	1.11	4059	9.23
GLENDALE	451	32.38	649	46.59	293	21.03	0	0.00	0	0.00	1393	3.17
HOLBROOK	762	17.31	3356	76.22	285	6.47	0	0.00	0	0.00	4403	10.01
GRAND BOULEVARD	929	17.63	4049	76.85	291	5.52	0	0.00	0	0.00	5269	11.98
WARREN	976	44.10	907	40.99	330	14.91	0	0.00	0	0.00	2213	5.03
MACK	994	70.75	92	6.55	319	22.70	0	0.00	0	0.00	1405	3.19
GRAND CIRCUS PK.	505	41.53	711	58.47	0	0.00	0	0.00	0	0.00	1216	2.76
CADILLAC CENTER	1348	29.59	3207	70.41	0	0.00	0	0.00	0	0.00	4555	10.36
RENAISSANCE CTR.	1421	61.44	892	38.56	0	0.00	0	0.00	0	0.00	2313	5.26
ORLEANS	164	96.47	6	3.53	0	0.00	0	0.00	0	0.00	170	0.39
LAFAYETTE	101	25.70	212	53.94	80	20.36	0	0.00	0	0.00	393	0.89
TOTAL	9640	21.92	24821	56.43	3635	8.26	5600	12.73	291	0.66	43987	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-22

Woodward Corridor Light Rail
Mode of Departure
(Evening Period-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	146	6.96	1666	79.29	103	4.92	176	8.38	9	0.45	2101	7.70
I-696	83	4.82	1482	86.13	39	2.24	111	6.47	6	0.34	1721	6.31
NINE MILE	111	13.21	431	51.52	72	8.60	212	25.37	11	1.30	837	3.07
STATE FAIR	168	15.71	473	44.22	91	8.50	321	30.00	17	1.56	1070	3.92
7 MILE	127	9.28	1002	73.44	72	5.28	156	11.41	8	0.59	1364	5.00
MCNICHOLS	279	15.72	694	39.07	181	10.20	591	33.25	31	1.76	1777	6.51
SEARS	211	12.26	1156	67.19	165	9.60	179	10.40	9	0.55	1721	6.31
GLENDALE	150	30.47	270	54.88	72	14.64	0	0.00	0	0.00	492	1.80
HOLBROOK	493	15.65	2514	79.91	140	4.44	0	0.00	0	0.00	3147	11.54
GRAND BOULEVARD	567	29.68	1259	65.90	84	4.42	0	0.00	0	0.00	1910	7.00
WARREN	666	52.62	499	39.45	100	7.94	0	0.00	0	0.00	1265	4.64
MACK	476	81.04	46	7.81	65	11.15	0	0.00	0	0.00	587	2.15
GRAND CIRCUS PK.	432	47.63	475	52.37	0	0.00	0	0.00	0	0.00	907	3.33
CADILLAC CENTER	3062	61.08	1951	38.92	0	0.00	0	0.00	0	0.00	5014	18.38
RENAISSANCE CTR.	2616	84.75	471	15.25	0	0.00	0	0.00	0	0.00	3087	11.32
ORLEANS	71	96.04	3	3.96	0	0.00	0	0.00	0	0.00	73	0.27
LAFAYETTE	55	27.64	118	58.91	27	13.45	0	0.00	0	0.00	200	0.73
TOTAL	9712	35.61	14511	53.21	1212	4.44	1746	6.40	92	0.34	27273	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-23

Woodward Corridor Light Rail
Mode of Departure
(Off Peak-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	347	6.96	3956	79.29	245	4.92	418	8.38	22	0.45	4989	7.70
I-696	197	4.82	3519	86.13	92	2.24	264	6.47	14	0.34	4086	6.31
NINE MILE	263	13.21	1024	51.52	171	8.60	504	25.37	26	1.30	1988	3.07
STATE FAIR	399	15.71	1123	44.22	216	8.50	762	30.00	40	1.56	2540	3.92
7 MILE	301	9.28	2379	73.44	171	5.28	370	11.41	19	0.59	3239	5.00
MCNICHOLS	663	15.72	1648	39.07	430	10.20	1403	33.25	74	1.76	4219	6.51
SEARS	501	12.26	2745	67.19	392	9.60	425	10.40	22	0.55	4086	6.31
GLENDALE	356	30.47	641	54.88	171	14.64	0	0.00	0	0.00	1168	1.80
HOLBROOK	1170	15.65	5970	79.91	332	4.44	0	0.00	0	0.00	7472	11.54
GRAND BOULEVARD	1346	29.68	2989	65.90	200	4.42	0	0.00	0	0.00	4535	7.00
WARREN	1581	52.62	1185	39.45	238	7.94	0	0.00	0	0.00	3004	4.64
MACK	1130	81.04	109	7.81	155	11.15	0	0.00	0	0.00	1394	2.15
GRAND CIRCUS PK.	1026	47.63	1128	52.37	0	0.00	0	0.00	0	0.00	2154	3.33
CADILLAC CENTER	7271	61.08	4633	38.92	0	0.00	0	0.00	0	0.00	11905	18.38
RENAISSANCE CTR.	6212	84.75	1118	15.25	0	0.00	0	0.00	0	0.00	7330	11.32
ORLEANS	168	96.04	7	3.96	0	0.00	0	0.00	0	0.00	174	0.27
LAFAYETTE	131	27.64	280	58.91	64	13.45	0	0.00	0	0.00	475	0.73
TOTAL	23061	35.61	34455	53.21	2878	4.44	4146	6.40	218	0.34	64758	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

Table 3-24

Woodward Corridor Light Rail
Mode of Departure
(Daily-Constrained)

STATION	WALK TRIPS	% OF ROW TOTALS	BUS TRIPS	% OF ROW TOTALS	K/R TRIPS	% OF ROW TOTALS	P/R TRIPS	% OF ROW TOTALS	P/R PASS TRIPS	% OF ROW TOTAL	TOTAL	% OF COL. TOTAL
ROYAL OAK	762	7.03	8164	75.36	588	5.43	1254	11.57	66	0.61	10834	7.28
I-696	482	5.11	7850	83.29	252	2.68	798	8.46	43	0.46	9425	6.33
NINE MILE	667	12.89	2420	46.76	504	9.74	1505	29.08	79	1.53	5175	3.48
STATE FAIR	678	13.20	2178	42.40	473	9.20	1719	33.46	90	1.74	5138	3.45
7 MILE	578	9.66	4352	72.80	319	5.34	694	11.61	35	0.59	5978	4.02
NICHOLS	1428	15.23	3672	39.18	968	10.33	3138	33.48	167	1.78	9373	6.30
SEARS	1192	11.12	7080	66.08	971	9.06	1400	13.07	72	0.68	10714	7.20
GLENDALE	961	28.41	1919	56.72	503	14.87	0	0.00	0	0.00	3383	2.27
HOLBROOK	2365	15.51	12207	80.09	671	4.40	0	0.00	0	0.00	15242	10.24
GRAND BOULEVARD	3853	28.74	9025	67.31	531	3.96	0	0.00	0	0.00	13409	9.01
WARREN	4228	53.74	3017	38.35	622	7.91	0	0.00	0	0.00	7868	5.29
MACK	3091	78.74	323	8.23	511	13.02	0	0.00	0	0.00	3925	2.64
GRAND CIRCUS PK.	2579	49.93	2586	50.07	0	0.00	0	0.00	0	0.00	5164	3.47
CADILLAC CENTER	15753	61.49	9864	38.51	0	0.00	0	0.00	0	0.00	25618	17.22
RENAISSANCE CTR.	13607	85.51	2306	14.49	0	0.00	0	0.00	0	0.00	15913	10.69
ORLEANS	532	97.63	13	2.37	0	0.00	0	0.00	0	0.00	545	0.37
LAFAYETTE	323	29.33	624	56.70	154	13.97	0	0.00	0	0.00	1101	0.74
TOTAL	53078	35.67	77602	52.15	7066	4.75	10507	7.06	553	0.37	148806	100.00

Source: SEMTA and Peat Marwick Mitchell & Co.

The same logic applies to the mode of departure. The fraction of trips departing the WLC that use auto modes is highest in the afternoon. For example, in the PM peak, 22 percent of the WLC riders depart in an auto while during the AM peak hour, only 3 percent use an auto mode. The daily average mode of departure lies between these extremes with 12 percent using an auto mode, 36 percent walking and 52 percent using a bus.

3.3.5 Woodward Corridor Bus Usage

This subsection summarizes the Initial network projections of bus usage in the Woodward Corridor. Bus service characteristics and patronage estimates are presented for two screenlines crossing the corridor. These screenlines are:

- Grand Boulevard from the Lodge Freeway to the Chrysler Freeway; and

- State Fair Avenue from Wyoming Road to John R Street.

The Grand Boulevard screenline bus and passenger crossings show that the heaviest hourly bus volumes occur in the inbound direction during the AM peak hour when 1,150 riders cross the screenline on 102 buses. This results in an average bus occupancy of 11.31. Average occupancies for off-peak and for peak hour, reverse direction buses range from 4.78 to 10.71 respectively.

These low bus occupancies are due to three factors:

- High frequency bus service divides the bus passenger demand over many vehicles, reducing average occupancy.

- The WLC offers a faster more frequent service which attracts riders away from competitive bus lines.

- Riders on Woodward Avenue buses feeding the WLC alight before crossing the screenline to board the rail line. The buses cross the screenline nearly empty even though they are effective feeders.

These factors suggest that the assigned WLC and parallel bus passenger volumes should be used with care. The modelling chain does not use a submode split model to assign riders to the different transit modes. Instead, all transit trips are assigned to the shortest path. In the Woodward Corridor, this means that most trips are assigned to the WLC or feeder buses and that relatively few are assigned to linehaul buses.

The State Fair Avenue screenline bus and passenger characteristics show that the heaviest bus and passenger volumes occur during the AM peak hour in the inbound direction when 604 passengers cross the screenline in 27 buses. This results in an average bus occupancy of 22.37. Average occupancies for off peak and for peak hour, reverse direction buses range from 3.14 to 13.68 respectively. The same factors responsible for low occupancies across the Grand Boulevard screenline apply to occupancies for buses crossing the State Fair screenline.

3.4 PROJECTED RIDERSHIP FOR THE BASELINE NETWORK

This subsection documents the results of the Baseline network simulation at the 402 zone level. This network includes existing transit service, CATS, and service improvements to commuter and bus operations.

3.4.1 Modal Split by Trip Purpose

The results of the mode split analyses and subsequent factoring to remove school trips are shown in Table 3-25. This process estimates that 6.1 percent of the regional Home-Based-Work trips will use transit. Work trips produced in or attracted to the CBD have a much higher mode split at 38.5 and 26.9 percent respectively.

The regional Home-Based-Other mode split is 4.0 percent. Although this is lower than the regional work mode split, the transit share of Home-Based-Other trips produced in or attracted to the CBD remains relatively high at 30.3 and 35.1 percent respectively.

The regional mode split for Non-Home-Based trips is 1.5 percent and the transit share for Non-Home-Based trips produced in or attracted to the CBD is 10.4 and 9.8 percent, respectively.

The results of the mode split process indicate that of the 13.7 million daily person trips generated in the Southeast Michigan region, 521,000 trips (or 3.8 percent) will use transit. These trips will be composed of 177,000 Home-Based-Work trips (34.0 percent of the total), 292,000 Home-Based-Other trips (56.0 percent of the total), and 292,000 Home-Based-Other trips (56.0 percent of the total), and 52,000 Non-Home-Based trips (9.9 percent of the total). Transit travel will have a strong CBD orientation with 31 percent of all transit trips attracted to the CBD and another 32 percent attracted to other parts of the Woodward Corridor.

TABLE 3-25
SUMMARY OF BASELINE TRANSIT TRIP ESTIMATES BY TRIP PURPOSE

Trip Productions

Georgraphic Area	Home Based Work Transit Trips	Home Based Work Percent Transit	Home Based* Other Transit Trips	Home Based* Other Percent Transit	Non Home Based Transit Trips	Non Home Based Percent Transit	Total Transit Trips	Total Percent Transit
Woodward Corridor	68,141	13.7%	95,341	8.7%	30,055	3.4%	193,537	7.8%
CBD	3,132	38.5	3,858	30.3	10,265	10.4	17,255	14.5
Remainder of Corridor	65,009	13.3	91,483	8.5	19,790	2.5	176,282	7.5
Outside of Corridor	109,207	4.6	196,669	3.2	21,741	0.8	327,617	2.9
Regional Total	177,348	6.1	292,010	4.0	51,796	1.5	521,154	3.8

Trip Attractions

	Home Based Work Transit Trips	Home Based Work Percent Transit	Home Based Other Transit Trips	Home Based Other Percent Transit	Non Home Based Transit Trips	Non Home Based Percent Transit	Total Transit Trips	Total Percent Transit
Woodward Corridor	121,817	14.6%	175,933	10.4%	29,705	3.4%	327,455	9.7%
CBD	55,826	26.9	92,205	35.1	11,624	9.8	159,655	27.1
Remainder of Corridor	65,991	10.5	83,728	5.9	18,081	2.4	167,800	6.0
Outside of Corridor	55,525	2.7	116,077	2.1	22,089	0.8	193,691	1.9
Regional Total	177,342	6.1	292,010	4.0	51,794	1.5	521,146	3.8

* Factored to adjust for school trips.

Source: SEMTA and Peat Marwick Mitchell & Co.

3.4.2 Transit Trips by Mode

This subsection documents the regional distribution of transit trips among the four transit modes in the Baseline network -- local bus, express bus, DPM and commuter rail. Table 3-26 shows unlinked trips, passenger miles, and passenger hours by transit mode for the AM peak hour and for the midday hour. This table shows that the majority of unlinked trips use local buses particularly in the midday hour when little express service is offered. Local bus riders have a relatively short average trip distance when compared to other modes. This reflects the tendency of travelers to prefer high frequency, low speed buses for short trips and lower frequency, high speed services for longer trips.

The effect of removing the WLC from the networks can be seen in Table 3-26. This comparison shows that in the AM peak hour, the number of local bus trips drop but the average trip distance increases. The opposite occurs for express buses. The explanation for this is that interchanges that use a local bus to feed the WLC in the Initial network will use an express bus in the Baseline network. These new travellers add to the number of express bus trips while travelling a shorter distance. This results in a lower average trip distance. For those interchanges where no express service is available, the WLC riders use a local bus. This shift does not make up for the number of feeder bus trips lost by removing the WLC but it does increase the average trip distance because these riders remain on the bus for greater distances.

TABLE 3-26

COMPARISON OF TRANSIT TRAVEL CHARACTERISTICS FOR BASELINE AND INITIAL NETWORK SIMULATIONS

BASELINE NETWORK

	AM PEAK HOUR (7:30 AM-8:30 AM)				MIDDAY HOUR (11:30 AM-12:30 PM)			
	Unlinked Trips	Pass. Miles	Pass. Hours	Average Trip Distance	Unlinked Trips	Pass. Miles	Pass. Hours	Average Trip Distance
Local Bus	67,207	225,891	14,597	3.36 miles	69,408	296,749	20,246	4.28 miles
Express Bus	15,641	125,702	6,494	8.04 miles	365	4,096	212	11.22 miles
CATS	2,700	1,972	154	0.73 miles	2,927	1,901	167	0.65 miles
Commuter Rail	972	15,544	528	15.99 miles	109	3,353	100	30.76 miles
TOTAL	86,520	369,109	21,773	4.27 miles	72,809	306,099	20,725	4.20 miles

INITIAL NETWORK

	AM PEAK HOUR (7:30 AM-8:30 AM)				MIDDAY HOUR (11:30 AM-12:30 PM)			
	Unlinked Trips	Pass. Miles	Pass. Hours	Average Trip Distance	Unlinked Trips	Pass. Miles	Pass. Hours	Average Trip Distance
Local Bus	83,357	259,726	16,475	31.2 miles	64,392	246,332	15,943	3.83 miles
Express Bus	14,332	118,798	5,888	8.29 miles	158	2,119	114	13.41 miles
Light Rail	16,369	72,545	2,859	4.43 miles	11,838	58,246	2,282	4.92 miles
CATS	2,512	1,847	146	0.74 miles	1,984	1,226	104	0.62 miles
Commuter Rail	1,310	19,073	651	14.56 miles	151	4,810	146	31.85 miles
TOTAL	117,880	471,989	26,019	4.00 miles	78,523	312,733	18,589	3.98 miles

Source: SEMTA and Peat Marwick Mitchell & Co.

3.4.3 Woodward Corridor Bus Usage

This subsection summarizes the Baseline network bus usage in the Woodward Corridor. Bus service characteristics and patronage estimates are presented for the same two screenlines used in subsection 3.3.5. These screenlines are:

- Grand Boulevard from the Lodge Freeway to the Chrysler Freeway; and

- State Fair Avenue from Wyoming Road to John R Street.

Grand Boulevard screenline bus and passenger crossing characteristics show that the heaviest hourly bus volumes occur in the inbound direction during the AM peak hour when 4,766 riders cross the screenline on 131 buses. This results in an average bus occupancy of 36.5. Average occupancies for off-peak and for peak hour, reverse direction buses range from 10.73 to 62.15.

State Fair Avenue screenline bus and passenger characteristics show that the heaviest bus and passenger volumes occur during the AM peak hour in the inbound direction when 1,822 passengers cross the screenline on 50 buses. This results in an average occupancy of 36.4. Average occupancies for off peak and for peak hour, reverse direction buses range from 10.91 to 69.5.

4.0 SUMMARY OF FINDINGS

This section summarizes the key findings of the Initial and Baseline network simulations. WLC ridership data presented in subsection 3.3.3 indicates that 148,800 passengers will use the WLC light rail line on a daily basis. The maximum load point on this line is located between the Mack and Grand Circus Park stations with 43,209 daily inbound passengers and 41,505 daily outbound passengers. This ridership is approximately 2.6 times higher than bus riders counted crossing the Fisher Freeway Screenline from Third Street to Beaubien Street in 1980 (see Table 4-1).

This growth rate is a product of several factors:

- Population and employment growth in the region and particularly in the Detroit CBD has increased the number of person trips travelling in the Woodward Corridor;

- Fast, frequent service provided by the WLC encourages a greater transit modal split; and

- Fast, frequent service provided by the WLC encourages transit passengers in other corridors (e.g. Grand Boulevard, Conant Avenue, and Van Dyke Road) to shift to the Woodward Corridor.

The modelling process appears to predict reasonable volumes for the Baseline case. Tables 4-2 and 4-3 show that Baseline transit crossings at Grand Boulevard are 80 percent higher in the AM peak and 74 percent higher during the midday than those observed in 1980. This is a reasonable growth given a forecasted increase in CBD employment to 147,000 and improvements to corridor bus

TABLE 4-1

COMPARISON OF WLC DAILY MAXIMUM LOAD POINT VOLUMES TO 1980 DAILY FISHER FREEWAY SCREENLINE VOLUMES

	WLC YEAR 2000 DAILY MAXIMUM LOAD POINT RIDERSHIP	1980 FISHER FREEWAY SCREENLINE DAILY RIDERSHIP
INBOUND	44,192	16,465
OUTBOUND	42,456	16,080
TOTAL	86,468	32,545

TABLE 4-2

AM PEAK HOUR SCREENLINE COMPARISONS

SCREENLINE	DIRECTION	BASELINE[2] SIMULATION	INITIAL[1, 2] SIMULATION	1980[3] COUNTS	1977[3] COUNTS
Grand Blvd. from 3rd St. to John R	IN	2,704	5,360	1,854	2,882
	OUT	593	1,935	632	748
Grand Blvd. from Lodge to Chrysler	IN	4,766	5,963	2,479	--
	OUT	917	2,032	666	--
Grand Blvd. from Lodge to GTW	IN	5,039	6,043	3,154	--
	OUT	917	2,032	666	--
State Fair from Wyoming to John R	IN	1,822	3,455	961	--
	OUT	393	1,348	586	--

1/ Initial simulation screenline crossings include WLC passengers.

2/ Source: Peat Marwick Mitchell & Company

3/ Source: SEMTA

TABLE 4-3

MIDDAY HOUR SCREENLINE COMPARISONS

SCREENLINE	DIREC-TION	BASELINE SIMULATION	INITIAL SIMULATION[1]	1980 COUNTS	1977 COUNTS
Grand Blvd. from	IN	1,529	4,328	1,108	1,431
3rd St. to John R	OUT	1,304	3,880	1,007	1,628
Grand Blvd. from	IN	2,123	4,623	1,182	--
Lodge to Chrysler	OUT	1,836	4,180	1,087	--
State Fair from	IN	1,224	1,755	287	--
Wyoming to John R	OUT	705	1,577	245	--

1/ Initial simulation screenline crossings include WLC passengers.

service. The projected Baseline ridership estimates closely compare to 1977 screenline counts taken when local and express buses offered a level of service comparable to the Baseline. This comparison does not, however, include patronage of bus lines using the Lodge or Chrysler Freeways. If passengers on these lines were included, the Baseline simulation would show a modest growth over 1977 ridership.

The reasonableness of the Baseline simulation results implies that the travel demand process is effectively estimating travel for the existing network with bus service improvements and increases in population and employment. The effect of introducing a light rail line on a partially grade separated alignment is a 41 percent increase in AM passengers and a 122 percent increase in Midday passengers at the Grand Boulevard Screenline. This increase is largely due to a higher transit mode split, increased attractiveness of the Woodward Corridor in comparison to other nearby corridors, and to the more peaked temporal factors used for Initial network simulation.

The simulated Baseline transit passengers crossing the State Fair screenline indicates a growth of 43 percent in the AM peak hour and 262 percent in the midday hour. The large growth rate in the midday period is caused by the use of a regionwide peaking factor for all bus routes. Passengers crossing the State Fair screenline are travelling between suburban and urban locations. Transit passengers on these interchanges are more likely to have a work purpose and travel during the peaks when the frequency of radial bus service is the highest. The regionwide peaking factors tend to underestimate the peaks and overestimate midday volumes on radial bus routes with low midday service.

APPENDIX A

Average Daily Parking Capacity and Cost

TABLE A-1

1975 AND 1980 PARKING CAPACITY AND COSTS (IN 1965 DOLLARS)

Zone Number	1975 Number of Spaces	1975 Average Daily Cost	1975 Average Hourly Cost	1980 Number of Spaces	1980 Average Daily Cost	1980 Average Hourly Cost
1	1,002	$ .81	$ .17	1,507	$ .72	$ .26
2	1,550	2.69	.54	2,107	1.66	.32
3	1,871	1.00	.21	1,842	.79	.41
4	673	1.67	.34	1,305	1.23	.41
5	696	.57	.12	1,629	.57	.38
6	2,794	.65	.14	3,650	.49	.31
7	936	.87	.18	-*	-*	-*
8	2,716	1.14	.23	5,038	.74	.34
9	1,475	1.95	.39	2,534	1.02	.55
10	115	.08	.02	11,607	1.39	.53
11	2,767	.17	.04	2,813	.24	.17
12	2,652	.46	.10	3,706	.39	.24
13	513	.29	.06	660	.15	.04
14	3,621	.78	.16	4,673	.53	.36
15	890	1.78	.36	1,377	1.41	.28
16	184	2.39	.48	296	.97	.26
17	157	3.86	.78	140	1.72	.08
18	765	2.75	.56	1,100	1.57	.13
19	1,602	1.05	.22	1,846	.74	.27
20	2,562	.41	.09	2,875	.43	.24
21	921	.45	.10	617	.59	.08
22	1,697	.22	.05	758	.01	.01
23	1,539	.32	.07	1,293	.08	.19
24	1,244	1.60	.33	1,328	.81	.32
25	415	1.94	.39	229	.62	.08
26	1,883	.72	.15	3,701	1.00	.23
27	1,848	.41	.09	841	.27	.08
28	1,227	.41	.09	893	.33	.08
29	1,655	.38	.08	1,269	.23	.08
30	1,153	.09	.02	102	.10	.03
32	90	.56	.12	2,500	.49	.10

Source: Southeast Michigan Council of Governments. "Regional Parking Supply Inventory and Costs." Detroit: June 1980, p. 144

TABLE A-1 (Continued)

1975 AND 1980 PARKING CAPACITY AND COSTS (IN 1965 DOLLARS)

Zone Number	1975 Number of Spaces	1975 Average Daily Cost	1975 Average Hourly Cost	1980 Number of Spaces	1980 Average Daily Cost	1980 Average Hourly Cost
49	81	$ .29	$ .06	162	$ .20	$ .20
50	3,566	2.43	.09	2,132	.29	.29
51	3,288	.38	.08	6,063	.28	.26
52	87	.33	.07	174	.22	.22
72	2,282	.44	.09	4,208	.52	.38
73	729	.37	.08	5,106	.38	.08
83	1,155	.74	.15	5,106	.38	.08
86	726	.29	.06	-*	-*	-*
151	4,178	1.25	.05	1,797	.46	.08
152	3,422	.22	.05	13,083	.57	.08
175	4,134	.06	.02	2,200	.05	.01
176	2,140	.06	.02	1,200	.05	.01
179	217	.28	.06	-*	-*	-*
197	3,150	.69	1.41	3,300	.51	.11
230	329	1.03	.01	455	.03	.01
305	662	0	.01	455	.03	.01
353	5,090	3.04	.01	11,462	.01	.01
374	400	0	.01	400	.01	.01
375	1,435	0	.01	1,435	.01	.01
598	8,498	1.32	.27	17,236	.93	.37
645	1,298	1.16	.24	2,596	.78	.78
696	2,702	0	.01	2,702	.05	.01
733	1,652	.06	.02	2,557	.05	.01
734	1,696	1.06	.02	1,696	.05	.01
736	334	1.06	.02	-*	-*	-*
742	1,618	0	.01	2,243	.01	.01
746	355	.44	.09	882	.40	.14
747	915	.62	.13	1,778	.43	.06
748	1,530	.44	.09	2,650	.30	.06
751	1,002	.62	.13	1,856	.39	.06
777	4,083	.17	.04	5,213	.24	.10

Source: Southeast Michigan Council of Governments. "Regional Parking Supply Inventory and Costs." Detroit: June 1980, p. 144

TABLE A-1 (Continued)

1975 AND 1980 PARKING CAPACITY AND COSTS (IN 1965 DOLLARS)

Zone Number	1975 Number of Spaces	1975 Average Daily Cost	1975 Average Hourly Cost	1980 Number of Spaces	1980 Average Daily Cost	1980 Average Hourly Cost
810	1,165	$ 0	$ .01	1,212	$ .01	$ .01
915	591	0	.01	1,212	.01	.01
918	10,720	0	.01	-*	-*	-*
936	4,572	0	.01	4,505	.01	.01
994	269	0	.01	410	.01	.01
995	72	0	.01	72	.01	.01
997	593	.23	.05	780	.15	.05
998	729	.13	.03	1,106	.14	.05
1011	1,366	0	.01	2,105	.01	.01
1016	6,200	.58	.12	16,200	.78	.16
1104	586	.19	.04	608	.09	.02
1107	3,491	.03	.01	3,042	.10	.02
1109	687	.03	.01	-*	-*	-*
1125	993	0	.01	1,513	.01	.01
1126	4,108	1.75	.16	3,938	.74	.10
1127	434	.52	.11	364	.25	.10
1128	603	3.07	.02	3,703	.06	.10
1129	1,339	.17	.04	1,199	.24	.05
1130	1,235	.03	.01	1,235	.18	.04
1132	1,402	1.10	.03	1 895	.08	.02
1133	2,309	.086	.02	2,050	.12	.03
1134	3,079	.16	.04	3,089	.33	.07
1135	3,940	.08	.02	4,350	.18	.04
1136	400	.06	.02	-*	-*	-*
1137	75	.06	.02	75	.07	.02
1244	760	.29	.06	223	.41	.04
1248	748	.05	.02	59	.38	.04
1382	5,244	.28	.06	2,866	.36	.04
1389	541	.03	.01	2,065	.04	.01
751	1,002	.62	.13	1,856	.39	.06

*No data.

Source: Southeast Michigan Council of Governments. "Regional Parking Supply Inventory and Costs." Detroit: June 1980, p. 144

APPENDIX B

Trip Table Adjustments:

Factor Tables to New Production and Attraction Control Totals

This appendix describes the procedure used to refactor the Home Based-Work, Home-Based-Other and Non-Home-Based person trip tables.

The input trip tables for these three purposes were obtained from SEMCOG at the 1446-zone level and aggregated to 402 zones. The "squeezing" process did not change regional trip totals but did change some interzonal trips to intrazonal trips in aggregated zones. Likewise, some intrazonal trips were changed to interzonal trips in zones that were split. The trip tables as delivered by SEMCOG are summarized in Tables B-1 through B-3.

An examination of trip tables revealed:

- Non-Home-Based trips were dramatically overestimated by the SEMCOG trip generation model. The model appears to overestimate 1980 Non-Home-Based trips by a factor of 2.5 (see Table B-4). Similar errors exist for the Non Home-Based trip table generated for the WLC Preliminary Engineering Effort.

- The forecasted growth for Home-Based-Work trips between 1980 and 2000 was unrealistically high. Table B-5 shows that the SEMCOG trip generation model forecasts a 33 percent increase in these trips for a period when employment increases by only 12 percent. Similar increases are forecast for the other purposes although this can be partially justified by an increase in the number of households.

- Trip generation rates for all three purposes are higher both on a per person and a per household basis than rates calculated from 1965 and 1980 Survey Data (See Table B-6)

TABLE B-1

YEAR 2000 HOME-BASED-WORK PERSON TRIPS BEFORE FACTORING

DISTRICT	A=1 [1]	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1 [2]	354,528	53,343	63,895	39,184	27,130	2,927	541,007
P=2	169,134	124,008	53,120	20,125	37,861	2,999	407,247
P=3	119,673	42,950	492,920	38,738	10,162	47,481	751,924
P=4	114,316	22,014	62,820	510,397	73,948	15,005	798,500
P=5	63,600	25,521	9,931	46,641	346,057	8,908	500,658
P=6	26,879	8,855	58,581	31,087	20,967	420,368	566,737
TOTAL	848,130	276,691	741,267	686,172	516,125	497,688	3,566,073

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

1/ A = Attraction zone

2/ P = Production zone

Source: Peat Marwick Mitchell & Company

TABLE B-2

YEAR 2000 HOME-BASED-OTHER PERSON TRIPS BEFORE FACTORING

DISTRICT	A=1	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1	606,737	86,386	56,091	115,599	20,127	416	885,356
P=2	222,822	337,350	83,775	47,848	52,634	521	744,950
P=3	153,371	102,133	1,674,325	107,877	11,871	34,637	2,084,214
P=4	150,371	40,774	94,048	1,928,247	55,240	16,743	2,285,423
P=5	98,315	102,343	18,124	155,216	1,046,632	12,724	1,433,355
P=6	57,794	26,556	110,857	109,584	53,385	1,315,027	1,673,203
TOTAL	1,289,410	695,542	2,037,220	2,464,371	1,239,889	1,380,068	9,106,500

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

Source: Peat Marwick Mitchell & Co.

TABLE B-3

YEAR 2000 NON-HOME-BASED PERSON TRIPS BEFORE FACTORING

DISTRICT	A=1	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1	915,038	178,300	102,303	153,254	47,678	3,275	1,399,848
P=2	179,969	347,928	90,967	48,762	85,128	2,226	754,980
P=3	109,618	94,891	1,517,323	103,554	10,976	36,074	1,872,436
P=4	161,865	51,212	104,974	1,852,050	105,367	15,713	2,291,181
P=5	50,501	89,101	11,289	106,021	1,023,068	11,692	1,291,672
P=6	6,742	4,600	51,906	24,043	16,634	1,052,282	1,156,207
TOTAL	1,423,733	766,032	1,878,762	2,287,684	1,288,851	1,121,262	8,766,324

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

Source: Peat Marwick Mitchell & Co.

TABLE B-4

PERSON TRIPS BY PURPOSE (IN THOUSANDS)

TRIP PURPOSE	1 1965 TALUS SURVEY	2 1980 HH SURVEY	3 1980 SEMCOG EST.	3 2000 SEMCOG EST. FOR WLCPE
HBW	2,123 (21.6%)	2,597 (22.8%)	2,677 (15.5%)	3,566 (16.6%)
HBO	5,525 (56.4%)	5,975 (52.3%)	7,502 (43.2%)	9,107 (42.5%)
NBH	2,160 (22.0%)	2,842 (24.9%)	7,172 (41.3%)	8,766 (40.9%)

1
TALUS. "Base Year Travel Survey." Detroit: October 1969
2 SEMTA. "Southeast Michigan Regional Travel Survey." Detroit: May 1980
3 SEMCOG. Computer Printouts Tabulating Trip Generation Estimates for 1980 and 2000. Detroit: April 1982.

TABLE B-5

CHANGES IN TRAVEL AND DEMOGRAPHICS

VARIABLE	% CHANGE '65 - '80	% CHANGE '80 - 2000 (SAF)
Population	6%	10%
Households	29%	27%
Employment	29%	12%
HBW	22%	37%/33%[1]
HBO	8%	52%/21%[1]
NHB	32%	208%/22%[1]
Total Trips	16%	88%/24%[1]

1 Percentage increase from 1980 Household. Survey to 2000 SEMCOG forecasts/Percentage increase from 1980 SEMCOG forecasts to 2000 SEMCOG forecasts.

TABLE B-6

TRIP GENERATION RATES

Purpose	Unit	1965 (TALUS)	1980 (HH SURVEY)	1980 (SEMCOG Est.)	2000 (SEMCOG Est.)
HBW	PT/Person[1]	0.477	0.549	0.566	0.682
HBO	PT/Person	1.242	1.262	1.585	1.742
NHB	PT/Person	0.486	0.600	1.515	1.676
TOTAL	PT/Person	2.205	2.412	3.666	4.100

Purpose		1965 (TALUS)	1980 (HH SURVEY)	1980 (SEMCOG Est.)	2000 (SEMCOG Est.)
HBW	PT/HH[2]	1.660	1.570	1.517	1.698
HBO	PT/HH	4.320	3.612	4.039	4.337
NHB	PT/HH	1.689	1.718	3.894	4.174
TOTAL	PT/HH	7.669	6.901	9.450	10.209

1/ Person Trips

2/ Households

Source: Peat Marwick Mitchell & Company

These problems required that the trip tables for Home-Based-Work, Home-Based-Other and Non-Home-Based trips be factored to more reasonable totals. This was done by developing district control totals for productions and attractions. The districts used for this exercise were the same six districts shown in Tables B-1 through B-3. These are:

1. Detroit, inside the Woodward Corridor
2. Detroit, outside the Woodward Corridor
3. Wayne County, outside Detroit
4. Oakland County
5. Macomb County
6. Remaining Region

The control totals were developed using:

- SEMCOG year 2000 trip tables for the WLC PE effort;
- SEMCOG 1980 trip tables;
- 1980 Household Survey Trip Production Data; and
- 1980 SAF forecasts for 1980 and 2000.

Production control totals were computed on a district basis. Home-Based-Work totals were developed to correct the overall trip rate assumed by the generation model as well as the high trip making growth rate between 1980 and 2000. Home-Based-Other and Non-Home-Based production totals were developed to correct just the trip rate. The revised control totals were computed for each of six districts using the following formulas:

$$P'_{HBW} = \frac{POPU_{2000}}{POPU_{1980}} * HHSP_{1980 - HBW}$$

$$P'_{HBO} = \frac{HHSP_{1980 - HBO}}{SCP_{1980 - HBO}} * P_{HBO}$$

$$P'_{NHB} = \frac{HHSP_{1980 - NHB}}{SCP_{1980 - NHB}} * P_{NHB}$$

Where:

P_{HBW} = unfactored HBW productions (year 2000 WLC PE)
P_{HBO} = unfactored HBO productions (year 2000 WLC PE)
P_{NHB} = unfactored NHB productions (year 2000 WLC PE)
P'HBW = factored HBW productions (year 2000 WLC PE)
P'HBO = factored HBO productions (year 2000 WLC PE)
P'NHB = factored NHB productions (year 2000 WLC PE)
POPU2000 = Year 2000 population from 1980 SAF
POPU1980 = Year 1980 production from 1980 SAF
HHSP
YEAR-PURP = Productions from 1980 Household Survey for year and purpose stated
SCP
YEAR-PURP = Productions from SEMCOG's long range planning runs for year and purpose stated.

Population and survey production data for the computation of control totals are shown in Tables B-7 and B-8.

Attraction control totals were computed by allocating the sum of all production control totals (by purpose) across the six attraction districts. The allocation was performed so that the share of trips attracted to each district was unchanged from the original, unfactored trip table.

Once the control totals were developed for the 6 districts and 3 purposes, new cell values were computed for each of 36 district-to-district interchanges. This was done separately for each trip so that the share of trips attracted to each district was unchanged from the original, unfactored trip table.

Once the control totals were developed for the 6 districts and 3 purposes, new cell values were computed for each of 36 district-

TABLE B-7

SEMCOG 1980 SAF POPULATION FORECASTS

AREA[1]	1980	2000
Detroit, Inside Corridor	673,752	676,633
Detroit, Outside Corridor	662,394	636,004
Wayne County, Outside Detroit	1,024,519	1,102,270
Oakland County	1,061,092	1,175,338
Macomb County	693,068	731,571
Remaining Region	618,189	904,566
REGION TOTAL	4,733,014	5,226,382

1/ NOTE: Area definitions in Detroit are not those used in Tables A-1 through A-3.

Source: SEMCOG

TABLE B-8

TRIP PRODUCTIONS BY AREA FROM 1980 HOME INTERVIEW SURVEY, 1980 SEMCOG TRIP GENERATION MODEL AND YEAR 2000 UNFACTORED TRIP GENERATION MODEL

	HBW	HBO	NHB
DETROIT [1]	194[2]	471	259
Inside Corridor	362	757	1031
	482	759	1294
DETROIT [1]	99	186	74
East of Corridor	201	429	385
	242	427	449
DETROIT [1]	226	446	120
West of Corridor	181	455	443
	221	431	412
OUTER WAYNE	530	1185	480
COUNTY	590	1747	1628
	756	2097	1872
OAKLAND COUNTY	97	144	139
Inside Corridor	135	396	443
	656	375	455
OAKLAND COUNTY	675	1568	789
Outside Corridor	480	1470	1373
	656	1910	1836
MACOMB COUNTY	447	1124	482
	399	1240	986
	501	1433	1292
SOUTHEASTERN	2598	5977	2843
MICHIGAN REGION	2677	7502	7172
	3566	9107	8766

1/ Area definitions for Detroit are not consistent with those used in Tables A-1 through A-3.

2/ The top number is from the 1980 Home Interview Survey, the middle number is from the 1980 SEMCOG Trip Generation Model, and the bottom number is from the year 2000 unfactored trip generation model.

to-district interchanges. This was done separately for each trip purpose using a FRATAR process that alternately balanced row and column sums until the matrix converged. The new district-to-district interchanges were compared to the interchanges in the original, unfactored trip table. A ratio was calculated equal to the new interchange divided by the old interchange.

The 36 ratios for each purpose were used as factors for the trip table at 402 zone level. Each interchange in the 402-zone table was classified into one of 36 cells in the district-to-district ratio table. Each interchange was multiplied by the appropriate ratio to compute a revised number of trips. These revised trips make up the trip tables used as input to the Initial and Baseline mode split models. Tables B-9 through B-11 show the results of the person trip table adjustment process.

TABLE B-9

YEAR 2000 HOME-BASED-WORK PERSON TRIPS AFTER FACTORING

DISTRICT	A=1	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1	171,959	25,013	27,572	11,595	8,939	1,064	246,142
P=2	123,349	87,415	34,472	8,957	18,768	1,632	274,593
P=3	101,872	35,334	373,337	20,124	5,880	30,125	566,672
P=4	173,222	32,238	84,717	472,173	76,159	16,959	855,468
P=5	81,692	31,678	11,351	36,571	301,971	8,528	471,791
P=6	29,956	9,538	58,095	21,149	15,881	349,241	483,860
TOTAL	682,050	221,216	589,544	570,569	427,598	407,549	2,898,526

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

Source: Peat Marwick Mitchell & Company

TABLE B-10

YEAR 2000 HOME-BASED-OTHER PERSON TRIPS AFTER FACTORING

DISTRICT	A=1	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1	404,949	55,634	40,504	57,180	9,870	220	568,357
P=2	166,290	242,988	67,640	26,468	28,867	308	532,501
P=3	99,475	63,914	1,174,874	51,855	5,660	17,941	1,413,719
P=4	177,659	46,475	120,233	1,688,762	47,962	15,801	2,096,892
P=5	59,551	26,405	123,584	83,699	40,424	1,082,135	1,415,798
P=6	6,742	4,600	51,906	24,043	16,634	1,052,282	1,156,207
TOTAL	1,022,908	550,850	1,549,766	2,042,519	1,032,257	1,128,298	7,326,591

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

Source: Peat Marwick Mitchell & Co.

TABLE B-11

YEAR 2000 NON-HOME-BASED WORK PERSON TRIPS AFTER FACTORING

DISTRICT	A=1	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1	247,793	46,322	26,428	20,254	6,495	304	347,596
P=2	47,671	88,378	22,977	6,302	11,332	206	176,866
P=3	35,252	29,264	465,364	16,258	1,776	4,031	551,945
P=4	148,795	45,161	92,036	831,025	48,667	5,024	1,170,708
P=5	44,503	75,311	9,486	45,613	453,014	3,583	631,510
P=6	9,884	6,468	72,570	17,205	12,253	536,347	654,727
TOTAL	533,898	290,904	688,861	936,657	533,537	549,495	3,533,352

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

Source: Peat Marwick Mitchell & Co.

APPENDIX C

Trip Table Adjustment

Factor HBO Transit Trip

Tables to Eliminate School Bus Trips

This appendix describes the procedure used to factor the Home Based-Other transit trip table to properly model school trips in suburban areas. This factoring is required because the SEMCOG modelling procedure includes school trips in the Home-Based-Other purpose for trip generation mode split. Unfortunately, the mode choice model is not satisfactory for splitting school trips among transit and auto modes in all jurisdictions of the region. This is because:

- Students on the way to school select a mode based on the modes provided, not on a trade off between cost, time and convenience. The availability of a mode is determined by community policy and can vary from jurisdiction to jurisdiction.

- The mode choice model was calibrated with data from 1965 TALUS survey and 1965 networks. Because little transit service existed outside Detroit in 1965, the model reflects Detroit conditions and does not simulate suburban school travel.

- In 1965, Detroit had magnet schools which attracted students from the entire city. These students travelled to school on public transit. The remaining parts of the region had (and still have) a neighborhood school system and generally used school buses to transport children when walking distances were too great.

The resulting trip generation and mode split models over-predict the number of school trips occurring on transit outside the City of Detroit and as a result over-predict the number of Home Based Other transit trips.

The strategy employed to correct for suburban school trips involves factoring all Home-Based-Other transit trips produced outside the City of Detroit and not attracted to a zone where a university or college is located (see Table C-1). The purpose of this approach was to eliminate primary and secondary students from transit buses in suburban areas but still simulate travel by university students.

The factor applied to trips produced outside Detroit and not attracted to a university zone was developed from transit trip purposes observed in the 1965 TALUS survey (see Table C-2). That data shows that school trips were 51.94 percent of all Home-Based Other trips. Since the model assumes that Detroit conditions are applicable throughout the region, only 48.06 percent of the model's estimate of Home-Based-Other transit trips are considered "true" transit trips. The remainder walk to a neighborhood school or use a school bus. To correct the output transit tables, Home-Based-Other trips produced outside Detroit are multiplied by 0.4806 unless they are attracted to a university zone.

The results of this adjustment are shown in Tables C-3 and C-4. Before adjustment, the mode split model predicted that 409,000 Home-Based-Other trips would use transit. Of these, 216,000 trips are produced outside Detroit (see Table C-3). After the adjustment, 311,000 Home-Based-Other trips use transit and 118,000 of these are produced outside Detroit (see Table C-4). This adjustment reduces the total number of Home-Based-Other transit trips to a more reasonable level allowing better estimates of travel in the Woodward Corridor.

TABLE C-1

UNIVERSITIES AND COLLEGES IN SOUTHEASTERN MICHIGAN

NAME	1446 Zone No.	402 Zone No.
University of Detroit	175	129
Wayne State University	50-51	61-62
University of Michigan		
Ann Arbor	1126	401
Dearborn	353	358
Henry Ford Community College	353	358
Mary Grove College	230	160
Mercy College	305	351
Schoolcraft College	508	360
Oakland County Community College		
Auburn Hills	742	383
Highland Lakes	810	376
Orchard Ridge	696	370
Oakland University	733-734	385
Macomb County Community College		
South Campus	936	390
Center Campus	1011	401
Eastern Michigan University	1107	401
Washtenaw County Community College	1125	401
Monroe County Community College	1258	402
St. Claire County Community College	1384	399

Source: SEMCOG

TABLE C-2

TRANSIT TRIPS BY PURPOSE FROM 1965 TALUS FACTORED TRIP TABLES

TRIP PURPOSE	NUMBER OF TRIPS
Home-Based-Work	176,421
Home-Based-Other	
Home Based Personal Business	42,267
Home Based Social Recreation	27,833
Home Based Shop	46,262
Home Based School	125,734
SUBTOTAL	242,096
Non-Home-Based	32,901
TOTAL	451,418

Source: Allen M. Vorheis & Associates, Inc. "Mode Choice Development", McLain, VA: Nov. 1969

TABLE C-3

HOME-BASED-OTHER TRANSIT TRIPS BEFORE FACTORING TO ACCOUNT FOR SCHOOL BUS TRIPS

DISTRICT	A=1	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1	94,838	9,160	5,350	7,002	887	0	117,237
P=2	51,356	11,151	6,879	4,885	2,315	0	76,586
P=3	20,392	3,986	33,203	3,315	54	34	60,984
P=4	22,766	3,657	10,452	53,475	3,446	22	93,818
P=5	16,003	7,030	460	11,440	12,360	0	47,293
P=6	3,900	429	3,615	4,476	859	531	13,810
TOTAL	209,255	35,413	59,959	84,593	19,921	587	409,728

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

Source: Peat Marwick Mitchell & Co.

TABLE C-4

HOME-BASED-OTHER TRANSIT TRIPS AFTER FACTORING TO ACCOUNT FOR SCHOOL BUS TRIPS

DISTRICT	A=1	A=2	A=3	A=4	A=5	A=6	TOTAL
P=1	94,838	9,160	5,350	7,002	887	0	117,237
P=2	51,356	11,151	6,879	4,885	2,315	0	76,586
P=3	10,168	1,913	21,661	1,869	35	34	35,680
P=4	11,436	1,770	6,068	26,721	2,262	22	48,279
P=5	7,851	3,379	250	5,650	8,553	0	25,683
P=6	1,907	206	1,975	2,534	789	531	7,942
TOTAL	177,556	27,579	42,183	48,661	14,841	587	311,407

DISTRICT 1: Detroit - Inside Corridor
2: Detroit - Outside Corridor
3: Rest of Wayne County
4: Oakland County
5: Macomb County
6: Remaining Region

Source: Peat Marwick Mitchell & Co.

APPENDIX D

PURPOSE OF DESIGN FLOW DEVELOPMENT TECHNICAL WORKING GROUP

A Design Flow Development Technical Working Group was formed by SEMTA to review and approve analysis techniques and important data inputs used in and projections developed in the Design Flow analysis. The Working Group was composed of representatives from the following local, regional, and state agencies involved in transportation planning in the Southeastern Michigan region and consultants involved in the WLC PE project:

- Detroit Department of Transportation;
- Detorit Community & Econonomic Development Department;
- Detroit Planning Department;
- Michigan Department of Transportation;
- Southeast Michigan Council of Governments;
- Southeastern Michigan Transportation Authority; and
- SEMTRAN and TAD.

The following summarizes important decisions and recommendations made by the Working Group that pertain to the ridership projections in this report:

- A forecast year of 2000 was approved for use in this study.
- The Small Area Forecasts of population, households, and employment developed by SEMCOG were used in this study. SEMCOG's projected CBD employment was reallocated by zone in the CBD to conform to City of Detroit plans.
- The 1,446 and 402 zone systems used were approved by the Working Group.
- SEMCOG's parking supply and rate estimates were approved for use for this analysis as was the estimate of automobile operating cost used by SEMCOG in its long-range planning program.
- Temporal distributions of bus travel and anticipated rail travel were reviewed and approved by the Working Group.

- The travel demand modelling procedures used in the project were reviewed and approved by the Working Group. This included the adjustments to the person trip tables documented in Appendices B and C of this report.
- The Baseline and Initial transit network, including routings, headways and operating speeds, and highway network were developed in conjunction with and approved by the Working Group.
- The proposed fare policies used for the Baseline and Initial transit networks were approved for use in the assessment.
- The bus operating cost mdoel was approved for use in this project.
- The Working Group reviewed design flow and mode of access ridership projections for the Baseline and Initital networks.