Impact of Staggered Work Hours

City of Austin

Urban Transportation Department

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INTRODUCTION

Staggering work hours is one method of better utilizing existing transportation facilities. With minimal financial investment, a program of rescheduling work hours can reduce travel time of commuters and improve congestion within defined employment concentrations. As a result, energy consumption, air quality, and employee productivity may be improved. However, the application of the strategy is contingent upon several factors: the willingness of employees and employers to modify work schedules, the degree to which congestion is dependent upon clustering of offices with similar work hours, and regimented time demands for business communications, shipments and deliveries, and retail operations. This report examines the potential impact on traffic flow of a staggered work hours program in Austin.

PREVIOUS EXPERIENCE

The term staggered work hours encompasses two types of modified work hours, both of which "redistribute the travel times of workers by redistributing their work hours."[1] The method of staggering work hours commonly employed in the United States assigns employees slightly varied work schedules. A second method, flextime, which has recently spread from Europe to the U.S., gives employees the prerogative to choose their own schedules so long as a required number of hours or amount of work is completed each day.

A variety of purposes has motivated the use of staggered work hours. The first formal staggered hours project in the U.S. was initiated in Washington, D.C. during World War II as a technique to reduce the need for transportation investment by maximizing use of available transportation. Most previous efforts,

such as that in Lower Manhattan, have been prompted by two related purposes: 1) reducing crowded conditions on transit vehicles and 2) maximizing use of transit facilities by spreading peak ridership over a longer time period. A few projects, such as that initiated by the 3M Company in St. Paul, have aimed at reducing traffic congestion on city roadways, particularly in the immediate vicinity of an office.[2] Some flextime programs, by contrast, are directed not at reducing traffic congestion but at offering more flexible hours to attract employees in a tight labor market. Many major U.S. corporations, such as Exxon and Control Data Corporation, have instituted flextime to achieve improved employee morale and productivity.[3]

Limited information is available on the relative success of the programs in meeting these objectives (Table 1). Some ridership and cost figures have been obtained for transit-oriented projects; and in some isolated instances, traffic flow has been monitored. Most projects have relied upon subjective evaluations of staggered hours by the participating employers and employees. From this limited data base, some generalizations can be made about the direct impact of modifying work hours:[4]

1. Well coordinated staggered work hours proposals have succeeded in spreading peak transit congestion when transit schedules are modified to meet the altered travel demands.

2. Increased ridership and revenues have resulted when projects were designed to end underutilization of vehicles just before and after rush hour. However, if new service has been added to transit schedules to accomodate new travel patterns, the extra cost sometimes has not been balanced by increased revenues.

3. Reduced turnover of workers at European firms offering staggered hours has confirmed the lure of more flexible hours.

4. Reduction of traffic congestion in large areas has not been clearly substantiated; however, "congestion in specific areas of high employment concentrations, around individual parking facilities, and in the vicinity of a single large plant" has been improved.[5]

In addition, staggered work hours can also produce indirect benefits. Employee morale can be enhanced because of reduced travel time, improved punctuality resulting from less delay commuting, and, to some extent, reduced crowds in restaurants, elevators, etc. Flextime, in particular, offers employees the flexibility of coordinating work shedules with other activities, thus providing a sense of autonomy lacking with regimented hours. In some cases, employees' productivity or quality of work may benefit.[5]

Air quality and energy use may be slightly affected by staggered hours. If transit vehicle crowding is successfully reduced, transit ridership may increase as riders are diverted from one-person automobile commuting. Also, improved traffic flow may diminish automobile idling, thus decreasing emissions and energy use. Even spreading peak hour traffic and thus distributing emissions over a longer period may incrementally improve air quality by lessening the amount of pollutants chemically reacting at a given time.[6]

Since the transportation system is designed to accomodate peak hour capacities,a successful staggered work hours program also can reduce the need to expand transportation facilities. However, the direct and indirect benefits of staggering hours are dependent on the extent and success of each program.

It should be recognized that staggering work hours may have several negative effects. First, if traffic congestion initially decreases, additional drivers may be attracted by the smoother traffic flow during peak periods: either they may be diverted from transit or carpooling, thus increasing total vehicle miles of travel, or they may have the flexibility to alter hours according to traffic flow. Indeed, there is no guarantee that employees following the flextime method would spread peak hour travel at all. A second potential problem of staggering hours is disrupting business communications since customarily,

standard hours are maintained to facilitate contact with clients, customers, related businesses, and shipments and deliveries. Finally, if employees are not given some discretion in selecting their staggered shift, morale problems could result. For example, modified work schedules could conflict with day care schedules, disrupt carpools, and place parking at a further premium.

Past experiences with staggered work hours have revealed the following criteria useful in evaluating potential programs:

1. Employee-Employer Support
   A primary requirement for successful implementation is employer and employee interest in staggering hours. The benefits and problems must be clearly explained to overcome what has been described as "institutional inflexibility."[7] For example, Atlanta undertook an extensive planning process to develop a plan yet it was never implemented because of employer resistance, particularly from the state government.[8]

2. Transit Coordination
   Successful attempts should coordinate suggested work schedules with transit schedules, particularly in cities with high transit ridership. Work hours for businesses with a large proportion of transit riders should be coordinated with transit schedules.

3. Avoiding Carpooling Employers
   Firms which now have extensive carpool participation normally would not be good candidates for staggered hours since an active carpooling program could have more impact on reducing congestion and vehicle miles of travel than staggered hours.

4. Appropriate Businesses
   Staggered work hours may not be well suited to some types of business activities such as wholesaling or teaching.

5. Geographic Concentrations
   Rather than a city-wide effort, successful programs initiate staggered work hours among large employers who are geographically concentrated in areas with heavy traffic flow. Diminishing marginal benefits to smooth traffic flow can be anticipated as smaller, more dispersed employers or those in distant suburbs are included.

METHODOLOGY

A four step procedure was used to identify Austin employers meeting these criteria and to develop a staggered work hours program: current work schedules and related information were obtained from large employers ; employers potentially suitable for staggered hours were identified; selected traffic counts were obtained; and the work schedules were compared with the traffic flow data.

This uncomplicated methodology was selected in order to quickly determine employers who have potential for staggered work hours. To precisely correlate varying work schedules with current traffic volumes, more detailed information would be needed: the exact origin, destination, and route of trips; traffic counts for all major roadways measured at small intervals throughout the day; a measure of how consistently workers follow their assigned schedules; and work hour information for all businesses regardless of their size. Because low implementation cost is a primary advantage of staggered work hours programs, this extensive research effort would be inappropriate. More extensive data can be gathered when programs are developed for specific employers. In September and October, 1976, all Austin employers with 100 or more employees were contacted by telephone to obtain the total number of their employees, the number following each work schedule, an evaluation of the adequacy of parking facilities, and a description of ongoing carpool programs. Responses were obtained from 157 out of 159 offices, with data ranging from approximations to accurate counts.

Data were compiled in tabular form then displayed graphically for analysis. All employers identified as likely candidates according to the criteria previously listed were mapped so that employment concentrations could be pinpointed. Within these employment concentrations, traffic flows at key

intersections were then measured to indicate time periods with peak traffic flow. These time periods were compared with the work schedules of nearby employers to determine whether adjusted work schedules for each employment concentration could reduce congestion.

FINDINGS

Many of the employers surveyed already stagger work hours to some extent. Most of those who do stagger hours still follow a single 8 hour shift, but the schedule is a variation of the traditional 8:00-5:00 shift, such as 7:30-4:30. Adjacent businesses sometimes adopt such hours so that they do not compound traffic problems by following identical schedules. Other enterprises, including retail stores, restaurants, and hospitals, must follow variations of the 8:00-5:00 day to accomodate their clients.

Some businesses presently observe a variety of staggered shifts. One such company schedules five daily shifts, ranging from 7:00-3:30 to 9:00-5:30, to improve access to its plant. Two state agencies have initiated flextime at selected locations, to permit a variety of schedules while providing for at least a minimal staff on the 8:00-5:00 shift.

Of those employers who have retained the 8:00-5:00 workday, a significant number are very large employers. The University of Texas staff, for example, continues to adhere to 8:00-5:00 schedules, although staggered hours may be arranged informally within departments. Many state agencies follow this practice as well, as do most banking and lending institutions. For two reasons, these employers may be amenable to staggering work hours. First, this type of office is often located in the city's core area which experiences heavy traffic during peak periods. Secondly, governmental agencies and financial institutions generally do not perform work activities which demand a uniform 8-5 schedule.

The desirability of staggering work hours must be determined for individual employment concentrations. The employers who appear to be candidates for staggering work hours formed nine identifiable employment locations (See Figure 1). Six of these areas are located in developed parts of the city with significant traffic flow and therefore were selected for investigation of traffic patterns. The results of this analysis follow :

Northwest Concentration - Eleven employers, who could stagger work hours or already do to some extent, are located in the area traversed by U. S. 183, Burnet Road, Anderson Lane, and Balcones Drive (See Figure 2). These major arterials intersect two important collectors: Shoal Creek Boulevard and Steck Avenue. The arterials carry considerable through-traffic destined for both business districts to the south and outlying manufacturing plants whereas collectors are often utilized by traffic destined to the area. Yet, the peaks occur at times which conflict with local work schedules. Graphs of traffic counts performed at three intersections are presented in Figures 3 through 8. For each of these intersections, the peak traffic periods of the dominant morning direction of travel and dominant evening direction are presented below:

Intersection	Dominant AM Approach	Dominant PM Approach
U.S. 183/Burnet	westbound, 7:15-7:30 a.m. (bimodal) 7:45-8:00 a.m.	eastbound, 5:00-5:15 p.m.
Burnet/Anderson	southbound, 8:00-8:15 a.m.	northbound, 5:15-5:30 p.m.
Shoal Creek/Steck	northbound, 8:00-8:15 a.m.	northbound, 5:15-5:30 p.m.

The businesses apparently suitable for staggered work hours currently observe a variety of schedules, but the most common arrival time is 8:00, and departure time 5:00. Figure 9 displays the daytime work schedules of employers able

to provide information. The largest employer, IBM, follows five shifts, ranging from 7:12-3:54 to 8:12-5:12, and the second largest, Glastron Boats, follows two shifts, 7:30-4:00 and 8:00-5:00. Some of the businesses have a single shift which is a variation of the 8:00-5:00 schedule. For example, the staff of TCC, Inc. works an 8:30-5:15 shift. Only two employers follow strict 8:00-5:00 work hours: the Air Control Board and the Northwest Branch Post Office.

Traffic on almost all approachs at each intersection increases consistently till 8:00-8:15 a.m. and then till 5:00 to 5:15 p.m. Thus, a comparison of work schedules with the traffic counts indicates that employees following 8:00-5:00 schedules would encounter smoother traffic flow by staggering work schedules earlier in the day.

U.S. 183/IH 35 Concentration - The U.S. 183/IH 35 interchange is the focal point of the concentration of eight businesses indicated in Figure 10. Both U.S. 183 and IH 35 carry large volumes of traffic, much of which is through-traffic destined for businesses to the south, east, and west. Two other major streets providing access to the area are Cameron Road and St. John's Avenue. Like those in the Northwest Concentration, roadways in this area experience broad peaks due to the volume of through-traffic. Results of the traffic counts performed at U.S. 183/IH 35 and U.S. 183/Cameron are graphed in Figures 11 through 16, while peak periods for dominant morning and evening approaches follow:

Intersection	Dominant AM Approach	Dominant PM Approach
U.S. 183/IH 35 (ESR)	northbound, 7:45-8:00 a.m.	northbound, 5:00-5:15 p.m.
U.S. 183/IH 35 (WSR)	eastbound, 7:45-8:00 a.m.	eastbound, 4:30-4:45 p.m.
U.S. 183/Cameron	westbound, 7:30-7:45 a.m.	eastbound, 5:00-5:15 p.m.

Several businesses in this area have varied their work schedules. For example, Eagle Signal Corporation employs 350 people who work a single shift, 7:30-4:15. Other employers, such as the Department of Highways and Public Transportation, have instituted staggered shifts but have not significantly dispersed their employees among the shifts. Some offices have maintained 8:00-5:00 schedules, including the area's largest employer, the Texas Rehabilitation Commission. As a result, 8:00 and 5:00 are by far the most common arrival and departure times of employers who are candidates for staggered hours (See Figure 17).

Because heavy traffic and limited entry onto IH 35 and U.S. 183 restrict access to the offices in the areas, several have expressed interest in staggering work hours. Among these is National Western Life Insurance which will move into its new building near the intersection of IH 35 and U.S. 183 in the near future. The Texas Rehabilitation Commission will be relocating outside the area in the fall of 1977. No information is now available on future employers at this site.

Comparing the work schedules with traffic data suggests that staggered work hours could benefit employees now following standard schedules. However, determining the time periods most appropriate for each work site would require additional study since travel patterns at the different intersection approaches do not coincide. In addition, although traffic at each intersection is lighter in the early morning (7:00-7:30), it is not consistently light in the early evening (4:30-4:45).

North Lamar Concentration - The North Lamar employment concentration extends north along Lamar Boulevard from 45th Street to Koenig Lane (See Figure 18). Although nearby medical facilities and the Department of Public Safety building also influence traffic flow in the area, this analysis has emphasized the vicinity of the expanding Department of Health Resources office. North Lamar Boulevard and Guadalupe Street are major north-south arterials which provide access to employment centers including U.T., the Capitol complex, and the Central Business District. Consequently, traffic is heavy along these streets throughout rush hour. Nonetheless, the traffic counts performed at the intersections of North Lamar Boulevard and Koenig Lane, North Loop Boulevard, 45th Street, and 38th Street revealed distinct traffic peaks (See Figures 19 through 26).

A broader peak period occurs in the evening, with maximum traffic flow reached from 5:15-5:30. The intervals with heaviest morning and evening traffic for the dominant approaches are the following:

Intersection	Dominant AM Approach	Dominant PM Approach
Lamar/Koenig	southbound, 7:45-8:00 a.m.	northbound, 5:15-5:30 p.m.
Lamar/North Loop	southbound, 8:00-8:30 a.m.	northbound, 5:00-5:15 p.m.
Lamar/45th	southbound, 8:15-8:30 a.m.	northbound, 5:00-5:15 p.m.
Lamar/38th	southbound, 8:00-8:45 a.m.	northbound, 5:15-5:30 p.m.

Conventional 8:00-5:00 work hours are observed by the majority of employers in this area who would be suitable for staggering work hours (See Figure 27). To provide 24 hour care, the Austin State Hospital, the largest employer, does stagger its medical personnel on three shifts, 7 a.m. - 3 p.m., 3 p.m.-11 p.m., and 11 p.m. - 7 a.m.; however, its office staff reports from 8:00-5:00.

The second largest office, the Department of Health Resources, has enlarged its facilities and will house 1,200 employees by the summer of 1977. Although now operating 8:00-5:00, the department is considering staggered work hours to facilitate access to the building.

According to the traffic counts, prior to 7:45-8:15 in the morning and 5:00-5:30 in the afternoon, traffic on most approaches at all intersections consistently builds. This uniform peaking indicates that employees following earlier schedules than the predominant 8:00-5:00 work hours can avoid considerable traffic.

Central Area Concentration - The Central Area, which includes the Central Business District and the Capitol complex, encompasses the majority of employers suitable for staggering work hours. Roughly bounded by Martin Luther King, Jr. Boulevard, West Avenue, 1st Street, and Red River, the Central Area contains forty businesses who now vary work schedules or would be likely candidates for staggered hours (See Figure 28). These roadways are heavily traveled during rush hours by commuters enroute to nearby offices as well as through-traffic following the limited routes over Town Lake. Broad morning and evening peaks result from the flexible schedules of University faculty and staff, workers already following staggered shifts, and non-work trips for shopping, banking, etc. In addition, the scarcity of parking may motivate tripmaking early in the rush hour, thus broading the peaks. According to traffic counts performed at five key intersections, highest volumes of traffic generally occur between 7:45 and 8:00 in the morning and 5:00 and 5:15 in the evening (See Figure 20 through 38). The time periods of heaviest traffic flow for the dominant approaches of the five intersections are the following:

Intersection	Dominant AM Approach	Dominant PM Approach
Lavaca/15th	eastbound, 7:45-8:00 a.m.	northbound, 5:00-5:15 p.m.
Congress/9th	northbound, 8:00-8:15 a.m.	northbound, 5:00-5:15 p.m.
Congress/6th	westbound, 7:45-8:00 a.m.	westbound, 5:00-5:15 p.m.
W. 1st/S. 1st/Lavaca	northbound, 7:45-8:00 a.m.	westbound, 5:00-5:15 p.m.
San Jacinto/Trinity/ Martin Luther King, Jr.	westbound, 7:45-8:00 a.m.	eastbound, 4:45-5:00 p.m.

Most of the employers indicated in Figure 28 are government agencies and financial institutions. Although a few have begun staggered hours, the majority still observe 8:00-5:00 working hours (See Figure 39). Workers assigned this schedule probably encounter the heaviest traffic flow of the day. Because morning peak traffic increases consistently at the intersections, staggered work hours may benefit participants. However, heaviest traffic volumes occur at more varied times in the evening. Since reduced traffic counts may indicate traffic congestion rather than smooth traffic flow, additional traffic data are necessary to evaluate the potential impact of staggered hours in this area.

Riverside/Congress Concentration - Immediately south of Town Lake, along Riverside Drive and Congress Avenue, several employers suitable for staggering work hours are clustered (See Figure 40). Because travel across Town Lake is limited to a few arterials, this area which encompasses both the Congress Avenue bridge and the Drake bridge (S. 1st Street) is very important to traffic flow. Large amounts of traffic utilize Riverside Drive, Congress Avenue, Barton Springs Road, and S. 1st Street during both rush hours. Traffic counts were performed at S. 1st/Riverside and Congress/Riverside (See Figures 41-44). Peaks in traffic flow of the dominant approach of each intersection follow:

Intersection	Dominant AM Approach	Dominant PM Approach
Riverside/S. 1st	northbound, 7:45-8:00 a.m.	southbound, 5:15-5:30 p.m.
Congress/Riverside	northbound, 7:30-7:45 a.m.	southbound, 5:00-5:15 p.m.

Of the eight employers indicated in Figure 40, all but two follow an 8:00-5:00 schedule (See Figure 45). Western Electric observes a 7:00-3:45 schedule. The Texas Education Agency, which instituted staggered work hours when its offices were recently relocated to this area, reports a very positive response by employees. Their three shifts, 7:30-4:34, 8:00-5:00, and 8:30-5:30, were necessitated by limited access to the offices from Riverside Drive.

The success of this staggered hours program as well as a comparison between work schedules and current traffic patterns suggests that staggered schedules might be effective if implemented throughout the area. Traffic is very heavy on the Drake bridge throughout both rush hours. However, a distinct traffic peak is apparent in the morning and evening at Congress Avenue and Riverside Drive, indicating that schedules can be altered so that employees would encounter improved traffic conditions.

South IH 35 Concentration - The six employers included in the South IH 35 concentration are located linearly along the freeway (See Figure 46). Woodward Drive, St. Edward's Drive, Oltorf Street, and Woodland Avenue provide east-west access. Traffic counts were performed at the intersection of Oltorf Street and the east and west service roads, and field observations were made at Woodward Drive and the service roads. According to the observations, traffic flow was staggered during the evening rush hour, resulting in relatively smooth flow at the Woodward intersections. Traffic counts for the Oltorf intersections are graphed in Figures 47 through 50. The peak periods of travel at these intersections are the following:

Intersection	Dominant AM Approach	Dominant PM Approach
Oltorf/IH 35 (ESR)	eastbound, 7:15-7:30 a.m. (bimodal) 7:45-8:00 a.m.	eastbound, 5:30-5:45 p.m.
Oltorf/IH 35 (WSR)	eastbound, 7:15-7:30 a.m.	southbound, 4:30-4:45 p.m.

All employers except the Department of Public Welfare offices observe variations of the 8:00-5:00 working day (See Figure 51). Because these offices follow generally uniform schedules, the access at each site may suffer congestion. However, the modified work hours of the different employers do not directly conflict. This observation is borne out by the traffic data. Consequently, staggered work hours cannot be recommended unless further study reveals the usefulness of such a program.

CONCLUSIONS AND RECOMMENDATIONS

Initial information obtained from traffic counts and employer surveys indicates that staggered work hours could be implemented to reduce travel time of many Austin employees and improve access to concentrated employment centers. During this study, only the largest employers were contacted for work schedule data and of these only a selected number were considered suitable for staggered work hours. Consequently, any staggered work hours program involving these employers would probably have a minimal effect on total traffic flow. However, participating individuals would encounter appreciably improved traffic as well as smoother access to the workplace by avoiding peak congestion. Energy use and air pollution would be reduced somewhat, and costs of commuting would be diminished. The experience of the Texas Education Agency in its recent adoption of staggered work hours illustrates the positive effects on employee morale which could result.

As a step toward encouraging staggered work hours throughout the city, an initial project is proposed. By selecting one concentration area for a demonstration project, the additional efforts needed to identify, promote, and implement more effective work schedules can be developed.

For two main reasons, the Riverside/South Congress Concentration would be an appropriate location for such a demonstration. First, access to many of the offices is very limited. For example, the buildings located on Riverside Drive east of Congress Avenue have no alternative to Riverside Drive. Second, the restricted traffic flow on the Congress Avenue Bridge intensifies congestion. Therefore, participants in the area are likely to discern improved traffic conditions by staggering work hours.

To implement a demonstration project, more detailed traffic flow studies would be performed. The employers would be contacted to obtain additional information on work schedules and to ensure their cooperation in the project. With input from the studies, the transportation staff and the employers would jointly determine appropriate work schedules. The benefits of the program would be clearly explained to participants to promote their involvement. Following implementation, the impact of the program would be monitored in two ways: traffic counts to detect any changes in travel patterns and a survey of employers and employees to determine their reaction. From experience obtained in the demonstration, a procedure could be developed for instituting staggered work hours at other employment concentrations or at individual offices with access problems.

APPENDIX: TABLES AND FIGURES

Table 1: Performance of Staggered Work Hours Programs

TYPE OF SYSTEM	SYSTEM DESCRIPTION	DIRECT COSTS	TIME FRAMEWORK	FUNDING SOURCE	GOVERNMENTAL AGENCY INVOLVED	PERFORMANCE MEASURES
1. Lower & mid-Manhattan Staggered Work Hours Plan, 1970-74	Concerted effort by business groups to encourage firms to stagger work hours. Over 200,000 people participating.	Minimal direct costs. $200,000 UMTA Technical Study grant in 1973	6-month initial lead-in; plan adopted sequentially by firms and public employers.	Minimal costs met by business groups and Port Authority	Staff direction by the Port Authority of NY and NJ	Critical peaking at downtown Manhattan transit stations reduced; no significant peaking reduction yet at midtown stations. Significant shifting of travel to non-traveled time periods. No reduction in traffic flows was found
2. Downtown Philadelphia Staggered Program, 1973-74	Concerted effort by governmental organization to interest firms in staggering work hours; transit service was increased initially. 32,000 people involved or 10% of downtown work force.	15k initially supplemented by additional 15k; used largely for salaries and promotional costs. Costs to transit system "high".	lead-time: 1-year study and concerted effort. Sequential additions expected.	UMTA, 15k to Chamber of Commerce (pass thru DVRPC), DVRPC, 15K FHWA parts of DVRPC's unified work plan.	Delaware Valley Regional Planning, City of Philadelphia, Chamber of Commerce, SEPTA	Reduced RR peak by 9%, reduced number of patrons thru turnstiles at downtown station by 20%.
3. St. Paul, Minnesota, 3M Plant, 1971	A formal staggered plan with one-half hour intervals was instituted for all employees.	Minimal scheduling and informational costs	Six-month lead-in for study of best time intervals.	All costs were met by 3M	None directly	There was a general percentage decrease in traffic at stations near the plant and morning and evening peak volumes decreased markedly (when figures normalized
Downtown Ottawa, Federal Employees, 1974	Instituted by transit operator. All employees allowed to select flexible hours within constraint; peak period transit service was increased and lengthened. 53% of all downtown employees participating.	Minimal direct costs; low marginal costs to transit operation	6 months lead-in time	None	Federal government and local transit operator	Significantly greater transit operating efficiency made possible. Marked flattening of peak curve; increased riders offset marginal costs, peak traffic volumes decrease. 5-6 increased transit ridership; no evidence of change in mode split or auto vehicle occupancy
5. Downtown Seattle Staggered Work Plan, 1974	An attempt to encourage firms to permit employees to travel to work in other than peak periods; designed to utilize transit vehicles running under capacity.	Minimal advertising costs	Approximate six-month lead-in	All costs were met by the transit operator	Seattle Metro Transit	Ridership believed to have increased in this time period; ridership peak appears to have flattened. All ridership how cannot be attributed to this technique alone.
6. Toronto, Ontario, Variable Hours Program	Initiated in June, 1974 by government of Ontario after successful demonstration project; includes both formal, staggered and flexible hour changes.	Minimal direct costs.	Two years lead-in including demonstration project.	Minimal costs met by government of Ontario	Government of Ontario	Only demonstration project results available. Indicates employees both types of changes favorably disposed. No counts of traffic or transit reduction in peak periods.

Source: Krzyozkowski, et al.

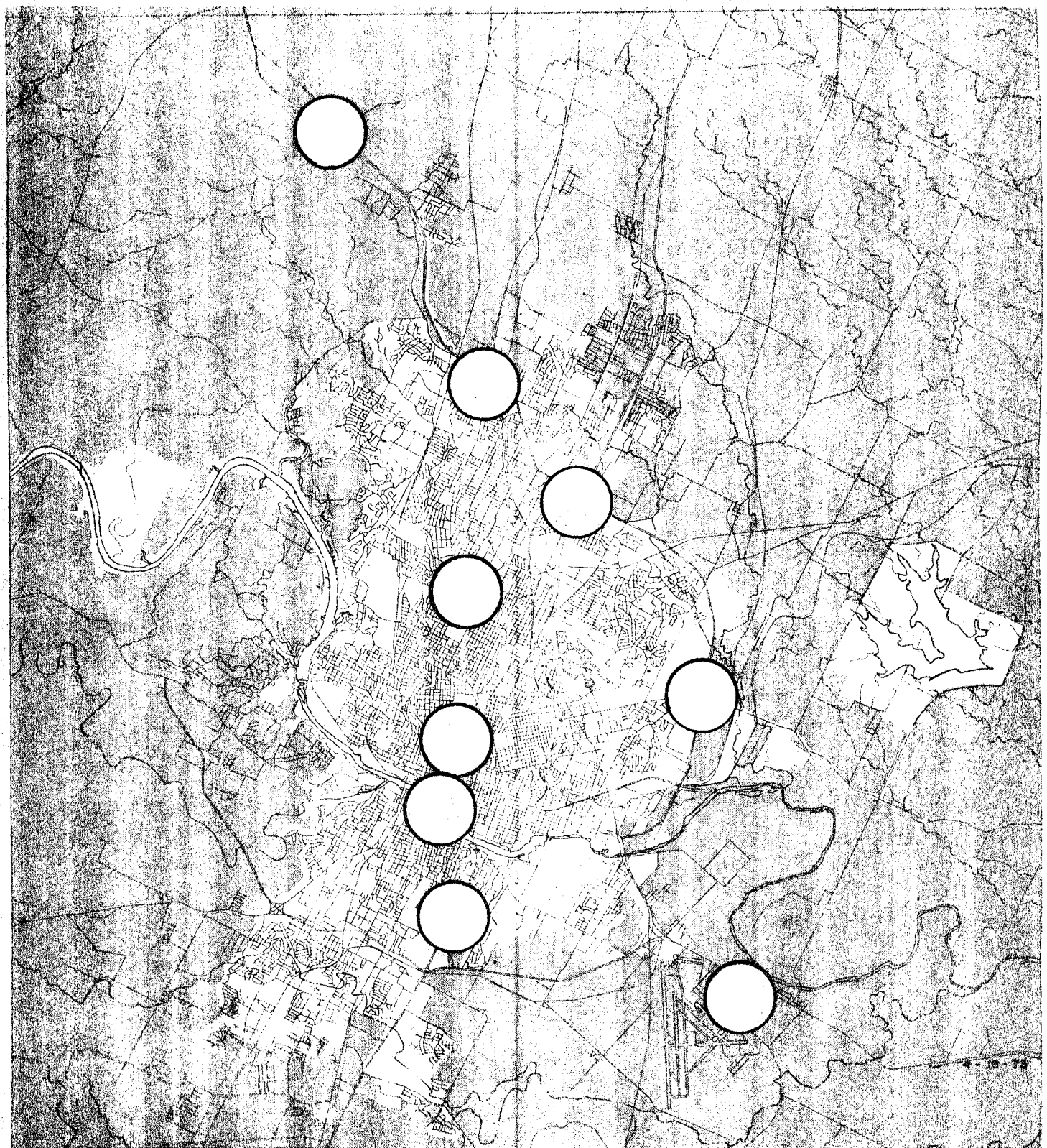
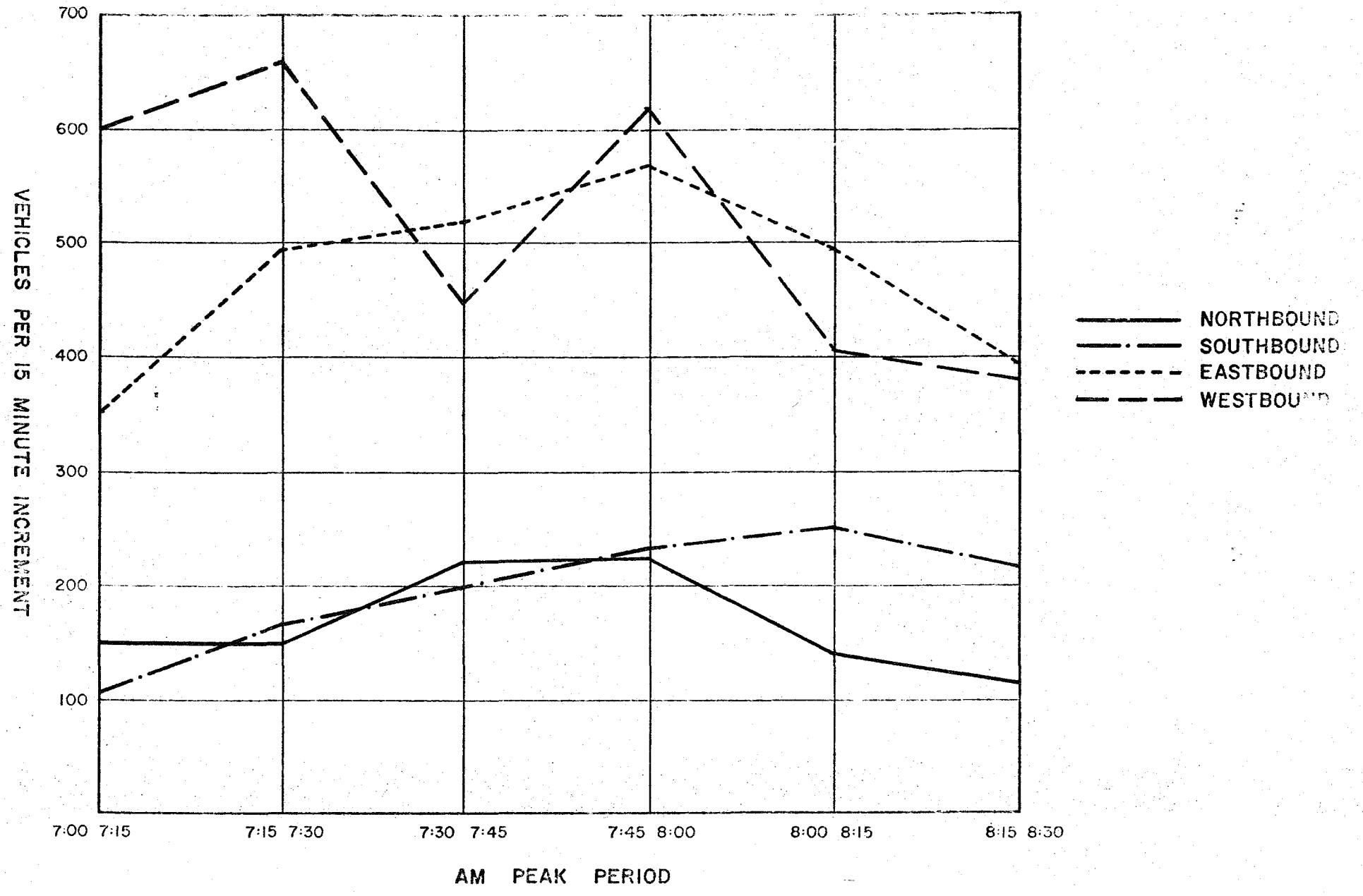


Figure 1

Employment Concentration

Figure 2
Northwest Concentration

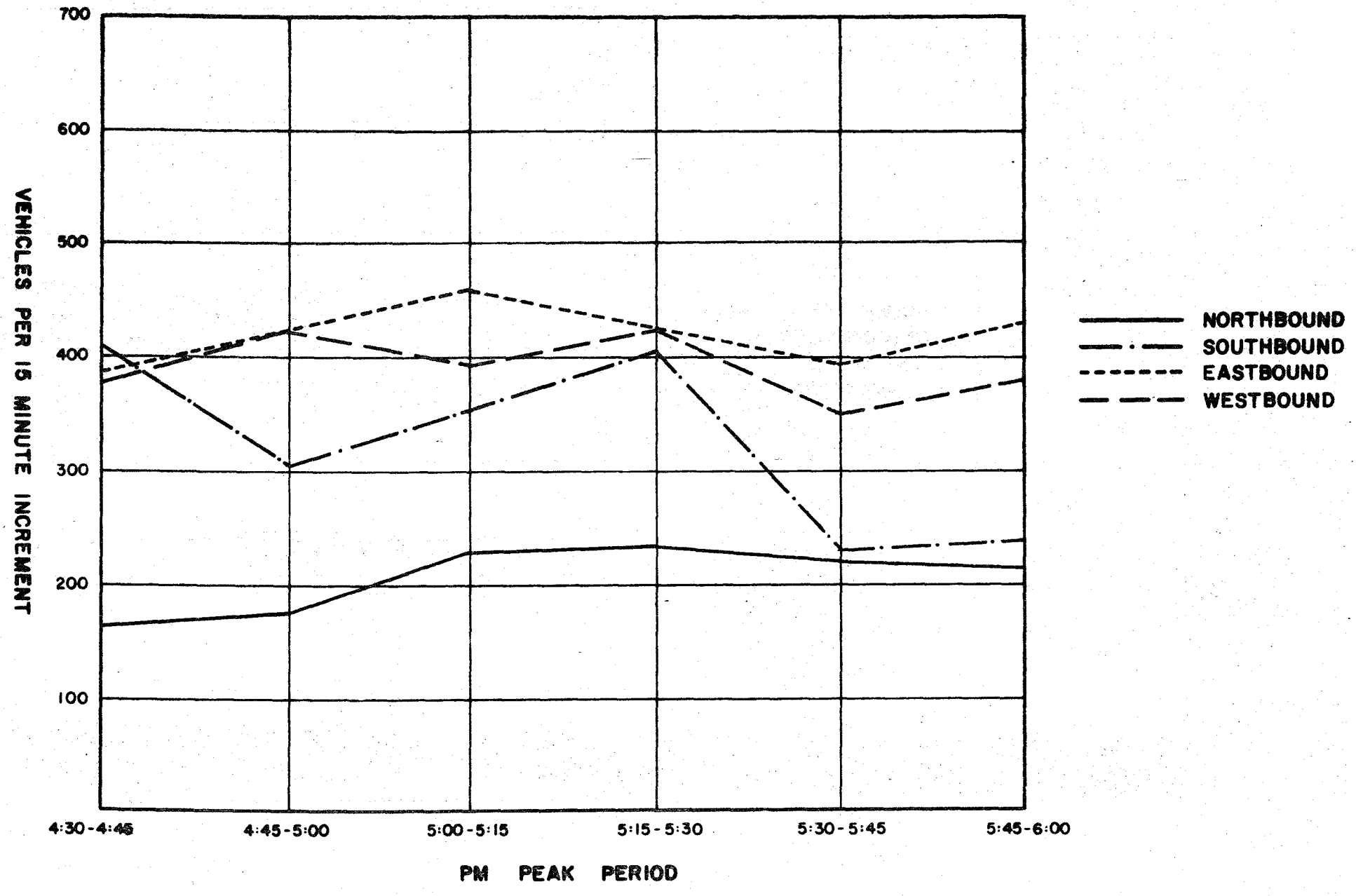
1. IBM Corporation
2. Balcones Research Center
3. Coca Cola and Dr. Pepper Bottling Company
4. Glastron Boat Company
5. Texas Nuclear
6. Air Control Board
7. Radian Corporation
8. Hart Graphics
9. U.S. Post Office
10. TCC, Incorporated



PEAK PERIOD TRAFFIC FLOW

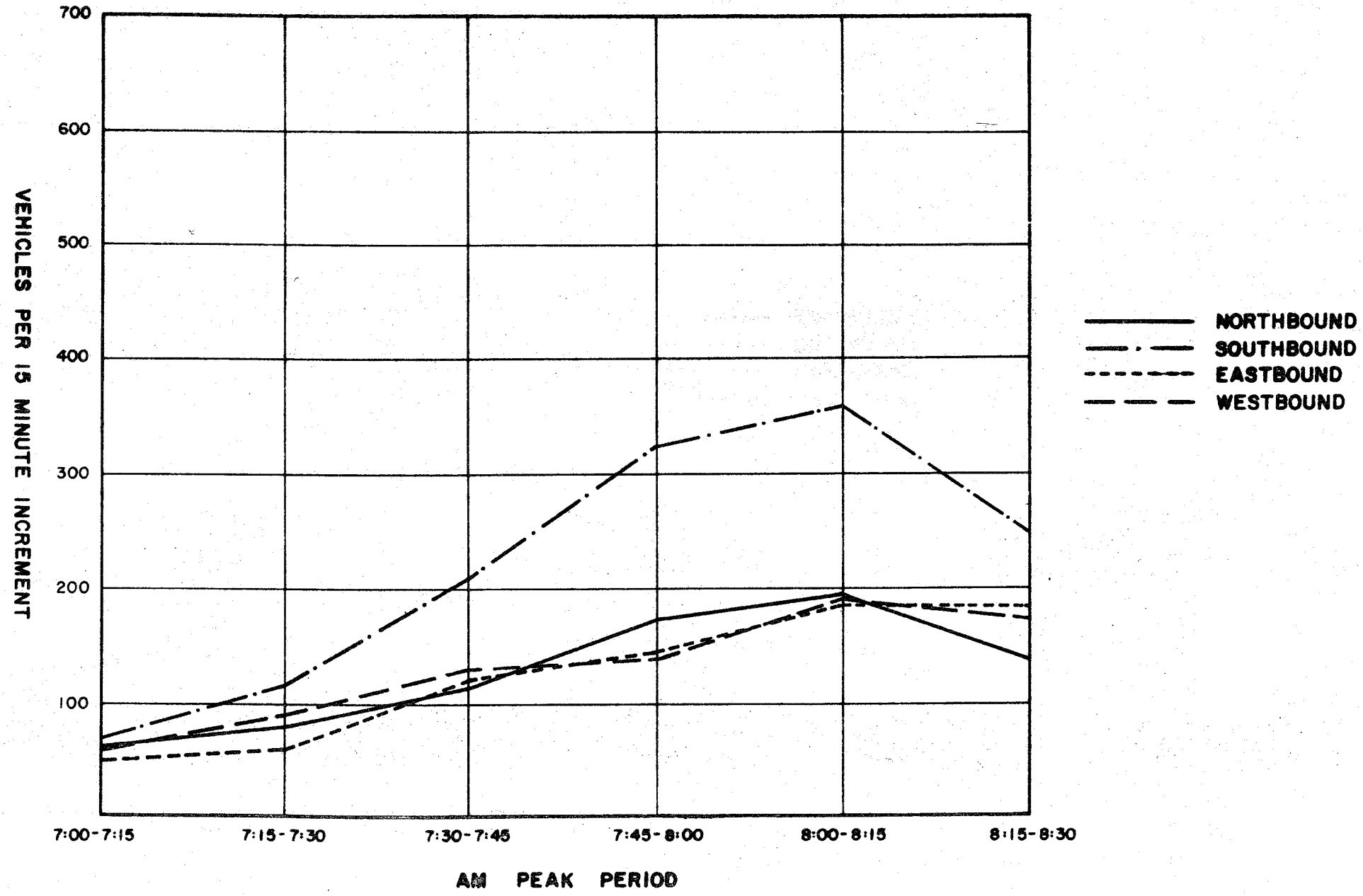
US 183 AND BURNET ROAD

FIGURE 3



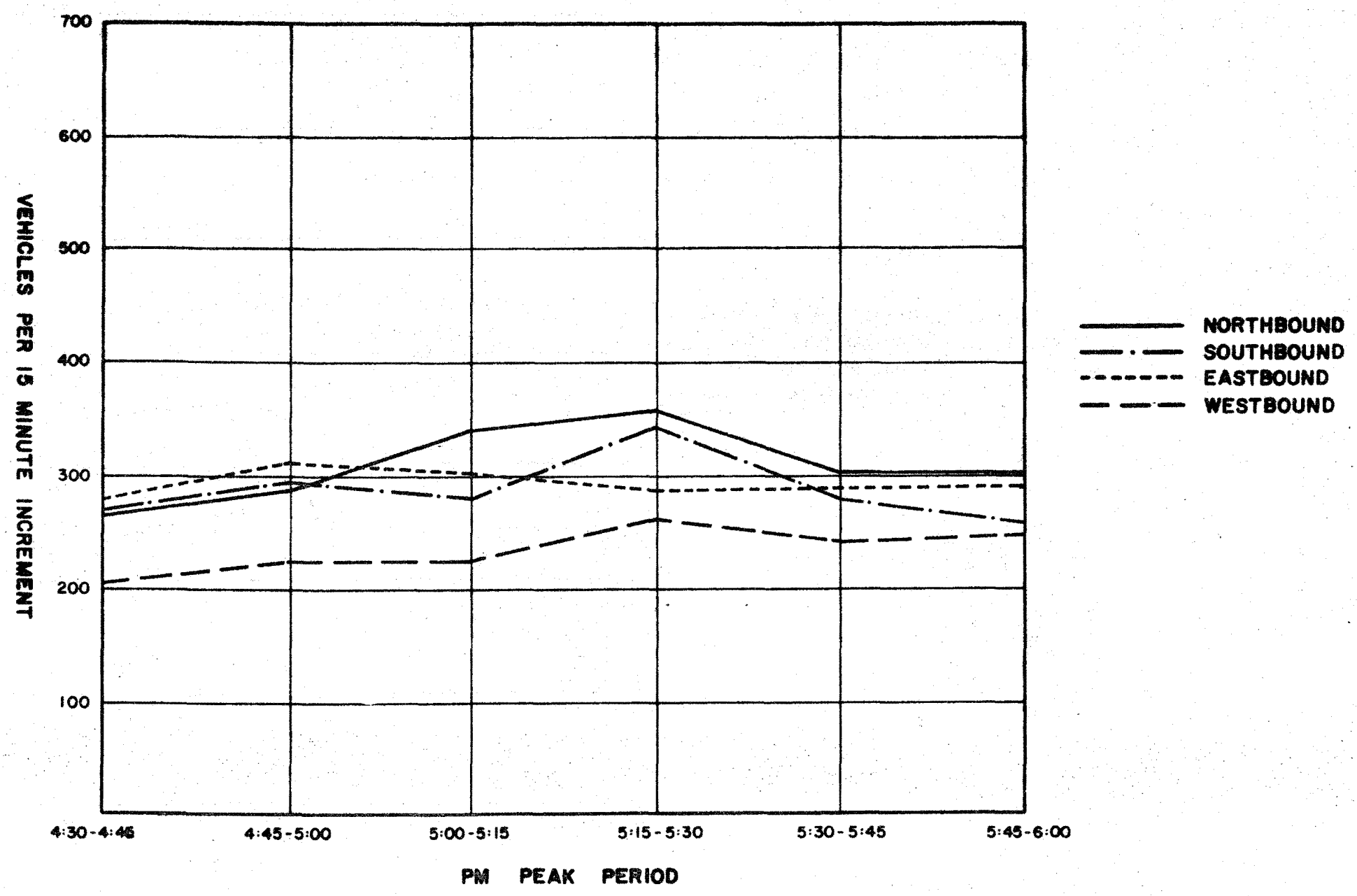
PEAK PERIOD TRAFFIC FLOW
US 183 AND BURNET ROAD

FIGURE 4



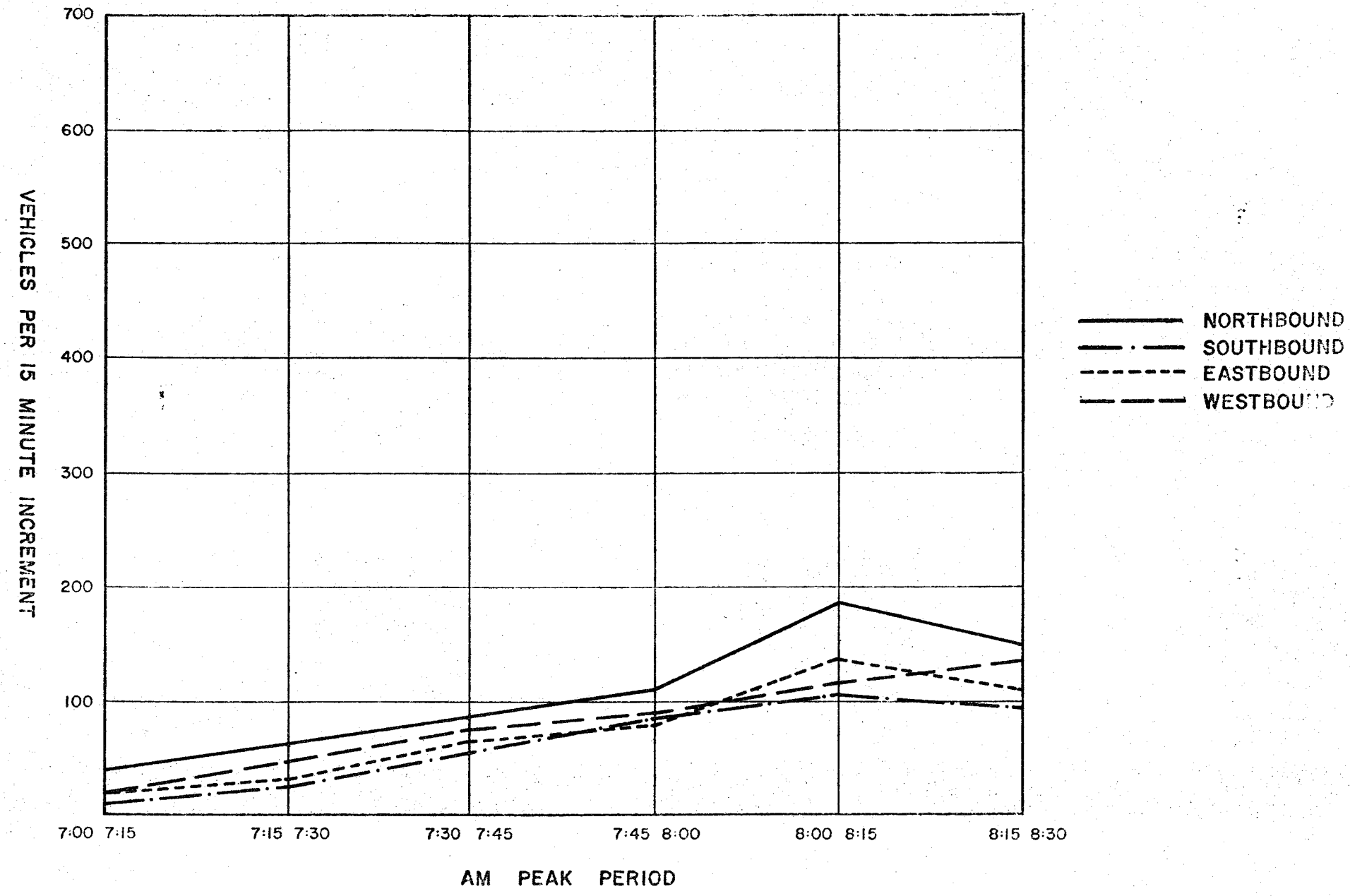
PEAK PERIOD TRAFFIC FLOW
BURNET ROAD AND ANDERSON LANE

FIGURE 5



PEAK PERIOD TRAFFIC FLOW
BURNET ROAD AND ANDERSON LANE

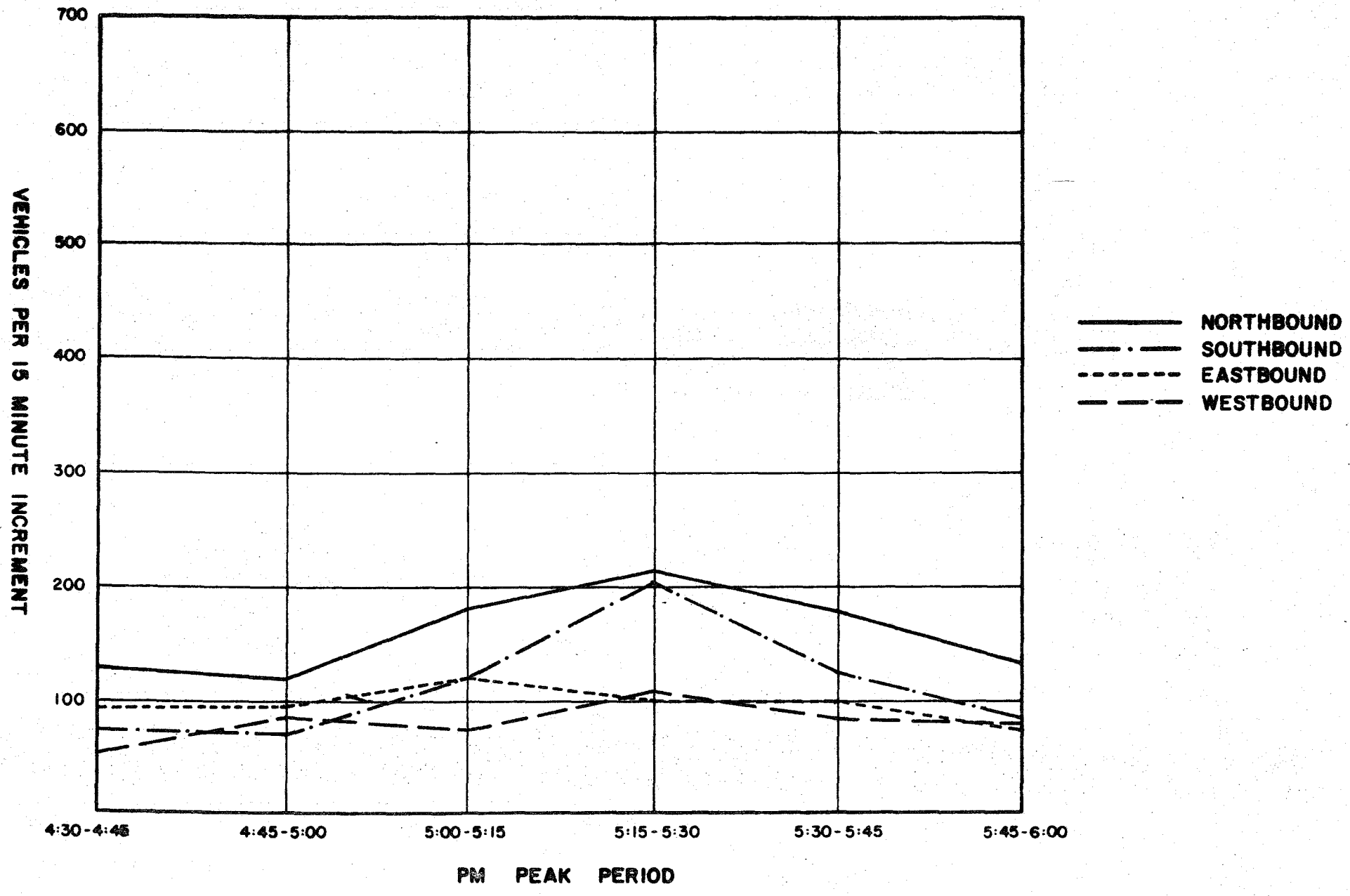
FIGURE 6



PEAK PERIOD TRAFFIC FLOW

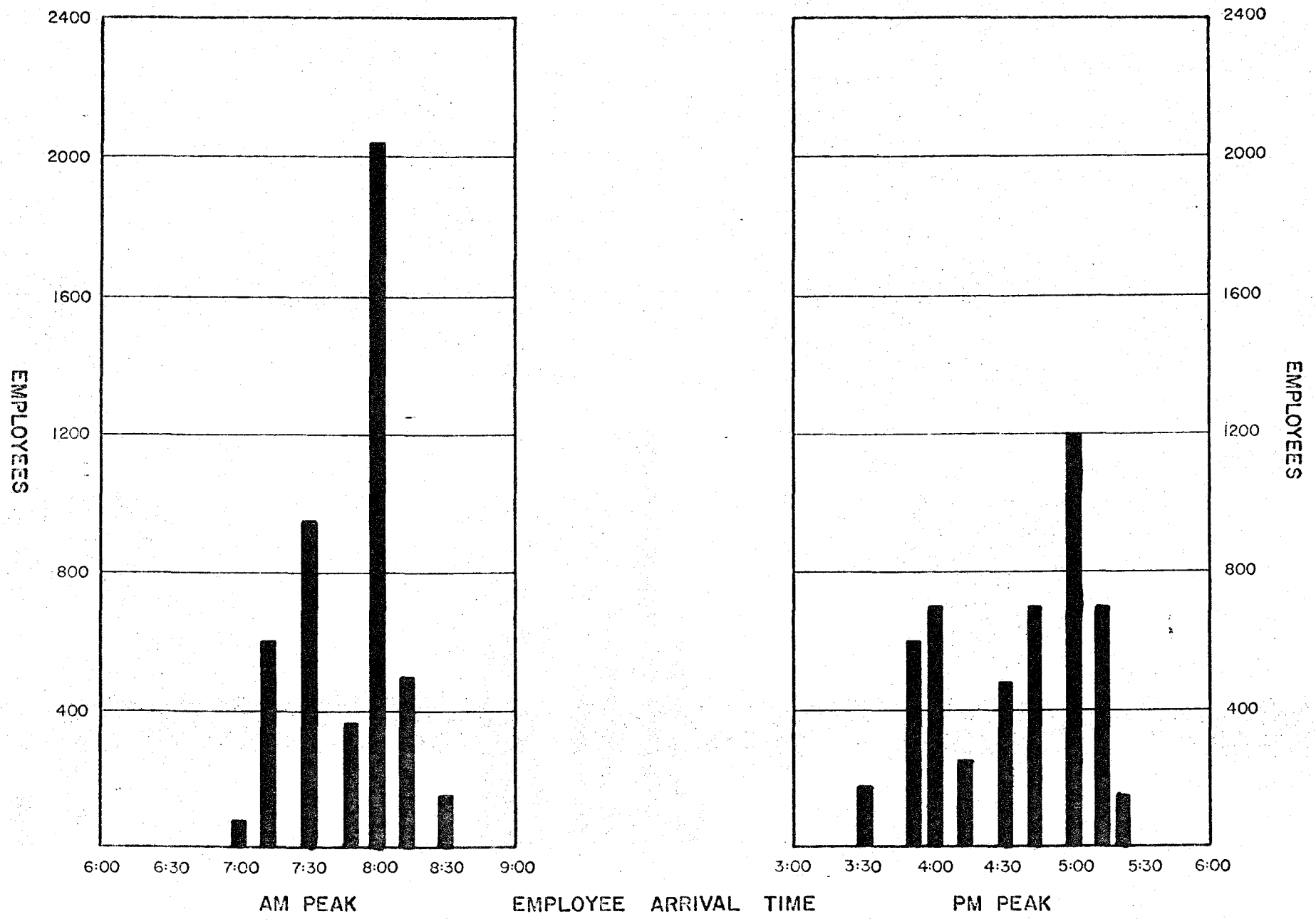
SHOAL CREEK BOULEVARD AND STECK AVENUE

FIGURE 7



PEAK PERIOD TRAFFIC FLOW
SHOAL CREEK BOULEVARD AND STECK AVENUE

FIGURE 8

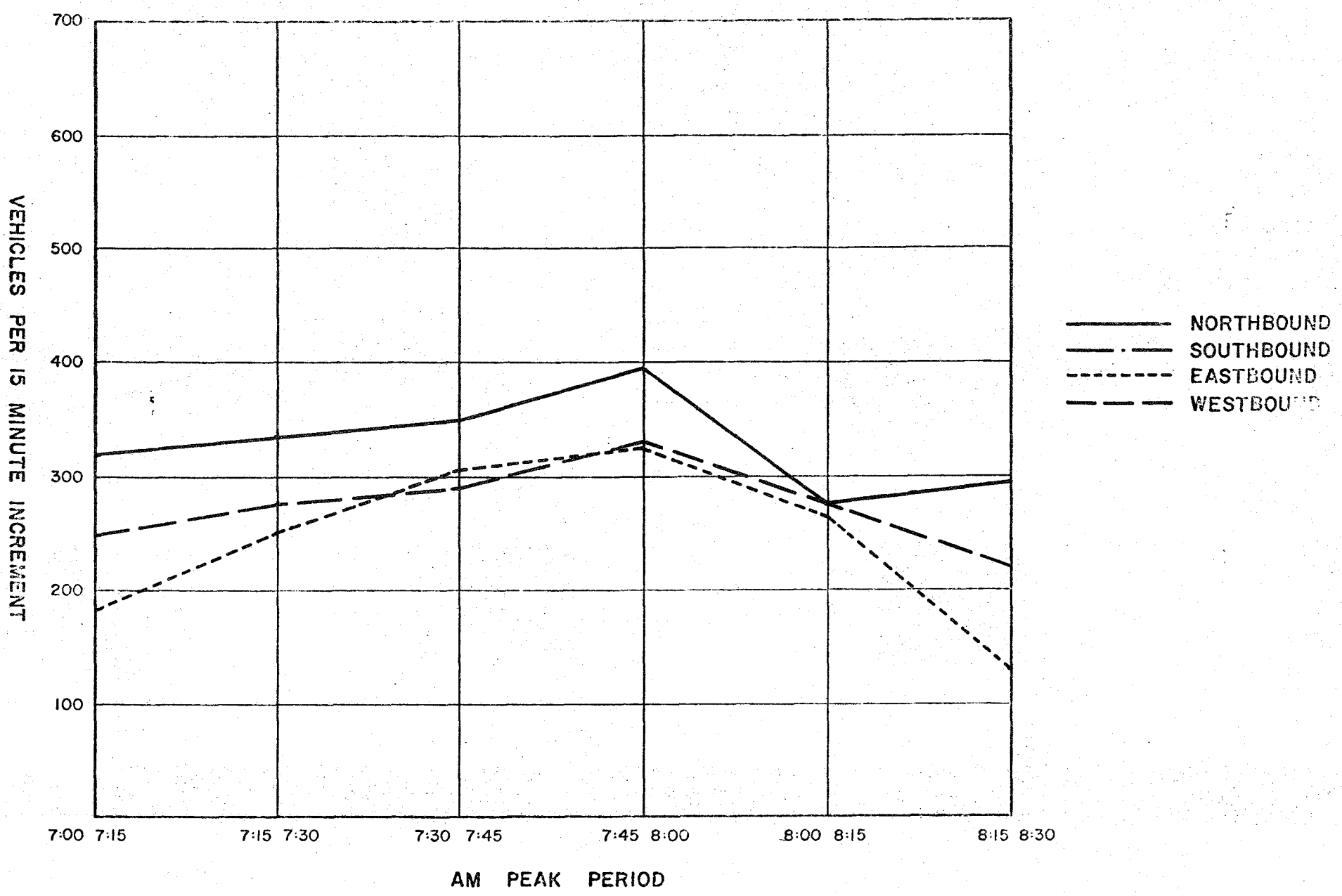


MAJOR EMPLOYERS WORK SCHEDULE
NORTHWEST CONCENTRATION

FIGURE **9**

Figure 10
U.S. 183/IH 35 Concentration

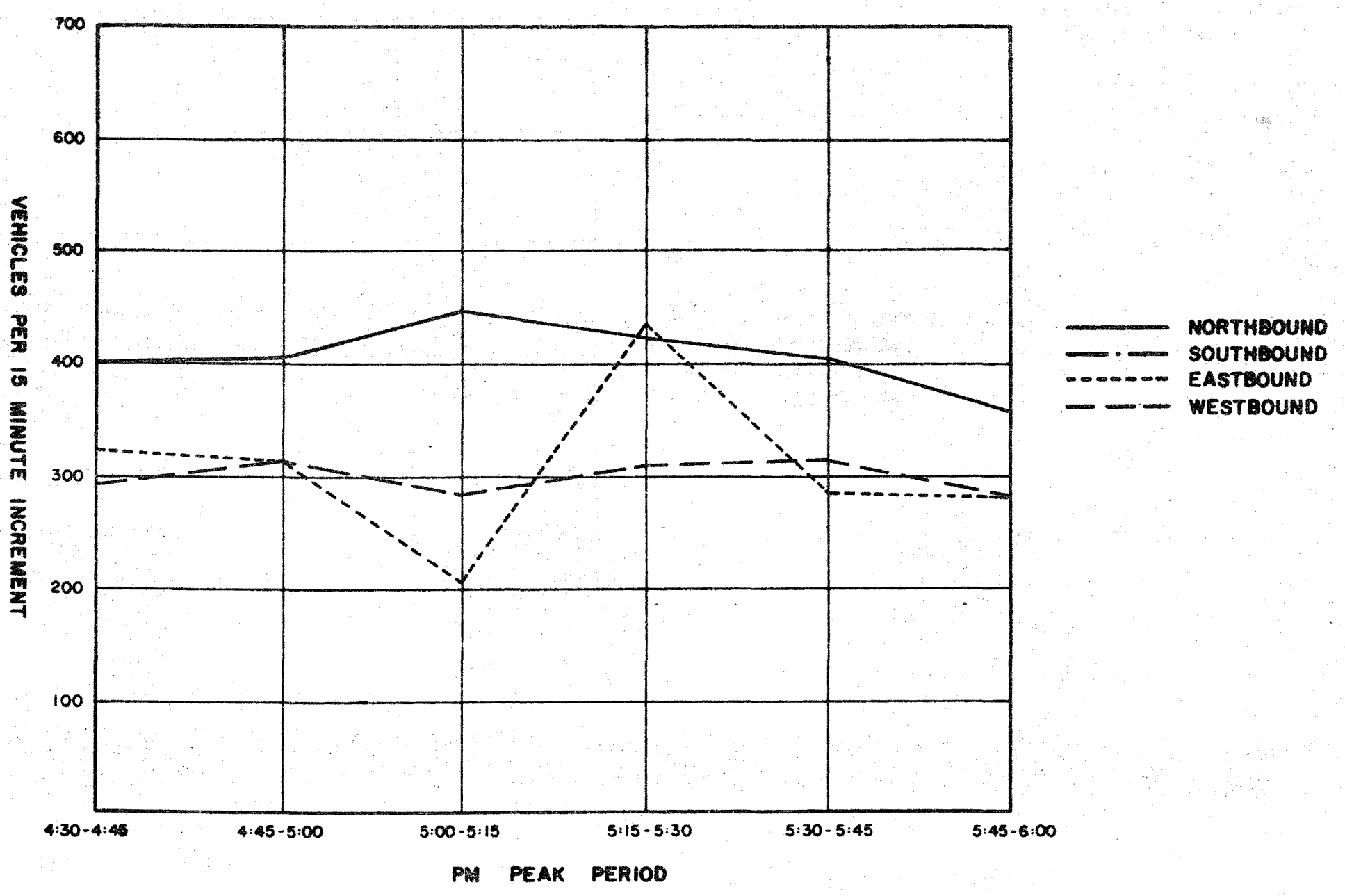
1. Texas Rehabilitation Commission
2. Texas Department of Highways and Public Transportation
3. National Western Life Insurance
4. Post Office
5. Southwestern Bell
6. American Founder's Life Insurance
7. Eagle Signal Corporation
8. Houston Instrument



PEAK PERIOD TRAFFIC FLOW

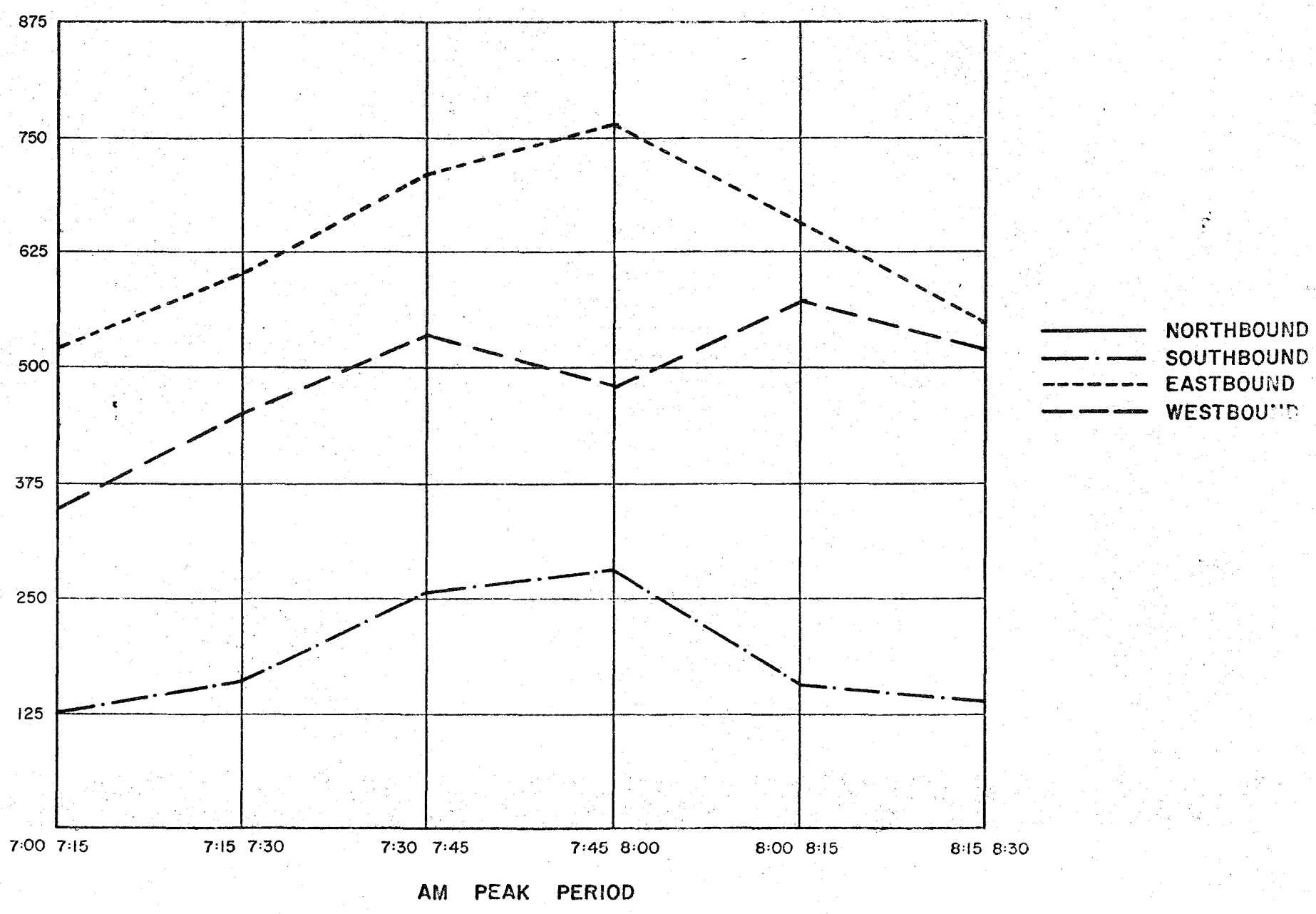
US 183 AND IH 35 EAST SERVICE ROAD

FIGURE 11



PEAK PERIOD TRAFFIC FLOW
US 183 AND IH 35 EAST SERVICE ROAD

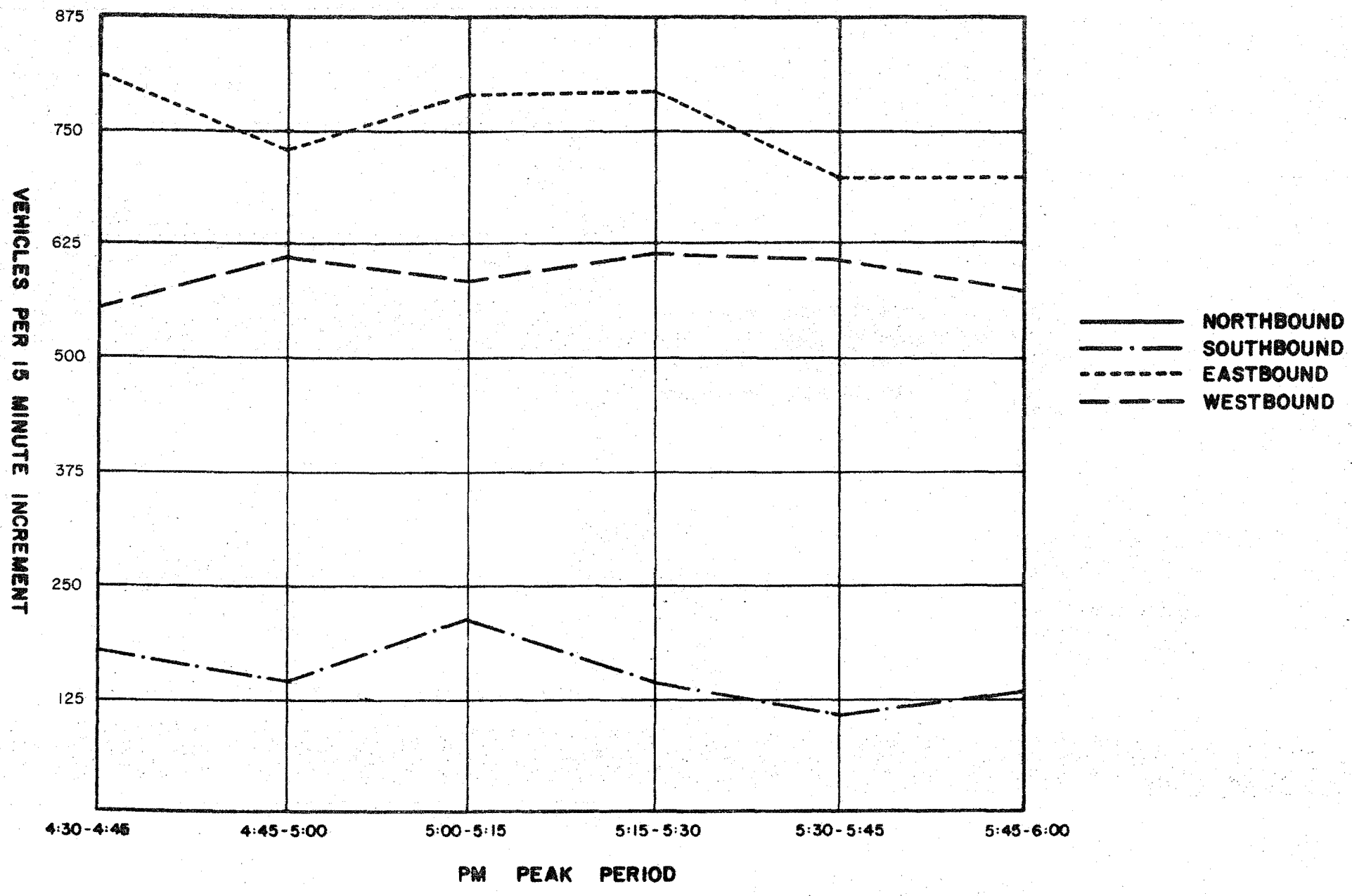
FIGURE 12



PEAK PERIOD TRAFFIC FLOW

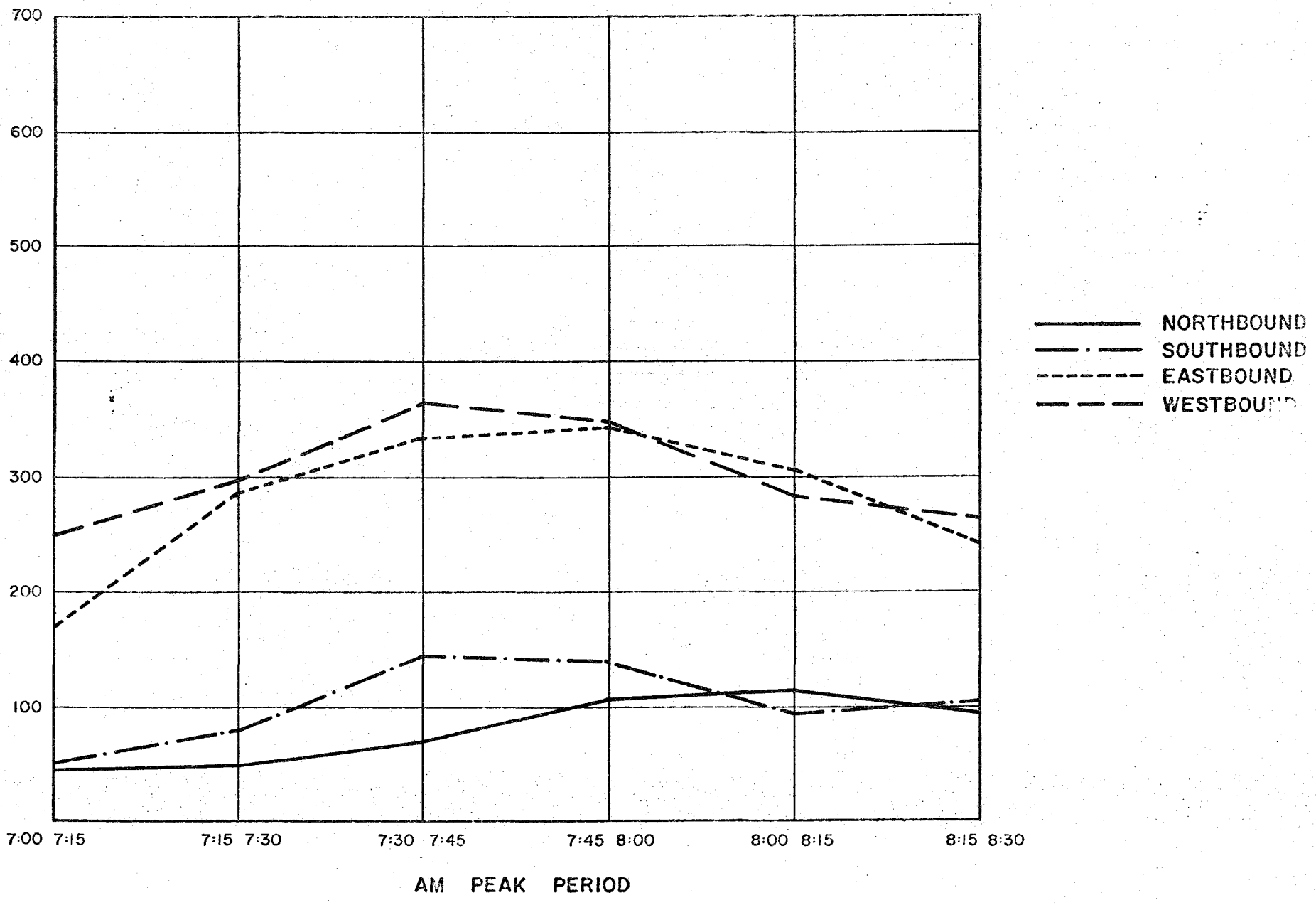
US 183 AND IH 35 WEST SERVICE ROAD

FIGURE 13



PEAK PERIOD TRAFFIC FLOW
US 183 AND IH 35 WEST SERVICE ROAD

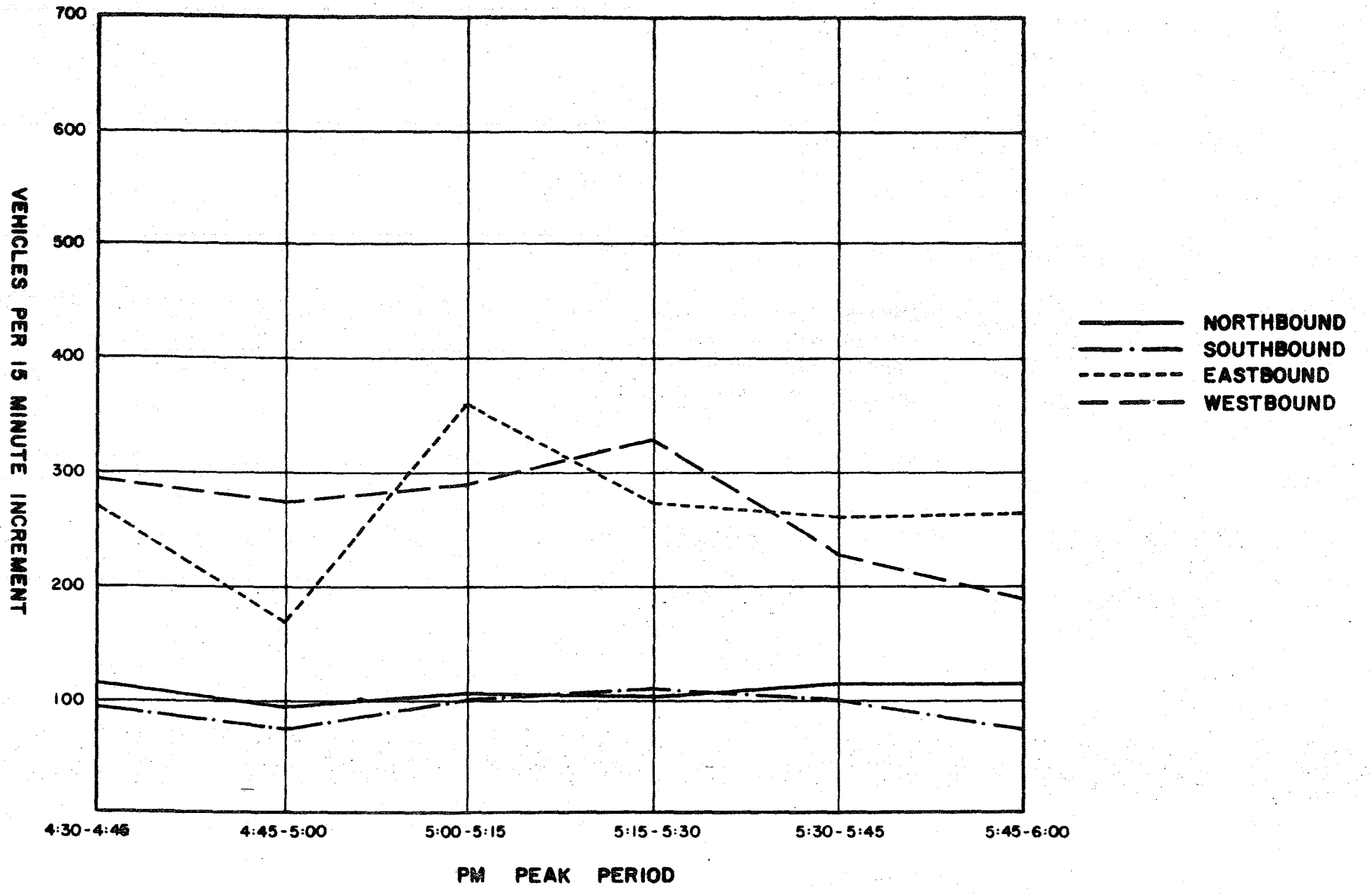
FIGURE 14



PEAK PERIOD TRAFFIC FLOW

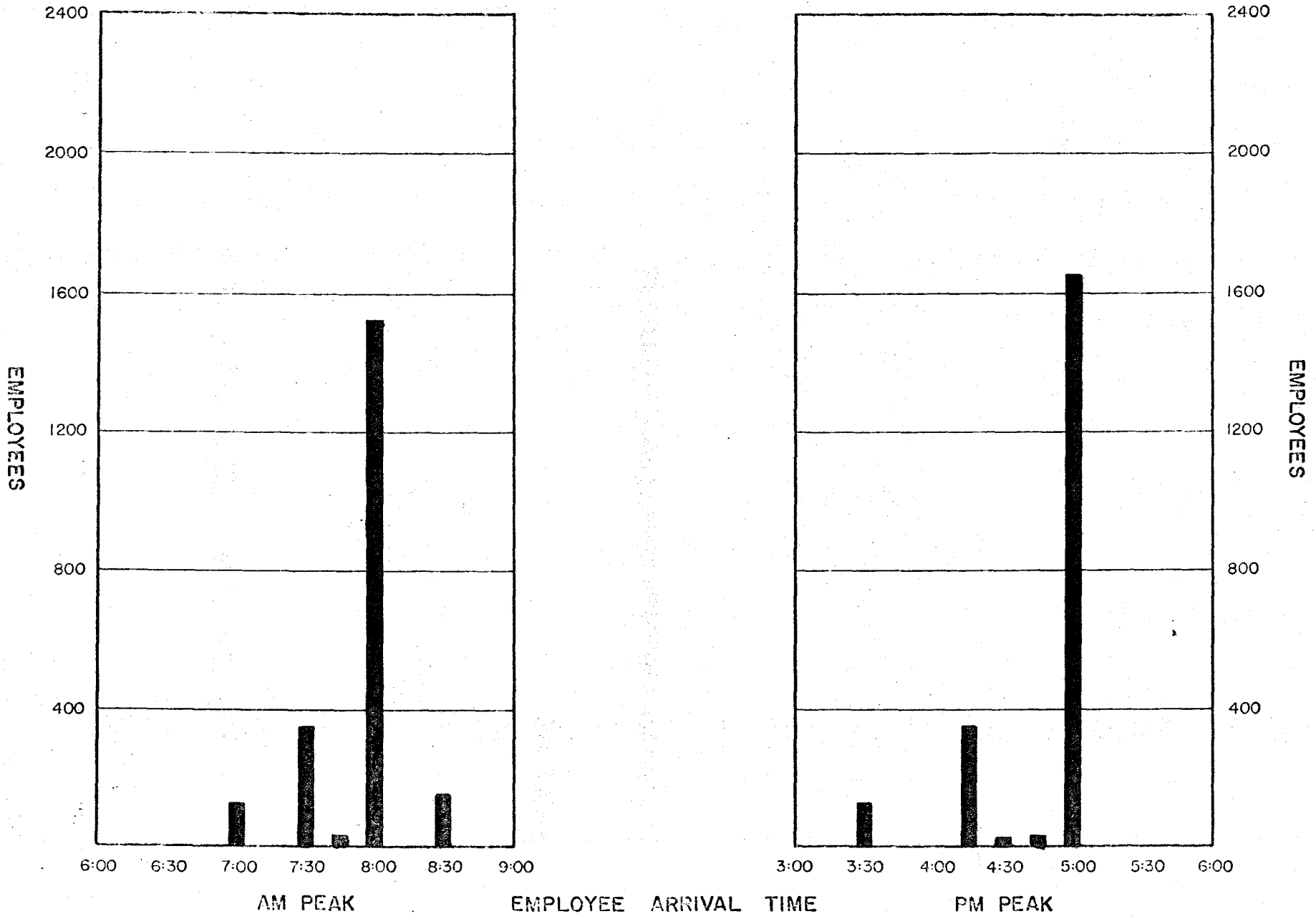
CAMERON ROAD AND US 183

FIGURE 15



PEAK PERIOD TRAFFIC FLOW
CAMERON ROAD AND US 183

FIGURE 16



MAJOR EMPLOYERS WORK SCHEDULE
US 183 / IH 35 CONCENTRATION

FIGURE 17

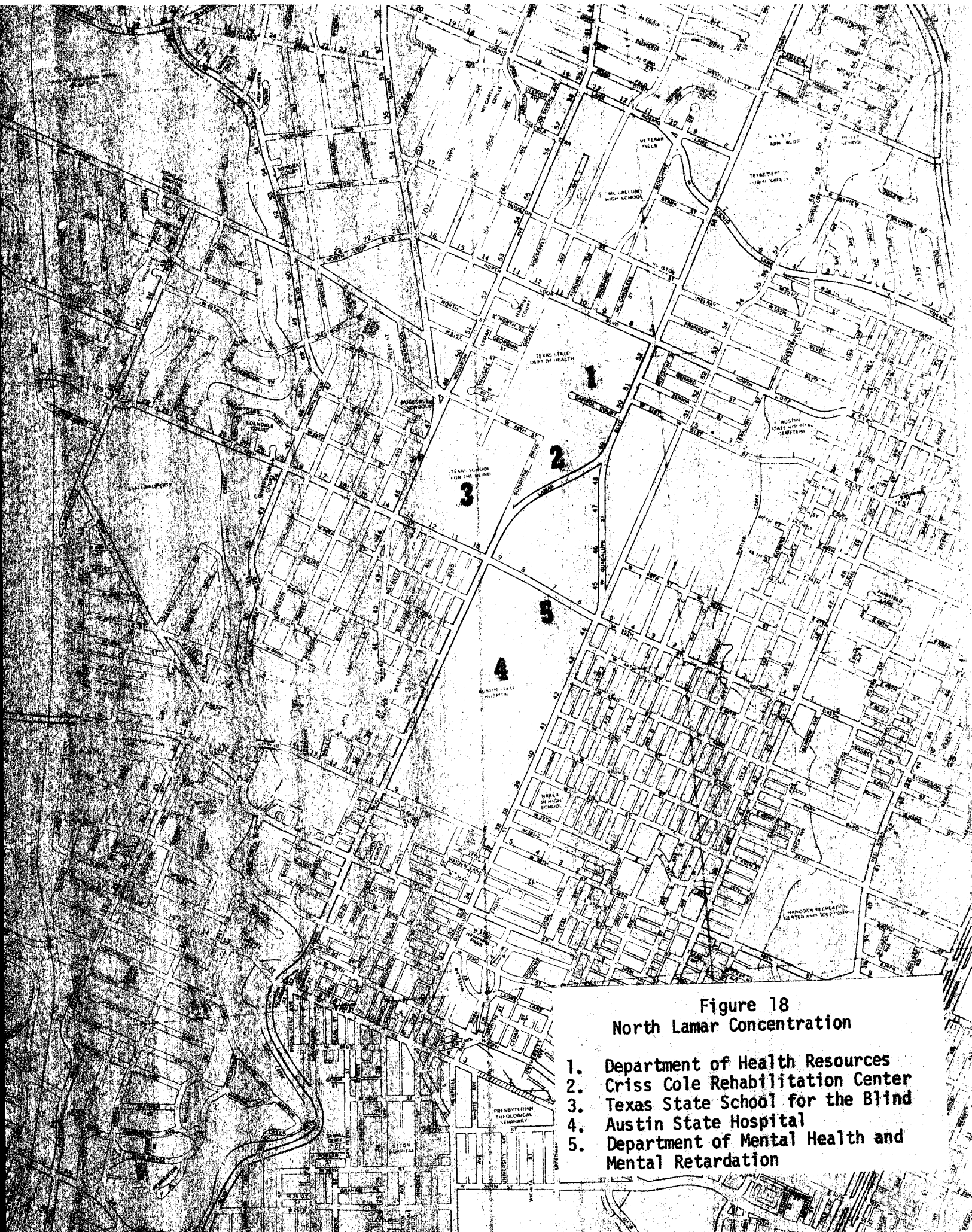
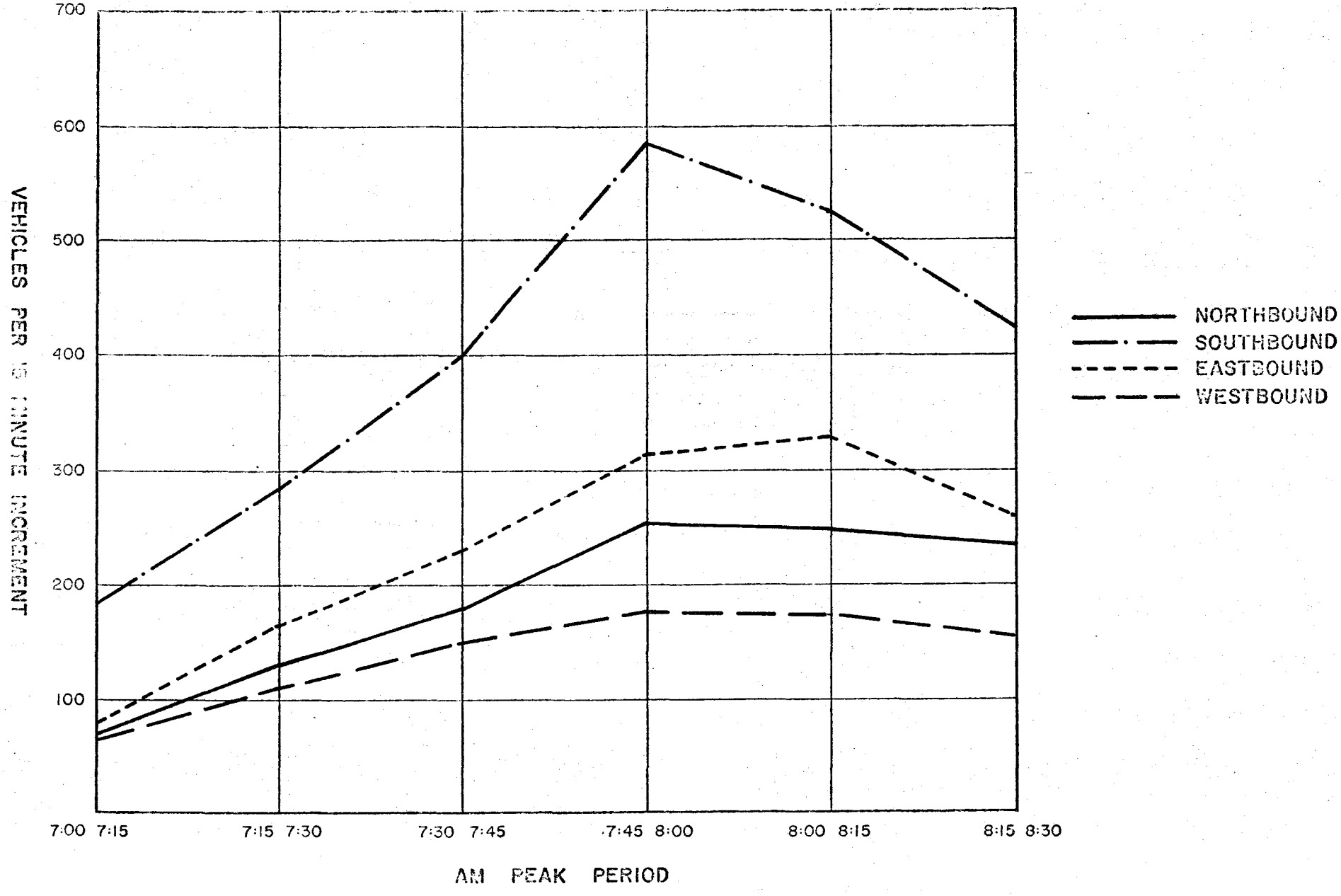


Figure 18
North Lamar Concentration

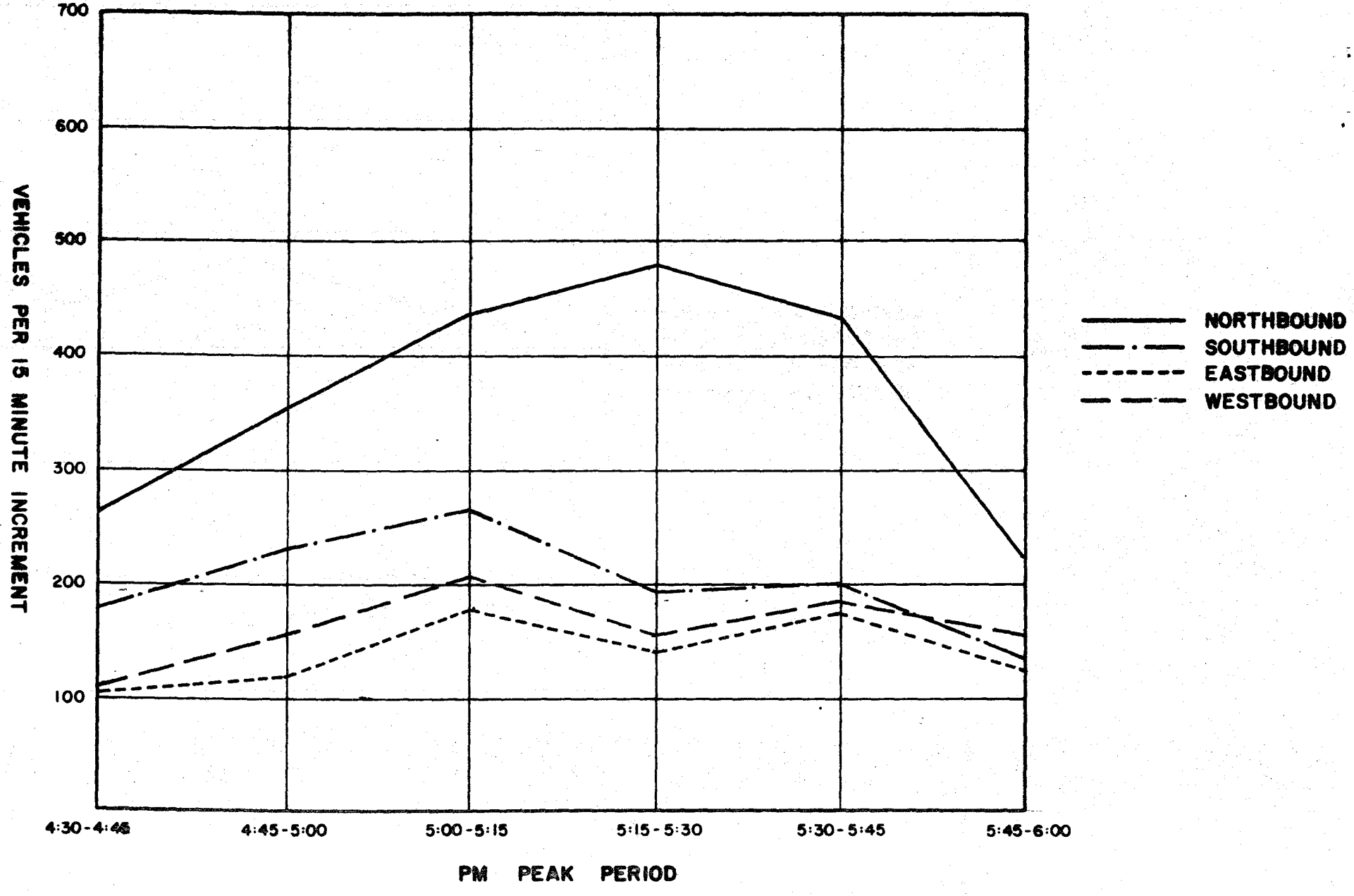
1. Department of Health Resources
2. Criss Cole Rehabilitation Center
3. Texas State School for the Blind
4. Austin State Hospital
5. Department of Mental Health and Mental Retardation



PEAK PERIOD TRAFFIC FLOW

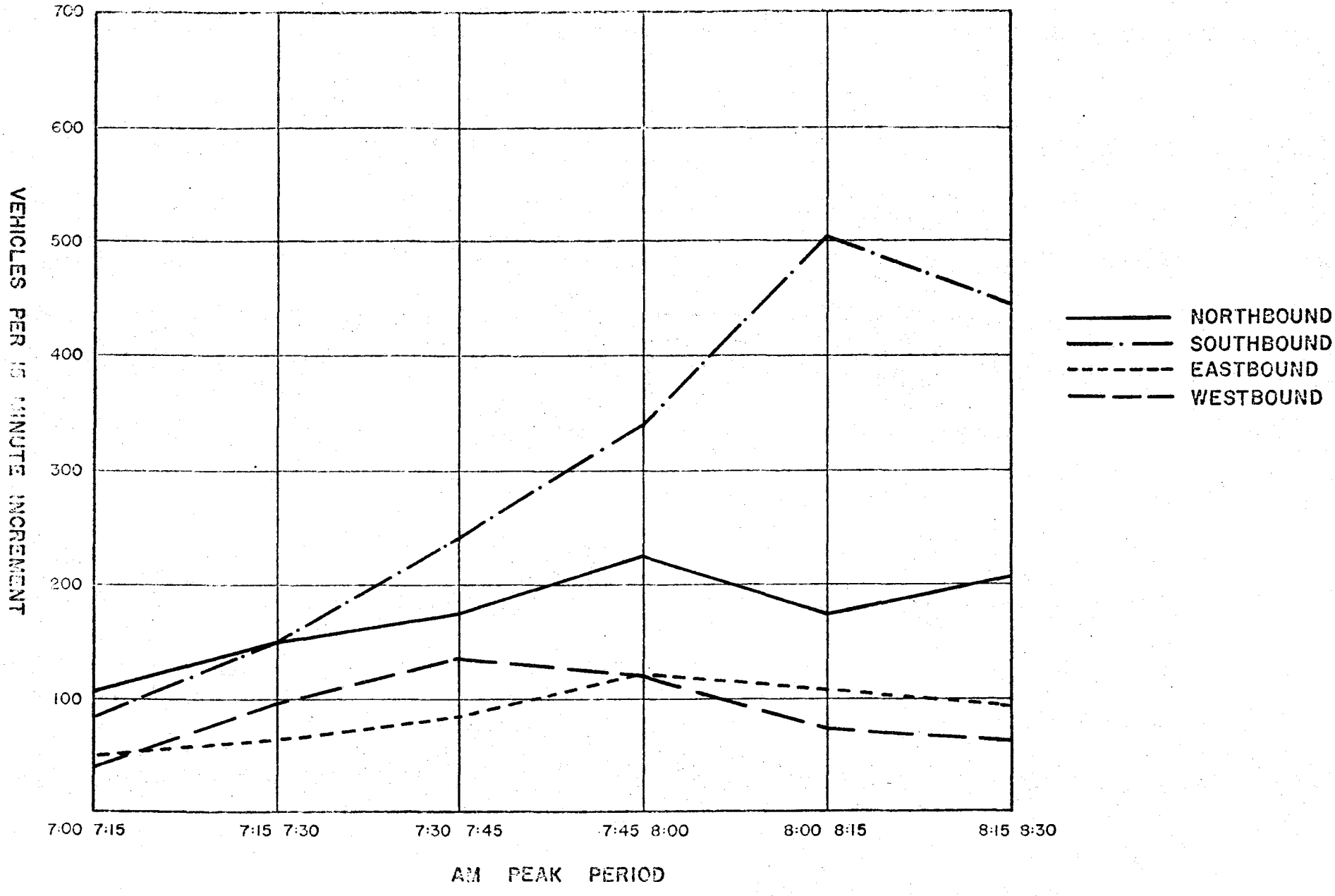
LAMAR BOULEVARD AND KOENIG LANE

FIGURE 19



PEAK PERIOD TRAFFIC FLOW
LAMAR BOULEVARD AND KOENIG LANE

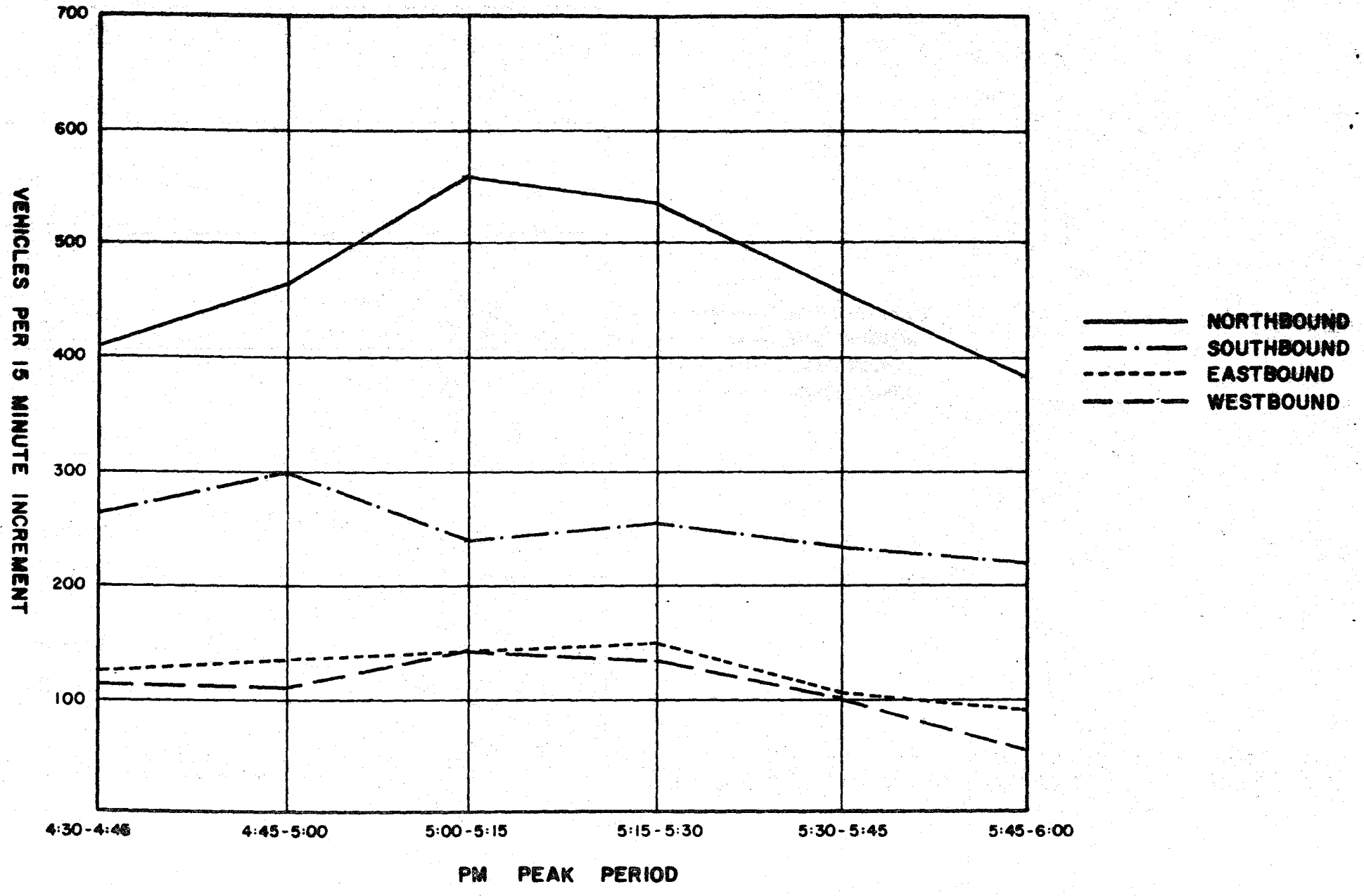
FIGURE 2(



PEAK PERIOD TRAFFIC FLOW

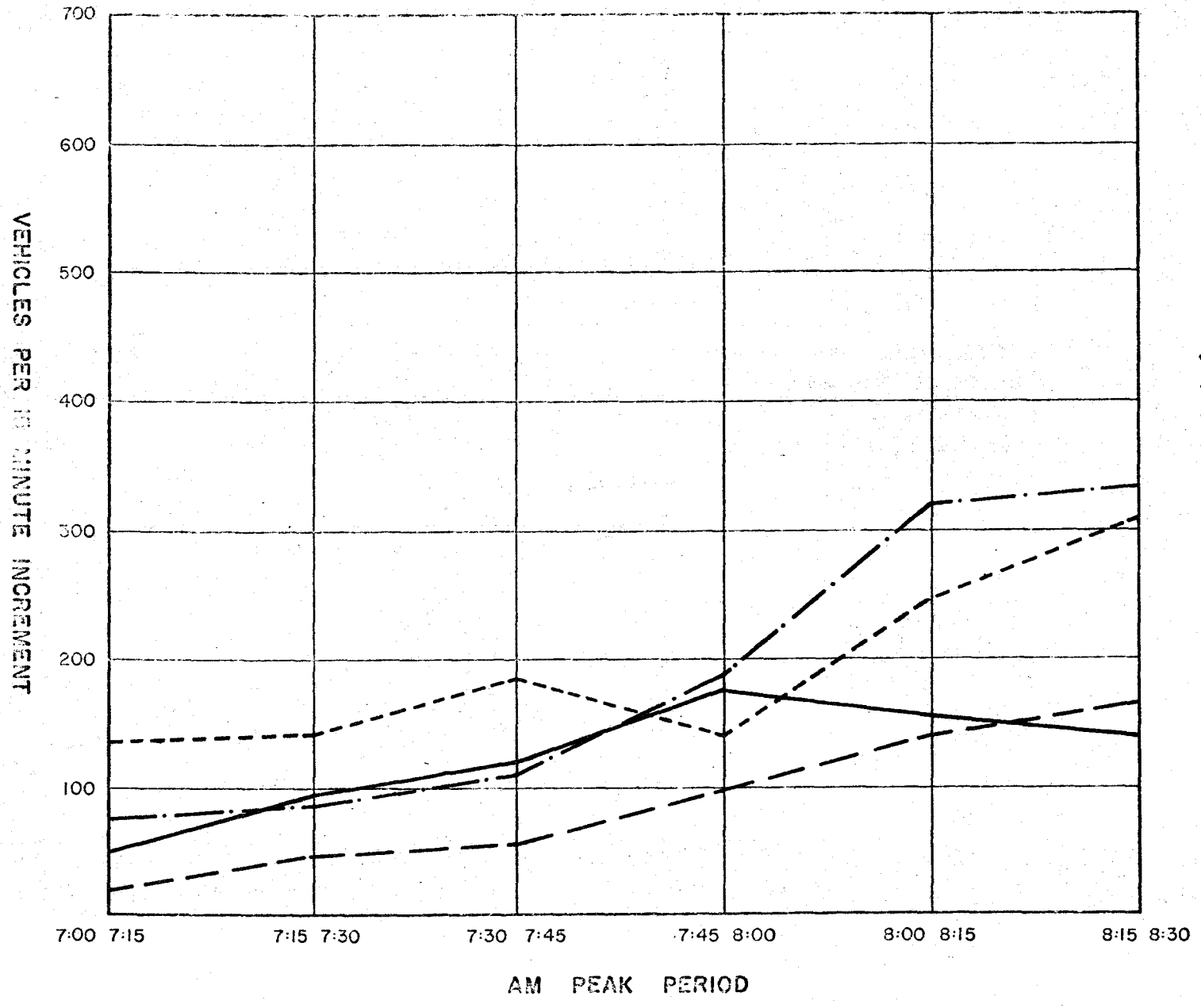
LAMAR BOULEVARD AND NORTHLOOP BOULEVARD

FIGURE 21



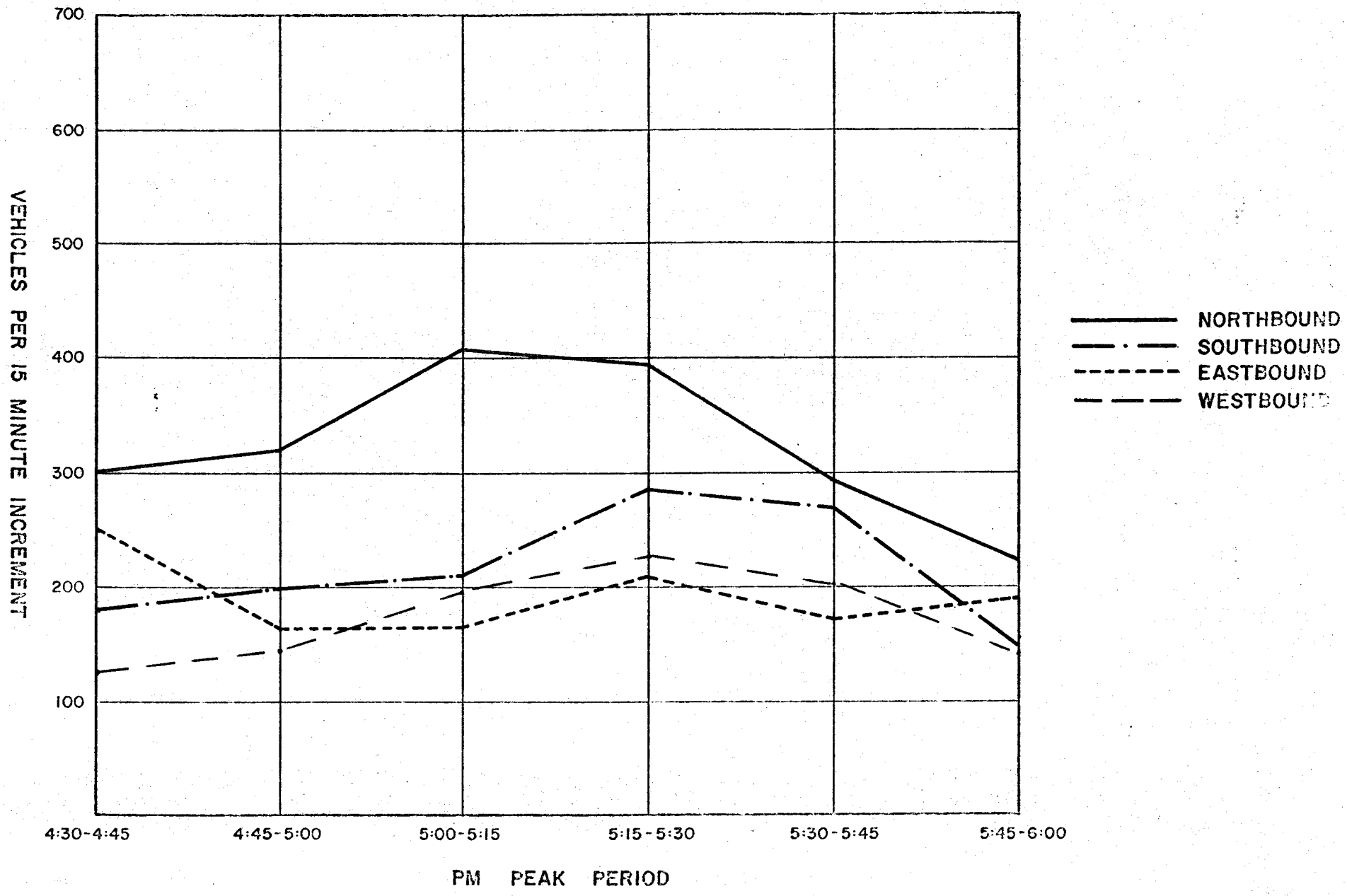
PEAK PERIOD TRAFFIC FLOW
LAMAR BOULEVARD AND NORTHLOOP BOULEVARD

FIGURE 22



PEAK PERIOD TRAFFIC FLOW

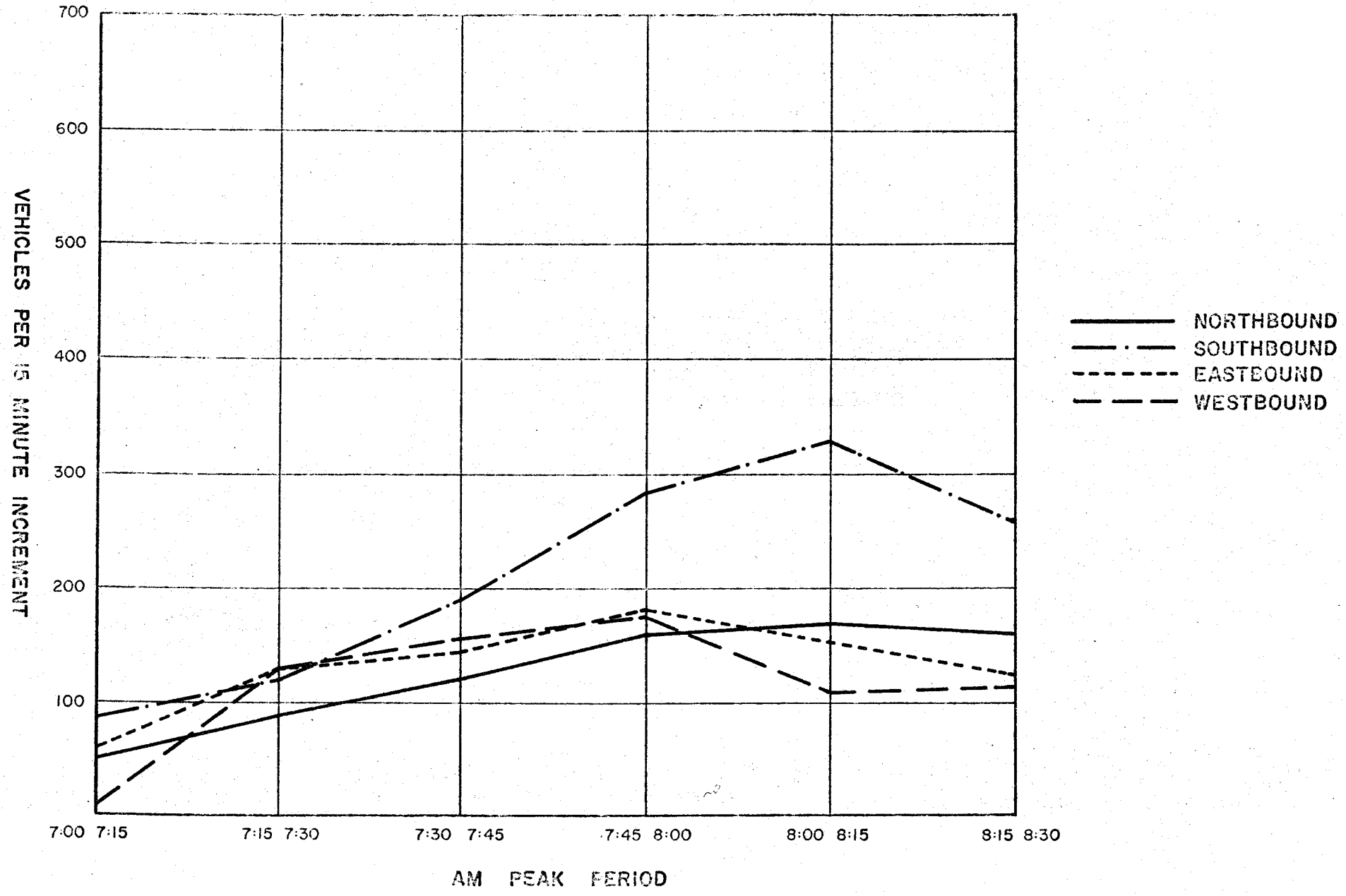
LAMAR BOULEVARD AND 45TH STREET



PEAK PERIOD TRAFFIC FLOW

LAMAR BOULEVARD AND 45 TH STREET

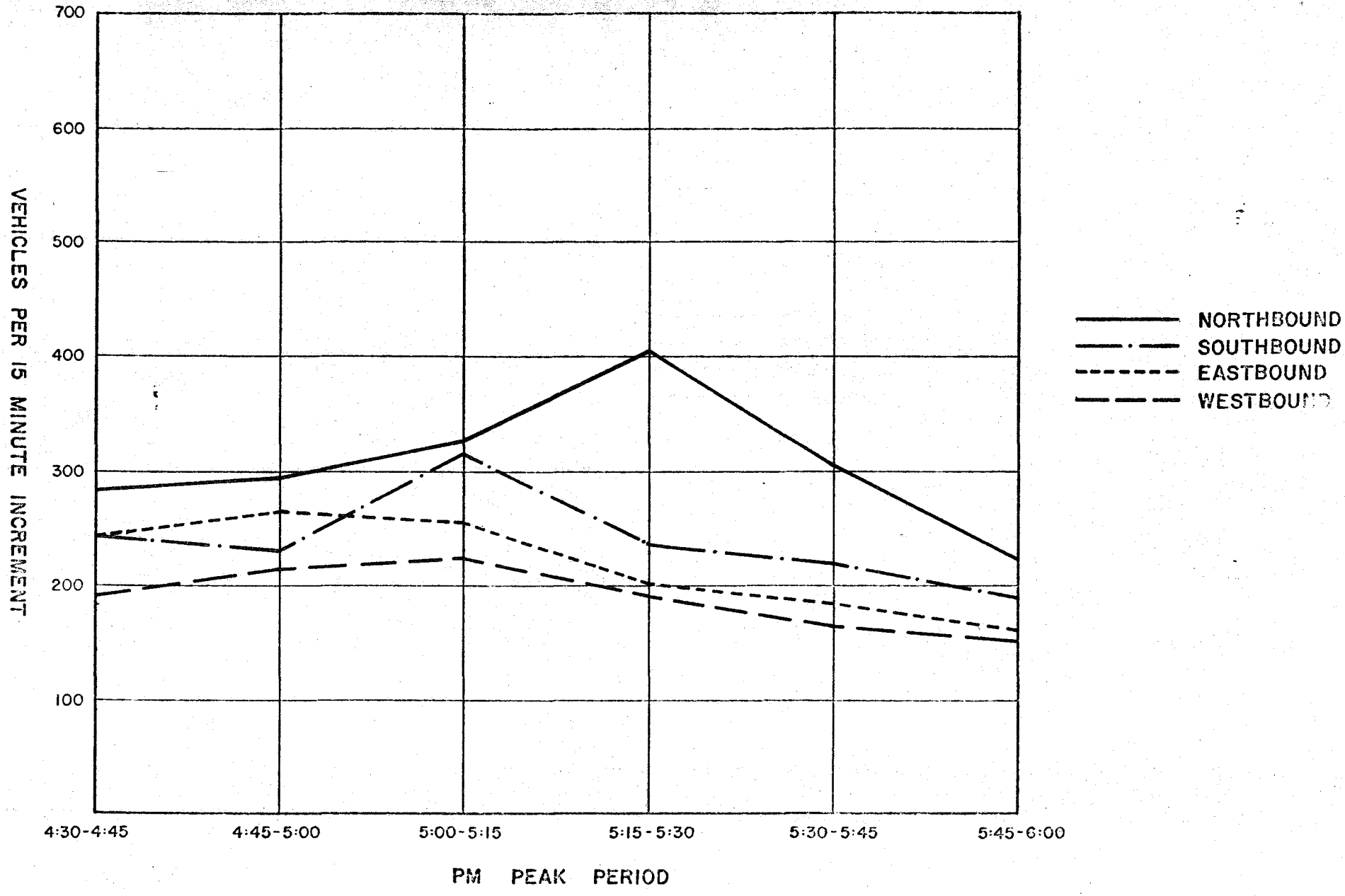
FIGURE 24



PEAK PERIOD TRAFFIC FLOW

LAMAR BOULEVARD AND 38TH STREET

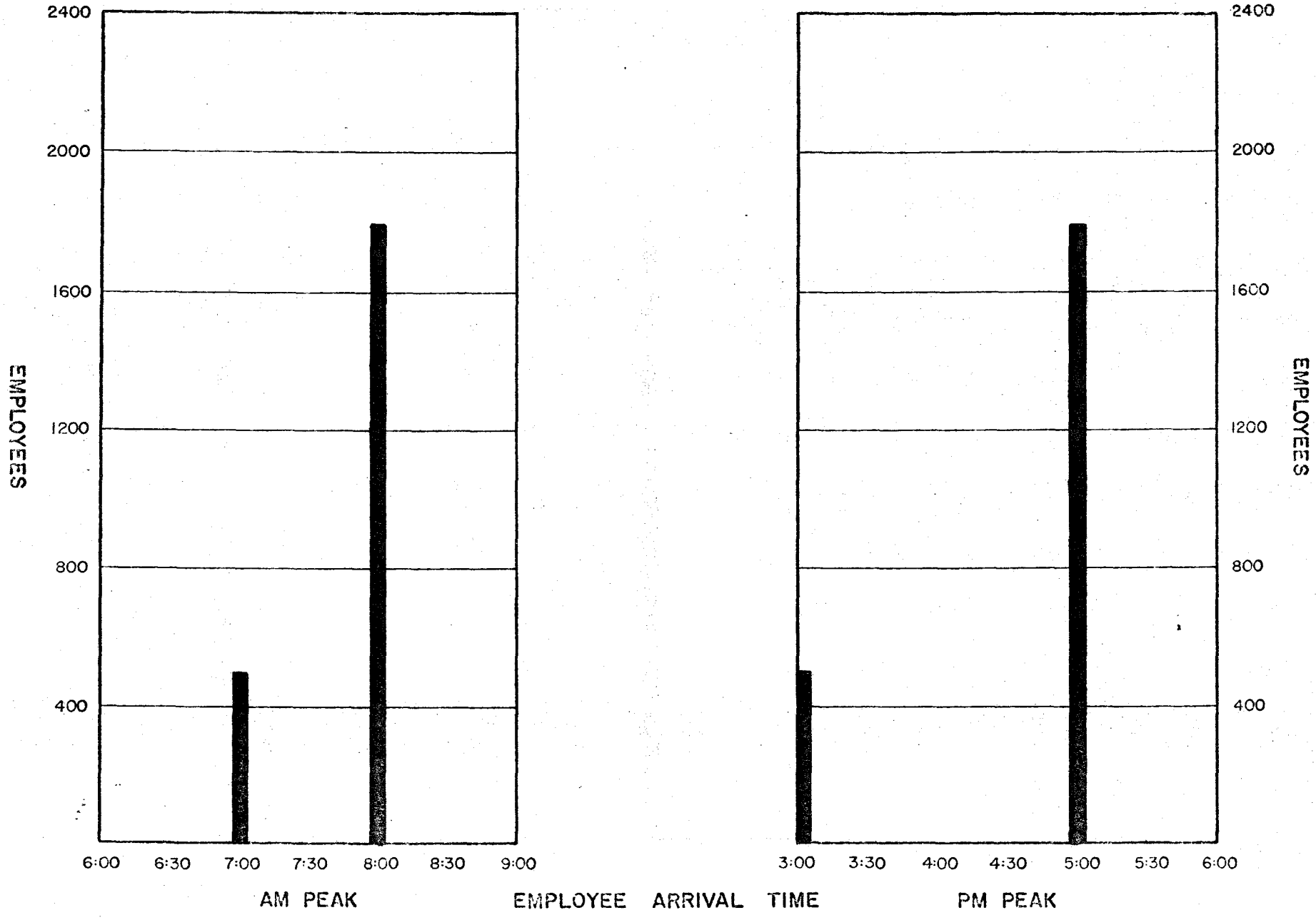
FIGURE 25



PEAK PERIOD TRAFFIC FLOW

LAMAR BOULEVARD AND 38 TH STREET

FIGURE **26**



MAJOR EMPLOYERS WORK SCHEDULE
NORTH LAMAR CONCENTRATION

FIGURE 27

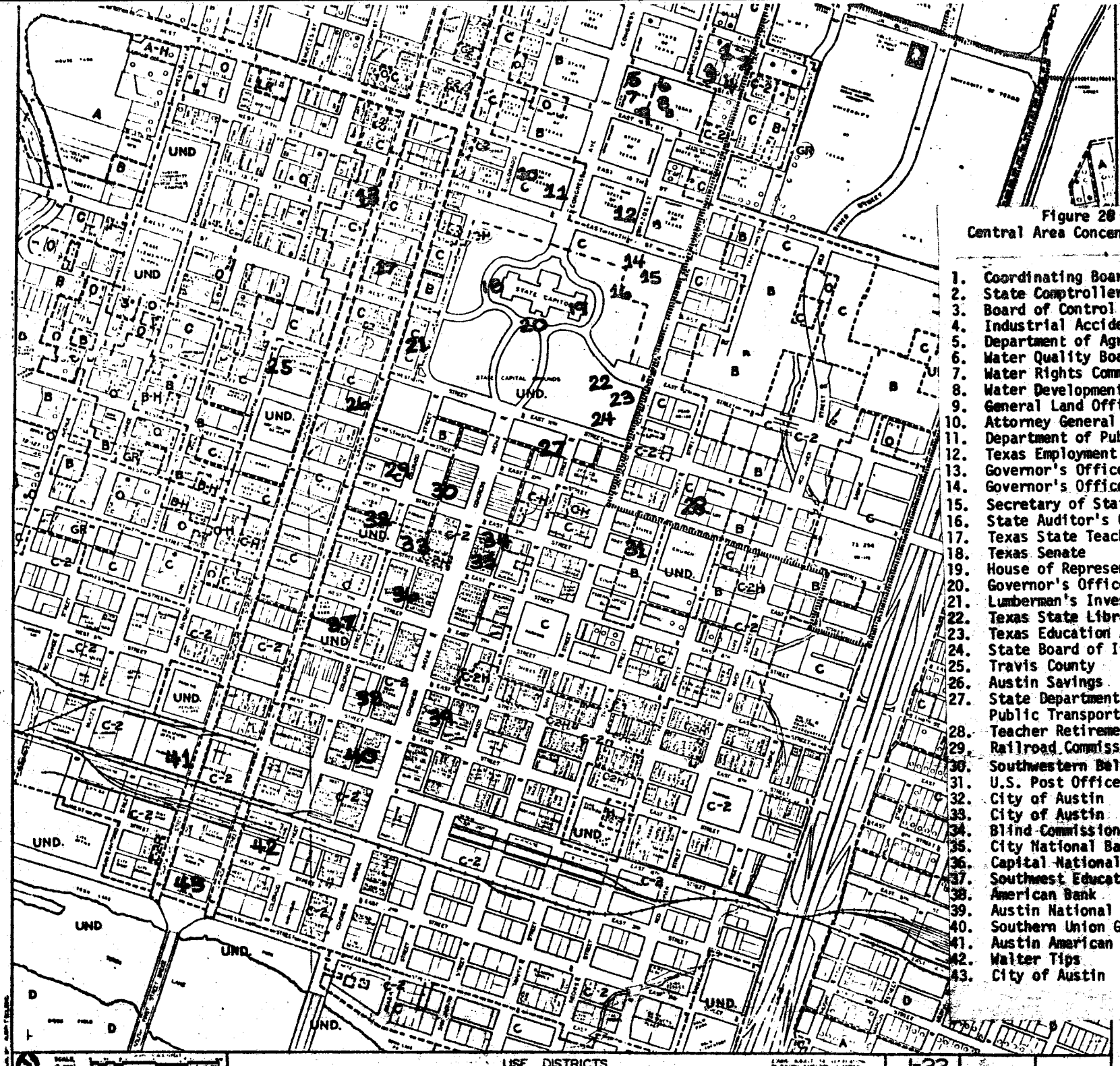
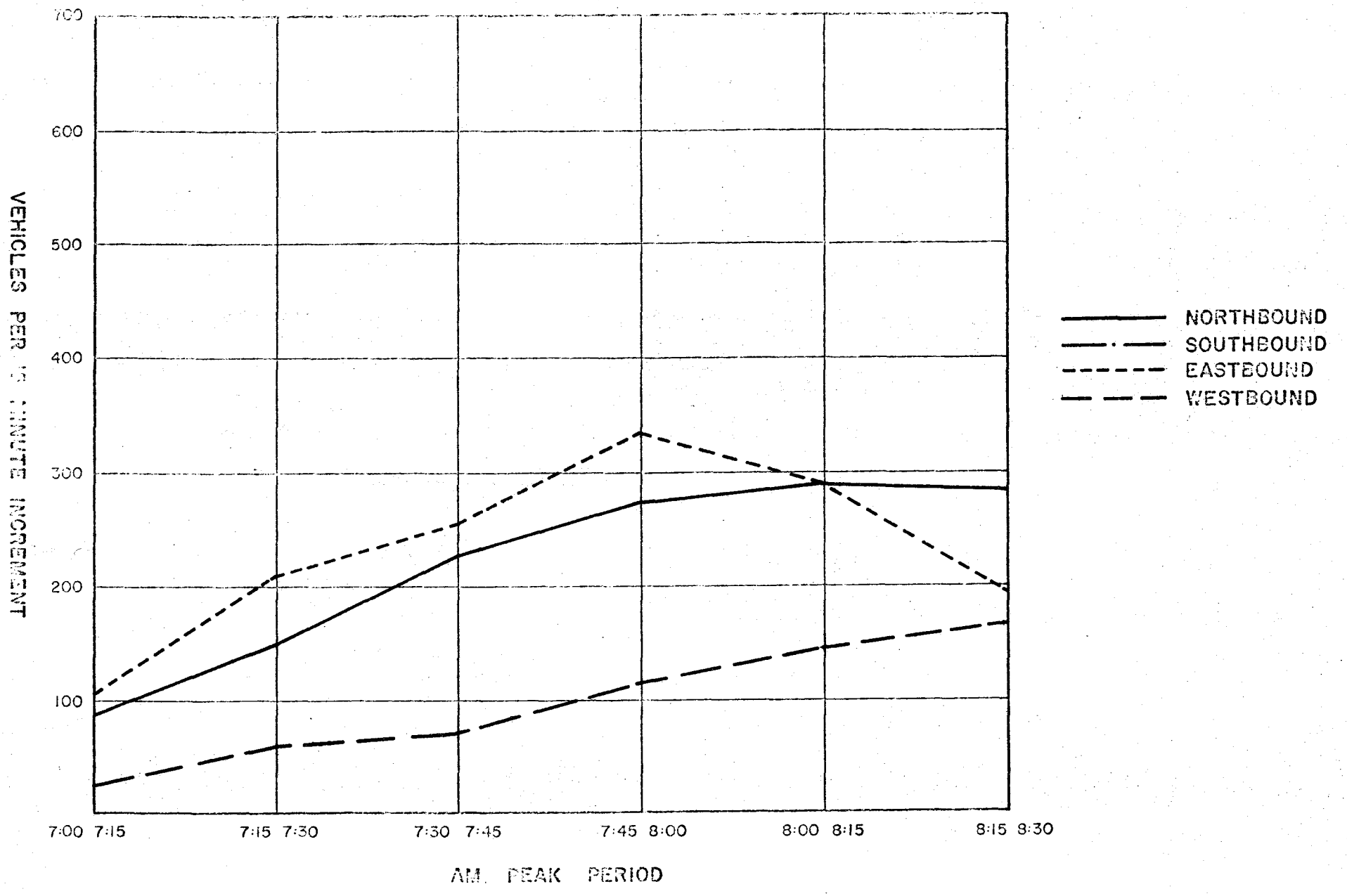


Figure 28
Central Area Concentration

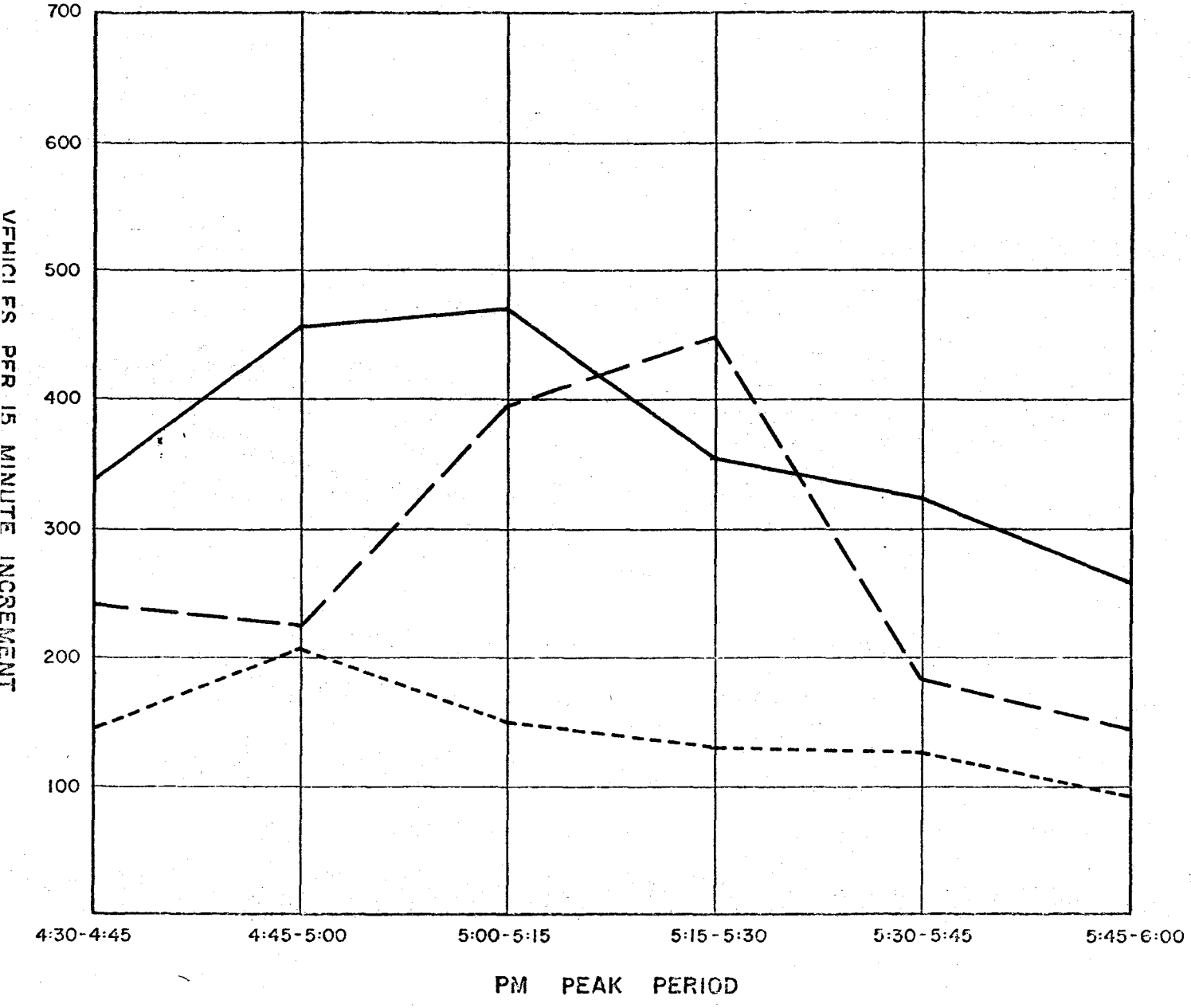
1. Coordinating Board
2. State Comptroller's Office
3. Board of Control
4. Industrial Accident Board
5. Department of Agriculture
6. Water Quality Board
7. Water Rights Commission
8. Water Development Board
9. General Land Office
10. Attorney General
11. Department of Public Welfare
12. Texas Employment Commission
13. Governor's Office
14. Governor's Office
15. Secretary of State's Office
16. State Auditor's Office
17. Texas State Teacher's Association
18. Texas Senate
19. House of Representatives
20. Governor's Office
21. Lumberman's Investment Corporati
22. Texas State Library
23. Texas Education Agency
24. State Board of Insurance
25. Travis County
26. Austin Savings
27. State Department of Highways and Public Transportation
28. Teacher Retirement System
29. Railroad Commission
30. Southwestern Bell
31. U.S. Post Office
32. City of Austin
33. City of Austin
34. Blind Commission
35. City National Bank
36. Capital National Bank
37. Southwest Educational Lab
38. American Bank
39. Austin National Bank
40. Southern Union Gas
41. Austin American Statesman
42. Walter Tips
43. City of Austin



PEAK PERIOD TRAFFIC FLOW

LAVACA STREET AND 15 TH STREET

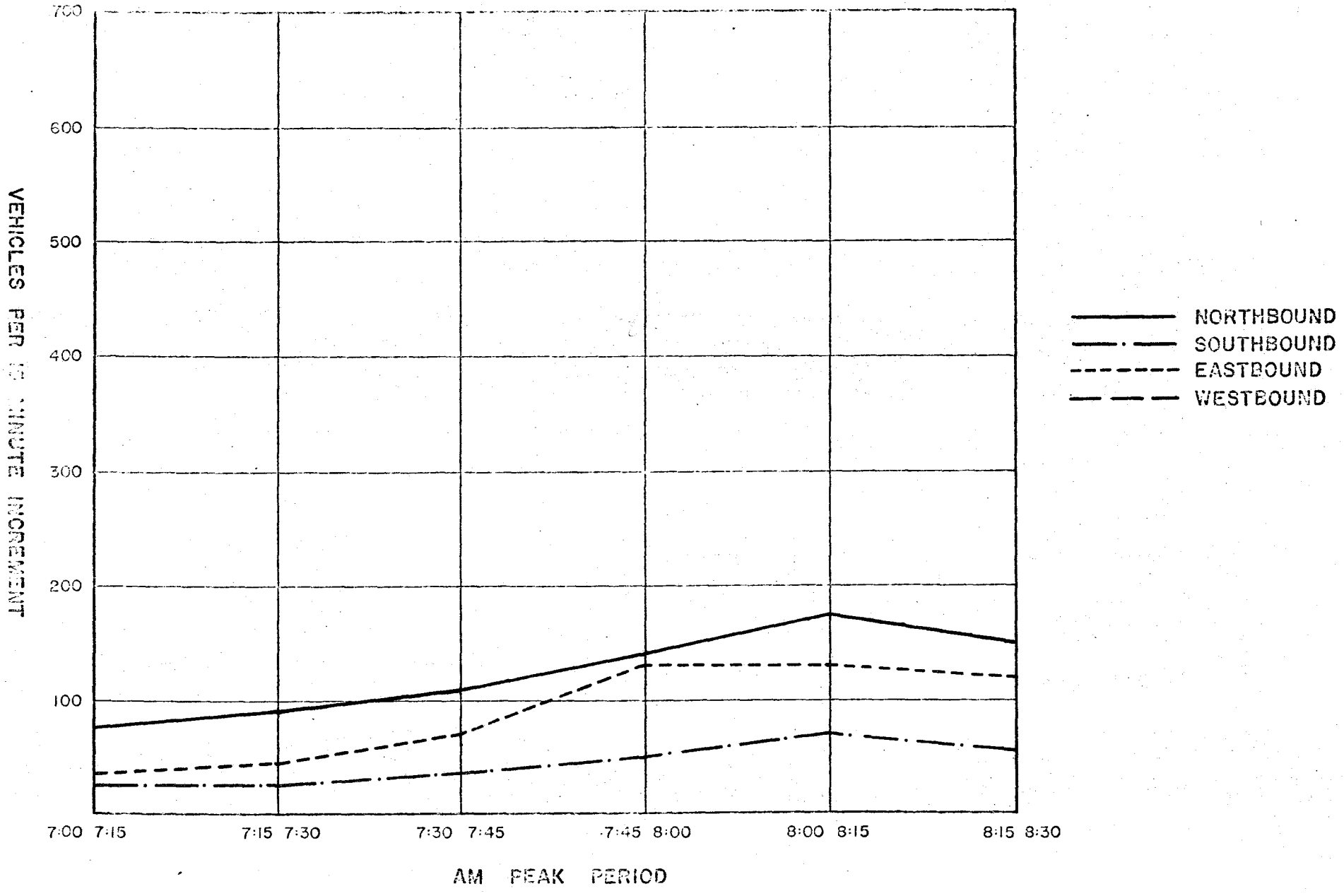
FIGURE 29



PEAK PERIOD TRAFFIC FLOW

LAVACA STREET AND 15 TH STREET

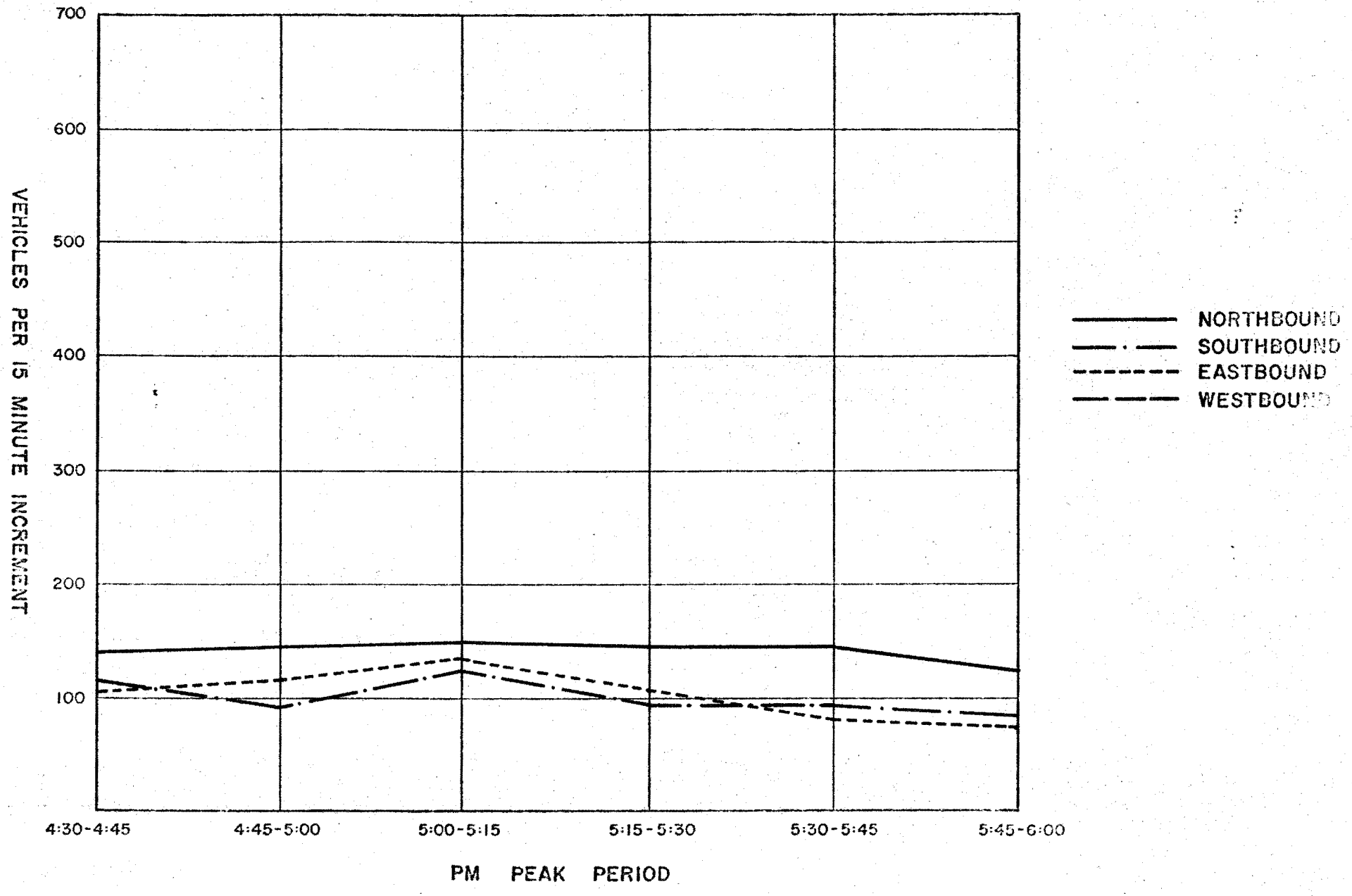
FIGURE 30



PEAK PERIOD TRAFFIC FLOW

CONGRESS AVENUE AND 9TH STREET

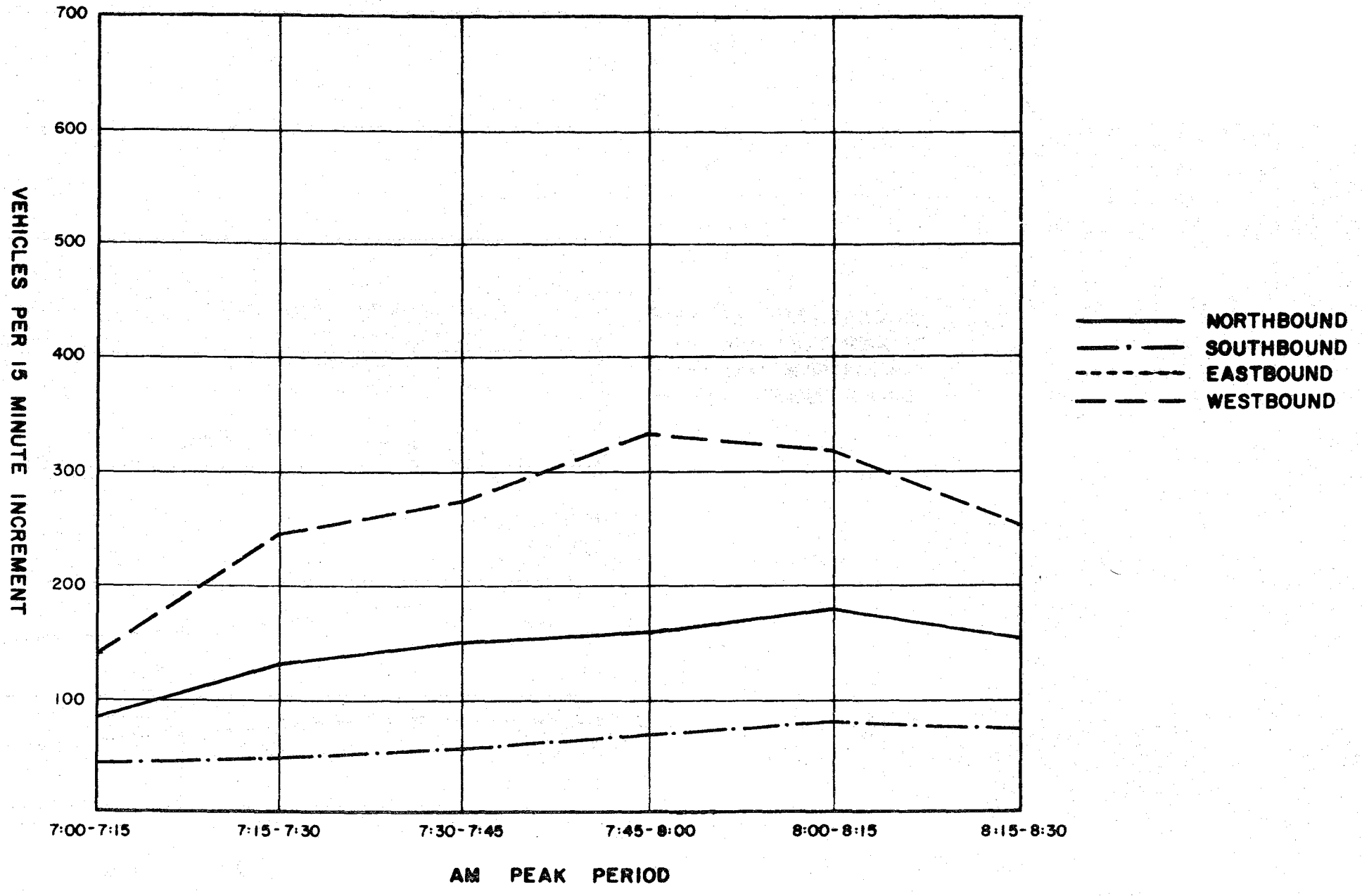
FIGURE 31



PEAK PERIOD TRAFFIC FLOW

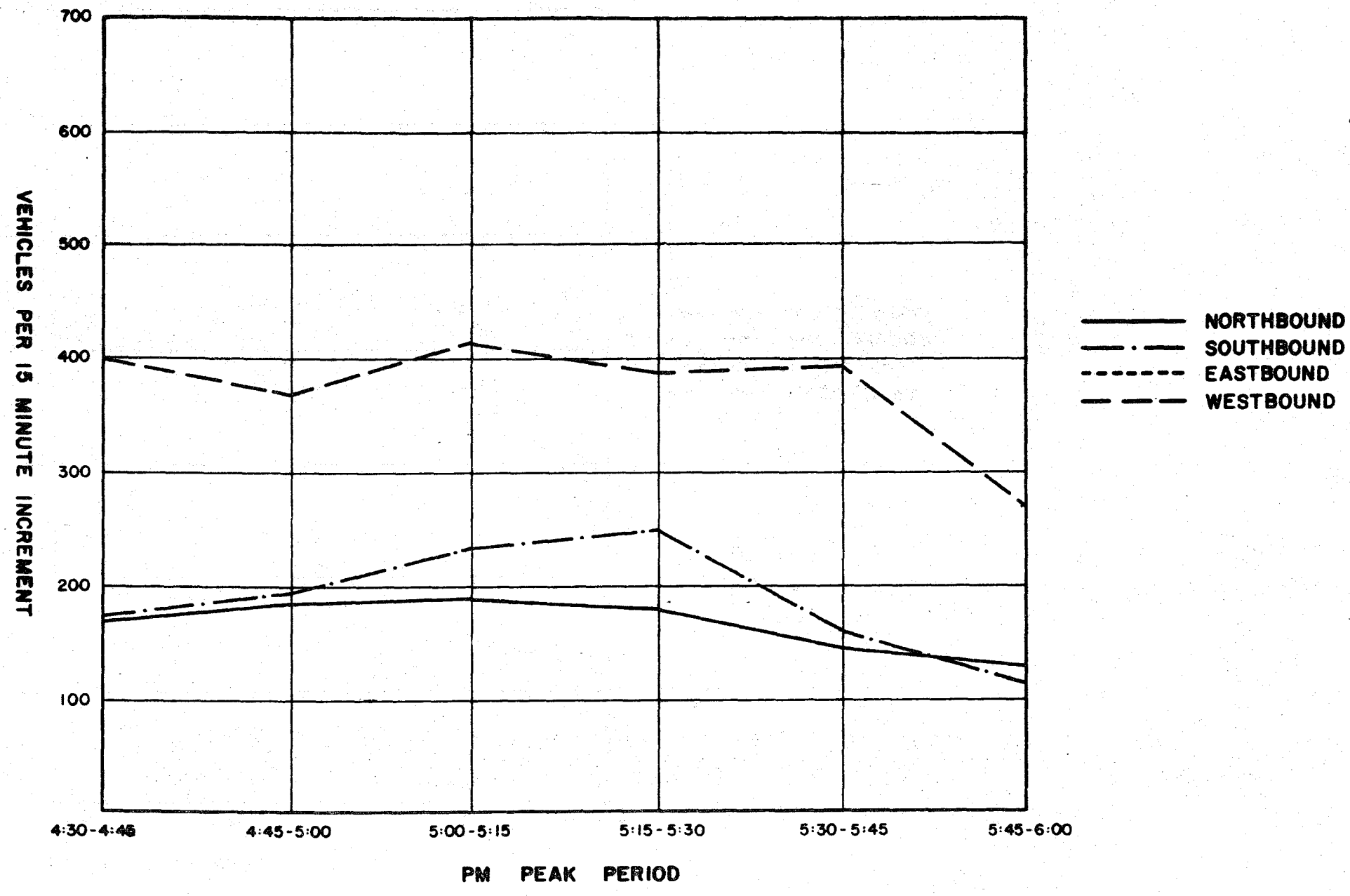
CONGRESS AVENUE AND 9TH STREET

FIGURE 32



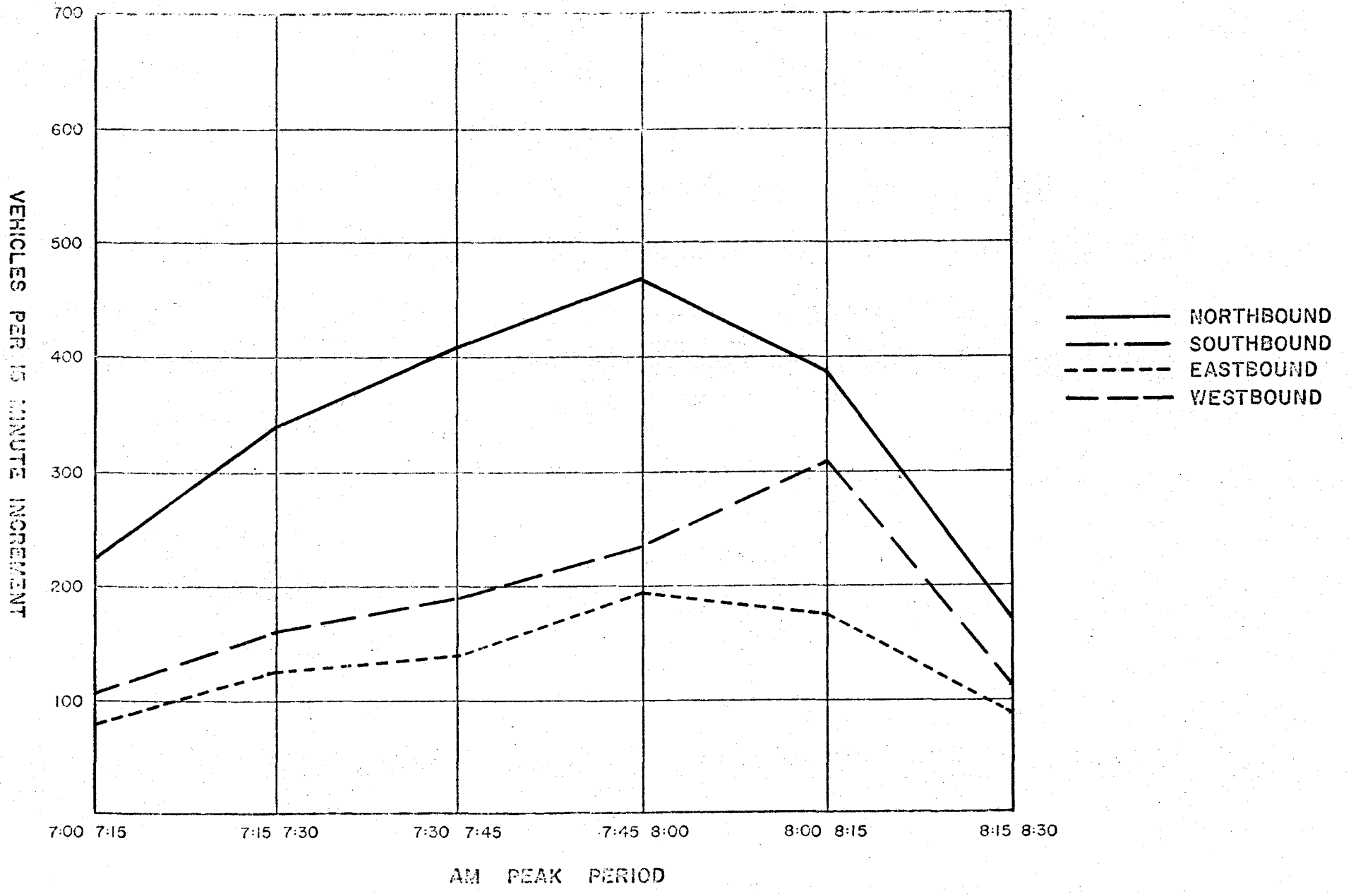
PEAK PERIOD TRAFFIC FLOW
CONGRESS AVENUE AND 6TH STREET

FIGURE 33



PEAK PERIOD TRAFFIC FLOW
CONGRESS AVENUE AND 6TH STREET

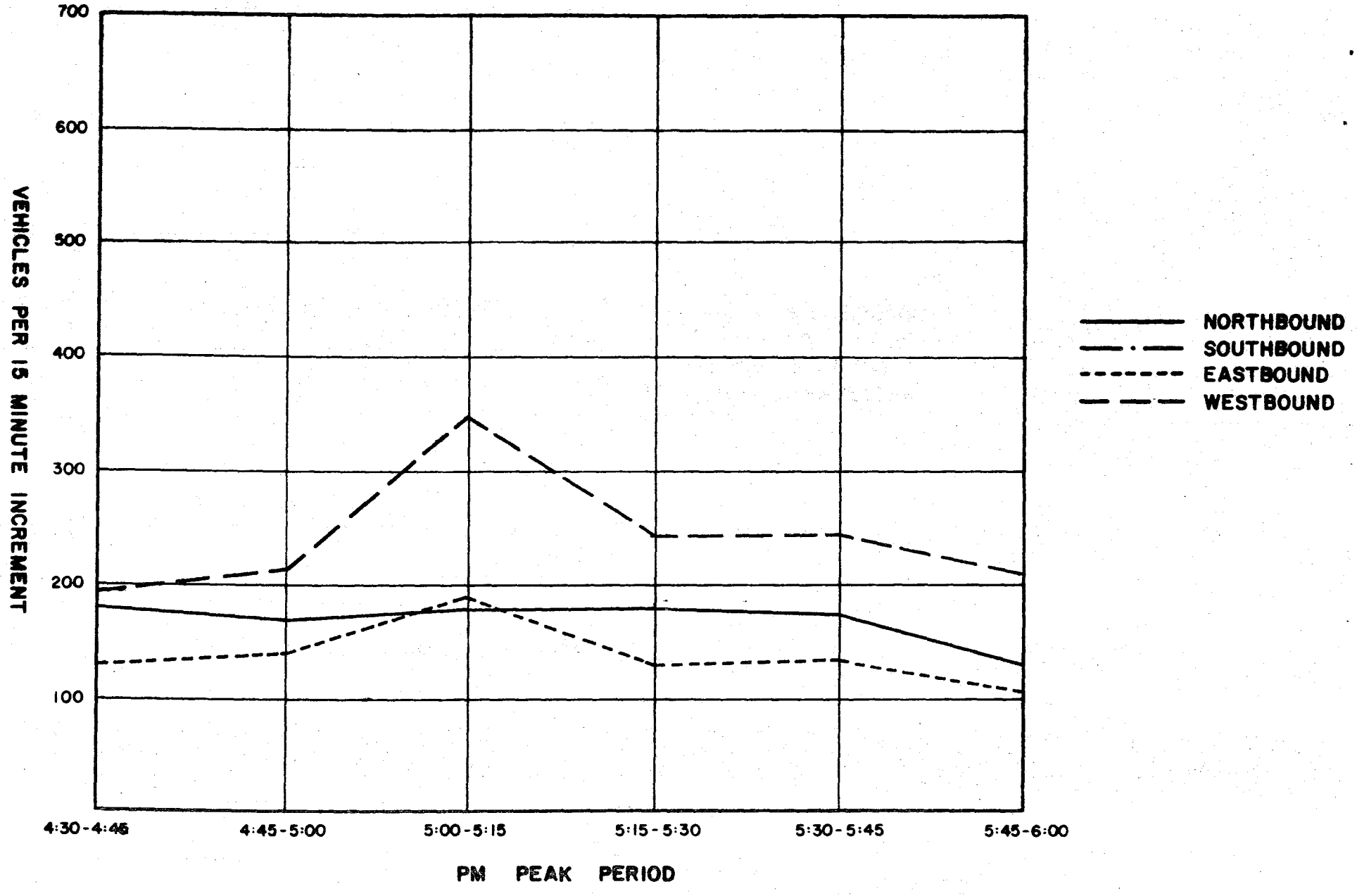
FIGURE 34



PEAK PERIOD TRAFFIC FLOW

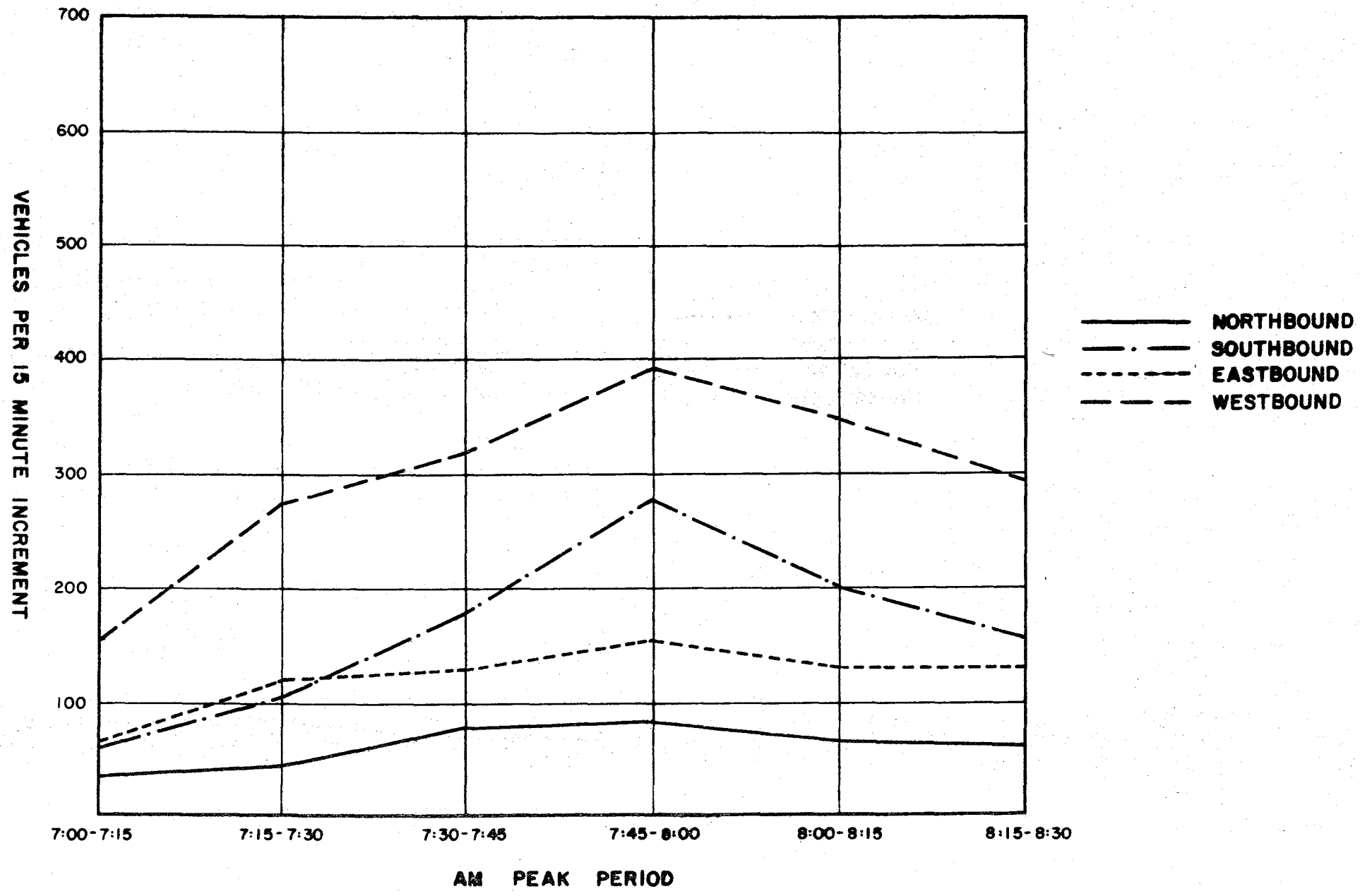
WEST 1ST STREET AND SOUTH 1ST STREET/LAVACA STREET

FIGURE 35



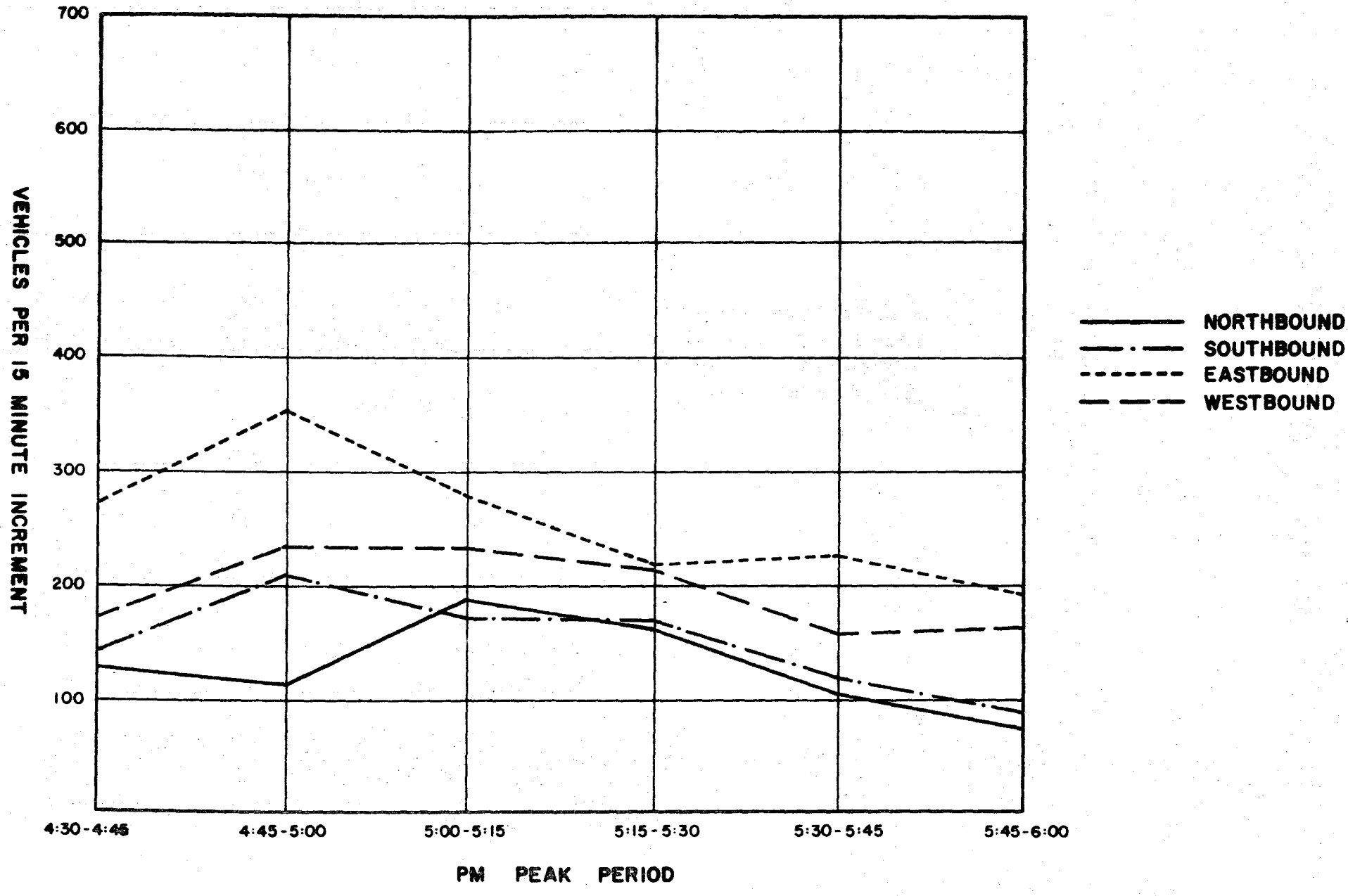
PEAK PERIOD TRAFFIC FLOW
WEST 1ST STREET AND SOUTH 1ST STREET/LAVACA STREET

FIGURE 3



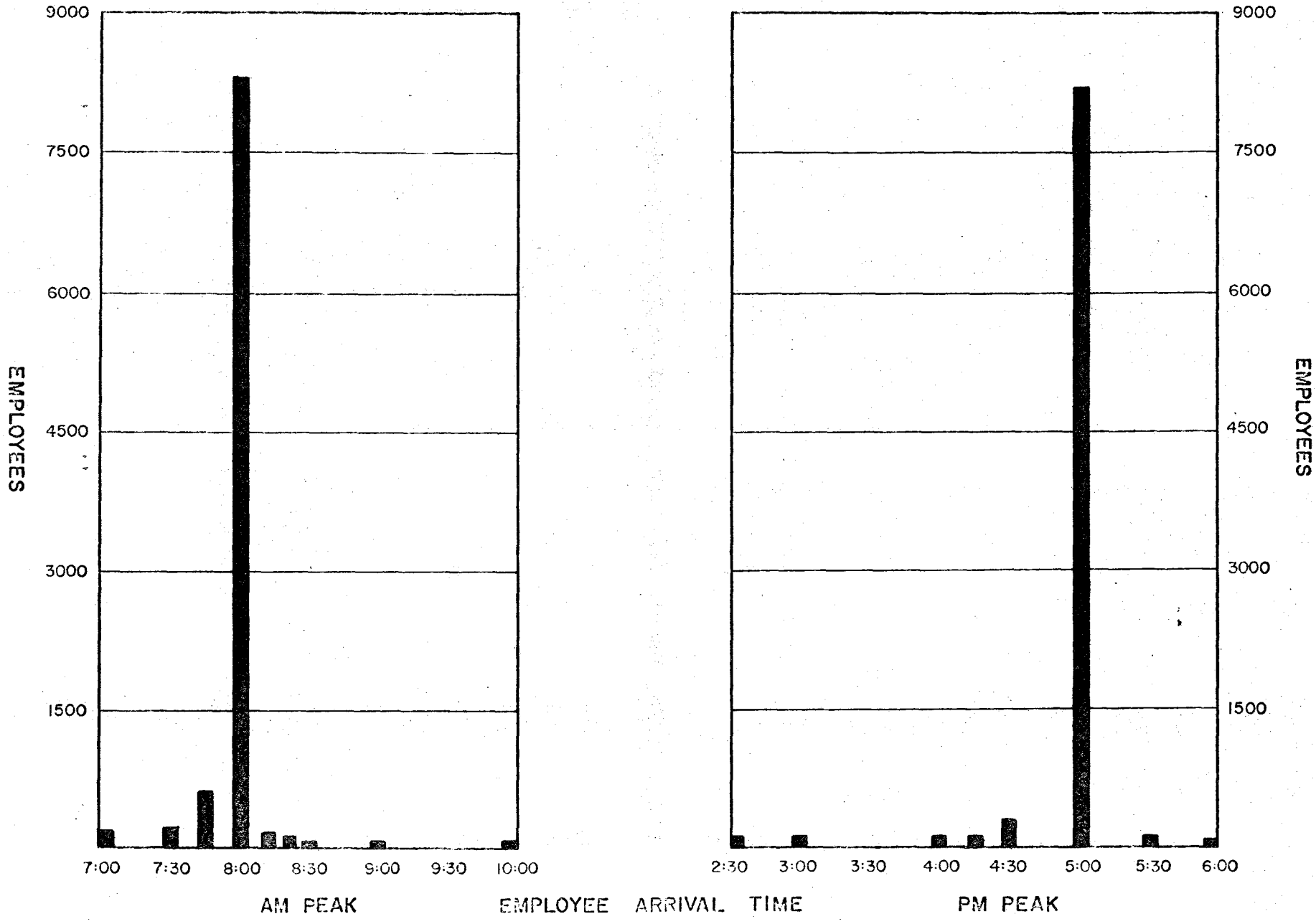
PEAK PERIOD TRAFFIC FLOW
SAN JACINTO STREET/TRINITY STREET AND MARTIN LUTHER KING, JR. BOULEVARD

FIGURE 37



PEAK PERIOD TRAFFIC FLOW
SAN JACINTO STREET / TRINITY STREET AND MARTIN LUTHER KING, JR. BOULEVARD

FIGURE 38



MAJOR EMPLOYERS WORK SCHEDULE
CENTRAL AREA CONCENTRATION

FIGURE

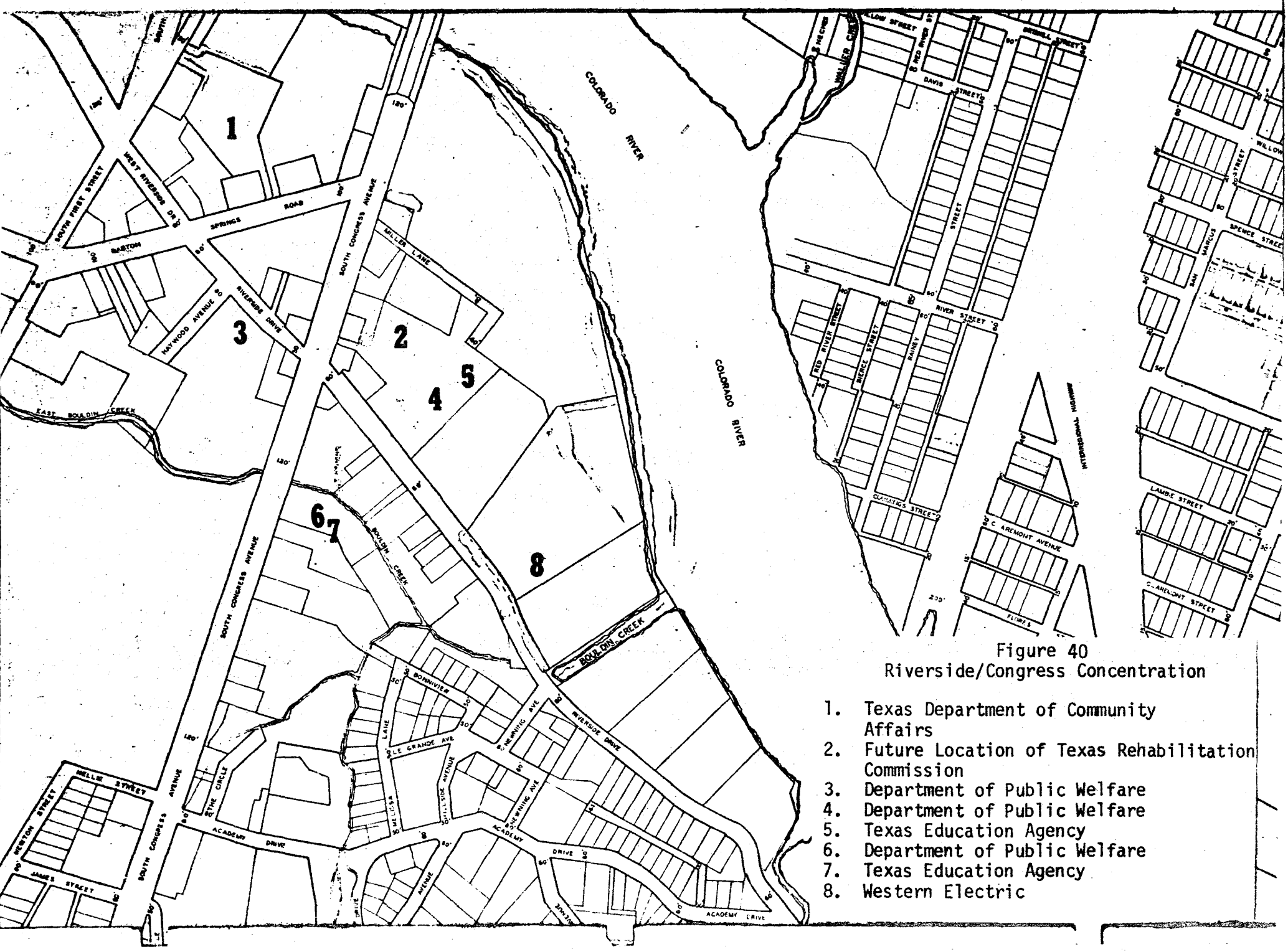
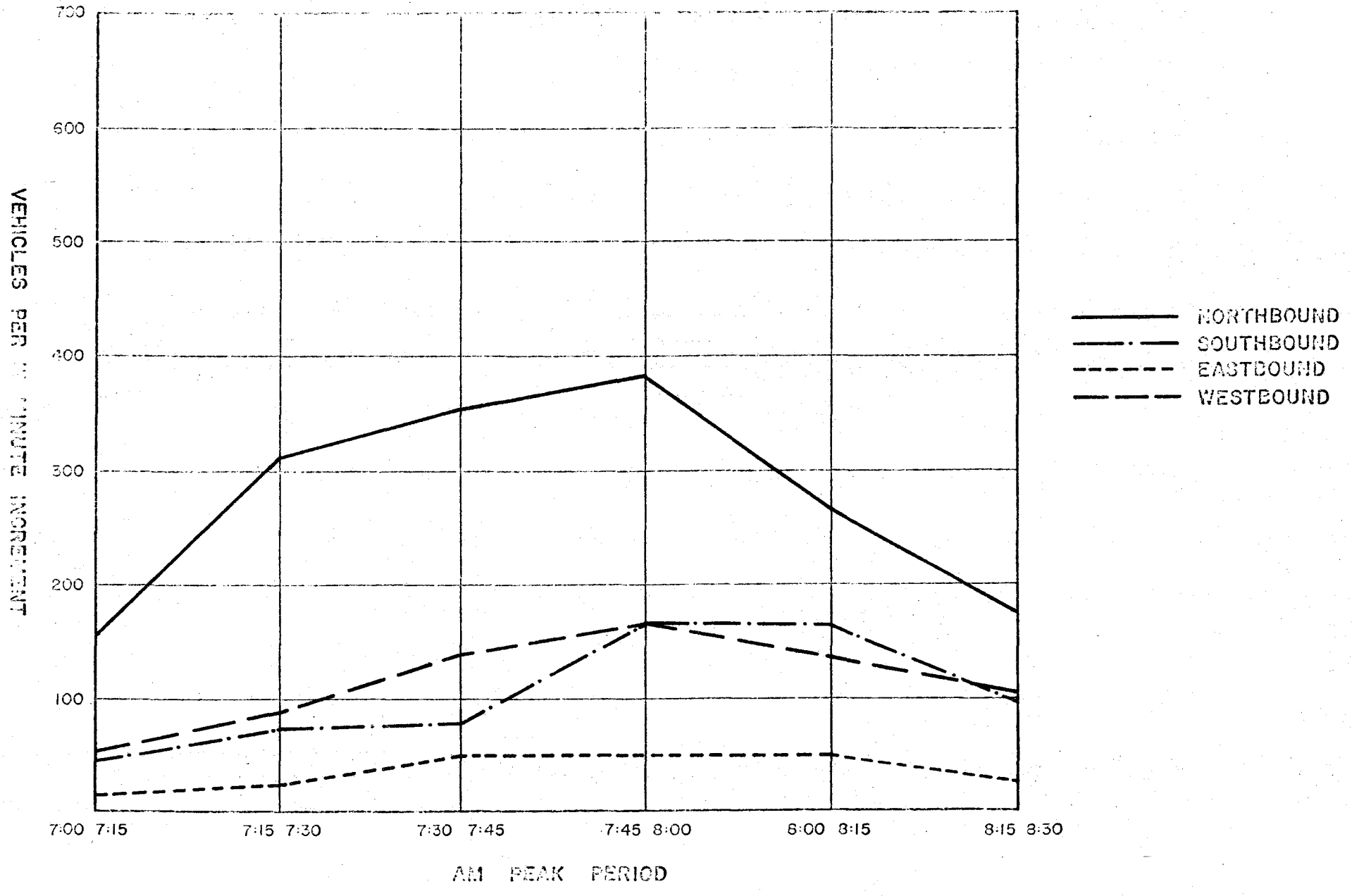


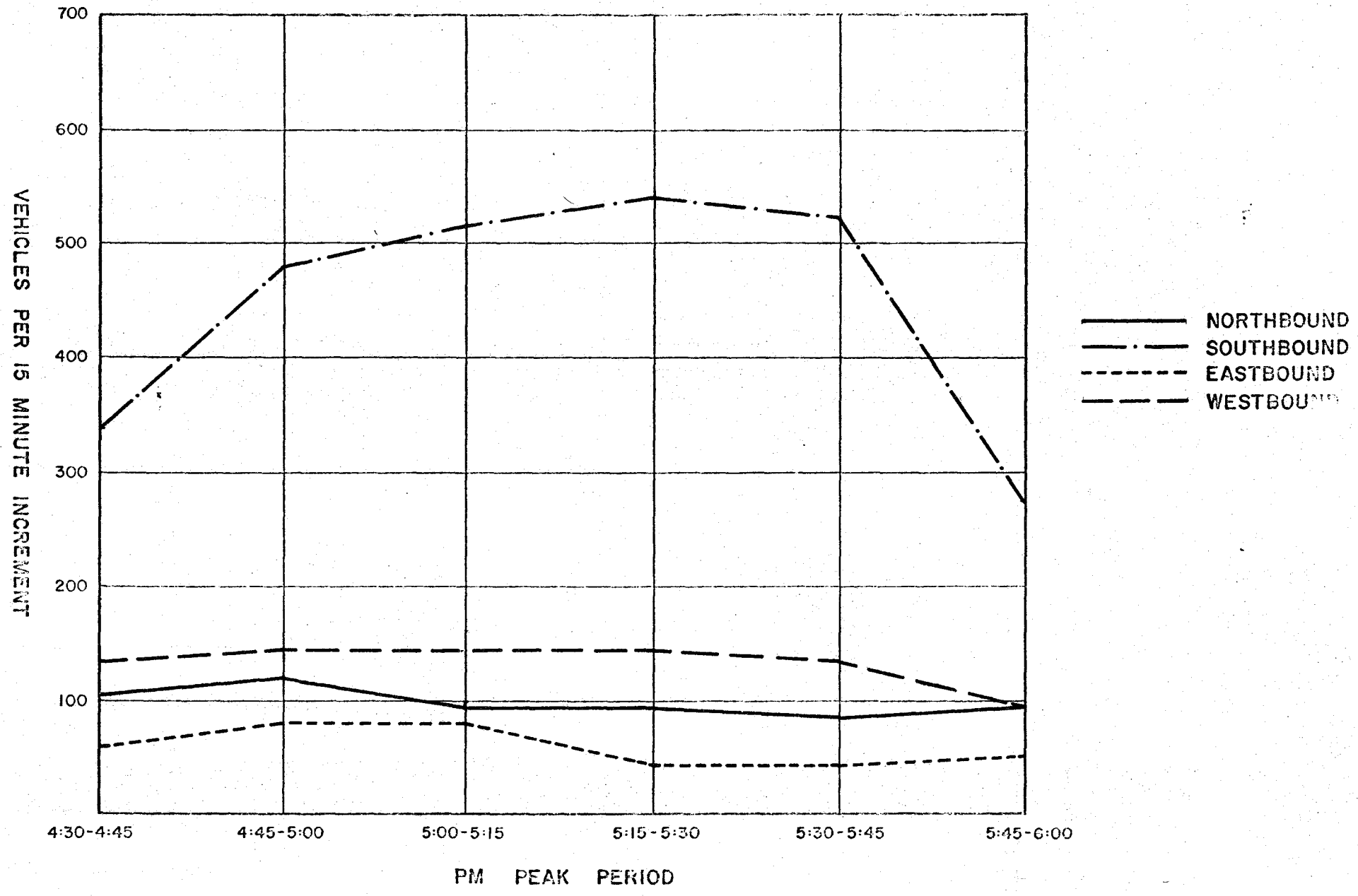
Figure 40
Riverside/Congress Concentration

1. Texas Department of Community Affairs
2. Future Location of Texas Rehabilitation Commission
3. Department of Public Welfare
4. Department of Public Welfare
5. Texas Education Agency
6. Department of Public Welfare
7. Texas Education Agency
8. Western Electric



PEAK PERIOD TRAFFIC FLOW

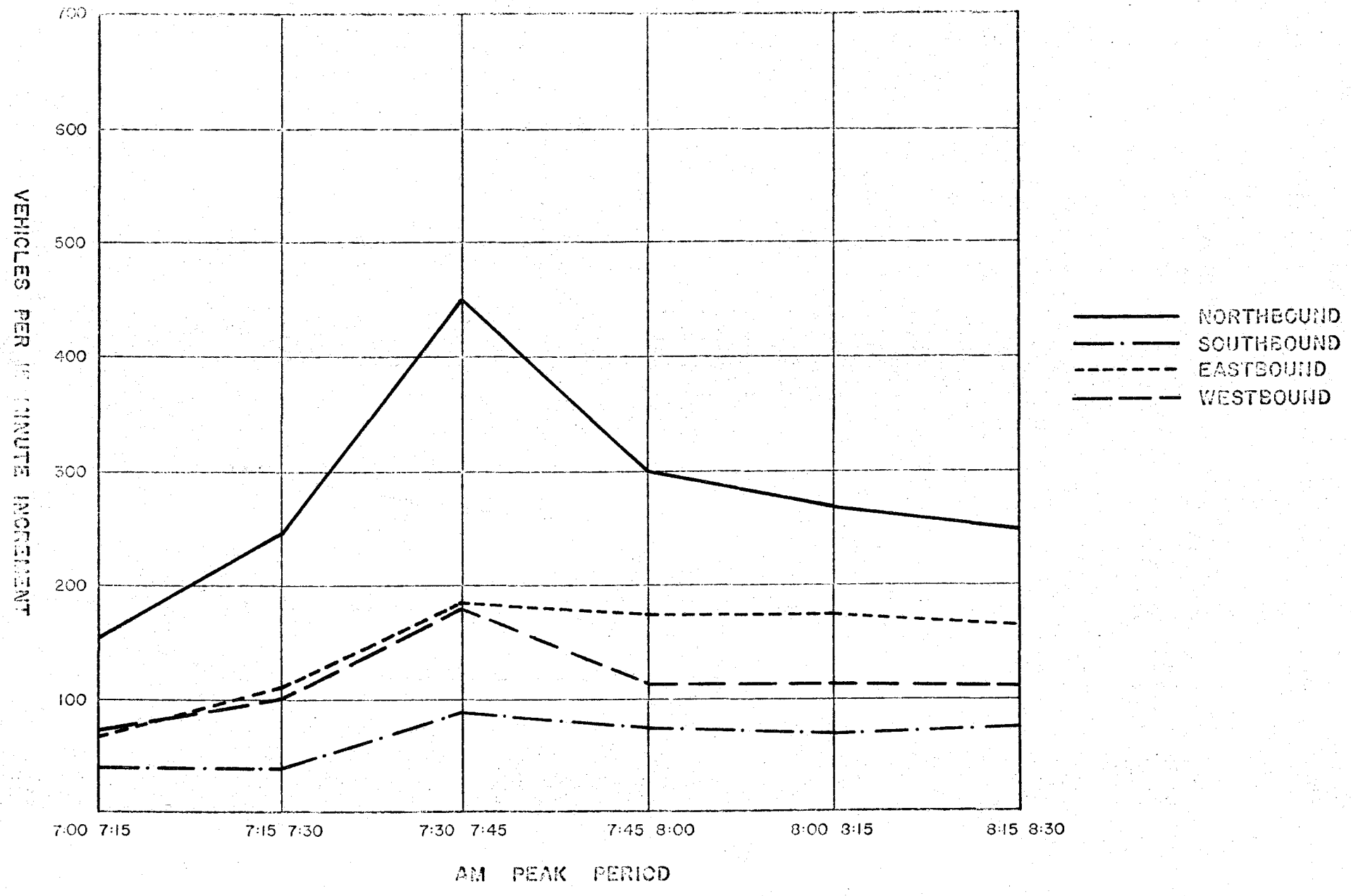
RIVERSIDE DRIVE AND SOUTH 1ST STREET



PEAK PERIOD TRAFFIC FLOW

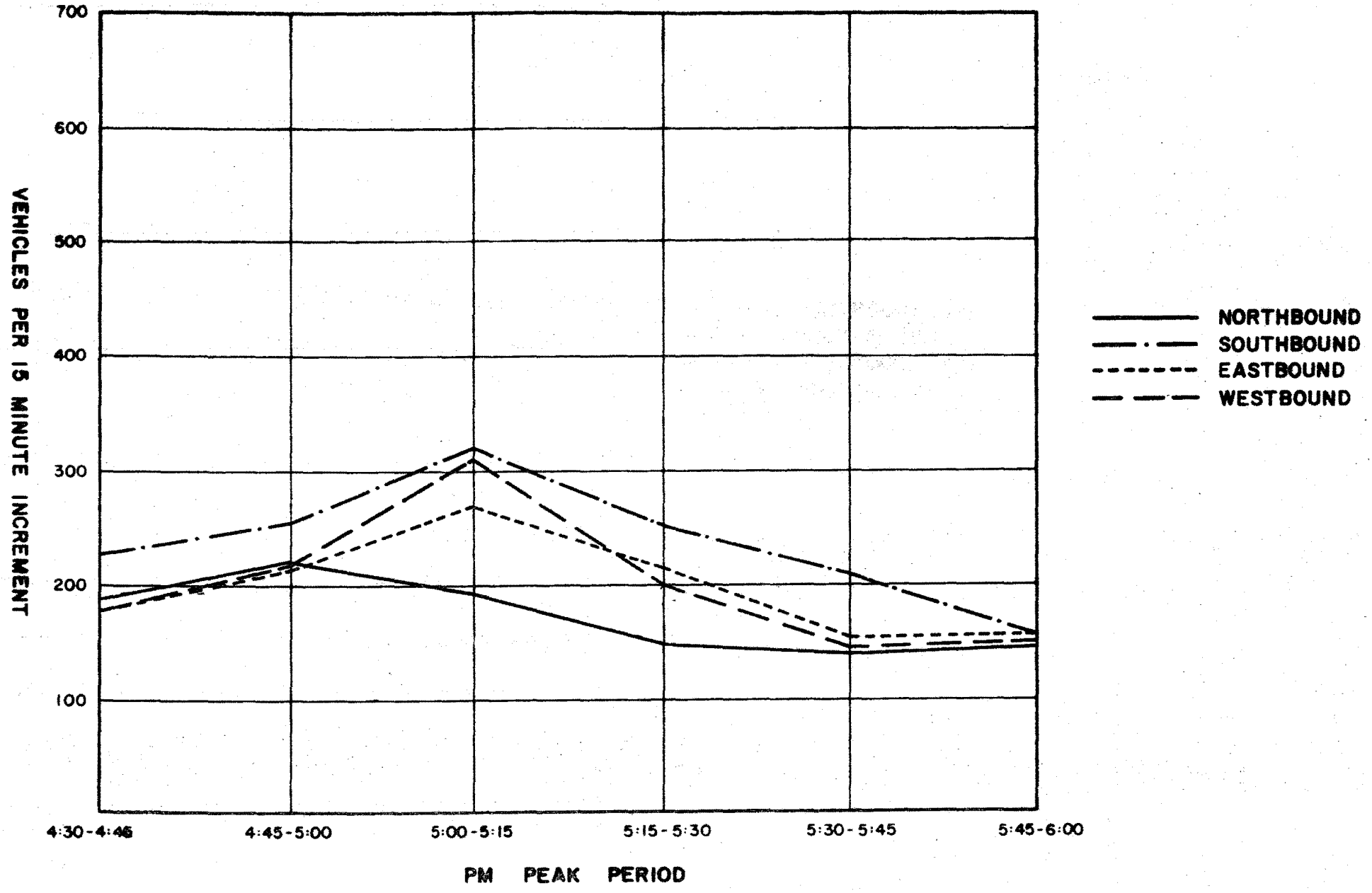
RIVERSIDE DRIVE AND SOUTH 1ST STREET

FIGURE 42



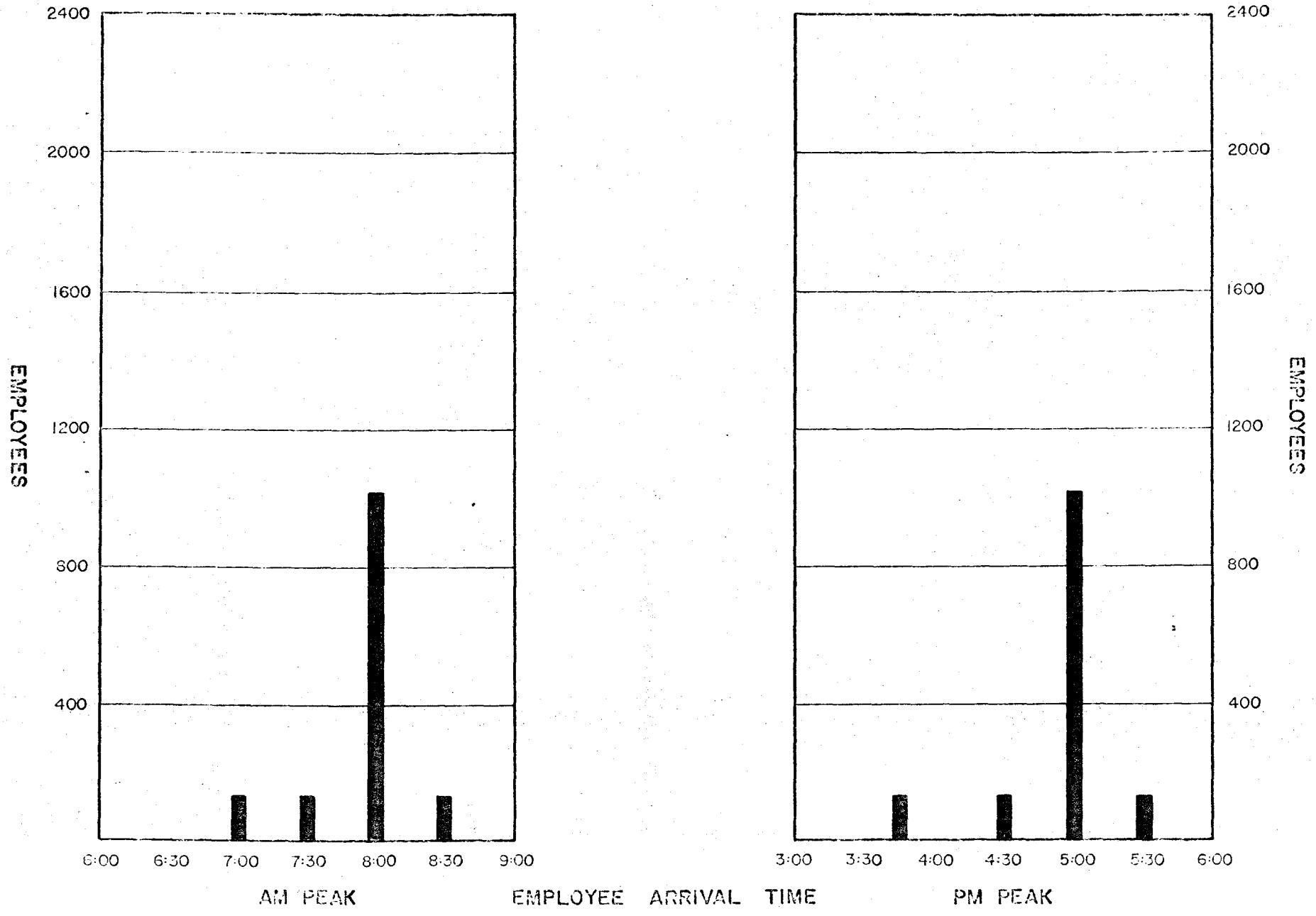
PEAK PERIOD TRAFFIC FLOW

CONGRESS AVENUE AND RIVERSIDE DRIVE



PEAK PERIOD TRAFFIC FLOW
CONGRESS AVENUE AND RIVERSIDE DRIVE

FIGURE 44



MAJOR EMPLOYERS WORK SCHEDULE
RIVERSIDE / SO. CONGRESS CONCENTRATION

FIGURE

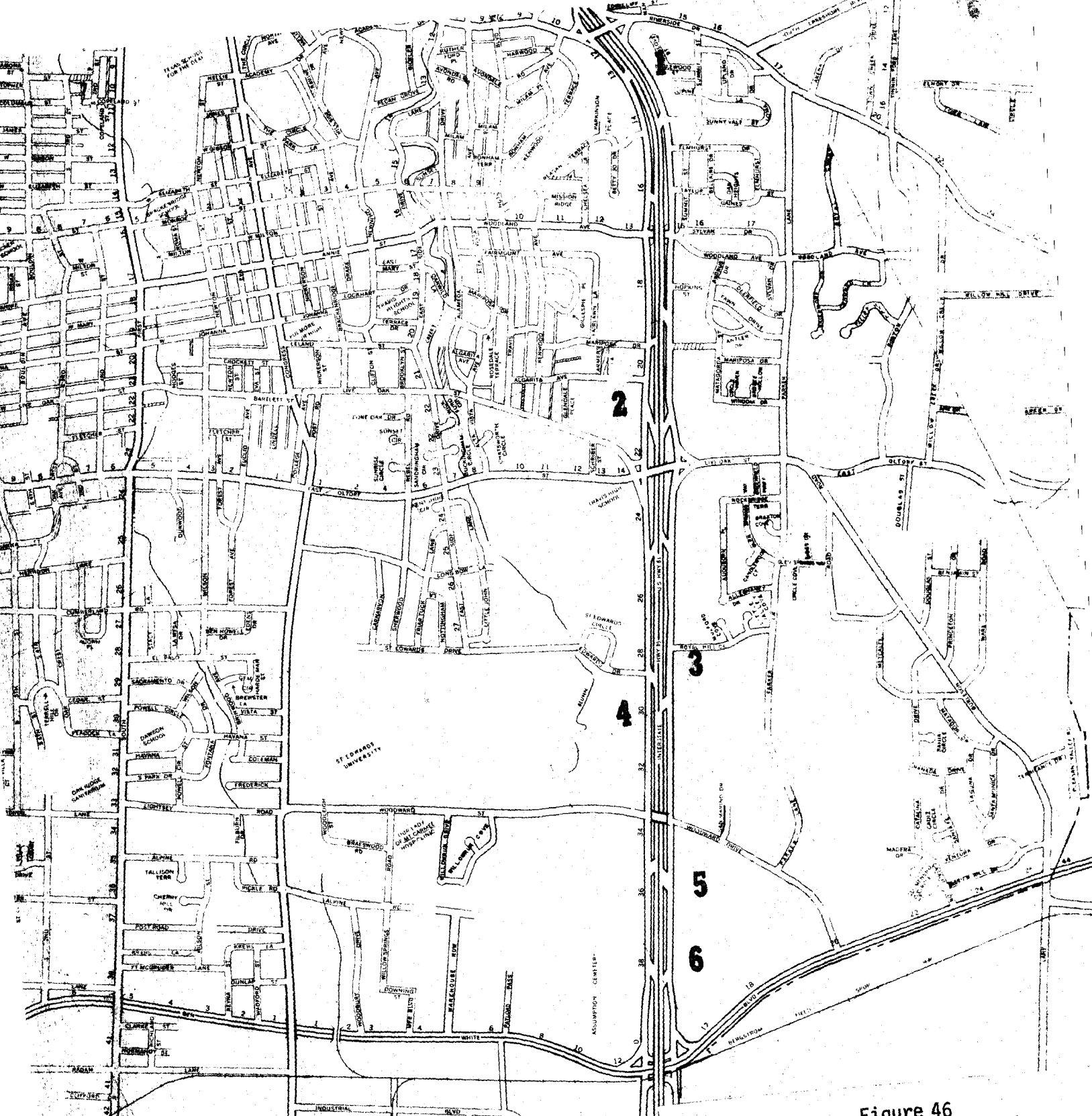
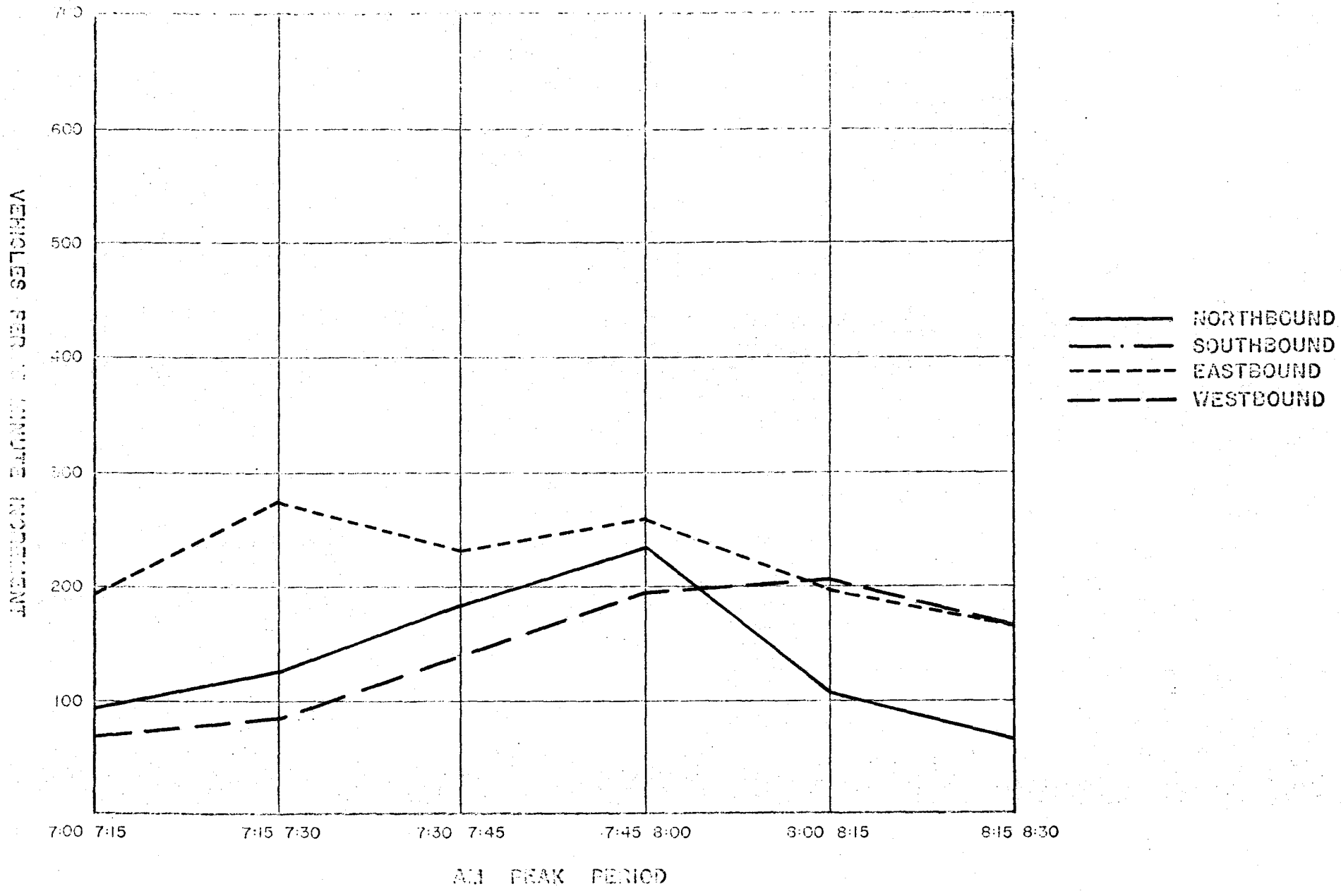


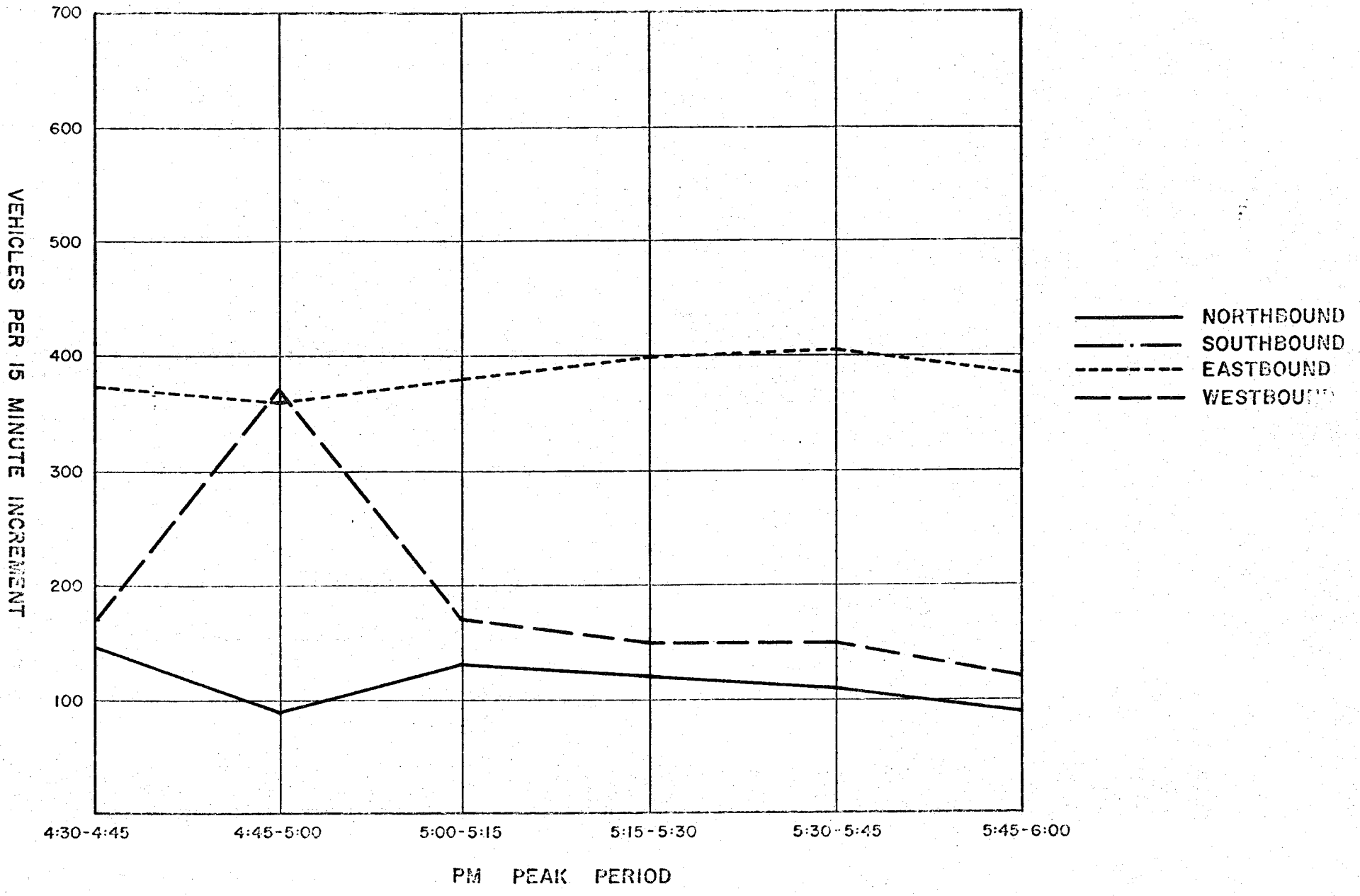
Figure 46
South IH 35 Concentration

1. Department of Public Welfare
2. Farmer's Insurance
3. Texas Insurance Advisory Associat
4. Department of Public Welfare
5. V.A. Data Processing
6. Internal Revenue Service



PEAK PERIOD TRAFFIC FLOW

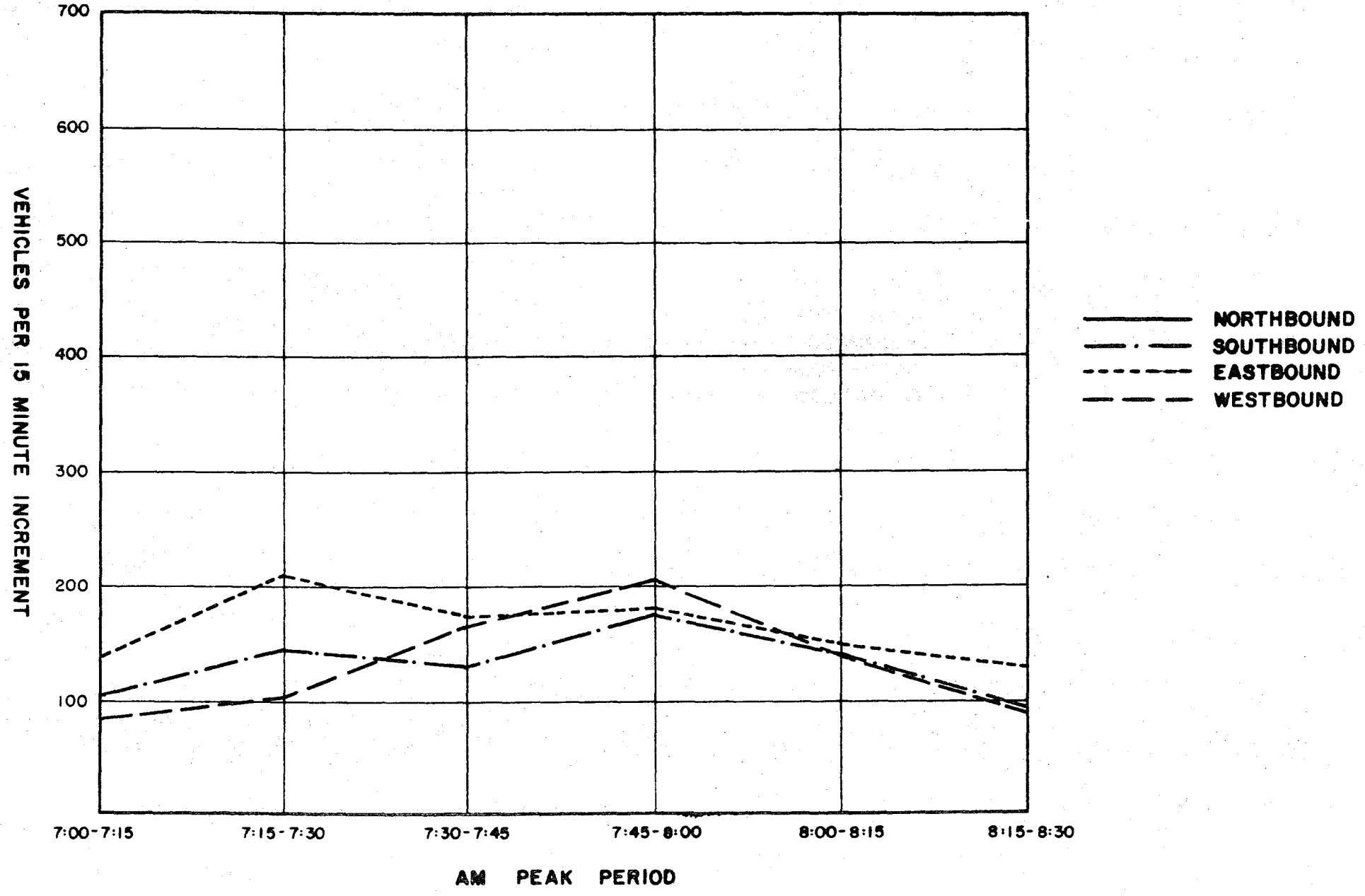
OLTORF ROAD AND IH 35 EAST SERVICE ROAD



PEAK PERIOD TRAFFIC FLOW

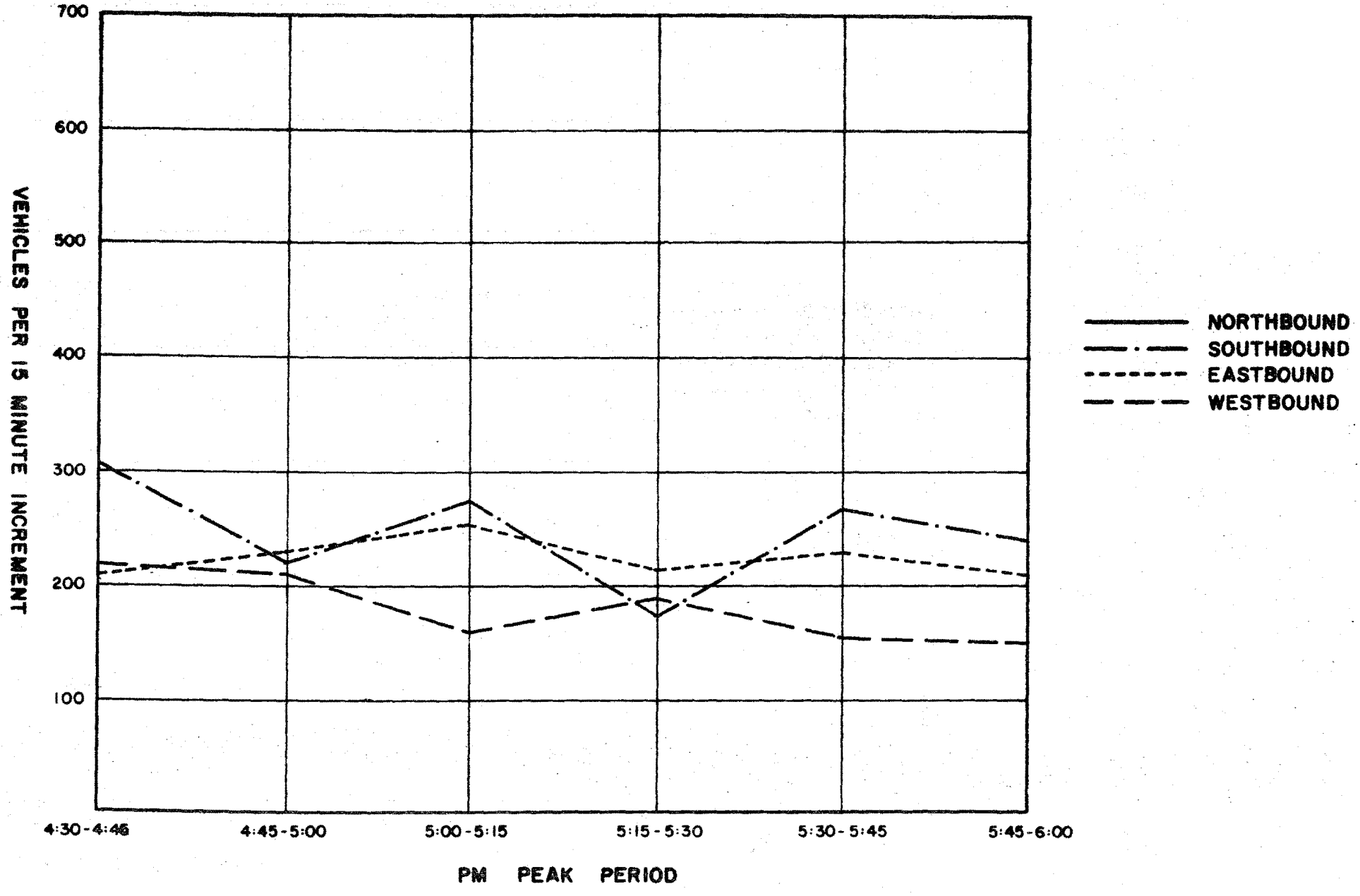
OLTORF ROAD AND IH 35 EAST SERVICE ROAD

FIGURE 48



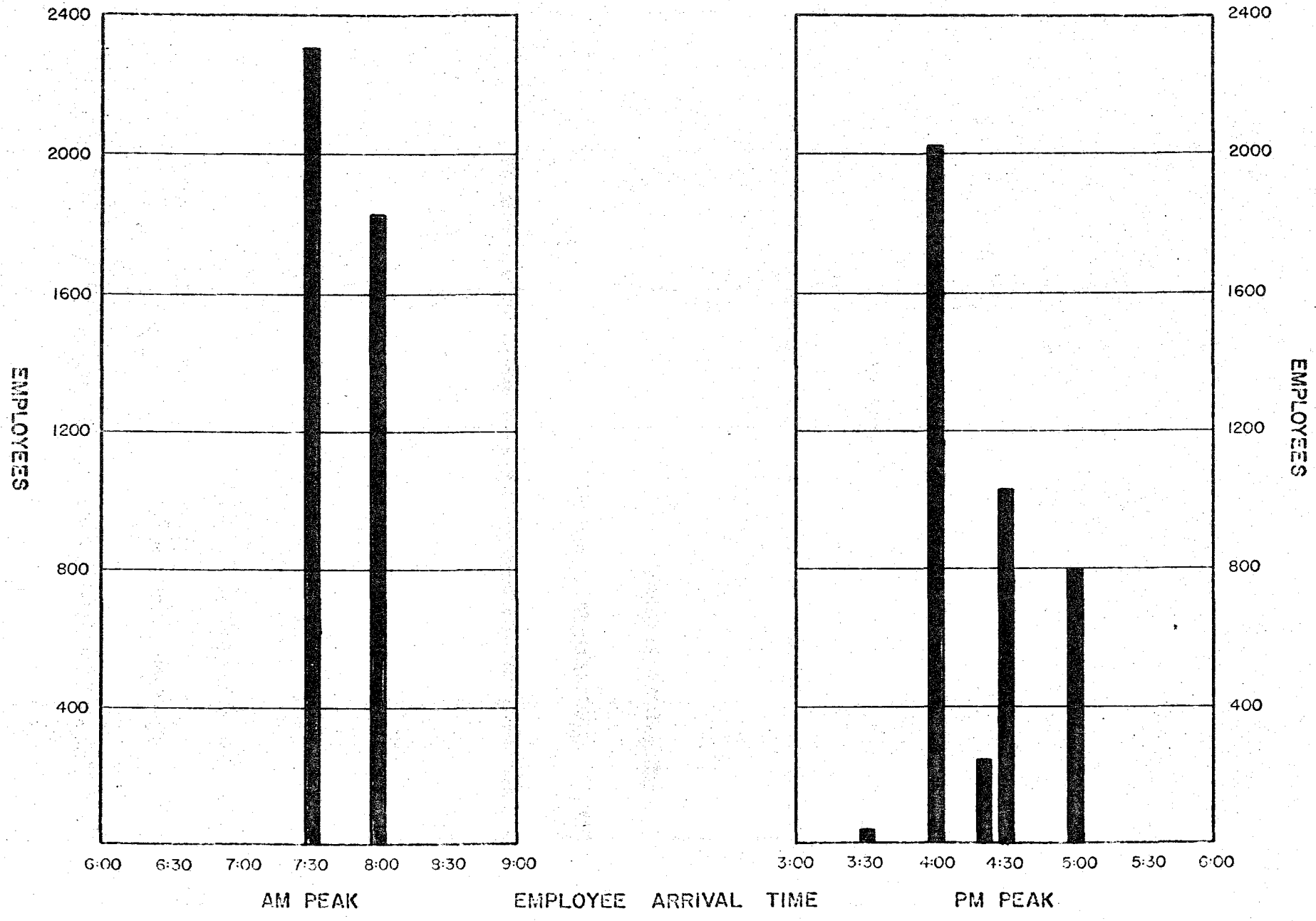
PEAK PERIOD TRAFFIC FLOW
OLTORF ROAD AND IH 35 WEST SERVICE ROAD

FIGURE 49



PEAK PERIOD TRAFFIC FLOW
OLTORF ROAD AND IH 35 WEST SERVICE ROAD

FIGURE 50



MAJOR EMPLOYERS WORK SCHEDULE
SOUTH IH 35 CONCENTRATION

FIGURE 5

FOOTNOTES

[1]Roberta Remak and Sandra Rosenbloom, Peak Period Traffic Congestion, Interim Report, revised, Prepared for National Cooperative Highway Research Program, Transportation Research Board, National Research Council, December, 1974, p. 41.

[2]Ibid., p. 47, 48.

[3]Vernon Louviere, "Raising Productivity with Flexible Work Hours," Nation's Business, November, 1976, p. 28.

[4]Remak and Rosenbloom, p. 3, 4, 51.

[5]Ibid., p. 55.

[6]Roman Krzyozkowski, Suzanne S. Henneman, Charles L. Hudson, Evelyn S. Putnam, Donna J. Thiesen, Joint Strategies for Urban Transportation, Air Quality and Energy Conservation, Vol. 1: Joint Action Programs, Interplan Report 7346 R, December, 1974, Santa Barbara, California, (DOT, FEA, EPA), p. 2-99, 100.

[7]Sandra Rosenbloom and Mark James Miller, Peak Hour Traffic Congestion: Non-Capital Solutions for Texas Cities, Austin, Texas: The Graduate Program in Community and Regional Planning, The University of Texas, August, 1973, p. 8.

[8]Remak and Rosenbloom, p. 49.