characteristics of urban transportation demand

UTPS

appendix

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTA-IT-06-0049-78-2		

4. Title and Subtitle	5. Report Date
Characteristics of Urban Transportation Demand - Appendix	January 1979
	6. Performing Organization Code
	8. Performing Organization Report No.
7. Author(s)	
Herbert S. Levinson	
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Wilbur Smith and Associates, New Haven, Connecticut DeLeuw, Cather & Company, Washington, DC	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address **U.S. Department of Transportation** **Urban Mass Transportation Administration** **400 Seventh Street, S.W.** **Washington, D. C. 20590**	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This Appendix to the CUTD handbook offers detailed data on individual cities, roads, routes, stations, etc. These are not in a form that is comparable from place-to-place, but may be of interest from an historical perspective for the urban areas concerned.

This report complements the previously distributed UTPS handbooks:

Characteristics of Urban Transportation Demand (CUTD) Available from NTIS as UMTA-IT-06-0049-78-1.

Characteristics of Urban Transportation Systems (CUTS) Available on the UTPS distribution tape and from NTIS as PB 233 580/AS

Traveler Response to Transportation System Changes Limited copies available from FHWA (HHP-22) or from NTIS as PB 265 830/AS

17. Key Words	18. Distribution Statement
Urban Transportation Demand Trip Generation and Production Trip Distribution Rapid Transit Expressways	**Available to the Public through the National Technical Information Service, Springfield, Virginia 22161.**

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	**Unclassified**		

CHARACTERISTICS OF URBAN TRANSPORTATION DEMAND

Appendix

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Prepared For

THE U.S. DEPARTMENT OF TRANSPORTATION

Urban Mass Transportation Administration

Federal Highway Administration

July 1978

FORWARD

Today's transportation planner must confront ever-changing issues within a variety of working environments. To assist him, UMTA's Planning Methods and Support program researches, develops, and distributes planning tools, including the documentation of novel planning studies, new design and forecasting techniques, and germane research results. This report is one example. Prepared by recognized experts, its content clearly presents usable planning concepts, and thus constitutes a valuable addition to the growing set of computerized and manual techniques comprising the UMTA/FHWA Urban Transportation Planning System (UTPS).

More important than the production and dissemination of a new tool is the experience and opinion of its user. Local issues change. Better methods evolve. Or, realistically, errors may appear in the final product. We depend on you, the transportation planner, to alert us to any of the above. We need your comments and your ideas. Please let us hear them, so we can continually improve our products.

You may obtain additional copies of this report from the National Technical Information Service (NTIS), Springfield, VA, 22101. On your request, please reference UMTA IT-06-0049-78-2.

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APPENDIX A -

APPENDIX TO CHAPTER I (INTRODUCTION)

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
HOUSEHOLD VARIABLES:				
HOUSEHOLD INCOME Worker Income Home Value/Rent	Known that higher trip generation is associated with higher income. Not known extent to which this is direct function of income vs. income acting as surrogate for auto ownership and residential location.	Known that work trip linkages involve matching of worker and job income. Not known to what extent income influences willingness to trade off satisfaction of trip objectives against trip cost savings.	Known that monetary trip cost weighed less by higher incomes whereas trip time may be weighed more. Transit/Auto Passenger captivity higher and Auto Driver captivity apparently lower for low incomes. More quantification needed.	Effects calculation of utility measures. Predictive problem in that public agencies tend to estimate high. Problem of choosing worker vs. household income. Useful in examining social value of transportation services.
AUTO OWNERSHIP Licensed Drivers in Household	Known that higher trip generation is associated with higher auto ownership. Not known to what extent this would still be true if walk trips counted.	Auto availability required for full use of travel opportunities in interchanges with little or no transit service.	Influences degree of transit captivity.	Requires careful prediction using essentially the same basic inputs as travel models themselves.
FAMILY COMPOSITION Number of Persons in Household Number of Workers in Household	Family needs and therefore trip generation are affected by stage in family life cycle. Not well studied.	Effect, if any, unknown.	Effect, if any, unknown	Not normally predicted.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
RESIDENTIAL DENSITY Type of Residence	Known that lower trip generation associated with higher density. Not known to what extent density is a surrogate for family composition and/or walk trip prevalence.	Effect, if any, unknown.	Known that higher transit use generally associated with higher density. Thought to be a surrogate for short walk distances to transit, high transit accessibility, and other factors.	Relatively easy to predict and thus often used as a surrogate.
SOCIO-ECONOMIC STATUS Race	Effect, if any, not known (aside from effect of income or occupation).	Effect, if any, not known (aside from effect of income or occupation).	Not known extent to which "acceptability" of mode influences mode or route choice.	Many but not all effects can be identified through use of the income variable.
TRIP MAKER VARIABLES:				
OCCUPATION Employment Classification	Known that trip production is higher for higher ranking occupations, but with dissimilarities primarily related to income.	Real world work trip linkages involve matching of worker and job classification.	Not known extent to which reported low usage of transit by blue collar workers is other than simply the effect of trip distribution and other exogenous factors.	Not normally used or studied as a predictive travel demand variable.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
AGE	Young and old make fewer work trips; other trips may be more influenced by transit accessibility than average. Not well studied, especially impact on serve passenger trips.	Effect unknown.	Known that young, older and old use transit more. In the 40-65 age group, not known if higher transit use is a function of captivity, trip distribution or habit.	Not normally used or studied as a predictive travel demand variable. Useful in bus service design and in understanding social value of special transportation services.
SEX	Not well studied.	Not well studied.	Known that women use local transit more. Not known if this is a function of auto availability, trip distribution or different perception of modal attributes.	Not normally used or studied as a predictive travel demand variable.
DRIVER'S LICENSE	Non-licensed may be more influenced by transit accessibility than average. May cause serve passenger trips. (See also "Auto Ownership.")	Travel by non-licensed restricted in interchanges with little or no transit service.	Known as a determinant of transit captivity, however, the trade-offs between the transit and auto passenger travel options for non-licensed are not well studied.	Not normally predicted. Useful in understanding social value of transportation services.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
RELIABILITY	Effect not known.	Effect not known.	Possibility that reliability deficiencies account for some of the penalty assigned to wait and transfer times.	Measures of reliability needed. Impacts poorly identified.
TRIP DENSITY	Effect not known.	Effect not known.	Evidence exists that opportunities for and occurrance of carpooling are quantifiably enhanced by presence of larger trip volumes in an interchange.	Measured as person trips per unit origin and destination zone area (trips per origin area x destination area).
INFORMATION	Effect not known.	Effect not known.	Postulated to equate to increased trip density in calculating the opportunity for carpooling.	Should serve to improve individual perception of travel parameters. Impacts poorly quantified or understood.
ADVERTISING OF TRANSIT Carpool Promotion	Effect not known.	Effect not known.	Thought to marginally affect mode choice but never quantified.	May serve to influence individual perception of travel parameters. Impacts poorly quantified or understood.
CAPACITY CONSTRAINTS	Effect not known.	Parking constraints thought to affect destination choice for the shop trip and possibly others.	Deterrence to auto use of parking constraints (lack of space) lacks quantification.	Capacity constraints enroute should be taken care of in other measures such as travel time & comfort. Parking constraints may be translatable into parking costs & walk time. Impacts poorly identified.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
HANDICAPS Disadvantaged Group Categories	Known that trip generation is lower for handicapped persons. Thought to be affected by transportation system attributes. Not well understood.	Not well studied.	Known to increase mode captivity, both transit and auto, depending on handicap.	Not normally used or studied as a predictive travel demand variable. Useful in understanding social value of transportation services.
AUTO AVAILABILITY	(See "Auto Ownership")			Not well defined as to what constitutes auto availability. Often totally lacks definition as a survey question.
TRIP VARIABLES:				
ORIGIN DESTINATION Production Zone Attraction Zone	Defined by the trip generation estimate or act.	Defined by the trip distribution estimate or act.	Modes and routes available and associated trip specific transportation system characteristics are a function of the origin and destination. (See other trip variables for effect.)	Proper O.D. information allows systematic calculation of trip specific system variables.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
TRANSIT FARE	Known that low fares attract trips from the walk mode (not a true change in generation.) Some evidence that other new trips are generated.			Some suspicion that there is a threshold below which fares have little impact.
AUTO OPERATING COST			Preferred treatment of auto cost in respect to its possible allocation among auto occupants has not been established.	Fixed costs not commonly included, but some question remains as to preferred approach and as to which out of pocket costs are actually perceived by the trip maker.
PARKING COST			(See Auto Operating Cost)	Question of how to treat free or subsidized employee parking in combination with market price parking deserves careful attention.
TOLLS			(See Auto Operating Cost)	
COMFORT Quality of Ride Air Conditioning Seat Availability Age of Equipment Cleanliness of Equip. Perceived Speed	Effect, if any, unknown.	Effect, if any, unknown.	Thought to marginally affect mode or at least route choice. Comfort factors have been ranked but never quantified.	Impacts poorly quantified or understood.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
WAIT TIME Wait Time for Transit Wait Time for Parking	Some evidence that new trips are attracted with lower wait times.	Any "new" trips attracted with lower wait times (or any modal improvement) may be trips diverted from other destinations.	No attempt has been made to analyze the restrictions on personal schedule imposed by carpooling. For transit, not known extent to which wait time applies given doorstep service or in respect to hypothetical wait time not actually spent at transit stop in the case of infrequent headway.	Commonly estimated at half the headway for transit. Extent and nature of any deviations from a linear value of wait time are not known.
TRANSFER TIME			Act of transferring may be perceived as involving a fixed penalty.	Commonly estimated at half the transit headway. Extent & nature of any deviations from a linear value of transfer time are not known.
TRAVEL COST (See also following individual travel cost components)	Effect not well understood.	Thought that desire to minimize travel cost is a factor in trip distribution. Not well studied.	Known that desire to minimize travel cost is a significant factor in mode choice. Lower incomes appear to weigh cost more.	A component of the utility measure.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
IN-VEHICLE TRAVEL TIME	Effect not well understood.	Known that desire to minimize travel time is a significant factor in trip distribution. Quantification presently empirical only.	Known that desire to minimize travel time is a significant factor in mode choice. Value of time open to discusstion especially as it may differ with income and trip purpose.	A component of the utility measure. Extent & nature of any deviations from a linear value of time are not known. Impact of serve passenger time in carpooling & demand activated transit not well understood.
OUT-OF-VEHICLE TRAVEL TIME Excess Time Convenience (See also following individual out-of-vehicle time components)	Effect, in general, not known.	Logical that desire to minimize out of vehicle time is a factor in trip distribution. Actual effect not known.	Accumulated evidence indicates that desire to minimize out-of-vehicle travel time is in mode choice weighed 2 to 3 times as heavily as desire to minimize in-vehicle travel time.	A component of the utility measure. Weights of sub-components within the out-of-vehicle travel time category have not been investigated individually.
WALK TIME Walk Time to Transit Walk Time from Transit Walk Time from Parking	Might have threshold type effect.	Might have threshold type effect.	Some evidence that may have threshold type effect.	Extent and nature of any deviations from a linear value of walk time are not known.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning)			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
MODE	Logically affected by mode availability. Not known extent to which mode choice is made prior to trip decision.	Logically affected by mode availability. Not known extent to which mode choice is made prior to destination decision.	Defined by the mode and route choice estimate or act.	Multi-mode trips (e.g. park and ride) cause definitional problems and are not as well understood as single mode trips.
AUTO OCCUPANCY Carpooling Number of passengers	(See "Mode")			Often poorly defined as a survey question.
PURPOSE	Defined by the trip generation estimate or act. Relationship of trip generation, importance of trip, and travel impedances not well understood.	Known that work trips are longest, shop trips shortest, other trips intermediate presumably because of relative difficulty or ease of trip purpose satisfaction. Relationship of trip length, travel impedences & ease of trip purpose satisfaction not well understood.	Known that mode choice differs among the trip purposes, even for equivalent mode options. Not known extent to which this is function of auto availability, flexibility of destination choice, or different perception or needs concerning modal attributes.	A basic predictive variable. Also useful in understanding social value of transportation services.
TRAVEL TIME	(See "In-Vehicle Travel Time" and "Out-of-Vehicle Travel Time")			The full extent of door-to-door travel time is pertinent.

Table A-1

VARIABLES AND THEIR EFFECT ON TRAVEL RESPONSE (Cont'd)

Variable	Effect on (and status of knowledge concerning			
	Trip Generation	Trip Distribution	Mode and Route Choice	Comments
SYSTEM VARIABLES (Non-Trip-Specific):				
ACCESSIBILITY VIA TRANSIT	Effect, if any, not satisfactorily quantified. High accessibility via transit can act as a surrogate for high density and related high incidence of walk trips, which equates to low vehicle trip generation. Logically, high accessibility by all modes should relate to high trip generation if walk trips are counted.	Important in describing the relative attractiveness of a single interchange in respect to the whole, as in the Gravity Model formulation.	Evidence exists that high transit accessibility increases choice of the transit mode even for a given set of trip maker characteristics and trip-specific travel options and system characteristics. Postulated that such decisions as auto ownership are predicated on overall accessibility and thus influence individual trip choice.	Gravity Model derivation need not be used. Can be measured as percent of regional employment (or D.U.'s, commercial area, trip attractions, etc.) within given number of minutes travel time from location of interest.
ACCESSIBILITY VIA HIGHWAY	Effect, if any, not satisfactorily quantified.	(See Accessibility Via Transit)	Effect, if any, not satisfactorily quantified. May not be a significant factor given typical North American auto accessibility levels.	(See Accessibility Via Transit)
LAND USE	The primary determinant of trip generation.	Land use arrangement is a basic factor in trip distribution.	Known that dense mix of land uses can shorten some percentage of trips to where walk mode can be used. Not well quantified.	Land use arrangement is a factor in accessibility.

SOURCE: Pratt, R.H. & Associates - "Design of Procedures to Evaluate Traveler Response to Changes in Transportation System Supply" Sept., 1974.

APPENDIX B -

APPENDIX TO CHAPTER 2
CHECKING THE RESULTS

APPENDIX B

APPENDIX TO CHAPTER 2
CHECKING THE RESULTS

This appendix describes some of the demand-estimation procedures used in the long-range urban transportation planning process. More detailed procedural information can be found in the FHWA Manual: Computer Programs for Urban Transportation Planning PLANPAC BACKPAC, General Information, April, 1977. General discussions of demand analysis in relation to urban transportation planning and system evaluation are contained in many standard references - (see, for example, Chapter 12 of the Transportation and Traffic Engineering Handbook, "Urban Transportation Planning".)

1. Major Steps

The long-range urban transportation planning process involves a series of iterative and sequential steps relative to analyzing travel demands, system performance, and community impacts. Figure B-1 shows the various demand-related steps in this process as defined by UMTA and FHWA. The process may be characterized by four general phases:

1. Inventories - This phase provides the base for subsequent steps. It includes inventories of economic activity, population, land-use, urban travel, and existing transportation facilities.

2. Analyses of Existing Conditions and Calibration of Forecasting Techniques - This phase develops the models and analytical procedures for use in forecasting future land-use and travel.

3. Forecasts of Future Conditions - This phase forms the heart of the demand-forecasting process.

   (a) Future forecasts of population and economic activities (usually expressed in terms of employment and income) serve as inputs to land-use analysis and the spatial allocation of population and urban activity.

   (b) Trip generation bridges the gap between land use and travel by providing the means by

URBAN TRAVEL DEMAND FORECASTING PROCESS

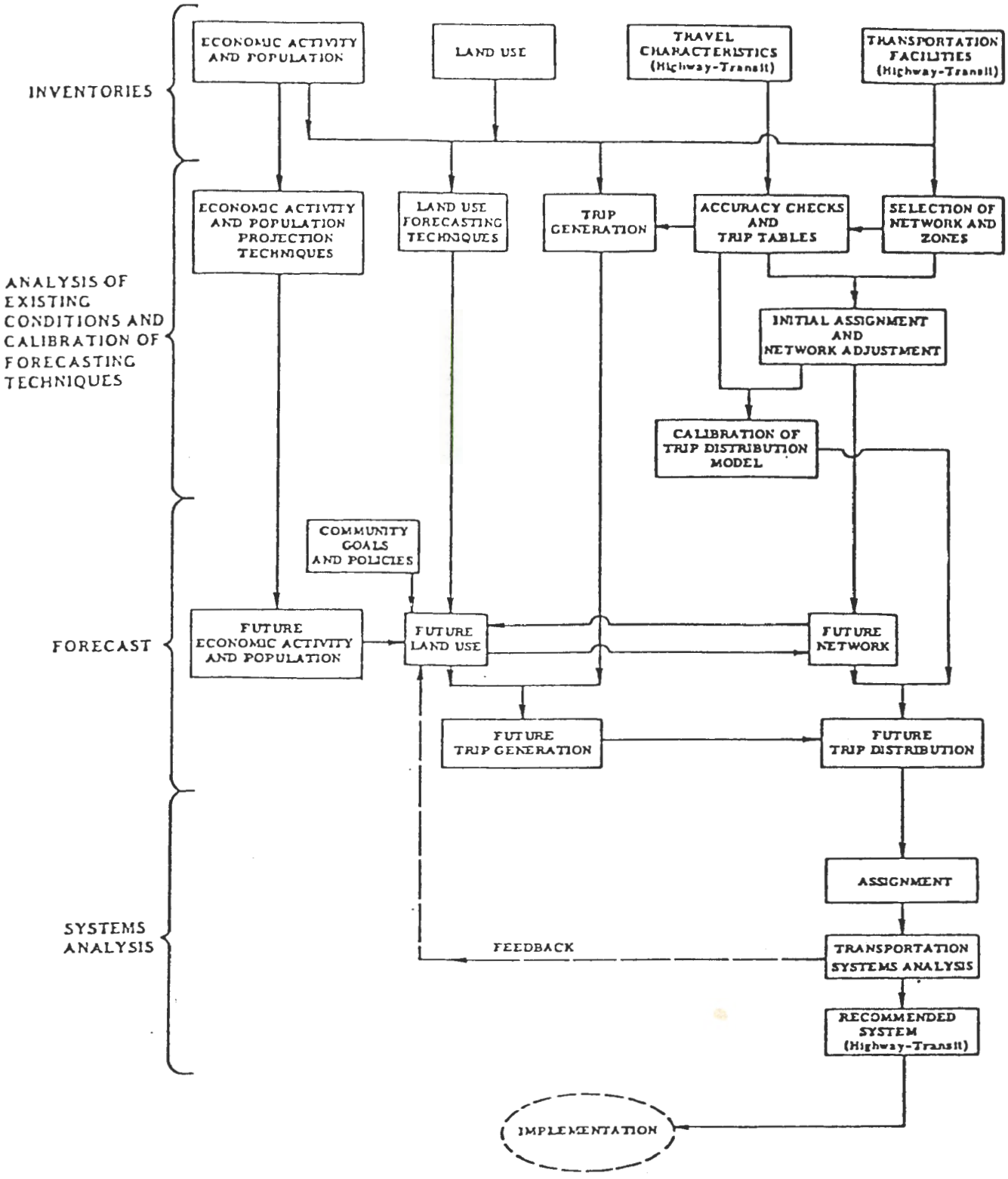


FIGURE B-1

which the number of trips that begin or end in a given analysis area can be related to the land use or socioeconomic characteristics of that area.

(c) The generated trip ends form the measures of trip "production" and trip "attraction" (or origins and destinations) that are used in trip distribution (along with measures of spatial separation developed from the highway and transit networks) to estimate origin-destination patterns.

(d) Modal choice analysis allocate trips between public and private transport. Trip assignment procedures allocate movements to specific paths on the highway and public transport systems.

4. Systems Analysis - This phase evaluates alternative land use and transportation systems. Measures of transportation system usage and performance provide important inputs into economic and environmental analysis.

These various steps should be viewed as highly integrated and iterative. From a behavioral perspective, it is difficult to separate decisions to travel from the choice of destination or mode. Figure B-2 shows how the various elements interrelate, while Table B-1 describes in general terms the various data requirements for each model component group.

In urban areas where major transit investments are anticipated, the model structure should allow projections of person-travel during specific periods of the day, i.e., morning peak, evening peak, or off-peak. Accurate and realistic network analysis procedures are essential to assure that system (producer) and user costs each are properly estimated.

2. Population, Employment, and Land Use

Population, land use, and employment forecasts form the basis for future travel estimates, since they influence the magnitude and locations of activity. In actual practice, land use forecasting involves a combination of planning and forecasting.

Measures of population and employment for base-year conditions may be obtained from the U.S. Census or from special surveys. Projections generally should be developed by the regional planning agency, based on anticipated changes in economic activity and population. Care should be exercised to avoid developing unduly optimistic or conservative forecasts.

TRANSPORT DEMAND FORECAST AND EVALUATION SYSTEM

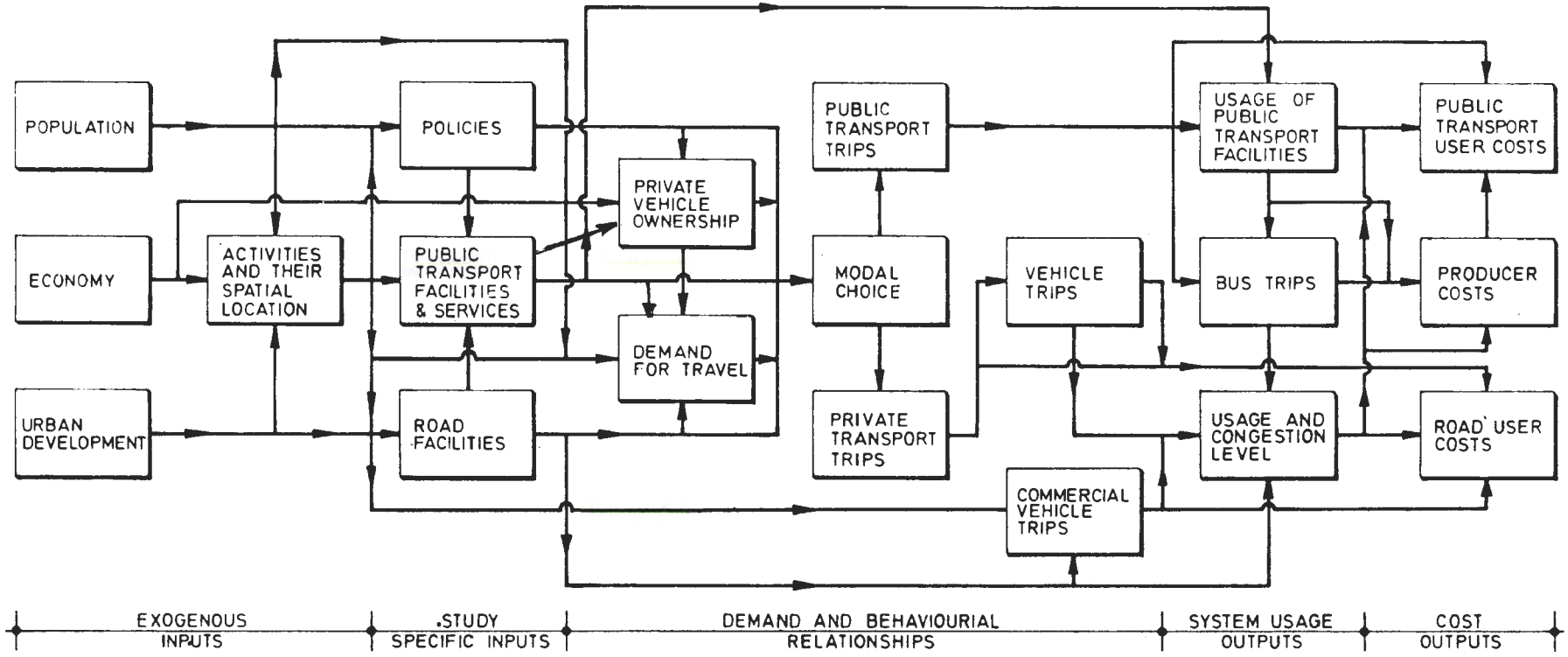


Table B-1

MODEL COMPONENTS AND THEIR APPLICATION

COMPONENT	DATE ITEMS AND APPLICATION FOR MODEL COMPONENTS	APPLICATION
Exogenous Inputs	Urban Development and Activity Levels, i.e., population, employment, schools, hospitals, etc., by spatial location	Travel Demand, i.e., Trip Generation and Attraction
	Economic Growth, i.e. household incomes	Demand for Private Vehicle Ownership, Travel Demand
Study-Specific Inputs	Pricing Policies, i.e., cost of operating private motor-vehicles parking charges, restraint measures, fare structure for public transport services	Private Vehicle Ownership, Travel Demand
	Road Transport Network Alternatives, i.e., facilities with their speeds and capacities	Travel Conditions and Costs by Private Transport Usage
	Alternative Public Transport Facilities, i.e., services, routings, fares and frequencies	Travel Conditions and Costs for Public Transport Usage
	Unit costs for public transport operations	Producer Costs for Public Transport Operation
Demand and Behavioural Relationships	Travel Demand in response to income levels, vehicle availability, cost of travel, availability of services	Travel Demand Patterns
	Route, Mode- and Submode and Destination Choice in response to available alternatives, cost and service differentials and ability to select	Demand for Travel by Mode on Specific Facilities and During Specific Time Periods
Travel Demand Patterns and Systems Usage	Loadings on mode- and submode-specific facilities and services during each time period	Service and Facility Utilization and Congestion Levels
User Cost Outputs	Travel Time and Cost Data for individual, mode-specific travel demands, i.e., each origin-destination pair	Evaluation of User Benefits and Costs
Producer Cost Outputs (System Costs)	Equipment needs and operating cost statistics for operation of services required under given usage levels. Gross Revenue	Evaluation of Producer Benefits and Costs. Analysis of Financial Results

SOURCE: B. Wildermuth "Public Transport in Singapore, An Analytical Approach to Evaluate Its Problems and Alternatives," presented at Australian Road Research Board Highway Engineering Workshop. August 31, 1976.

FIGURE B-2

Land Use - Land use forecasts can be based on professional judgement, viz., estimated changes in density gradients and degrees of saturation, or on land use models.

- Accessibility models relate land use growth to changes in the zone's accessibility, or the degree of access to employment or housing.

- The Empiric Activity Allocation Model is essentially composed of a system of simultaneous linear regression equations which quantify relationships between the output (dependent) and causal (independent) variables. The equations are formed by hypothesizing relationships among activities and by applying statistical techniques to historical data. The final form of the model is calibrated using historic data for two points in time.

- The Projective Land Use Model (PLUM) provides projects of future small-area population employment and land use based upon the distribution of these characteristics in a base year, coupled with several allocation algorithms which differentiate between "basic" and "local serving" employment.

Population - Urban area population forecasts may be derived by evaluating the net national increase in population (births minus deaths) and the net migration to or from the study area. The basic estimating equations for this "Cohort Survival" technique as set forth in The Methods and Materials of Demography, Volume 2,(1) is as follows:

$$P_1 = P_o + B - D + I - E \qquad (1)$$

Where: P_o = Population at time o.

P_1 = Population at time 1.

B = Births

D = Deaths

I = Immigration

E = Emmigration.

(1) Shryock, H.S. and Siegel, S.S., The Methods and Materials of Demography, Volume 2, U.S. Department of Commerce, Bureau of the Census, Washington, D.C., October, 1971.

Population estimates for individual zones or communities within an urban area, should reflect past trends, land availability, and development propensity. Individual estimates should be related to an overall area control total.

3. Trip Generation

Trip generation defines the relation between urban activity and travel. Trip generation procedures estimate the transportation demands generated by various land-uses or activities. These demands are usually measured as trip-ends or trip-destinations. From a behavioral perspective, trip generation models attempt to quantify choice as to trip frequency and type.

The basic approaches to trip generation are documented in many comprehensive urban area transportation studies. Their role in the comprehensive transportation planning process and suggested approaches to analyses including statistical estimation techniques are detailed in the Guidelines for Trip Generation Analysis, 1967, and Trip Generation Analysis, 1975, prepared by the Federal Highway Administration, and the Transportation and Traffic Engineering Handbook, 1975.(2)

Relevant Parameters - Conventional trip generation analysis includes two basic components:

- Trip production relates to the residential or home-end of trip and reflects the trips generated at home.
- Trip attraction relates to the non-home-end of home-based trips (i.e., trips to the commercial, industrial, school, or social-recreational activities that attract urban travelers.)

This distinction is made to better reflect differences in trip-making characteristics as a function of dwelling-unit characteristics and to enable trip distribution models to perform more satisfactorily. For non-home based trips, the distinction between productions and attractions is not clear.

The following factors have been used in trip generation procedures:

(2) Guidelines for Trip Generation Analysis, Federal Highway Administration, Washington, D.C., 1967, and Trip Generation Analysis, Federal Highway Administration, 1975, Transportation and Traffic Engineering Handbook, Institute of Transportation Engineers, 1975.

Trip Production

1. Population
   a. total
   b. by age, sex, income, and household size.
2. Number of dwelling units
3. Automobile ownership (usually a function of income and population density).
4. Employed Labor Force
   a. white collar
   b. blue collar
5. Students

Trip Attraction

1. Employment
   a. total
   b. white collar
   c. blue collar
2. Floor space (sq. ft.)
3. Land Use - Type and Amount (acres)
4. School Enrollment
5. Recreational Attractiveness

Procedures - Trips are usually developed for an average weekday except where specific studies are made for special generators such as a sports stadium.

Trip productions at the household (home) are generally used as a control for trip attractions at non-residential land uses. Thus, the total number of trips made in a region should be equal to the number of trip productions. In the event that forecast attractions differ from forecast productions, they should be factored on a zone-by-zone basis until regional total productions and attractions are equal.

- Vehicle availability models classify each household and its members into one of several categories--i.e.,

no car, one-car, and multi-car. The models describe the propensity for a given household to fall into one of the specific categories as a function of household income, the cost of operating motor vehicles, and the availability of alternative modes of transport.

- Trip Production models assume that each person has a certain basic requirement for urban travel, which depends largely on the socioeconomic status and vehicle availability classification of his household and on his basic occupation.

  The underlying hypotheses are that (a) travel demands for typical types of persons are constant over time, and (b) total demands for travel change as a result of shifts in the number of persons within different socioeconomic subgroups.

  The models consist of sets of trip-rates for different trip purposes, household classifications, and income groupings. Work trips are generated only for the working population and school trips only for the student population. Travel demands for other purposes are generated on the basis of total population, adjusted to account for the proportion of below school-age children who do not travel on their own.

- Trip Attraction models reflect the attractions of trips of various activities, i.e., employment, schools, shops, entertainment, social, public, and health institutions.

Regression analysis or category analysis may be utilized in relating the preceding parameters to urban trip-making. The latter method is widely used by the traffic planner in estimating impacts of new developments. In applying either approach, it is essential to evaluate results for reasonableness. Relationships should be developed on a disaggregate basis to increase reliability and to avoid problems of collinearity.

Trip production models generally should be based on cross-classification analyses. Trip attraction models generally should be based on trip rates for various activity units.

1. Multiple regression equations have been widely used to estimate trips. These equations take the form $Y = A_1x_1 + A_2x_2 + A_3x_3 \ldots\ldots A_nx_n + B$ where ideally X_1, X_2, X_3, X_n represent input, variables, ideally independent.

Collinearity among "input" variables is common when equations are developed on a zonal basis and the variables include population, school children, car ownership, and/or labor force. The more populous zone, for example, usually also has the greatest number of school children, workers, and cars. This problem can be overcome by developing disaggregate relationships on an individual household or person-basis.

2. Trip Rates, Category, trip rate, or cross classification analyses can be developed from specific household and/or land-use characteristics. In this procedure, households are grouped into specific categories and the rate of trip-making in each category is derived. Once basic classifications are accomplished, regression equations also can be utilized. A typical cross-classification model might be as follows:

TRIPS PER DWELLING UNIT

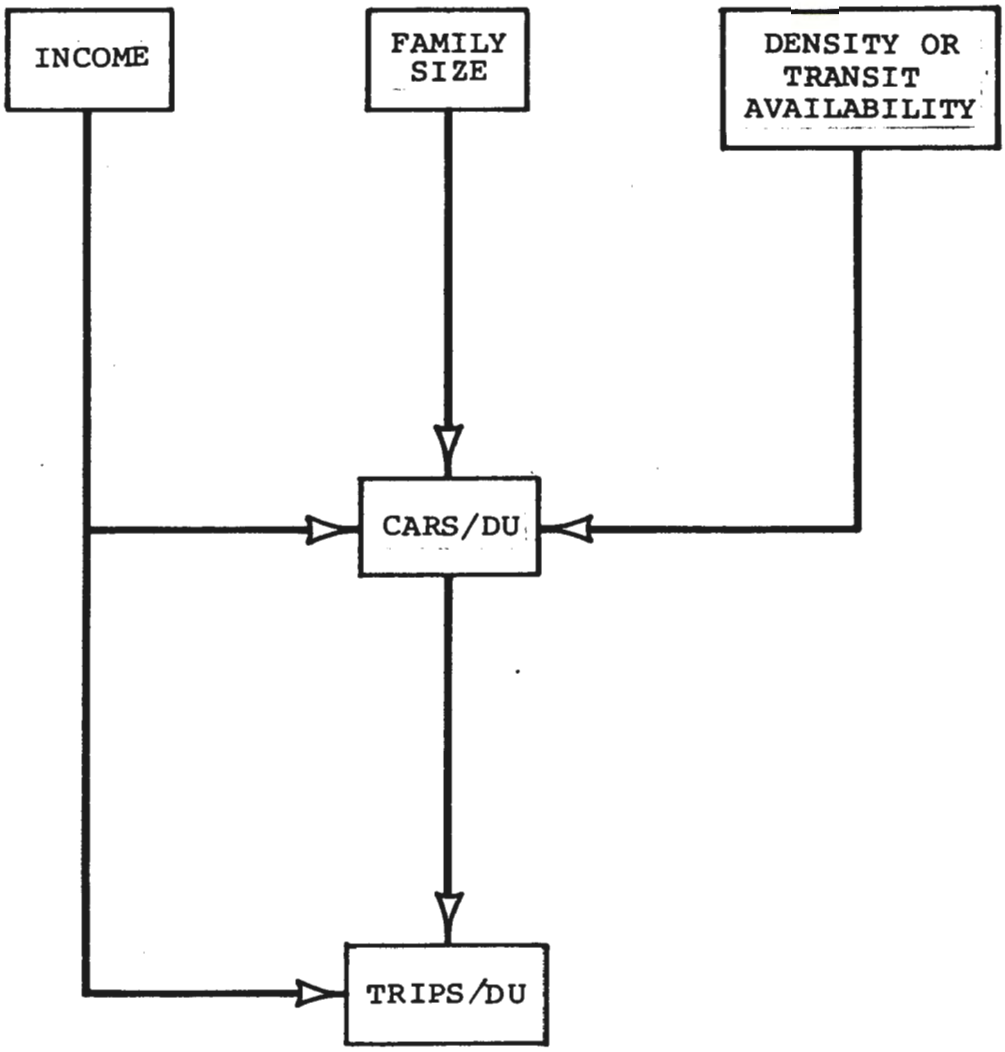
INCOME RANGE	CARS/DWELLING UNIT 0	1	2	3+
Low	*	*	-	-
Low-Medium	*	*	*	-
Medium	*	*	*	*
Medium-High	-	*	*	*
High	-	*	*	*

(*Denotes adequately sized sample)

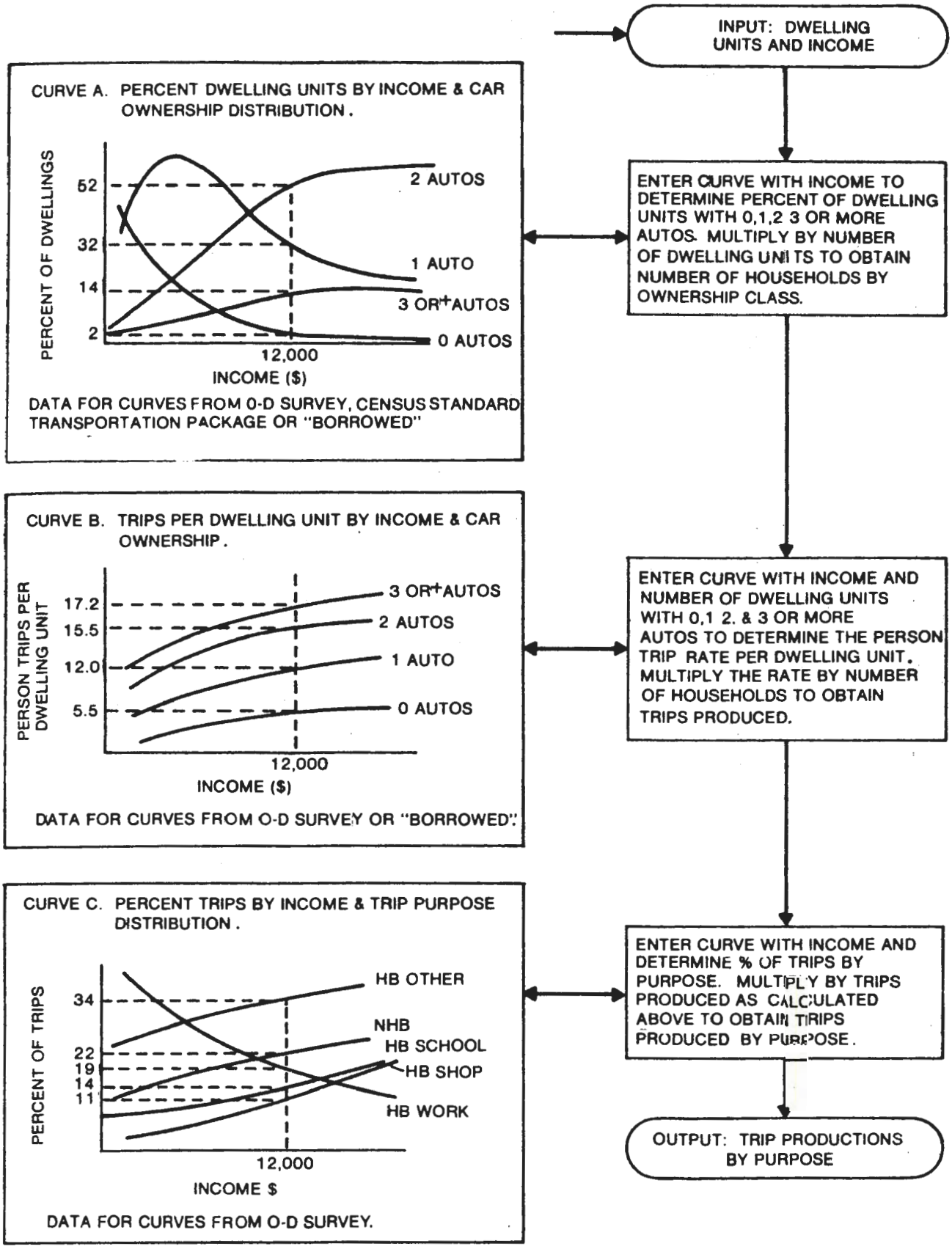
Trip Production Models - Trip production models should reflect (1) basic independent variables, and (2) the types of trips involved in the analysis. Income and car ownership should normally represent the basic input variables, although density may be significant in some areas. The relationships among these trip production parameters are shown in Figure B-3.

Trip purpose stratifications normally should consider five purposes--home-based work, home-based areas shop, home-based school, home-based other, and non-home-based. However, three trip purposes--home-based work, home-based other, and non-home-based--generally should be considered for smaller urban areas (i.e., under 250,000 population).

The trip production sequence consists of a series of sub-models relative to income distribution, car ownership, total trips and trip purpose. Figure B-4 sets forth the various steps involved in this sequence. Principal steps are as follows:



CONCEPT
HOME BASED TRIPS
PRODUCED BY RESIDENTS



EXAMPLE OF URBAN TRIP PRODUCTION PROCEDURE.

FIGURE B-4

SOURCE: FHWA Trip Generation, 1975.

1. Identify the distribution of dwelling units by income.

2. Estimate the proportion of dwelling units in each income group owning 0, 1, 2, 3+ autos per dwelling unit (Curve A).

3. Estimate the trips per dwelling unit, or per person, based on (a) car ownership or (b) car ownership and income (Curve B).

4. Estimate the trips per dwelling unit or per person by purpose based on (a) car ownership,or (b) car ownership and income (Curve C).

4. Trip Distribution

The development of origin-destination travel patterns by connecting trip productions with trip attractions is commonly referred to as trip distribution. From a behavioral perspective, trip distribution models attempt to quantify destination choice. Each trip produced selects a destination among the available attractions according to the cost (usually in perceived travel time) of reaching a specific attraction, relative to the cost of reaching alternative attractions.

Methods - Trip distribution methods have progressively evolved over the last several decades from a total reliance on growth factor techniques to the wide use of interactance models.

- Growth Factor Models - Growth factor models (such as the Fratar Model) are applicable to short-range planning, and for longer range planning where urban areas are already built up and little change is expected; and as a possible cross-check on more elaborate modelling systems. They assume that future trips will be proportional to existing trips.

  Where there are no existing trips to or from a zone, it is difficult to accurately project the volume of future trips. In addition, growth models are generally not responsive to transportation system supply changes.

- Simplified Allocation Model - For estimating changes in trip patterns to a major generator, such as a central business district or airport, a simplified allocation model can be used. Future CBD employment or floor space can serve as a control, and future travel can be allocated relative to changes in

population growth in the surrounding tributary areas. This model is structurally similar to the well-known "gravity model" formula, except that friction factors are excluded. It can be formulated as follows:

$$t_2 = \frac{\frac{P_{2(j)}\ t_1}{P_{1\ (j)}}}{\sum_j \frac{P_{2(j)}\ \ t_1}{P_{1(j)}}} \quad N\ (a) \qquad (2)$$

where: $N(a)$ = number of future CBD trips to zone a in CBD for a given development option.

P_2 = future population in outlying zone j.

P_1 = base year population in outlying zone j.

t_1 = base year trips from zone j to zone a in CBD.

$\sum_j$ = summation over j outlying zones.

t_2 = number of future trips to CBD zone a from zone j.

Intervening Opportunity Model - This model, used in Chicago and Pittsburgh, and Upstate New York urban transportation studies, is based on a probabilistic formulation. It describes the probability that a given destination zone will contain an acceptable destination point in relation to the potential trip ends available in destination zones closer to the point of origin.

The model is formulated as follows:

$$Tij = O_i (e^{-LB} - e^{-LA}) \qquad (3)$$

where: Tij = total trip origins between i and j.

Oi = total trip origins produced at i.

e = base for natural logarithms.

A = sum of all destination zones, in terms of closeness, i and j, and including j.

B = sum of all destination zones between i and j, but excluding j.

L = the probability density of a destination acceptability at the point of consideration.

Calibration is accomplished by adjustment of the probability density function (L), until a satisfactory simulation (by traffic assignment) of existing (or projected) travel patterns is obtained. The model has been typically calibrated to match vehicle-miles. Either a single "L" or multiple "L"s, depending upon trip purpose are developed.

The model is difficult to understand and accurate calibration of "L" factors is found difficult. For these reasons, it is not as widely used as the Gravity Model.

Gravity Model - The gravity model is the most widely used technique for estimating zonal traffic interchanges. It does not require base-year origin-destination trip information as input, and it can produce trip interchanges where there were none in the base year.

The model assumes that the trip interchange between zones is directly proportional to the relative attraction between zones and inversely proportional to the spatial separation between them. This relationship can be expressed as follows:

$$T_{ij} = P_i \frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}} \qquad (4)$$

Where:

T_{ij} = trips produced in zone i and attracted to zone j.

P_i = trips produced by zone i.

A_j = trips attracted by zone j.

F_{ij} = empirically derived "travel time factor".

K_{ij} = zone-to-zone adjustment factor--generally 1.0.

Travel-time factors, also known as friction factors or propensity factors (Fij), express the effect that spatial separation exists on trip interchange. This separation is usually measured by total travel-times between zones. The factors are roughly an inverse exponential function of the travel times. Several sets of factors are normally used depending on the number of trip purposes.

Trip distributions are developed separately for each basic trip purpose. Traditionally, average trip times by purpose are calibrated to existing patterns to adjusting the travel time impedence functions or friction factor Fij. In addition, zone-to-zone adjustment factors, familiarly known as K-factors, are used to allow for effects on travel patterns by social and economic influences not accounted for in the gravity formulation.

Data required for gravity model calibration include zone-to-zone trip tables (whose source is usually a travel survey) and zone-to-zone travel times (developed through network analysis procedures). The trip tables are often stratified by up to eight or more trip purposes. They may be comprised of vehicle trips or person trips, usually depending on the type of modal split analysis to be done. Person trip tables are necessary for detailed transit system analyses.

A trip time frequency distribution is usually used as a basis for comparison of trip interchanges computed from the gravity equation with surveyed

trip interchanges. If the trip time frequency distribution produced from the gravity output is not reasonably close to the survey distribution, then adjustments are made to the travel-time factors by a manual iterative procedure. Normally, about three calibration runs are required to produce an acceptable trip time distribution.

System speed assumptions should be carefully checked to avoid overstating future travel (i.e., VMT, PMT) where major system changes are introduced. This should be accomplished by utilizing peak-period speeds for work and school trips and off-peak speeds for other trips. Average speeds resulting from systems assignments should be compared with those assumed in the model; appropriate speed adjustments should be made to bring the two in balance; and the distribution-assignment process should be iterated.

Distribution Model Comparisons - The results of alternative trip distribution models on average trip lengths and trip times are shown in Table B-2.

(1) Trip distributions keyed to distances (viz., the opportunity model) will tend to hold trip lengths constant irrespective of changes in system speeds.

(2) Trip distribution keyed to trip times (viz., conventional gravity model) will tend to increase trip lengths proportionate to the increase in system speeds.

(3) A "weighted gravity model" which uses time-and-distance or disutility to create friction factors tends to closely approximate the time spent in travel model in forecasting both trip times and lengths. Average trip lengths increase and average trip times decrease relative to existing conditions, with increases in system speeds. The increases in length, however, are less than would be achieved from conventional application of the gravity model.

5. Modal Choice

Techniques for allocating travel to public and private transport modes should reflect specific study needs. Long-range transportation planning studies, especially in larger urban areas should utilize modal-choice models which relate time, cost, or generalized impedance to transit usage for stratifications such as a purpose, income and/or auto ownership. For smaller urban areas, modal choice may be related to parameters such as car ownership and income following the trip generation stage.

Table B-2 (A)

TRIP LENGTH FORECAST METHODS

	PRESENT (1)		FUTURE (2)	
(A) OPPORTUNITY MODEL	$\bar{L}_1$	$\cong$	$\bar{L}_2$	
(B) GRAVITY MODEL	$\bar{T}_1$	$\cong$	$\bar{T}_2$	
$\therefore$	$\bar{L}_2$	$\cong$	$L_1 \frac{\bar{V}_2}{\bar{V}_1}$	(by purpose)
(C) WEIGHTED MODEL	$C_A \bar{L}_1 + C_B \bar{T}_1 \cong K = C_A \bar{L}_2 + C_B \bar{T}_2$			
	if $C_A = C_B$			
	$L_2 = L_1 \left(1 + \frac{60}{V_1}\right) \Big/ \left(1 + \frac{60}{V_2}\right)$			
(D) TIME SPENT MODEL	$\bar{N}_1 \bar{T}_1 \cong \bar{N}_2 \bar{T}_2$		N = Trips/Person	
	$\bar{T}_2 = \frac{\bar{N}_1 \bar{T}_1}{\bar{N}_2}$		$\bar{L}_2 = \frac{N_1 V_2}{\bar{N}_1 V_1}$	

Table B-2 (B)

TRIP LENGTH EXAMPLES

PRESENT

5 Miles

15 Minutes

20 MPH

FUTURE

(A)

5 Miles

30 MPH 10 Minutes

(B)

15 Minutes

30 MPH 7.5 Miles

(C) $L_2 = 5 \left(1 + \frac{60}{20} \right) \left(1 + \frac{60}{30} \right) =$ 6.7 Mi.

13.3 Min.

(D) $N_1 = 2.5$

$N_2 = 3.0$

$L_2 = \frac{2.5}{3.0} \frac{30}{20} 5 =$ 6.3 Mi.

12.6 Min.

Short range studies should generally rely on analogy methods. Such methods may also be used to verify patronage forecasts derived from models.

Detailed discussions of modal choice parameters and procedures are found in:

1. Proceedings of the Modal Choice and Transit Planning Conference, March 17th and 18th, 1966, at Cleveland, Ohio, Seven County Transportation and Land-Use Study;

2. Fertal, M.; Weiner, E.; Balek, A.J.; and Sevin, A.F.; Modal Split - Documentation of Nine Methods for Estimating Transit Usage, United States Department of Commerce, Bureau of Public Roads, December, 1966;

3. Modal Split Simulation Model, Technical Report No. 4, prepared by Alan M. Voorhees Associates for Department of Housing and Urban Development, March, 1967; and,

4. A Review of Operational Urban Transportation Models, FINAL REPORT DOT-TSC-496, April, 1973, Peat, Marwick, Mitchell.

Significant Factors - The choice of urban transport mode depends upon the relative availability, reliability, and utility (time-costs) of private and public transport. Significant factors include:

(1) urban area size, age, density, and structure;

(2) the nature and intensity of downtown development;

(3) income and car ownership availability;

(4) the type of trip; and,

(5) the relative quality of transit and highway service expressed in terms of travel times, out-of-pocket travel costs and/or "disutility". Downtown parking costs can be a major modal choice determinant.

Analysis of urban travel behavior indicates that:

. Transit use traditionally has been greatest in those parts of urban areas that were developed as a result of, and tributory to, public transport routes.

- Car ownership and net residential density are major determinants of travel mode. The highest transit use is generally from high-density, low car ownership (usually low income neighborhoods).

- Attractive transit service relative to car travel will tend to increase public transport ridership.

- Transit use to the city center correlates closely with the density of employment or person-destinations. For example, more than 90 percent of the travelers into Manhattan, where employment approximates 800 persons per acre, arrive by transit, as compared to Denver, where 20 percent arrive by transit, and employment approximates 150 persons per acre.(3)

Short Range Transit Planning - Ridership estimates for bus service extensions and improvements should be similar to ridership experience of bus lines traversing similar type neighborhoods with comparable service frequency and fare (for example, boarding passengers per bus mile). Alternatively, ridership may be estimated by careful market analyses of schools, employment centers, and population residing within a specified walking distance of the bus route.

Modal allocations for specific generators--as a new urban development project--should be developed based on analogy with areas with comparable land uses and transit service.

Modal Choice Models - Modal choice models are of a probabilistic nature: they postulate that the choice of mode depends on the availability of alternatives, the expected utility of the trip (i.e., its purpose), and the differences in perceived travel times and travel costs between the competing modes for various groups of travelers. The allocation of urban travel may be done (a) before (b) as part of, or (c) after the trip distribution process.

1. Trip End Model - Early transportation studies generally utilized trip end models which allocated travel to alternate modes prior to trip distribution. This method requires separate distributions of auto and transit trips.

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(3) Levinson, Herbert S., Modal Choice and Public Policy; Engineering at the Transportation Conference, American Society of Civil Engineers. Engineering Issues, January, 1973, Journal of Professional Activities.

Although it predicts "captive" transit ridership, it is difficult to quantify the effects of differing service levels on "choice" ridership.

2. Trip Interchange Model - More recent studies have utilized trip interchange models, which allocate the total person trips after (or as part of) trip distribution to alternative transport modes as a function of interchange--specific parameters such as time and cost. These models often take the form of a family of diversion curves, stratified by trip purpose, car ownership, and/or income. Travelers which do not have a realistic choice of modes are normally allocated to the mode on which they depend while the remaining travel market is allocated among modes according to each mode's relative utility for a given trip.

Contemporary Methods - Current modal choice methods are both system and user responsive. They utilize car availability, car ownership, and/or income factors to differentiate between optional (choice) and more dependent (captive) riders. They then relate modal choice on a disaggregate or trip basis to "total trip costs" or "disutility" by mode and by (a) developing curves for each discrete level of car ownership/availability, or (b) considering income/car ownership in estimating equations. They assume that each level of car ownership or availability--travelers make modal decisions based on perceptible time and/or out-of-pocket cost differences. Walking and waiting times are usually weighted by 2 to 3 in developing disutility functions.

Disaggregate behavior modal split methods include both probit and logit models. Both of these functions follow "S"-shaped diversion curves; in both cases, the effects of mode choice on given differences in travel times are larger near the point of inflection (indifference) than where the probability of mode choice approaches one or zero.

1. Probit Model - This model assumes that the probability of transit use is normally distributed relative to the difference between highway and transit disutility. The percent of transit use represents the area under the standard normal curve between ∞ and the given utility. The probit function is expressed as follows:

$$P = \int_{-\infty}^{G(x)} f(z) \quad \text{where} \quad f(z) = \frac{1}{\sqrt{a\pi}} e^{(1/2\ z^2)}\, dz \qquad (6)$$

where: Z is the standard normal variate.

P = percent transit use.

G(x) is a disutility function, such as:

$$y = a_o + a_1 \Delta T + a_2 \Delta c + bx,$$

where: ΔT = Time difference

Δc = cost difference

x_1 = socioeconomic variable

The relationship becomes a straight line on normal probability papers when G(x) is graphed along the x axis and P is graphed in normal coordinates along the y axis.

2. Logit Model - This model assumes that the probability of transit use is exponentially distributed, in the following general form:

$$P = \frac{e^{L(x)}}{1 + e^{L(x)}} \qquad (7)$$

where: L(x) is a disutility function.

e = base of natural logarithms.

P - percent transit use.

Curves for the various functions G(x) and L(x) can be derived through multivariable probit and logit analysis. The UTPS "U-Logit" model program can be utilized to derive parameters and to assess statistical reliability.

Illustrative applications of current modal and sub-modal split relationships are summarized in Table B-3.

6. Trip Assignments

Traffic assignment is the analysis step which allocates origin-to-destination (or zone-to-zone) travel to specific paths

Table B-3

ILLUSTRATIVE MODAL CHOICE MODELS

AREA	MODEL
Chicago Area Transportation Study (Disaggregate Models)	CAR-RAIL
	PROBIT $G(x) = .76 - .0063\Delta C - .024\Delta T - 1.5 \times 10^{-5}$ income $+ .0070$ Dist. (11)
	LOGIT $L(x) = 1.23 - .010\Delta C - 0.040\Delta T - 2.4 \times 10^{-5}$ income $+ .012$ Dist. (12)
	CAR-BUS
	PROBIT $G(x) = -.89 - .0063\Delta C - .0083\Delta T + .083 \times 10^{-3}$ income $+ .088$ Dist. (12)
	LOGIT = $L(x) = -1.4 - .011\Delta C - .012\Delta T + .13 \times 10^{-3}$ income $+ .16$ Dist. (12)
	where: ΔC = Cost difference and ΔT = time difference
A.M. Voorhees and Associates Dallas-Fort Worth Region	$P = e^{-e^{[0.00774\ U + 68]}}$
	where: P = percent of trips by transit.
	U = marginal disutility.
Pratt and Deen-Submodal Split	$Y = \frac{100}{e^{-.013x} + 1}$ (15)
	where: x = equivalent time savings on rapid transit in terms of weighted time
	y = percent of transit trips choosing rapid transit.
	$R^2 = 0.886$

in the network. Application of conventional traffic assignment procedures should be based on realistic assumptions of network speeds and post assignment checks should be made to assess their validity. Commonly employed methods include the following:

(a) All-or-nothing methods assign all trips to the minimum time paths between origin and destination zones. Consequently, if a path is even slightly faster than an alternative path, all zone-to-zone trips will be assigned to the faster route.

(b) Multiple Routing Assignment methods assigns origin-destination travel to more than one path, based on travel times or impedance. Thus, trips are assigned in a more realistic pattern.

(c) Capacity-Restrained Assignment techniques utilize various methods to reflect the decreases in travel speeds which occur as a network link approaches capacity (i.e., speed versus volume-to-capacity ratios). Consequently, the path-finding algorithm selects routes which have slower free flow speeds than alternative paths, but which become attractive as the alternative paths reach capacity. This method normally produces the most accurate assignments, but it requires more computational time than the other techniques. The adjusted link speed can be computed by the formulas.

$$T = To \ (1 + 0.15 \ (V/C)^4) \qquad (8)$$

Where T = travel time (at which traffic (V) can travel on the subject link)

To = free-flow travel time; observed travel time (T_b) at practical capacity times 0.87

V = assigned volume

C = practical capacity

$$Ta = 0.75 \ T_b + 0.25 \ T \qquad (9)$$

Where Ta = assignment link travel impedance for use in next assignment.

T_b = observed travel time at practical capacity.

In some cases, system speeds can be restrained initially as an alternative to iteration. One approach is to assign work and school trips based on anticipated peak-hour speeds, and to assign non-work trips based on midday speeds; the peak and off-peak speeds utilized for trip distribution, by purpose can be used for assignment. Another option is to restrain freeway speeds prior to assignment to approximate these speeds which might result from capacity retrained assignments.

Results of system assignments should be checked for reasonableness. Bus and rail transit assignments for projected future conditions should be carefully compared with present ridership, and with anticipated travel across the downtown cordon. Finally, it must be realized that traffic assignment is not, in itself, a substitute for system planning.

APPENDIX C

APPENDIX TO CHAPTER 3
(TRIP CHARACTERISTICS)

A. TRAVEL SUMMARIES AND TRENDS

- EMPLOYMENT CHARACTERISTICS
- LAND-USE CHARACTERISTICS
- TRAVEL TRENDS

Table C-1

EMPLOYMENT PROJECTIONS FOR SELECTED URBAN AREAS

	EXISTING				FUTURE			
CITY	Year	Study Area Population	Employment	Ratio	Year	Study Area Population	Employment	Ratio
Albuquerque, N.M.	1962	284,600	100,000	.35	1985	825,000	300,000	.36
Baltimore, Md.	1962	1,607,800	602,100	.37	1980	2,161,000	833,600	.39
Baton Rouge, La.	1965	245,100	93,400	.38	1985	443,000	165,100	.37
Birmingham, Ala.	1965	559,100	213,600	.38	1990	1,028,800	425,100	.41
Boston, Mass.	1963	3,584,400	1,296,000	.36				
Buffalo, N.Y.	1962	1,350,000	492,000	.36				
Champaign, Ill.	1963	94,200	39,700	.42				
Chattanooga, Tenn.	1960	241,800	97,000	.40	1980	344,500	138,600	.40
Chicago, Ill.	1956	5,169,700	2,548,800	.49	1980	7,802,000	3,873,800	.50
Cincinnati, Ohio	1965	1,392,000	452,600	.33				
Cleveland, Ohio	1963	2,140,000	747,700	.35				
Columbia, S.C.	1964	196,000	69,900	.36	1985	365,500	133,200	.36
Columbus, Ohio	1964	734,200	248,600	.34				
Dallas, Tex.	1964	1,820,800	678,400	.37				
Denver, Col.	1960	806,100	308,200	.38				
Detroit, Mich.	1953	2,968,900	1,187,000	.40				
Erie, Pa.	1970	201,600	79,100	.39	1990	231,600	106,700	.46
Evansville, Ind.	1970	175,500	75,800	.43	1990	202,100	93,300	.46
Fort Lauderdale, Fla.	1964	450,000	115,200	.26				
Fort Wayne, Ind.	1966	232,700	115,700	.49				
Honolulu, Hawaii	1960	480,100	200,300	.42				
Houston, Tex.	1960	1,159,500	409,900	.35				
Indianapolis, Ind.	1964	762,900	320,000	.42	1985	1,149,200	430,200	.37
Jacksonville, Fla.	1960	365,100	128,600	.35				
Jacksonville, Fla.	1968	547,200	195,800	.36				
Johnstown, Pa.	1965	110,400	44,400	.40	1990	144,000	58,700	.41
Kansas City, Mo.	1957	857,600	340,100	.40				
Knoxville, Tenn.	1962	241,800	89,100	.37	1982	335,700	119,800	.36
Lafayette, La.	1965	78,900	33,400	.42	1985	128,400	53,700	.42
Little Rock, Ark.	1964	222,700	81,500	.37	1990	412,100	155,400	.38
Los Angeles, Cal.	1961	7,592,900	3,047,000	.40				
Los Angeles, Cal.	1967	9,008,400	3,330,800	.37				
Louisville, Ky.	1964	768,900	278,000	.36				
Memphis, Tenn.	1964	647,700	227,200	.35				
Miami, Fla.	1964	1,187,000	429,400	.36	1985	2,138,000	795,000	.37
Milwaukee, Wisc.	1963	1,644,300	634,900	.39				
Minneapolis, Minn.	1970	1,874,400	744,700	.40				
Mobile, Ala.	1967	279,700	89,700	.32	1995	511,500	186,900	.37
Monroe, La.	1965	96,600	39,600	.41	1985	162,500	60,300	.37
Nashville, Tenn.	1959	357,600	142,000	.40	1980	467,100	214,600	.46
New Orleans, La.	1960	825,500	314,700	.38	1980	1,313,100	500,400	.38
New York (Tri-State)	1963	16,302,000	6,220,000	.38				
Oklahoma City, Okla.	1965	574,000	228,500	.40	1985	987,000	404,100	.41
Orlando, Fla.	1965	355,600	112,800	.32	1985	834,000	300,000	.36
Peoria, Ill.	1964	260,800	99,200	.38	1985	355,300	129,700	.36
Philadelphia, Pa.	1960	4,007,000	1,437,300	.36	1985	4,680,000	1,762,100	.38
Pittsburgh, Pa.	1958	1,472,100	554,900	.38	1980	1,902,200	721,400	.38
Pittsburgh, Pa.	1967	2,601,400	975,200	.37	2000	3,151,300	1,360,000	.43
Portland, Ore.	1960	715,100	268,700	.38				
Providence, R.I.	1960/61	658,600	215,500	.33				
Richmond, Va.	1964	417,600	185,100	.44	1980	550,700	262,800	.48
Sacramento, Cal.	1968	774,000	265,900	.34				
St. Louis, Mo.	1957	1,275,500	490,500	.38	1980	1,721,400	817,300	.47
Salinas-Monterey,Cal.	1970	207,400	78,600	.38				
Salt Lake City, Utah	1960	394,300	125,600	.32	1980	800,000	250,000	.31
San Diego, Cal.	1966	1,180,000	350,300	.30				
San Diego, Cal.	1975	1,554,700	590,200	.38	1985	1,986,100	759,200	.38
San Francisco, Cal.	1965	4,400,300	1,664,000	.38	1990	7,447,100	3,114,300	.42
San Juan, Puerto Rico	1964	758,800	216,000	.28				
Seattle, Wash.	1961	1,347,000	463,400	.34				
South Bend, Ind.	1967	222,100	86,900	.39				
Springfield, Ill.	1964	137,000	61,300	.44	1985	180,300	82,400	.46
Springfield, Mass.	1965	531,000	199,700	.36	1990	690,000	249,800	.36
Stockton, Cal.	1967	170,000	58,000	.34				
Tampa-St. Petersburg, Fla	1965	395,700	119,200	.30				
Tucson, Ariz.	1960	244,500	67,400	.28	1980	678,000	203,000	.30
Tulsa, Okla.	1964	364,400	131,400	.36	1985	580,500	211,400	.36
Washington, D.C.	1955	1,568,500	736,000	.47				
Washington, D.C.	1968	2,714,000	1,116,000	.41				
Winston-Salem, N.C.	1965	157,600	74,100	.47	1985	256,200	107,700	.42

SOURCE: Comprehensive Metropolitan Area Transportation Studies in each urban area.

Table C-2

LAND USE IN SELECTED URBAN AREAS

LAND USE	CHICAGO, 1970 (2,973,650 acres) Percent of Developed Land	CHICAGO, 1970 (2,973,650 acres) Percent of Total	SOUTH BEND, INC., 1967 (120,404 acres) Percent of Developed Land	SOUTH BEND, INC., 1967 (120,404 acres) Percent of Total
Residential	35.8	11.4	47.5	14.9
Commercial	3.5	1.1	2.2	0.7
Manufacturing	4.4	1.5	3.0	1.0
Trans., Comm., Utilities	10.8	3.5	9.4 (1)	2.9
Public and Semi Public Bldgs.	8.6	2.6	0.7	0.2
Open Space	15.5	5.0	8.4	2.6
Auto Parking	0.3	0.1	---	---
Highways-Streets	19.4	6.2	28.8	9.0
Total Developed	100.0	31.5	100.0	31.3
Vacant or Undeveloped		68.5		68.7
TOTAL		100.0		100.0

LAND USE	ATLANTA, 1961 (1,238,634 acres) Percent of Developed Land	ATLANTA, 1961 (1,238,634 acres) Percent of Total	WASHINGTON, D.C. 1968 (Cordon Area) Percent of Developed Land	WASHINGTON, D.C. 1968 (Cordon Area) Percent of Total
Residential	51.7	9.6	41.6	18.3
Commercial	3.9	0.7	4.7	2.1
Manufacturing	5.0	1.0	3.5	1.5
Trans.-Comm., Utilities	(see above)	---	--- (2)	---
Public and Semi-Public Bldgs.	4.2	0.8	19.5	8.6
Open Space	6.1	1.1	11.2	4.9
Streets and Alleys	29.1	5.4	19.5	8.6
Total Developed	100.0	18.6	100.0	44.0
Vacant or Undeveloped		81.4		56.0
TOTAL		100.0		100.0

(1) Service.
(2) Including streets.
Note: Parking and miscellaneous not identified.
SOURCE: Comprehensive Metropolitan Area Transportation Studies.
Note: Additional land-use tabulations are contained in Table 5-2 Traffic and Transportation Engineering Handbook.

Table C-3

LAND-USE COMPARISONS-VARIOUS URBAN AREAS

LAND USE CATEGORY	URBAN AREAS Percent of Developed Land				
	Atlanta (1953)	Memphis (1964)	Mobile (1967)	St. Louis (1960)	Birmingham (1965) (d)
Residential	50.2	37.2	62.8	45.6	49.2
Commercial	2.9	4.1	3.1	3.6	2.7
Manufacturing Light Industry) Heavy Industry)	5.3	7.1 (a)	4.4	4.8	8.4
Trans.-Commun.-Utilities-Railroads	3.2	7.3 (b)	1.6	2.8	3.1
Parks and Playgrounds (Open Space)	5.1	--	3.6	7.1	3.5
Public and Semi-Public Buildings	11.9	27.1 (c)	9.0	18.1	11.0
Streets	21.4	17.2	15.5	18.0	22.1
TOTAL	100.0	100.0	100.0	100.0	100.0

(a) Includes wholesale and warehouse land uses.
(b) Includes all transportation, utilities, communcations land uses.
(c) Includes parks and playgrounds.
(d) Based on developed area of 101,556 acres, including streets and railroads.

SOURCE: Land Use Statistics compiled by Harland Batholomew and Associates.

Table C-4

CHICAGO AREA TRANSPORTATION STUDY TRIP COMPARISONS

(1956-1970)

	ILLINOIS		INDIANA
	1956[1] Survey	1970[2] Survey	1971[3] Survey
Population/D.U.	3.1	3.05	3.38
Percent White	N.A.	80.7	81.0
Percent Non-white	N.A.	19.3	19.0
Age 16 or over (percent of pop.)	71.6	68.4	66.5
Licensed of Age 16 or Older	54	67.2	76.5
Household Income Distribution			
Under $3,000	N.A.	10.1	10.2
$3,000 to $9,000	N.A.	27.0	29.3
greater than $9,000	N.A.	45.1	42.6
Unknown		17.8	17.9
TOTAL		100.0	100.0
Auto/D.U.	0.81	1.04	1.38
Trips/D.U.	6.1	7.2	9.9
Tripmakers/D.U.	N.A.	1.7	2.0
Trips/Tripmakers	N.A.	4.2	4.8
Trips/Person-Age 5	2.0	2.6	3.2
Average Trip Time (all modes)[4]	N.A.	19 min.	19 min.
Average Trip Length (all modes)[4]	4.3 mi.	5.17 mi.	6.49 mi.
Average Auto Driver Trip Length	3.9 mi	5.18 mi.	6.54 mi.
Average Driver Trips/Auto Owned	3.7	4.97	4.46
"Purpose To" Distribution (Percent)			
Home	43.5	42.6	40.5
Work	20.5	15.3	11.2
Business Related to Work[5]		3.2	2.8
Shop	5.5	12.5	12.3
School	1.9	3.7	3.5
Social Recreation	14.8	12.9	20.9
Personal Business	10.3	6.7	5.8
Other (includes serves Pass.)	3.5	3.1	3.0
TOTAL	100.0	100.0	100.0

(1) The CATS 1956 study area consisted of the county of Cook and part of Lake and DuPage counties. The survey period was from April to October.
(2) The 1970 study area consists of Cook, DuPage, Kane, Lake, McHenry, and Will counties. The survey period was from June to December.
(3) The study area consists of Lake and Porter counties in Indiana.
(4) Excludes walk to work and work at home.
(5) In the 1956 survey business related to work was included as a "to work" trip.

SOURCE: Chicago Area Transportation Study.

Table C-5

TRIPS BY PRIORITY MODE (THOUSANDS) - 1956 and 1970 PERSON TRIPS
(1956 STUDY AREA ONLY) (1)

Chicago Area Transportation Study

PRIORITY MODE	1956 TRIPS	1956 PERCENT	1970 TRIPS	1970 PERCENT
Auto Driver	4,811	48.4	7,492	57.8
Auto Passenger (2)	2,706	27.3	3,482	26.9
Suburban Railroad	246	2.5	213	1.6
Rapid Transit	479	4.8	501	3.9
Bus (3)	1,686	17.0	1,262	9.8
TOTAL	9,931	100.0	12,950	100.0

(1) Includes only trips with origin, destination, and residence inside the 1956 study area.
(2) Includes taxi passengers.
(3) Includes school bus trips.
SOURCE: Chicago Area Transportation Study.

Table C-6

PERSON TRIPS BY TRIP PURPOSE (THOUSANDS) - 1956 and 1970
(1956 STUDY AREA ONLY) [a]

Chicago Area Transportation Study

TRIP PURPOSE TO	1956 Trips	1956 Percent	1970 Trips	1970 Table 565 A	1970 Percent
Home	4,319	43.5	5,621	5,653	43.5
Work	2,033	20.4	2,378	2,529	18.5
Shop	547	5.5	1,643	1,644	12.6
School	193	1.9	472	474	3.6
Social-Recreational	1,476	14.9	1,598	1,601	12.3
Personal Business	1,022	10.3	839	842	6.5
Other	341	3.5	399	400	3.0
TOTAL	9,931	100.0	12,950	13,142	100.0

[a] Includes only trips with origin, destination, and residence inside the 1956 study area.

NOTE: Does not include walk to work or work at home.

SOURCE: Chicago Area Transportation Study.

Table C-7

BASIC DIMENSIONS OF CHANGE, 1949-1970

Minneapolis-St. Paul

	1949	1958	1970	PERCENT INCREASE OR DECREASE '49 to '58	'58 to '70	'49 to '70
Land Area Within Study Boundaries (Sq. Miles)	(Est.) 200	889.8	2,968			
Population Resident Within Study Area	(Est.) 940,000	1,376,865	1,874,670	46.0	36.0	99.0
Person Trips Per Average Day	1,675,681	3,366,919*	5,095,040**	100.9	51.0	204.0
Average Trip Arrivals In CBD's*	313,192	312,112	269.868	-.3	-13.5	-13.8
Average Daily Transit Trips	431,701	252,500***	161,559	-41.5	-36.0	-62.6
Estimated Vehicle Miles Traveled Per Day	N.A.	7,500,000++	23,828,725		218.0	
Estimated Interstate Freeway Route Miles	0	0	140+			
Average Daily Trips Per Person	1.78	2.45	2.72	38.0	11.0	53.0

*Includes external trips

**All trips generated by residents of the 7-county study area

***The Role of Mass Transit, Twin Cities Metropolitan Area, March 1963, State of Minnesota, Dept. of Highways, P.7

+Estimate, Minnesota Highway Department

++Estimate, Metropolitan Council Staff

SOURCE: Metropolitan Council, A Summary Report of Travel in the Twin Cities Metropolitan Area, 1974.

Table C-8

COMPARISON BETWEEN THE 1953 AND 1965 TRAVEL SURVEY STUDY AREAS-SOUTHEAST MICHIGAN (DETROIT)

Selected Demographic and Tripmaking Characteristics

CHARACTERISTIC	STUDY AREA 1953	1965
Population	2,968,875	4,041,809
Area (square miles)	709	2,530
Density (persons per square mile)	4,188	1,597
Households (occupied D.U.'s)	895,835	1,146,136
Cars Available (Cars Owned-1965)	845,815	1,510,062
Cars Available per Household	0.95	1.32
Persons per Household	3.33	3.53
Total Factored Person Trips per Household	6.27	8.56
Home-Based Person Trips per Household	4.65	6.64
Home-Based Work Trips per Household	2.05	2.43

SOURCE: Southeast Michigan Council of Governments.

B. TRIP GENERATION - TRIP PRODUCTION
(Also Includes D - TRIP PURPOSE)

(Alphabetical by Metropolitan Area)

Table C- 9

COMPARISON TABLE OF TRIP GENERATION RATES FOR STATEWIDE MODEL FOR URBAN AREA STUDIES (INCLUDES OVERLAP), CALIFORNIA

Trip Type: TOTAL

TRIPS PER HOUSING UNIT Vehicle = Auto+Taxi+Pickup	LARTS 1967 7 Day	Stockton 1967 7 Day	Sacramento 1969 7 Day	San Diego 1966 7 Day	SCOTS 1964 5 Day	Bakersfield 1965 5 Day	Eureka 1963 5 Day	BATS 1965 7 Day	Stanislaus 1970 7 Day	Salinas-Monterey 1970 7 Day	Fresno 1970 7 Day
0 VEHICLES											
Single	.06	.08	.12	.13	.04	.16	.15	.11	.09	.05	.17
Multiple	.07	.11	.05	.20	.12	.10	.49	.05	.12	.14	.22
Group	.06	.03	.02	.20	.06	.07	0	.08	.02	.11	.01
Multiple + Group	.07	.06	.04	.20	.10	.09	.27	.05	.07	.12	.13
Single + Multiple	.07	.10	.09	.16	.09	.15	.27	.07	.10	.08	.19
TOTAL	.07	.07	.07	.18	.08	.14	.21	.07	.84	.10	.15
1 VEHICLE											
Single	3.74	3.88	3.98	4.04	4.72	5.42	5.80	4.95	4.05	4.05	3.93
Multiple	3.46	4.12	3.74	3.74	4.36	4.89	4.86	4.27	4.36	4.46	4.26
Group	2.39	1.98	1.91	2.27	3.65	5.52	3.50	4.11	2.21	2.36	2.54
Multiple + Group	3.39	3.74	3.56	3.40	4.28	4.92	4.68	4.26	4.26	3.99	4.09
Single + Multiple	3.62	3.94	3.90	3.94	4.58	5.33	5.60	4.68	4.11	4.19	4.03
TOTAL	3.58	3.84	3.84	3.79	4.53	5.33	5.53	4.67	4.09	4.03	3.99
2+ VEHICLES											
Single	7.04	7.27	6.97	7.91	9.39	10.17	10.32	8.20	7.73	7.85	7.71
Multiple	6.11	7.02	6.45	6.69	9.06	9.16	8.80	6.91	7.09	7.12	7.16
Group	4.19	2.87	3.89	3.19	8.12	5.50	10.45	13.08	3.26	5.13	4.10
Multiple + Group	6.06	6.89	6.39	6.50	8.95	9.11	8.98	7.17	7.00	6.99	7.10
Single + Multiple	6.89	7.25	6.91	7.79	9.34	10.12	10.21	8.00	7.70	7.78	7.64
TOTAL	6.88	7.24	6.90	7.76	9.32	10.12	10.22	8.01	7.70	7.76	7.64
DWELLING UNITS											
Single	5.37	5.34	5.49	5.74	6.74	7.42	7.52	6.44	5.83	5.89	5.83
Multiple	3.27	3.38	3.64	3.50	4.07	4.55	4.56	3.61	4.26	6.45	4.23
Group	.82	.36	.61	.82	1.72	1.17	1.80	5.96	.34	1.04	.71
Multiple + Group	2.98	2.14	3.10	2.44	3.57	4.06	3.91	3.68	3.48	3.24	3.58
Single + Multiple	4.67	4.96	5.07	5.19	5.92	7.07	7.03	5.51	5.65	5.55	5.48
	4.50	4.41	4.86	4.59	5.59	6.95	6.78	5.51	5.50	5.04	5.25
TOTAL	300,414	300,578	300,457	300,462	300,472	300,476	300,469	800,517 800,518	300,718	300,918	301,180

Table C- 9 (contd)

Comparison Table of Trip Generation Rates for Statewide Model for Trip Type Total

Urban Area Studies (includes overlap)

DRIVER TRIPS PER VEHICLE Vehicle = Auto+Taxi+Pickup	LARTS 1967 7 Day	Stockton 1967 7 Day	Sacramento 1969 7 Day	San Diego 1966 7 Day	SCOTS 1964 5 Day	Bakersfield 1965 5 Day	Eureka 1963 5 Day	BATS 1965 7 Day	Stanislaus 1970 7 Day	Salinas-Monterey 1970 7 Day	Fresno 1970 7 Day
1 VEHICLE											
Single	3.74	3.88	3.98	4.04	4.72	5.42	5.80	5.24	4.05	4.05	3.99
Multiple	3.46	4.12	3.74	3.74	4.36	4.89	4.86	4.90	4.36	4.46	4.26
Group	2.39	1.98	1.91	2.27	3.65	5.52	3.50	4.69	2.21	2.36	2.54
Multiple + Group	3.39	3.74	3.56	3.40	4.28	4.92	4.68	4.90	4.26	3.99	4.03
Single + Multiple	3.62	3.94	3.90	3.94	4.58	5.33	5.60	5.13	4.10	4.19	4.09
Total	3.58	3.84	3.84	3.79	4.53	5.33	5.53	5.12	4.09	4.03	3.99
+ VEHICLE											
Single	3.12	3.21	3.05	3.49	4.20	4.46	4.61	3.56	3.32	3.46	3.30
Multiple	2.86	3.30	3.00	3.10	4.11	4.00	4.07	3.27	3.28	3.38	3.33
Group	1.81	1.43	1.64	1.50	3.83	2.75	4.42	5.48	1.36	2.44	1.82
Multiple + Group	2.84	3.25	2.97	3.01	4.08	3.98	4.12	3.39	3.22	3.32	3.30
Single + Multiple	3.08	3.22	3.04	3.45	4.19	4.44	4.57	3.52	3.32	3.36	3.30
Total	3.07	3.21	3.04	3.44	4.19	4.44	4.57	3.53	3.31	3.45	3.30
ALL VEHICLES											
Single	3.25	3.37	3.24	3.64	4.33	4.70	4.93	3.92	3.47	3.60	3.43
Multiple	3.20	3.80	3.38	3.53	4.30	4.52	4.64	4.06	3.86	4.08	3.80
Group	2.36	2.07	1.90	2.65	3.80	5.32	3.88	5.23	2.00	2.54	2.42
Multiple + Group	3.16	3.60	3.29	3.38	4.24	4.55	4.54	4.11	3.79	3.81	3.49
Single + Multiple	3.24	3.42	3.26	3.62	4.32	4.68	4.90	3.94	3.50	3.68	3.72
Total	3.23	3.40	3.25	3.59	4.31	4.68	4.88	3.95	3.49	3.65	3.48
Source Tab #	300,414	300,578	300,457	300,462	300,472	300,476	300,469	800,517 800,518	300,718	300,918	301,180

SOURCE: California Department of Transportation,

Table C-10

EFFECT OF CAR OWNERSHIP ON AVERAGE NUMBER OF TRIPS PER HOUSEHOLD BY TRIP PURPOSE

Cincinatti Urbanized Area, 1965

TRIP PURPOSE	ZERO-CAR HOUSEHOLDS	ONE-CAR HOUSEHOLDS	MULTI-CAR HOUSEHOLDS	RATIO ONE/NON	RATIO MULTI/ONE
Home-Based Work	0.62	1.66	2.49	2.68	1.50
Home-Based Shopping	0.37	1.05	1.58	2.84	1.50
Home-Based Social-Recreational	0.30	1.11	2.10	3.70	1.89
Home-Based School (1)	0.17	0.44	1.04	2.59	2.36
Home-Based Other	0.32	0.87	1.58	2.71	1.81
SUBTOTAL	1.78	5.13	8.79	2.88	1.71
Non Home-Based	0.19	1.37	2.86	7.20	2.09
ALL PURPOSES	1.97	6.50	11.65	3.30	1.79

(1) Based on trip and household data from households interviewed during school year.

SOURCE: Ohio-Kentucky-Indiana (OKI) Urban Transportation Study, Regional Transportation and Development Plan. Wilbur Smith and Associates, 1968

Table C-11

RELATIONSHIP OF AVERAGE HOUSEHOLD INCOME AND HOUSEHOLD TRIP RATES FOR CAR OWNING HOUSEHOLDS

Cincinnati Urbanized Area, 1965

AVERAGE INCOME (dollars)	ONE-CAR HOUSEHOLDS (trips per household)	MULTI-CAR HOUSEHOLDS	RATIO MULTI/ONE
Less than 6,500	5.23	9.29	1.78
6,500 to 7,499	6.14	11.10	1.81
7,500 to 8,499	6.36	10.52	1.65
8,500 to 9,999	7.05	12.00	1.70
10,000 to 13,999	7.42	13.08	1.76
14,000 and over	6.31	14.58	2.31
ALL INCOMES	6.50	11.65	1.79

SOURCE: Ohio-Kentucky-Indiana Urban Transportation Study
Regional Transportation and Development Plan
Wilbur Smith and Associates, 1968

Table C-12

TRIP GENERATION BY HOUSEHOLD TYPE
AND VEHICLE OWNERSHIP

Los Angeles, 1967

A. PERSON TRIPS PER HOUSEHOLD BY VEHICLE OWNERSHIP AND HOUSING UNIT TYPE (WEEKDAY)

Los Angeles, 1967

HOUSING UNIT TYPE	VEHICLE OWNERSHIP 0	1	2+	TOTAL
Singles	1.3	6.3	11.0	8.7
Multiples	1.5	5.2	8.9	5.4
Group Quarters	0.5	2.8	5.6	1.3
TOTAL	1.2	5.8	10.7	7.2

B. VEHICLE DRIVER TRIPS PER HOUSEHOLD BY VEHICLE OWNERSHIP AND HOUSING UNIT TYPE (WEEKDAY)

Los Angeles, 1967

HOUSING UNIT TYPE	VEHICLE OWNERSHIP 0	1	2+	TOTAL
Singles	0.1	4.1	8.1	6.1
Multiples	0.1	3.8	7.1	3.7
Group Quarters	0.1	2.4	4.4	0.8
TOTAL	0.1	3.9	7.9	5.1

SOURCE: Los Angeles Regional Transportation Survey LARTS Base Year Report 1967, Origin-Destination Survey, 1971.

Table C-13

TRIP GENERATION BY FAMILY SIZE AND HOUSEHOLD INCOME

Los Angeles, 1967

A. TRIP GENERATION BY HOUSEHOLD INCOME (WEEKDAY)

Los Angeles, 1967

Household Income (1967 dollars)	Percent Households	Percent Person Trips	Person Trips Per Hsld.	Driver Trips Per Hsld.
Less than 3,000	10.2	2.8	2.2	1.1
3,000 - 3,999	7.0	3.3	3.8	2.2
5,000 - 4,999	8.6	6.7	6.2	4.3
6,000 - 5,999	9.3	8.3	7.0	4.9
7,000 - 7,999	8.8	8.8	7.9	5.5
8,000 - 8,999	8.0	9.0	8.9	6.3
9,000 - 9,999	8.0	9.5	9.4	6.8
10,000 - 12,499	12.0	16.5	10.9	7.8
12,500 - 14,999	8.1	11.8	11.5	8.4
15,000 - 19,999	6.8	10.0	11.8	8.7
20,000 - 24,999	2.7	4.0	11.8	8.8
Over 25,000	2.8	4.3	12.1	9.1

B. TRIP GENERATION BY FAMILY SIZE (WEEKDAY)

Los Angeles, 1967

Family Size (persons)	Percent of Households	Person Trips Per Household	Person	Driver Trips Per Household	Person
1	21.9	2.3	2.3	1.8	1.8
2	29.6	5.8	2.9	4.4	2.2
3	15.7	8.5	2.8	6.4	2.1
4	14.8	10.3	2.6	7.2	1.8
5	9.5	11.5	2.3	7.4	1.5
6 or more	8.5	12.9	1.9	7.6	1.1

SOURCE: Los Angeles Regional Transportation Survey - LARTS Base Year Report 1967, Origin-Destination Survey, 1971.

Table C-14

WEEKDAY TRIPS PER PERSON BY PURPOSE BY INCOME
Tri-State Area (N.Y.), 1963

	Household Income[a]									
	$0–2,999		$3,000–5,999		$6,000–9,999		$10,000+		Total	
Trip Purpose	Elderly	Total Population[b]	Elderly	Total Population[b]	Elderly	Total Population[b]	Elderly	Total Population[b]	Elderly	Total Population[b]
Home	0.22	0.35	0.36	0.59	0.41	0.84	0.55	1.00	0.35	0.77
Work	0.03	0.13	0.10	0.34	0.20	0.46	0.28	0.58	0.12	0.42
Shop	0.09	0.07	0.13	0.10	0.11	0.18	0.15	0.21	0.11	0.15
School	0.00	0.04	0.00	0.07	0.00	0.12	0.00	0.15	0.00	0.11
Social	0.05	0.06	0.07	0.07	0.07	0.08	0.06	0.10	0.06	0.08
Recreational	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.06	0.02	0.04
Personal Business	0.08	0.10	0.11	0.10	0.10	0.14	0.16	0.21	0.10	0.15
Other[c]	0.00	0.01	0.02	0.02	0.02	0.06	0.04	0.10	0.03	0.06
TOTAL	0.49	0.77	0.81	1.31	0.93	1.92	1.27	2.41	0.79	1.78

[a] Income of household of which a person is a member.
[b] Population over five years old..
[c] Ride, Serve Passenger trips without a primary trip purpose, and out-of-cordon change mode trips.

SOURCE: Joni K. Markovitz, "Transportation Needs of the Elderly", Traffic Quarterly, April, 1971.

Table C-15

PERSON TRIPS RELATED TO CHARACTERISTICS OF HOUSEHOLDS, 1965
San Francisco Bay Area

Household classification	Total person trips		Percent distribution of person trips by mode				Percent person trips in autos by auto drivers
	Trips/ household	Trips/ person	Auto	Transit	Walk or other	Total	
Residential density class							
Under 10 DUs/acre	9.0	2.7	81.9	4.9	13.2*	100.0	----
10-30 DUs/acre	7.3	2.5	67.0	13.8	19.2*	100.0	----
Over 30 DUs/acre	6.8	3.4	41.9	21.0	37.1*	100.0	----
D. U. structure class							
Single unit	10.4	2.9	77.3	5.7	17.0	100.0	68.7
2-19 units	6.6	2.6	66.6	11.7	21.7	100.0	72.3
20 or over units	6.1	3.3	60.4	12.0	27.7	100.0	64.3
Income class							
Less than $5,000	5.5	2.4	59.9	10.6	29.6	100.0	64.1
$5,000-$7,000	8.1	2.7	72.4	7.9	19.7	100.0	68.4
$7,000-$9,000	9.2	2.8	75.3	6.0	18.7	100.0	67.9
$9,000-$12,500	11.2	3.1	77.3	5.8	16.9	100.0	69.7
$12,500 and over	12.6	3.4	80.2	5.6	14.2	100.0	71.5
Car availability class							
No cars available	3.9	2.0	17.9	30.5	51.5	100.0	7.8
One car available	8.1	2.7	73.1	7.5	19.5	100.0	67.2
Two cars available	11.4	3.4	80.4	4.6	15.0	100.0	71.9
Three or more cars available	14.2	3.4	85.5	3.5	11.0	100.0	74.4

* Walk only.

SOURCE: Bay Area Transportation Study.

Table C-16

PERSON TRIPS PER HOUSEHOLD

ACCORDING TO HOME OWNERSHIP, SOUTHEAST MICHIGAN, 1965

HOME OWNERSHIP	TOTAL[1]	DETROIT	OTHER WAYNE	OAKLAND	MACOMB
Own or buying	9.0	6.8	8.6	10.4	10.2
Rent	5.4	4.1	7.0	7.8	8.0
Other	6.6	3.7	7.7	9.5	8.2
Trip Average	8.0	5.7	9.3	9.9	9.7
Number of Interviews	41,364	17,173	10,522	7,941	5,232

(1) Includes interviews in Washtenaw, Monroe, Livingston, and St. Clair Counties.

SOURCE: Pampu, D.A., and Tartoni, G.J., Weekday Travel Patterns in the Detroit Region 1965, Dearborn Campus-The University of Michigan, June 1968.

Table C-17

PERSON TRIPS PER HOUSEHOLD

ACCORDING TO NUMBER OF CARS AVAILABLE

Southeast Michigan, (Detroit) 1965

NUMBER OF CARS AVAILABLE	TOTAL[1]	DETROIT	OTHER WAYNE	OAKLAND	MACOMB
None	1.7	1.7	1.5	1.8	1.5
One	6.9	5.7	7.8	7.7	8.0
Two	11.1	9.3	11.8	12.0	11.6
Three or more	17.1	13.8	19.4	18.3	17.1
Trip Average	8.0	5.7	9.3	9.9	9.7
Number of Interviews	41,364	17,173	10,522	7,941	5,232

(1) Includes interviews in Washtenaw, Monroe, Livingston, and St. Clair Counties.

SOURCE: Pampu, D.A., and Tartoni, G.J., Weekday Travel Patterns in the Detroit Region 1965, Dearborn Campus-The University of Michigan, June 1968.

Table C-18

HOUSEHOLD TRIPMAKING BY LIFE STYLE

Southeast Michigan, (Detroit) 1965

LIFE CYCLE	HOUSEHOLD LOCATION					
	Detroit	Rest of Wayne	Oakland	Macomb	Rest of Study Area	Study Area
Unmarried, No Children, Under 45	3.9(1)	5.4	7.3	7.1	5.6	4.8
Married, No Children, Under 45	6.0	8.7	8.7	8.3	7.3	7.5
Youngest Child Aged 0-4	7.4	10.9	11.0	10.8	10.2	9.8
Youngest Child Aged 5-17	9.4	13.7	15.0	14.1	14.3	12.7
Youngest Child 18 or Older	8.0	10.9	11.6	10.9	10.6	9.6
Married, No Children, Over 45	4.4	6.2	6.3	6.0	5.4	5.4
Unmarried, No Children, Over 45	1.9	2.5	3.2	2.8	1.4	2.2
Average	6.1	10.0	10.6	10.6	9.6	8.5

(1) Person Trips per Household

SOURCE: Base Year Travel Survey, October 1969
With assistance of the Center for Urban Studies, University of Michigan, Dearborn Campus.

Table C-19

WASHINGTON, D.C. METROPOLITAN AREA TRIP GENERATION BY CAR OWNERSHIP

A. HOME AND WORK PERSON TRIPS PER HOUSEHOLD

ITEM	BY AUTO	BY BUS	TOTAL	PERCENT BUS
No Car	0.30	0.88	11.8	74.5
One Car	1.48	0.30	1.78	16.7
Two Cars	2.17	0.10	2.27	4.5
Three or More	3.11	0.09	3.20	2.8
ALL HOUSEHOLDS	6.31	0.50	6.81	7.3

B. AVERAGE NON-WORK TRIPS PER HOUSEHOLD

No Car	0.40	0.50	0.90	55.5
One Car	4.00	0.10	4.10	2.4
Two Cars	7.30	0.10	7.40	1.4
Three or More	10.80	0.10	10.90	0.9
ALL HOUSEHOLDS	4.70	0.16	4.86	3.2

C. ALL TRIPS - SUM

No Car	0.70	0.38	2.08	66.3
One Car	5.48	0.40	5.88	7.3
Two Cars	9.47	0.20	9.67	2.1
Three or More	13.91	0.19	14.10	1.3
ALL HOUSEHOLDS	11.01	0.66	11.67	5.7

* As auto drivers or passengers.

SOURCE: 1968 Home Interview Survey. Statistics exclude households in rural parts of Loudoun, Prince William, Montgomery, and Prince George's Counties outside of the study area cordon.

C. TRIP GENERATION - TRIP ATTRACTION

Table C-20

SUMMARY

VEHICLE TRIP GENERATION RATES AND PEAK-HOURS BY LAND USE

ITEM	MEAN	RANGE
Residential Subdivisions (Single Family)		
Trips Per Dwelling Unit	10.6	6.6 - 16.2
Trips Per Person	2.8	1.6 - 5.2
A.M. Peak Hour (AWD)	7.9%	4.9 - 13.4%
P.M. Peak Hour (AWD)	10.1%	7.9 - 12.2%
Apartments		
Trips Per Apartment	6.8	4.8 - 8.9
A.M. Peak Hour (AWD)	8.0%	5.9 - 10.7%
P.M. Peak Hour (AWD)	10.2%	7.8 - 15.2%
High Schools		
Trips Per Student	1.7	1.1 - 2.4
Trips Per 1000 SF G.F.A.	12.5	10.3 - 17.0
A.M. Peak Hour (AWD)	20.8%	13.0 - 25.2%
P.M. Peak Hour (AWD)	15.1%	12.6 - 17.8%
Golf Courses		
Trips Per G.L.A. (Acres)	5.4	2.3 - 8.9
Trips Per Parking Space	4.0	2.3 - 6.5
Sunday Peak Hour	12.0%	6.0 - 15.4%
AWD Peak Hour	10.6%	8.4 - 11.9%
Saturday Peak Hour	13.7%	7.0 - 23.4%
Rest Homes and Chronic and Convalescent Homes		
Trips Per Bed	2.7	1.9 - 4.0
Trips Per Employee	5.0	2.5 - 9.7
Employees Per Bed	0.57	0.22- 0.96
P.M. Peak Hour (AWD)	13.8%	9.6 - 16.7%
Industrial Parks		
Trips Per 10000 SR G.F.A.	79.6	41.6 -108.9
Trips Per Employee	4.5	2.3 - 8.8
G.F.A./G.L.A.	0.16	0.04- 0.42
A.M. Peak Hour (AWD)	13.0%	8.6 - 18.7%
P.M. Peak Hour (AWD)	13.7%	8.0 - 25.3%

NOTE: One-Way Vehicle Trips.

SOURCE: Zevin, I., Trip Generation Study of Various Land Uses Connecticut Department of Transportation, June, 1974.

Table C-21
SUMMARY OF TRIP GENERATION RATES FOR

AVERAGE RESIDENTIAL USES

TYPE USE	ONE-WAY VEHICLE TRIPS PER DWELLING
SINGLE FAMILY DWELLINGS	9.51
LOW VALUE (<$25,000)	9.52
($25-50,000) MEDIUM VALUE	11.00
HIGH VALUE (>$50,000)	15.58
(<2.5 D.U./Acre) LOW DENSITY	8.87
2.5-5.0 D.U./Acre) MEDIUM DENSITY	9.72
(>5.0 D.U./Acre) HIGH DENSITY	8.69
APARTMENTS	6.89
HIGH-RISE APARTMENTS (>4 Floors)	7.78
MOBILE HOME PARKS	6.09
RETIREMENT COMMUNITIES	3.27
CONDOMINIUMS	4.97

SOURCE: TRIP GENERATION BY LAND USE - PART I
Maricopa Association of Governments - 1974.
Trips to or from area = twice destinations.

Table C-22
SUMMARY OF TRIP GENERATION RATES FOR
AVERAGE COMMERCIAL USES

TYPE USE	ONE-WAY VEHICLE TRIPS PER				
	1000 GFA	ACRE	EMPLOYEE	ROOM	SEAT
FREE STANDING RETAIL	44.99	----	31.73	----	----
AUTO SUPPLY	88.75	----	----	----	----
DEPARTMENT STORES	36.12	----	32.76	----	----
DISCOUNT STORES	35.84	----	40.84	----	----
DISCOUNT STORES WITH SUPERMARKETS	81.21	----	30.31	----	----
NEW CAR DEALERS	44.31	----	----	----	----
SUPERMARKETS	135.30	----	----	----	----
SHOPPING CENTERS	42.07	444.94	23.35	----	----
(<200,000 GFA) ZERO GENERATOR	63.77	816.57	32.42	----	----
(350-400,000 GFA) ONE GENERATOR	42.65	393.39	20.31	----	----
TWO + GENERATOR	46.34	397.70	22.09	----	----
UNDER 500,000 Sq. Ft.	45.88	330.75	20.57	----	----
500,000 to 1,000,000 Sq. Ft.	34.71	368.49	20.35	----	----
OVER 1,000,000 Sq. Ft.	33.50	578.62	30.86	----	----
HOTELS/MOTELS WITH CONVENTION FACILITIES	----	156.45	----	9.20	----
MOTELS WITHOUT (<50 Units) CONVENTION FACILITIES	----	64.34	----	5.56	----

SOURCE: TRIP GENERATION BY LAND USE - PART I
Maricopa Association of Governments - 1974.
Trips to or from area = twice destinations.

(Continued)

Table C-22 (cont.)

SUMMARY OF TRIP GENERATION RATES FOR
AVERAGE COMMERCIAL USES

TYPE USE	ONE-WAY VEHICLE TRIPS PER				
	1000 GFA	ACRE	EMPLOYEE	ROOM	SEAT
SIT DOWN RESTAURANTS	233.19	1097.29	----	----	0.67
FAST FOOD RESTAURANTS	553.04	1824.59	----	----	----
OFFICES	12.56	225.61	----	----	----
GENERAL	10.32	145.05	----	----	----
MEDICAL	52.79	426.38	----	----	----
GOVERNMENTAL	27.68	66.25	----	----	----
ENGINEERING	22.99	281.79	----	----	----

Table C-23

SUMMARY OF TRIP GENERATION RATES FOR

AVERAGE INDUSTRIAL USES

TYPE USE	ONE-WAY VEHICLE TRIPS PER			
	1000 GFA	ACRE	EMPLOYEE	INDIVIDUAL SITE
FREESTANDING GENERAL MANUFACTURING	4.37	27.85	2.34	----
(200-400. Employees UNDER 500,000 Sq. Ft.	4.94	21.98	2.88	----
OVER 500,000 Sq. Ft.	4.20	31.55	2.20	----
WAREHOUSES	5.52	72.97	4.47	----
RESEARCH AND DEVELOPMENT	5.09	60.79	2.40	----
INDUSTRIAL PARKS	9.32	75.57	3.69	97.53

SOURCE: TRIP GENERATION BY LAND USE - PART I
Maricopa Association of Governments - 1974.
Trips to or from area = twice destinations.

Table C-24

SUMMARY OF TRIP GENERATION RATES FOR

AVERAGE RECREATIONAL USES

TYPE USE	ONE-WAY VEHICLE TRIPS PER			
	ACRE	1000 Ft. SHORE	SEAT	ATTENDEE
PARKS AND RECREATION	8.61	----	----	----
OCEAN FRONT	21.62	535.38	----	----
LAKE WITH BOATING	3.64	23.84	----	----
GENERAL RECREATION	17.41	----	----	----
MARINA	16.13	----	----	----
GOLF COURSES	5.67	----	----	----
WILDERNESS PARKS	0.07	----	----	----
BOWLING	296.30	----	----	----
PARTICIPANT SPORTS	26.54	----	----	----
NATIONAL MONUMENT	11.93	----	----	----
ANIMAL ATTRACTIONS	72.24	----	----	----
SPECTATOR SPORTS	----	----	0.26	1.13
PRO. BASEBALL	----	----	0.16	1.18
HORSE RACING	----	----	0.61	1.08

SOURCE: TRIP GENERATION BY LAND USE - PART I
Maricopa Association of Governments - 1974.
Trips to or from area = twice destinations.

Table C-25

SUMMARY OF TRIP GENERATION RATES FOR

AVERAGE INSTITUTIONAL USES

TYPE USE	ONE-WAY VEHICLE TRIPS PER		
	STUDENT	STAFF	BED
EDUCATIONAL	1.81	13.65	----
FOUR YEAR UNIVERSITIES	2.46	9.76	----
(2 Year Curriculum) JUNIOR COLLEGES	1.44	28.18	----
SECONDARY SCHOOLS	1.30	19.91	----
ELEMENTARY SCHOOLS	0.50	9.77	----
COMBINATION ELEMENTARY SECONDARY SCHOOL	0.74	10.95	----
HOSPITALS	----	6.10	14.75
GENERAL	----	5.93	13.98
CHILDRENS	----	10.08	25.20
CONVALESCENT	----	4.49	3.24
UNIVERSITY	----	7.85	36.96
VETERANS	----	2.17	3.75

SOURCE: TRIP GENERATION BY LAND USE - PART I
Maricopa Association of Governments - 1974.
Trips to or from area = twice destinations.

Table C-26

SUMMARY OF TRIP GENERATION RATES FOR

AVERAGE OTHER USES

TYPE USE	ONE-WAY VEHICLE TRIPS PER		
	MILITARY PERSONNEL	CIVILIAN EMPLOYEES	TOTAL PERSONNEL
MILITARY BASES	2.22	7.07	1.69

TYPE USE	ONE-WAY VEHICLE TRIPS PER		
	ACRE	BASED AIRCRAFT	TAKEOFF/ LANDING
GENERAL AVIATION AIRPORTS	3.57	5.80	2.01

SOURCE: TRIP GENERATION BY LAND USE - PART I
Maricopa Association of Governments - 1974.
Trips to or from area = twice destinations.

Table C-27

COMPARISON OF VEHICULAR AND PEDESTRIAN TRIP GENERATION BY RETAIL STORES

New York Metropolitan Area

	Trips entering and leaving during 24 Hrs per 1,000 sq ft (93 m^2) of fl. space	
Suburban shopping centers	Observed vehicle trips	Assumed person trips at 2.0 persons per vehicle
1. Average of 21 neighborhood centers (under 100,000 gross sq ft)	79	158
2. Average of 44 Community centers (100,000 - 499,999 gross sq ft)	56	112
3. Average of 23 regional centers (over 500,000 gross sq ft)	30	60

Urban establishments

Type	Location	Gross fl. space sq ft	Period of count	Observed person trips in and out on foot	% walk-only trips
4. Delicatessen	Manhattan	2,500	Sa. 10 A.M.-10 P.M.*	2,460	70
5. Supermarket	Queens	7,500	wk. day 9 A.M.-9 P.M.	428	n.a.
			Sa. 9 A.M.-9 P.M.	536	n.a.
6. Supermarket	Manhattan	5,100	Sa. 9 A.M.-6 P.M.	509	n.a.
7. Jun. dept. store	Manhattan	69,600	wk. day 9 A.M.-9 P.M.	385	n.a.
8. Supermarket	Manhattan	14,500	wk. day 9 A.M.-9 P.M.	372	n.a.
9. Supermarket	Richmond	7,500	wk. day 9 A.M.-9 P.M.	285	n.a.
10. Dept. store	Manhattan	176,700	wk. day 9 A.M.-9 P.M.	252	n.a.
11. Boutique	Manhattan	3,400	wk. day 11 A.M.-7 P.M.*	205	61
			Sa. 10 A.M.-6 P.M.	488	81

Sources: Lines 1-3, Tri-State Regional Planning Commission, *Trip Generation Rates.* Line 4, Leonard Lowell and Elizabeth Kline; Line 5, Leonard Huber; Line 6, Richard Goldfine; Line 8, John S. Mills; Line 9, Robert M. Greene; Line 11, Mary Ortiz and Karen Countryman: unpublished papers for New York University Graduate School of Public Administration. Lines 7 and 10, Regional Plan Association.
*Open beyond period of count shown.

SOURCE: Pushkarev, B. and Zupan, J. Urban Space for Pedestrians, 1976.

Table C-28 (A)

Comparison of Vehicular and Pedestrian Trip Generation by Offices and a Museum

	Location	Gross fl. space, sq ft	Trips entering and leaving during 24 Hrs per 1,000 sq ft (93 m²) of fl. space	
Suburban office buildings				
			Observed vehicle trips	Assumed person trips at 1.2 persons per auto
1.	New Jersey	186,000	17.9	21.5
2.	Maryland	170,000	17.5	21.0
3.	Long Island	1,180,000	15.0	18.0
4.	Virginia	836,000	8.9	10.7
Urban office buildings				
Type			% Walk-only trips	Observed person trips in and out on foot
5. Local use	Bronx	59,000	n.a.	58.0
6. Mixed use	Manhattan	314,000	n.a.	17.3
7. Headquarters	Manhattan	1,634,000	26	14.2
8. Headquarters	Manhattan	1,048,000	26	13.2
9. 24 bldgs.	Seattle	5,241,000	n.a.	15.4
10. Museum of Modern Art	Manhattan	227,000	26.8	21.0

Sources: Lines 1-4, Tri-State Regional Planning Commission, *Trip Generation Rates.* Line 5, William M. Murphy, unpublished paper for New York University Graduate School of Public Administration. Lines 6-8, Regional Plan Association. Line 9, Herbert S. Levinson, "Modeling Pedestrian Travel," mimeographed, Wilbur Smith and Associates, 1971. 10:00 A.M. to 6:00 P.M. outbound count converted to 24-hr in and out flow based on New York cyclical pattern. Line 10, David Johnson, "Museum Attendance in the New York Metropolitan Region," mimeographed, Regional Plan Association, 1967, and updated employment and attendance figures from the Museum of Modern Art.

Table C-28 (B)

Comparison of Vehicular and Pedestrian Trip Generation by Restaurants

Type	Location		Trips entering and leaving during 24 Hrs per 1,000 sq ft (93 m²) of fl. space	
Suburban establishments			Observed vehicle trips	Assumed person trips at 2.5 persons per vehicle
1. 2 restaurants	New Jersey		72.2	180
Manhattan establishments				
		Gross fl. space sq ft	Period of count	Observed person trips in and out on foot
2. Cafeteria	57th St.	7,200	wk. day 10 A.M.-8 P.M.*	492
3. Sandwich shop	Garment Dist.	1,000	wk. day 6 A.M.-3 P.M.	430
4. Restaurant	Times Sq.	12,000	wk. day 9 A.M.-9 P.M.*	173

Sources: Line 1, Tri-State Regional Planning Commission, *Trip Generation Rates.* Line 2, Harold Zombek and Line 3, Albert Herter: unpublished papers for New York University Graduate School of Public Administration. Line 4, Regional Plan Association.
*Open beyond period of count shown.

SOURCE: Pushkarev, B. and Zupan, J. Urban Space for Pedestrians, 1976.

Table C-29

COMPARISON OF VEHICULAR AND PEDESTRIAN PERSON TRIP GENERATION BY RESIDENCES

Location	No. of dwellings observed	Trips entering and leaving during 24 hrs. Vehicles, observed per dwelling	per resident	Persons in vehicles, assumed per resident	per 1,000 gross sq ft (93 m²)
Single family dwellings					
				(assume 1.6 persons per auto trip)	
1. Maryland	8,778	8.64	2.34	3.7	
2. California	5,719	9.49	2.56	4.1	
3. Long Island	208	11.40	2.41	3.9	
Suburban apartments					
				(assume 1.4 persons per auto trip)	
4. Virginia	2,508	7.58	3.45	4.8	
5. Maryland	3,029	7.30	3.17	4.4	
6. California	2,821	5.90	3.28	4.6	
Urban apartments					
		Trips entering and leaving during 24 hrs on foot, observed			
		per dwelling		per resident	per 1,000 gross sq ft (93 m²)
7. Manhattan, 30th St.	288*	7.6		4.5	8.3
8. Manhattan, 12th St.	136†	8.0		5.0	9.1

Sources: Lines 1-6, Tri-State Regional Planning Commission, *Trip Generation Rates*, Interim Technical Report 4365-4410, 1973. Line 7, Regional Plan Association. Line 8, Elaine Spevak, unpublished paper for New York University Graduate School of Public Administration.
*914.3 sq ft (85 m²) gross floor space per dwelling.
†882.4 sq ft (82 m²) gross floor space per dwelling.

SOURCE: Pushkarev, B. and Zupan, J. Urban Space for Pedestrians 1976

Table C-30

PEAK ACCUMULATION AND TURNOVER RATES AT SELECTED BUILDINGS

New York Metropolitan Area

Bldg. type	Trip rate per 1,000 sq ft (93 m^2) in and out	Gross fl. space in bldg. per person during peak accumulation sq ft (m^2)	Turnover rate (daily one-way trips per peak accumulation occupant
Super-market	536	73 (6.8)	19.7
Dept. store	252	76 (7.1)	9.6
Restaurant	173	36 (3.3)	3.2
Office	58	162 (15.0)	4.7
Office	17	320 (29.7)	2.7
Office	14	340 (31.5)	2.4
Office	13	330 (30.7)	2.3
Residence	8.3	544 (50.5)	2.3

SOURCE: Pushkarev, B. and Zupan, J., Urban Space for Pedestrians, 1976.

E. TRIP GENERATION - TRUCK TRIPS

Table C-31

GOLDEN TRIANGLE COMMERCIAL TRUCK TRIPS BY DESTINATION TRIP PURPOSE BY TRUCK TYPE
Pittsburgh, 1967

	DESTINATION TRIP PURPOSE							TOTAL	
TRUCK TYPE (1)	Pick Up Goods	Deliver Goods	Pick Up and Deliver	Go to Base Of Operations	Go to Garaging Address	Render a Service	Personal Business	Number	Per-cent
Light	436	3,216	520	405	143	449	0	5,169	54.01
Medium	758	1,770	551	703	59	139	10	3,990	41.69
Heavy	255	95	24	2	32	0	4	412	4.30
TOTAL NUMBER	1,449	5,081	1,095	1,110	234	588	14	9,571	100.00
TOTAL PERCENT	15.14	53.09	11.44	11.60	2.44	6.14	0.15	100.00	

(1) Includes Truck Survey results only

SOURCE: Southwest Pennsylvania Regional Planning Commission.

Table C-32

TRUCK CHARACTERISTICS
DALLAS - FORT WORTH CBD'S - 1972

A. TYPE OF VEHICLE AND SHIPMENT WEIGHT

TYPE	PER CENT	MEDIAN SHIPMENT WEIGHT (LBS.)
Passenger Car	18	6
Panel-Pickup Truck	10	8
Van	27	33
Single-Unit Truck	40	130
Tractor-Trailer	3	170
Other	2	180
TOTAL	100	

B. COMMERCIAL VEHICLE STOPS IN CBD

ITEM	PER CENT
Delivery of Commodities	58.8
Pickup of Commodities	15.7
Delivery and Pickup of Commodities	10.0
Securities	6.9
Service Calls	5.0
Correspondence	3.6
TOTAL	100.0

C. CBD COMMERCIAL SHIPMENT BY COMMODITY

ITEM	PER CENT
Food and Beverage	22.4
Instruments and Equipment	18.9
Paper and Printing Products	13.3
Apparel	4.9
Furniture	4.3
Other Commodities	21.7
Unclassified Small Parcels	12.5
Not Specified	2.0
TOTAL	100.0

SOURCE: On-site Surveys, A. M. Voorhees and Associates, Inc. and South Central Texas Council of Governments.

Table C-33

DAILY TRUCK STOP GENERATION BY RETAIL STORES AND RESTAURANTS
Toronto, 1970

TYPE OF STORE	NO. OF STORES SURVEYED	AVERAGE STOPS/ STORE/ DAY	MEDIAN STOPS/ STORE/ DAY	RANGE OF STOPS PER STORE
Photography	6	2.2	1.5	3 (low 1, high 4)
Drugs	2	2.5	2.5	3 (1 4)
Jewelry	4	2.5	2.0	4 (1 5)
Shores	8	1.9	1.0	3 (1 4)
Department (except large dept. store	2	18.0	18.0	2 (17 19)
Grocery/Supermarket	7	8.1	6.0	24 (1 25)
Music	4	2.5	1.5	5 (1 6)
Clothing-Textiles	14	2.6	1.0	10 (1 11)
Furniture-Applicances	10	8.0	3.5	34 (1 35)
Cigar-Discount-Variety	9	3.4	3.0	5 (1 6)
Total	66	Overall Av. 4.5	Overall Median 2.0	Range 34

SOURCE: Toronto Generalized Survey; Bates, M.V., Goods Movement By Truck in the Central Area of Selected Canadian Cities, Canadian Trucking Association, Ottawa, 1970.

F. TAXI TRIP CHARACTERISTICS

G-H-I. PERSON TRAVEL AND TRIP LENGTHS
VEHICLE TRIP LENGTHS
TRIP TIMES

- CHARACTERISTICS
- TRENDS

(Alphabetical by Metropolitan Area)

Table C-34

TAXI TRIPS BY DESTINATION TRIP PURPOSE TO DATA SUMMARY AREAS
Southwest Pennsylvania, 1967

Destination Data Summary Area (1)	DESTINATION TRIP PURPOSE																				Total	
	To Pick Up Fare		To Deliver Fare		To Deliver and Pick Up Fare		To Garaging Address		To Render A Service		To Base Of Operations		To Cruise		Driver's Personal Business		To Taxi Stand			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Golden Triangle	2,393	57.72	1,385	33.40	260	6.27	0	0.00	0	0.00	92	2.22	16	0.39	0	0.00	0	0.00	4,146	100.00
																				14.4%
Remainder of Pittsburgh	5,720	42.56	6,408	47.68	264	1.96	620	4.61	16	0.12	236	1.76	80	0.59	24	0.18	72	0.54	13,440	100.00
																				46.6%
Remainder of Allegheny County	3,058	43.09	3,318	46.74	330	4.65	178	2.51	0	0.00	106	1.49	20	0.28	12	0.17	76	1.07	7,098	100.00
																				24.6%
Remainder of Region within Home Interview Area	1,813	43.51	1,919	46.05	47	1.13	335	8.04	2	0.05	24	0.57	12	0.29	15	0.36	0	0.90	4,167	100.00
																				14.4%
Total %		45.01		45.16		3.12		3.93		0.06		1.59		0.44		0.18		0.51		100.00
Total Number	12,984		13,030		901		1,133		18		458		128		51		148		28,851	
																				100.0%

(1) See Figure 1.3 which delineates four data summary areas.

SOURCE: Southwest Pennsylvania Regional Planning Commission.

Table C-35

VEHICLE TRAVEL TIME AND DISTANCE
AVERAGES FROM TOTAL TRIP ASSIGNMENTS

California

STUDY	YEAR	AVERAGE VEHICLE MILES	AVERAGE VEHICLE MINUTES	AVERAGE VEHICLE MPH
Bakersfield	1970	3.87	6.76	34.38
Fresno	1971			
Work Trips		4.78	13.21	
Non-Work+Ext		3.94	9.71	
LARTS	1974			
Work Trips		9.24	20.19	27.50
Non-Work+Ext		6.40	11.75	32.71
Sacramento	1974			
Work Trips		6.99	12.49	33.57
Non-Work+Ext		5.64	9.19	36.84
San Diego	1975	7.17	11.58	37.22
San Joaquin Co.	1972	6.06	9.20	39.55
Santa Barbara Co.	1970	4.86	8.00	36.45
Monterey Co	1974	6.12	9.98	36.83
Stanislaus Co.	1975	5.12	7.55	40.74

SOURCE: California Trans.

Table C-36

TRIPS, PERSON MILES OF TRAVEL (THOUSANDS), AND AVERAGE TRIP LENGTH (MILES), BY TRIP PURPOSE - 1970 PERSON TRIPS

Chicago

PURPOSE TO	TRIPS	PERCENT	PERSON-MILES	PERCENT	AVERAGE TRIP LENGTH (MILES)
Home	7,904	42.4	41,798	43.7	5.3
Work	2,770[a]	14.9	18,519[1]	19.4	7.0[2]
Business Related To Work	580	3.1	4,276	4.5	7.4
Shop	2,324	12.5	6,955	7.3	3.0
School	678	3.6	2,097	2.2	3.1
Social-Recreational	2,560	13.8	14,560	15.2	5.7
Personal Business	1,224	6.6	5,486	5.7	4.5
Other	576	3.1	1,956	2.0	3.4
TOTAL	18,616	100.0	95,647	100.0	5.1

[1] Includes walk to work and work at home trips.
[2] Average trip length calculated with walk to work and work at home trips excluded.
SOURCE: Chicago Area Transportation Study.

Table C-37

AVERAGE TRIP LENGTH (MILES) BY TRIP PURPOSE AND LOCATION OF TRIP DESTINATION - 1970 PERSON TRIPS

Chicago Area

PURPOSE TO	CHICAGO CENTRAL AREA	CHICAGO (WITHOUT) CENTRAL AREA	SUBURBAN ILLINOIS	INDIANA	REGION
Home	5.6	4.9	5.3	6.3	5.3
Work (a)	9.9	6.2	5.9	7.4	7.0
Business Related to Work	6.9	8.3	7.0	7.7	7.4
Shop	6.8	2.6	2.9	4.1	3.0
School	8.4	4.3	2.3	3.0	3.1
Social/ Recreational	6.6	7,8	4.5	6.5	5.7
Personal Business	7.6	5.1	3.5	7.5	4.5
Other	6.4	5.3	2.1	6.2	3.4
TOTAL	8.4	5.3	4.6	6.1	5.1

(a) Walk to work and work at home trips excluded.
SOURCE: Chicago Area Transportation Study.

Table C-38

AVERAGE TRIP LENGTH (MILES) BY TRIP PURPOSE AND PRIORITY MODE
-1956 AND 1970 PERSON TRIPS (1956 STUDY AREA ONLY) (1)

Chicago

TRIP PURPOSE	AVERAGE TRIP LENGTH								
	Auto			Transit			TOTAL (2)		
	1956	1970	Percent Difference	1956	1970	Percent Difference	1956	1970	Percent Difference
Home	3.9	4.1	5.1	5.3	5.7	7.5	4.3	4.4	2.3
Work	4.8	5.9	22.9	6.2	8.0	29.1	5.3	6.3	18.9
Shop	2.3	2.5	8.7	4.4	4.6	4.5	2.6	2.6	0.0
Personal Business	3.3	3.4	3.0	4.3	5.4	25.6	3.5	3.7	5.7
Social Recreational	3.8	3.9	2.6	4.5	4.8	6.7	3.9	3.9	0.0
School	2.4	2.9	20.8	2.9	2.8	-3.5	2.6	2.8	7.7
Other	2.4	2.4	0.0	4.9	8.5	74.5	2.4	2.6	8.3
TOTAL	3.8	4.0	5.3	5.3	5.8	9.4	4.2	4.3	2.4

(1) Includes only trips with origin, destination and residence inside the 1956 study area.

(2) The total percent change can be greater or less than that either of the individual mode changes within given purpose, depending on differences in relative levels of modal usage between 1956 and 1970.

SOURCE: Chicago Area Transportation Study.

Table C-39

CHANGES IN AVERAGE TRIP LENGTH, SKOKIE

Mode	1956			1964		
	Number of Trips	% of All Trips	Average Trip Length	Number of Trips	% of All Trips	Average Trip Length
Auto Driver	52,514	54.0	3.348	45,550	56.0	3.900
Passenger	30,101	31.0	2.885	19,870	24.4	2.576
Railroad	1,281	1.3	12.300	110	0.1	13.120
Bus	10,786	11.1	2.613	13,070	16.1	1.465
Rapid Transit	2,503	2.6	10.696	2,712	3.4	10.825
Total	97,185	100.0	3.451	81,312	100.0	3.428
		Per cent change in Average Trip Length for all modes is -0.7				

Skokie Study Area Average Trip Length by Purpose

Purpose	1956			1964		
	Number of Trips	% of All Trips	Average Trip Length	Number of Trips	% of All Trips	Average Trip Length
Work	20,375	22.5	6.939	19,624	24.1	7.291
Home	19,971	22.0	1.160	24,126	29.6	1.215
Shopping	9,202	10.1	2.177	11,631	14.3	2.215
School	5,978	6.6	1.538	9,234	11.3	2.089
Social-Recreation	18,689	20.6	3.610	6,213	7.7	4.185
Eat Meal	3,954	4.3	2.969	2,287	2.8	2.933
Personal Business	12,588	13.9	3.396	8,303	10.2	3.291
Total	90,757	100.0	3.479	81,418	100.0	3.408
		Per cent change in Average Trip Length for all purposes is -2.1				

SOURCE: Chicago Area Transportation Study, "Changes in Average Trip Length", A Case Study by Mode and Purpose of Skokie Trips made in 1956 and 1964.

Table C-40

AVERAGE DISTANCES TRAVELED, IN MILES
BY MODE AND PURPOSE

Minneapolis - St. Paul

		Trips Oriented To:	
	All Trips	Mpls. CBD	St. Paul CBD
TOTAL PERSON TRIPS	4.87	6.20	6.91
– AS AUTO DRIVERS	5.09	5.52	5.74
– AS PUBLIC BUS PASSENGERS	4.25	4.27	3.75
ALL TRIPS BETWEEN HOME AND WORK	6.57	6.19	6.44
– AS AUTO DRIVERS	6.91	6.99	6.85
– AS PUBLIC BUS PASSENGERS	4.31	4.28	3.94
ALL TRIPS BETWEEN HOME AND SHOPPING	3.27	5.49	3.73
– AS AUTO DRIVERS	3.08	6.83	4.35
– AS PUBLIC BUS PASSENGERS	3.40	3.95	2.84
ALL AUTO DRIVER TRIPS WHICH:			
– USE FREEWAY	8.74	8.36	9.53
– DID NOT USE FREEWAY	3.53	5.92	5.10

SOURCE: Metropolitan Council, A Summary Report of Travel in the Twin Cities Metropolitan Area, 1974.

Table C-41

REGIONAL AVERAGES OF REPORTED TIME PER TRIP IN MINUTES

Minneapolis - St. Paul, 1970

Purpose To	All Modes	Auto Drivers	Auto Passengers	Public Bus
Work	19.8	19.2	16.9	33.6
Shop	11.7	11.4	11.3	25.2
School	19.6	27.0	10.5	32.6
Soc-Rec.	16.2	17.3	14.9	34.3
Pers. Bus.	14.7	14.2	14.9	28.5
All Purposes	17.1	16.9	15.3	33.4

SOURCE: Metropolitan Council, A Summary Report of Travel in the Twin Cities Metropolitan Area, 1974.

Table C-42

MEDIAN TRIP TIMES IN MINUTES
FOR ALL PERSON TRAVEL

1958 - 1970

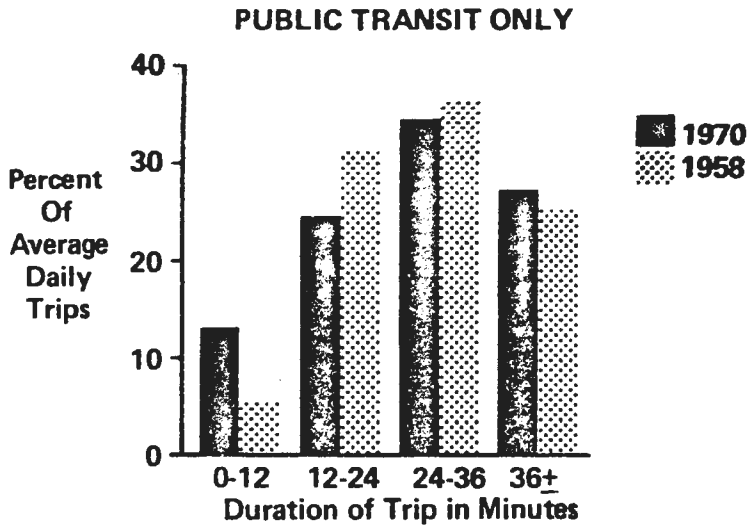
Minneapolis - St. Paul

Purpose of Trip	1958	1970
WORK	26.0	22.3
SCHOOL	20.5	19.8
SOCIAL RECREATION	19.0	18.3
PERSONAL BUSINESS	16.5	16.1
SHOPPING	13.0	14.2

SOURCE: A Summary Report of Travel in the Twin Cities Metropolitan Area, April 1974, Metropolitan Council.

DURATION OF TRANSIT TRAVEL,
1958 - 1970

Minneapolis - St. Paul



AVERAGE AUTO DRIVER TRIP DURATIONS

Minneapolis - St. Paul

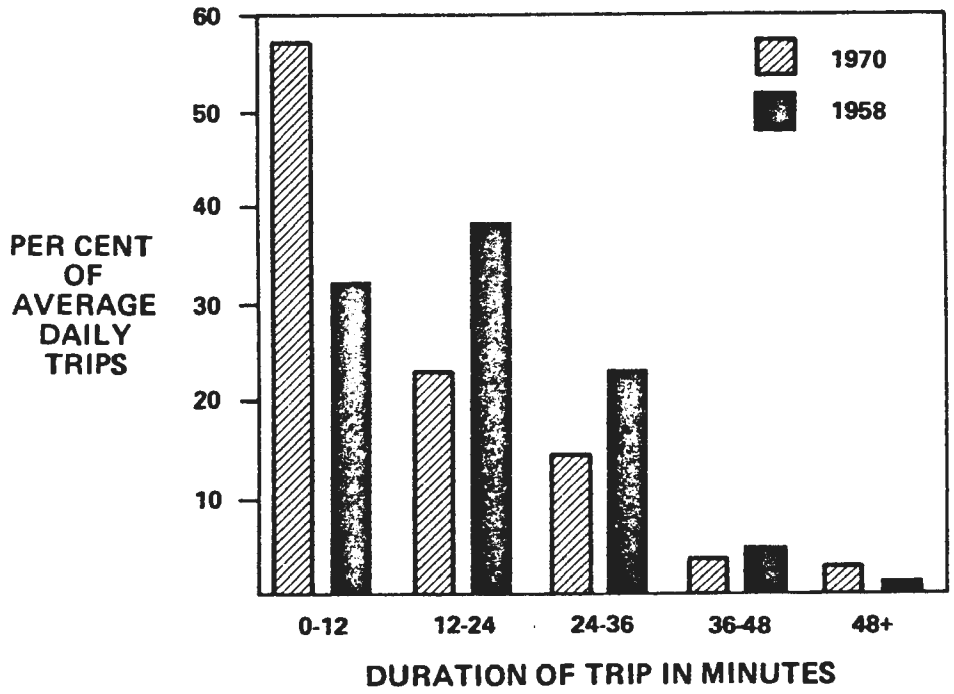


FIGURE C-1

SOURCE: A Summary Report of Travel in the Twin Cities Metropolitan Area, Metropolitan Council.

Table C-43

SELECTED TRIP DISTANCE, TIME,
AND SPEED CHARACTERISTICS

Minneapolis-St. Paul, 1970

AUTO DRIVER TRIPS ONLY:	Did Not Use Freeway	Did Use Freeway	
AVERAGE DISTANCE, MILES	3.53	8.74	ALL TRIPS
AVERAGE TIME, MINUTES	10.52	18.21	
AVERAGE MILES PER HOUR	20.13	28.80	
AVERAGE DISTANCE	4.90	9.73	TRIPS BETWEEN HOME AND WORK ONLY
AVERAGE TIME	13.30	19.80	
AVERAGE MILES PER HOUR	22.11	29.48	

SOURCE: Metropolitan Council, A Summary of Travel in the Twin Cities Metropolitan Area, April, 1974.

Table C-44

Average Times, Distances, Speeds and Person-Miles of Travel for Work Trips to the Manhattan CBD and to Rest of 31-County Region, by Income Group, 1960.

Annual Earnings of Workers	Average Time (minutes)	Average Distance (miles)	Average Speed (mph)	Work Trips (000's)	Person-Miles of Travel (000's)
Manhattan CBD:					
Under $5,000	43	6.7	9.3	1,060	7,102
$5,000-$10,000	54	10.9	12.0	579	6,311
$10,000 and over	61	15.2	15.0	218	3,313
Total	**49**	**9.0**	**11.1**	**1,858**	**16,726**
Rest of Region:					
Under $5,000	22	4.2	11.3	3,093	12,990
$5,000-$10,000	28	7.0	15.1	1,799	12,593
$10,000 and over	32	9.4	17.4	329	3,092
Total	**25**	**5.5**	**13.3**	**5,221**	**28,675**
Region Average:					
Under $5,000	26.2	4.6	10.5	4,153	20,092
$5,000-$10,000	31.5	7.4	14.1	2,378	18,904
$10,000 and over	41.7	12.4	17.8	547	6,405
Total	**29.1**	**6.1**	**12.6**	**7,079**	**45,401**

Source: Regional Plan Association.

Table C-45

AVERAGE TIMES, DISTANCES AND SPEEDS FOR WORK TRIPS FROM NEW YORK CITY AND OUTSIDE NEW YORK CITY RESIDENCES BY INCOME GROUP AND AUTO AVAILABILITY, 1963.

	Average Time (minutes)	Average Airline Distance (miles)	Average Airline Speed (mph)
NYC Residents[a] without Autos:			
$0-$4,000	29.0	2.9	6.0
$4,000-$10,000	35.0	4.0	6.9
$10,000 and over	31.8	4.5	8.5
NYC Residents[a] with Autos:			
$0-$4,000	25.3	3.4	8.0
$4,000-$10,000	33.9	5.3	9.4
$10,000 and over	36.2	6.1	10.1
Non-NYC Residents[b] without Autos:			
$0-$4,000	18.5	1.9	6.1
$4,000-$10,000	25.6	4.1	9.6
$10,000 and over	26.8	4.9	11.0
Non-NYC Residents[b] with Autos:			
$0-$4,000	15.6	2.9	11.1
$4,000-$10,000	27.6	6.8	14.8
$10,000 and over	36.4	9.9	16.3

[a] Excluding Richmond.
[b] Including Richmond.
Source: Tri-State Regional Planning Commission.

Table C-46

TRANSPORTATION DEMAND INDICATORS
Washington, D.C. Area (1968)

ITEM	RING	PERCENT USE OF TRANSIT* To CBD	PERCENT USE OF TRANSIT* Total	PERCENT OF TRIPS TO CBD	DAILY-VEHICLE MILES OF TRAVEL/ HOUSEHOLD	AVG. AUTO TRIP DISTANCE Home To Work	AVG. AUTO TRIP DISTANCE Home To Non-Work	DAILY AVG. MI. PER RESIDENT AUTOMOBILE
CBD	0	60	38	81	3.7	6.1	3.3	9.0
CITY	1	58	26	62	6.1	4.5	4.2	8.6
	2	54	18	50	9.1	4.8	3.8	9.6
BELTWAY	3	42	15	44	15.4	6.3	4.2	13.0
	4	20	6	33	27.6	7.5	4.4	15.6
	5	14	4	28	37.6	9.2	5.4	18.2
FRINGE AREA	6	12	2	20	40.0	10.1	6.3	19.0
	7	8	1	14	46.3	14.5	7.1	24.2
	ALL	34	19	33	30	8.0	4.9	15.9

*To work--percent use of transit for nonwork travel (2/3 of trips) was 3.0 percent.
SOURCE: 1968 Home Interview Survey Data, Washington, D.C., G. Wickstrom.

Table C-47

AVERAGE TRIP LENGTH FOR NON-WORK TRIPS - 1968
WASHINGTON, D.C. METROPOLITAN AREA

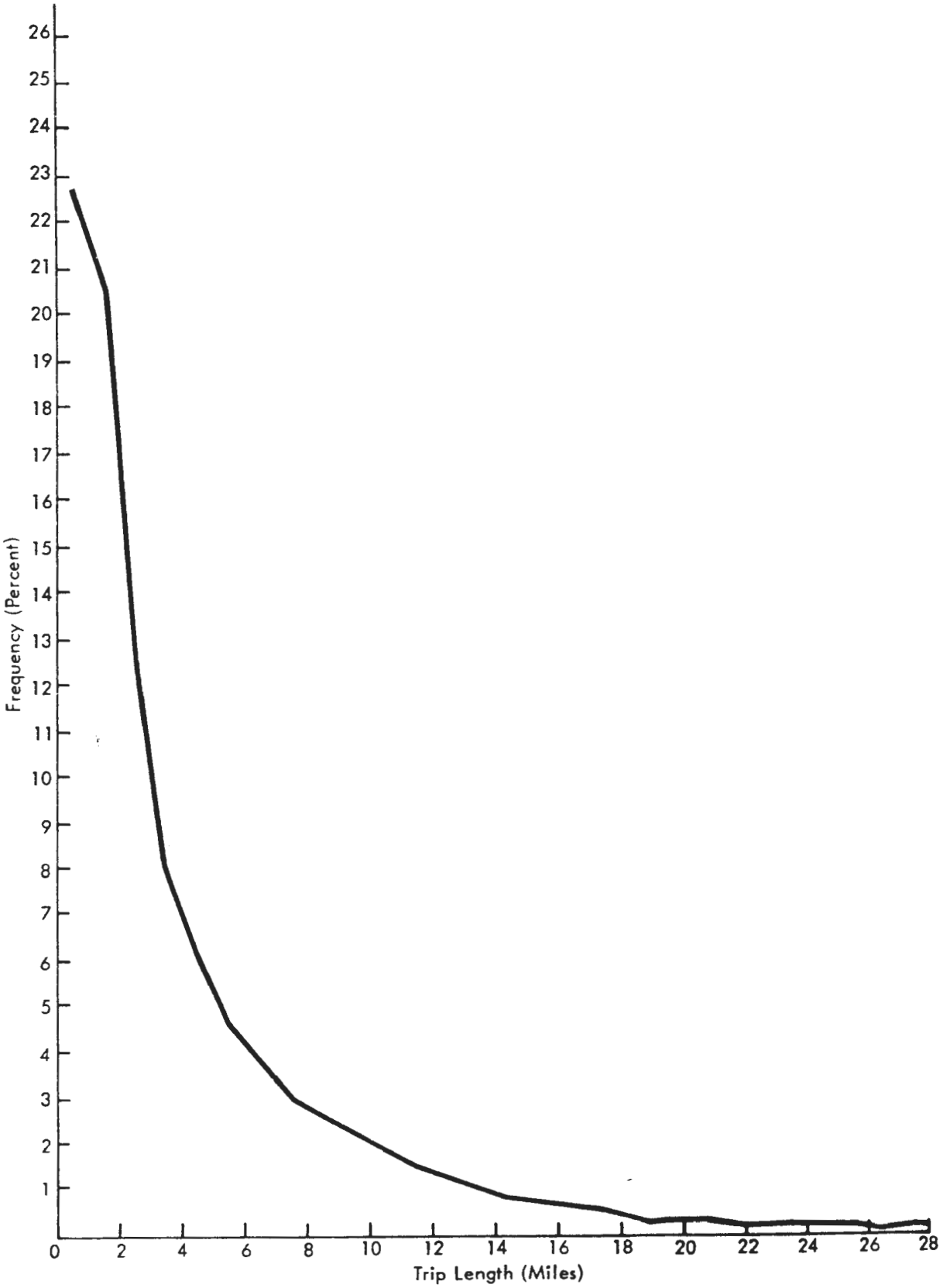
PURPOSE AT DESTINATION	AVERAGE MILES TRAVELED BY MODE (Airline)			
	Auto Driver	Auto Passenger	TRANSIT	TOTAL
Shop	3.9	4.2	3.5	4.0
Social/Recreation	5.8	5.2	5.8	5.4
Personal Business	5.0	5.4	4.9	5.1
School	6.0	3.5	3.2	3.8
Other	5.7	6.4	5.2	5.8
Home	4.8	4.9	3.5	4.7
All Non-work	4.9	4.9	3.6	4.8

SOURCE: Washington D.C. Metropolitan Council of Governments.

G.H.I. PERSON TRAVEL AND TRIP LENGTHS
VEHICLE TRIP LENGTHS
TRIP TIMES

. FREQUENCY DISTRIBUTIONS

(Alphabetical by Metropolitan Area)

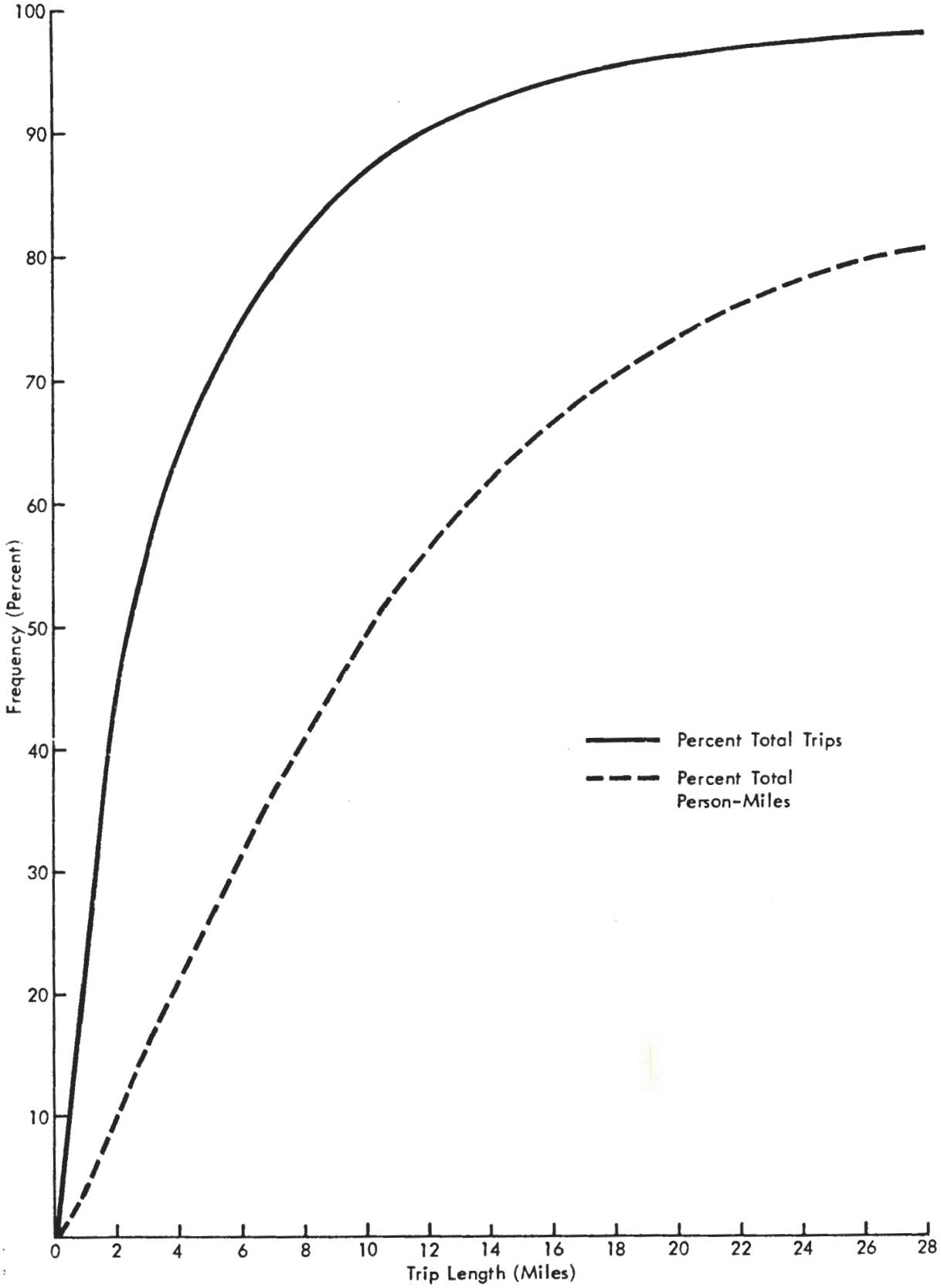


PERCENT FREQUENCY DISTRIBUTION OF TRIPS BY TRIP LENGTH
1970 PERSON TRIPS

CHICAGO

FIGURE C-2

SOURCE: Chicago Area Transportation Study.

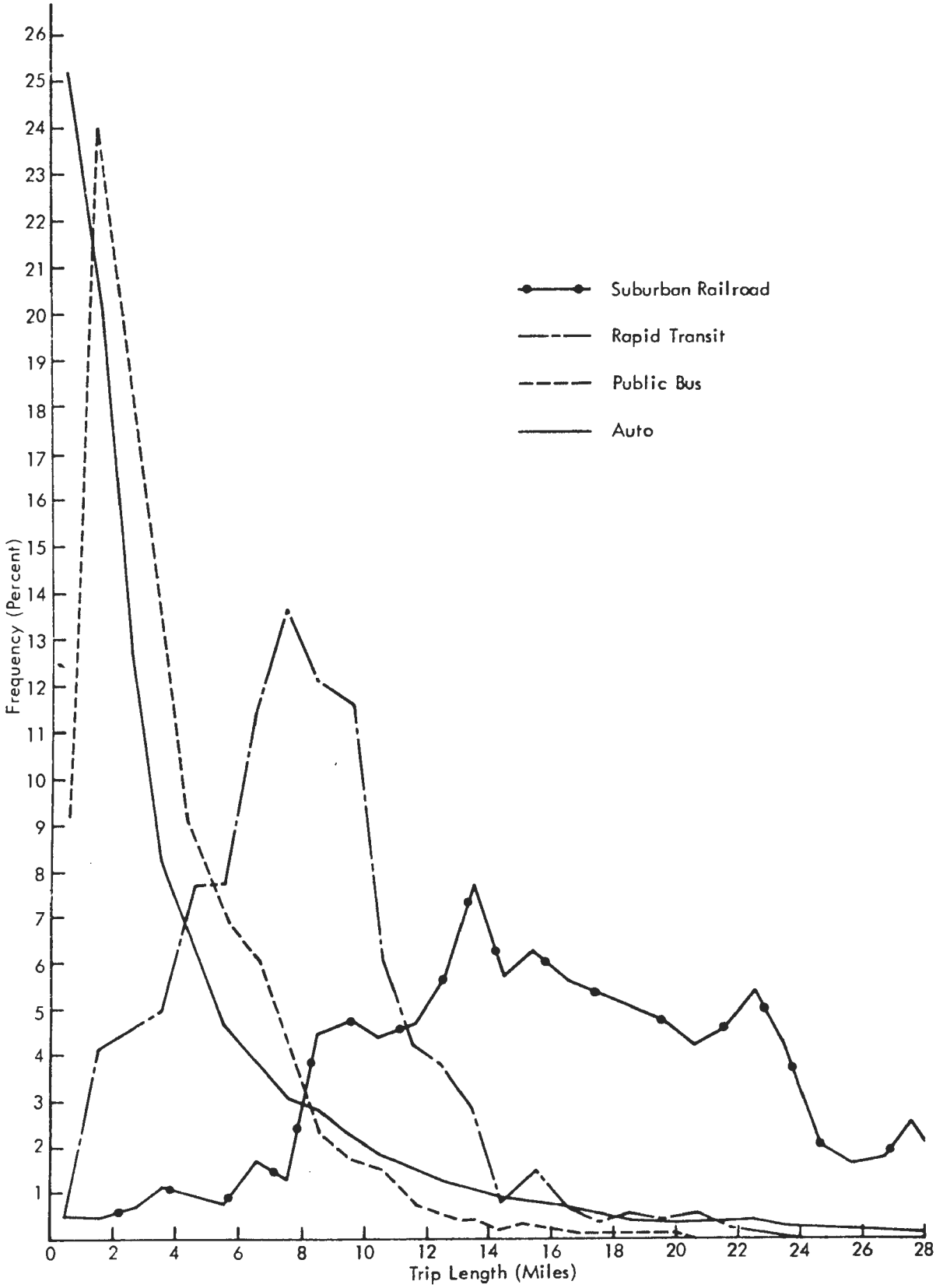


CUMULATIVE PERCENT FREQUENCY DISTRIBUTION OF TRIPS AND ASSOCIATED PERSON-MILES OF TRAVEL BY TRIP LENGTH
1970 PERSON TRIPS

CHICAGO

FIGURE C- 3

SOURCE: Chicago Area Transportation Study.



PERCENT FREQUENCY DISTRIBUTION OF TRIPS BY TRIP LENGTH FOR SELECTED PRIORITY MODES - CHICAGO
1970 PERSON TRIPS

FIGURE C-4

SOURCE: Chicago Area Transportation Study.

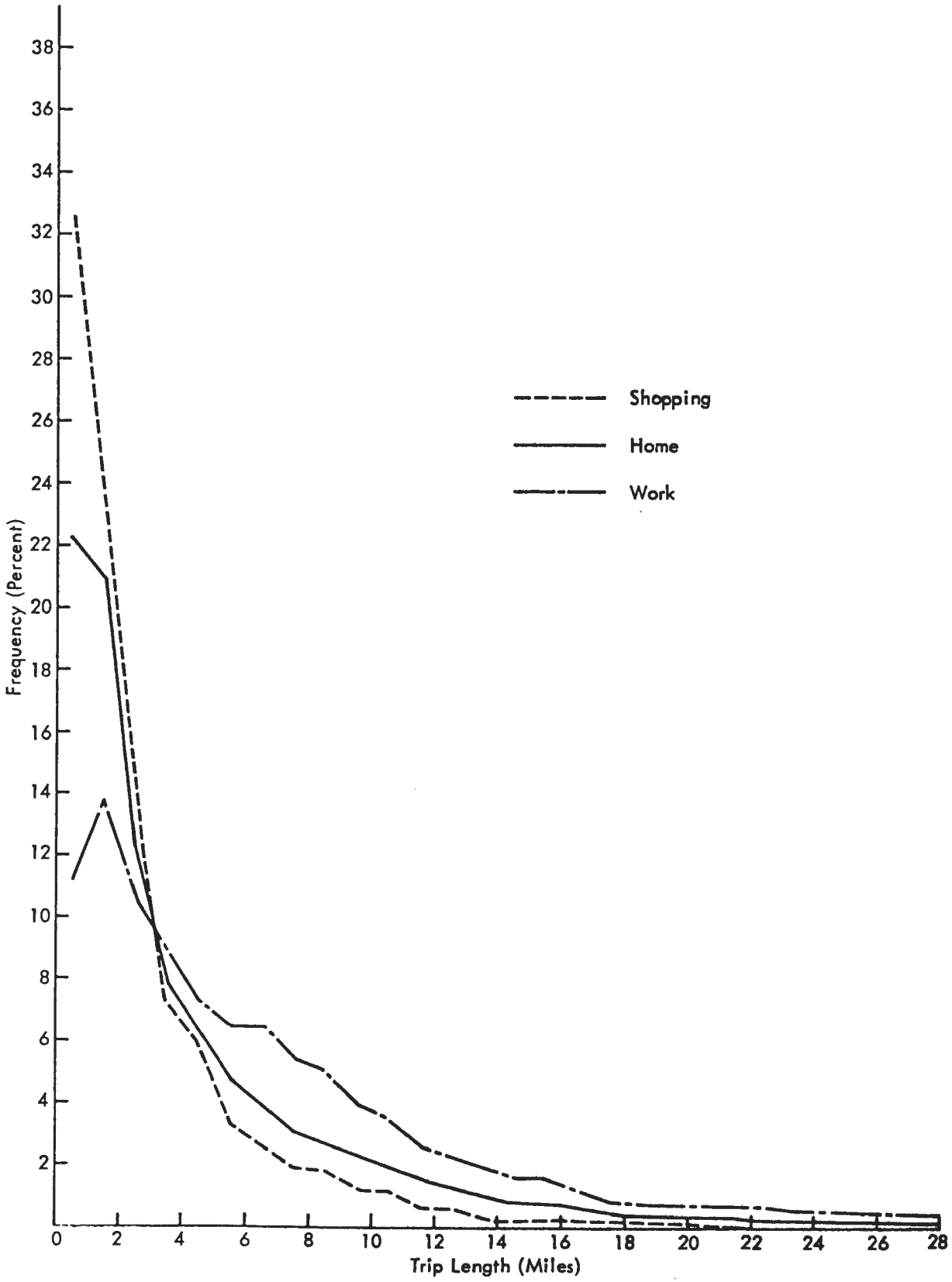
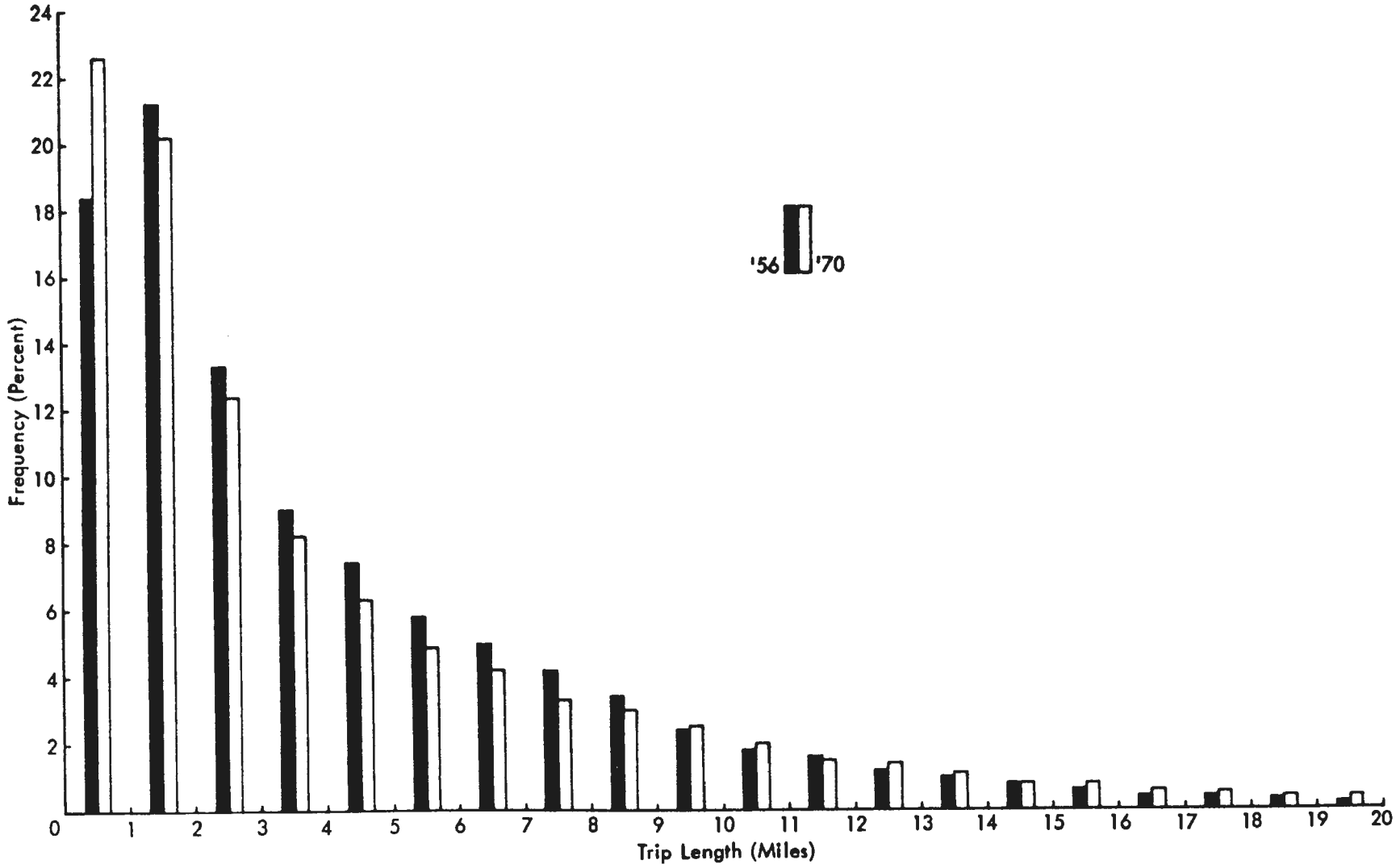


Figure 6 PERCENT FREQUENCY DISTRIBUTION OF TRIPS BY TRIP LENGTH FOR SELECTED TRIP PURPOSES
1970 PERSON TRIPS

FIGURE C-5

SOURCE: Chicago Area Transportation Study.

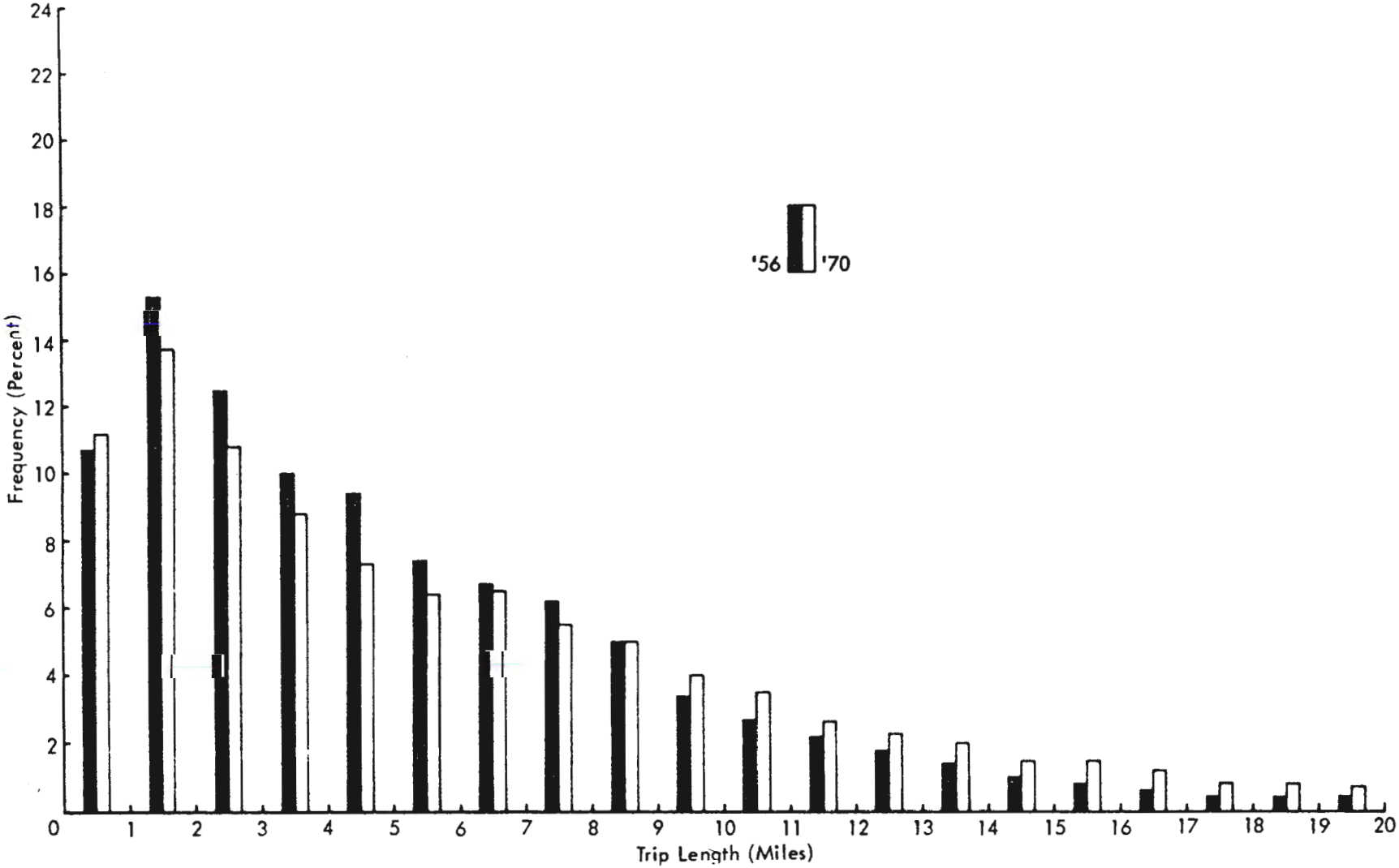


PERCENT FREQUENCY DISTRIBUTION OF TRIPS BY TRIP LENGTH
1956 AND 1970 PERSON TRIPS (1956 STUDY AREA ONLY)

SOURCE: Chicago Area Transportation Study

CHICAGO

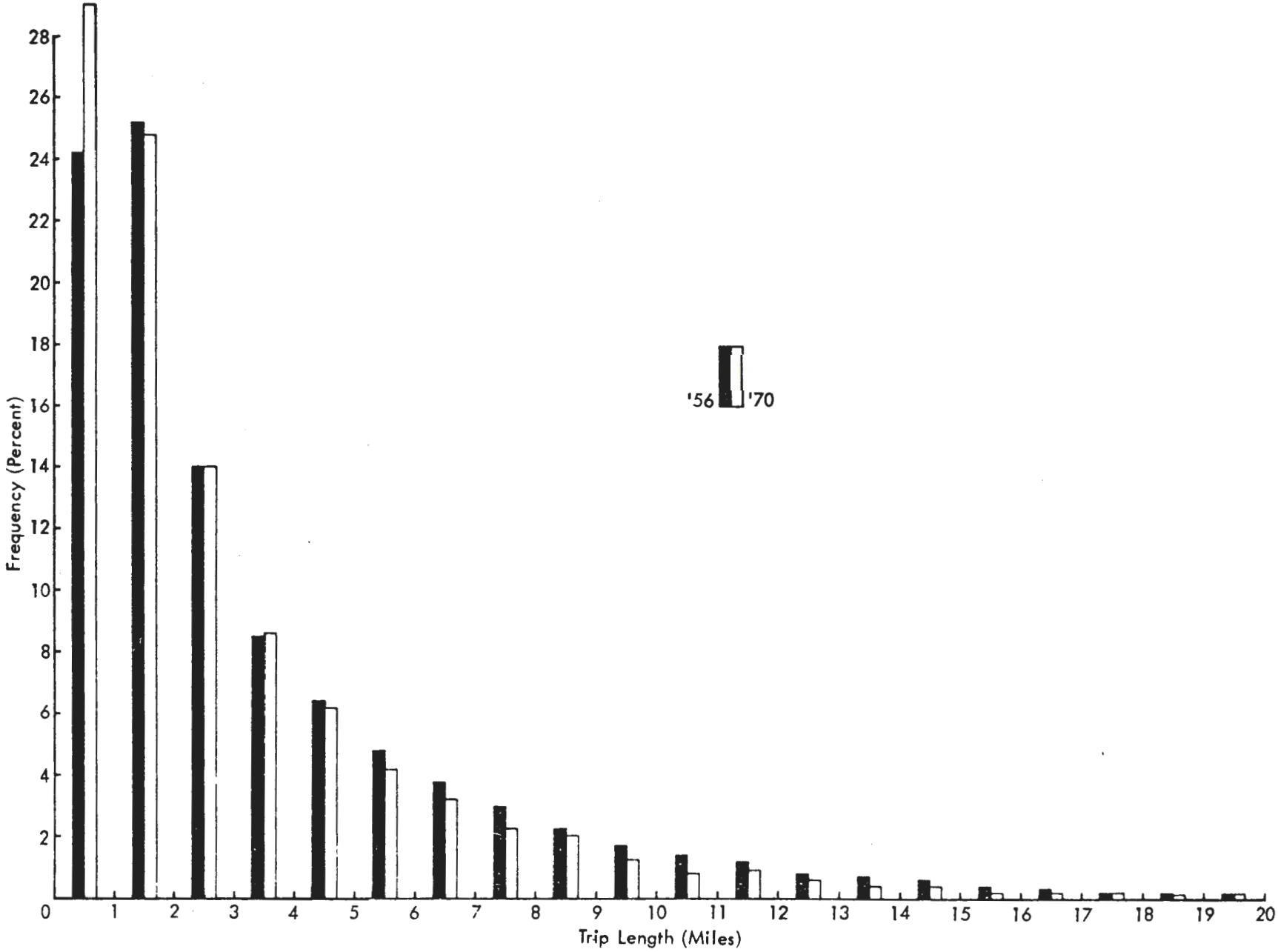
FIGURE C-6



PERCENT FREQUENCY DISTRIBUTION OF TRIPS TO WORK BY TRIP LENGTH
1956 AND 1970 PERSON TRIPS (1956 STUDY AREA ONLY)
CHICAGO

FIGURE C-7

SOURCE: Chicago Area Transportation Study



PERCENT FREQUENCY DISTRIBUTION OF NONWORK TRIPS (EXCLUDING TRIPS TO HOME) BY TRIP LENGTH
1956 AND 1970 PERSON TRIPS (1956 STUDY AREA ONLY)

FIGURE C-8

SOURCE: Chicago Area Transportation Study

CHICAGO

LOS ANGELES REGIONAL TRANSPORTATION STUDY

TRIP FREQUENCY DISTRIBUTION

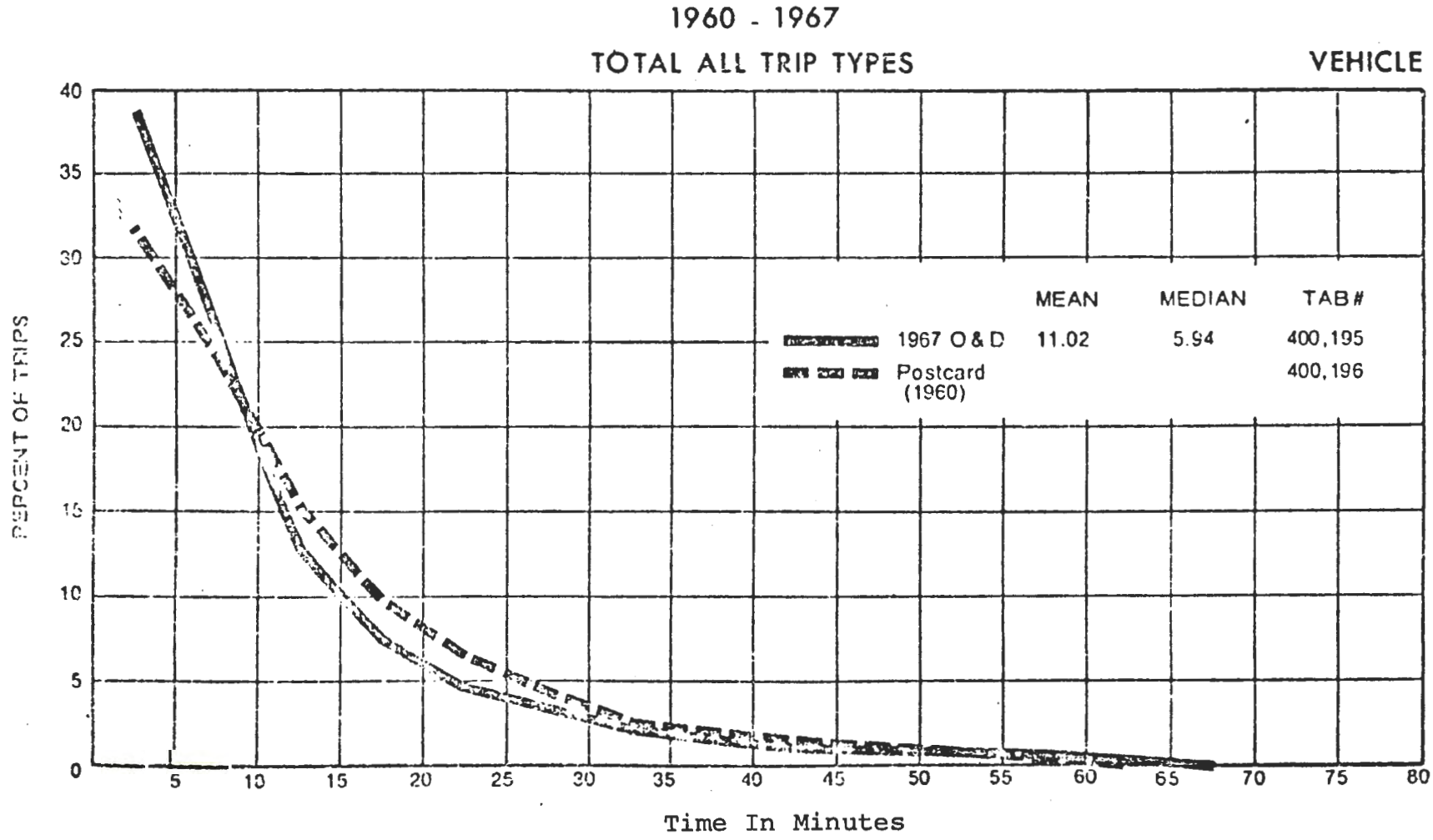


FIGURE C-9 (A)

LOS ANGELES REGIONAL TRANSPORTATION STUDY

TRIP FREQUENCY DISTRIBUTION

1960 - 1967

TRIP TYPE 4 (Home-Work) VEHICLE

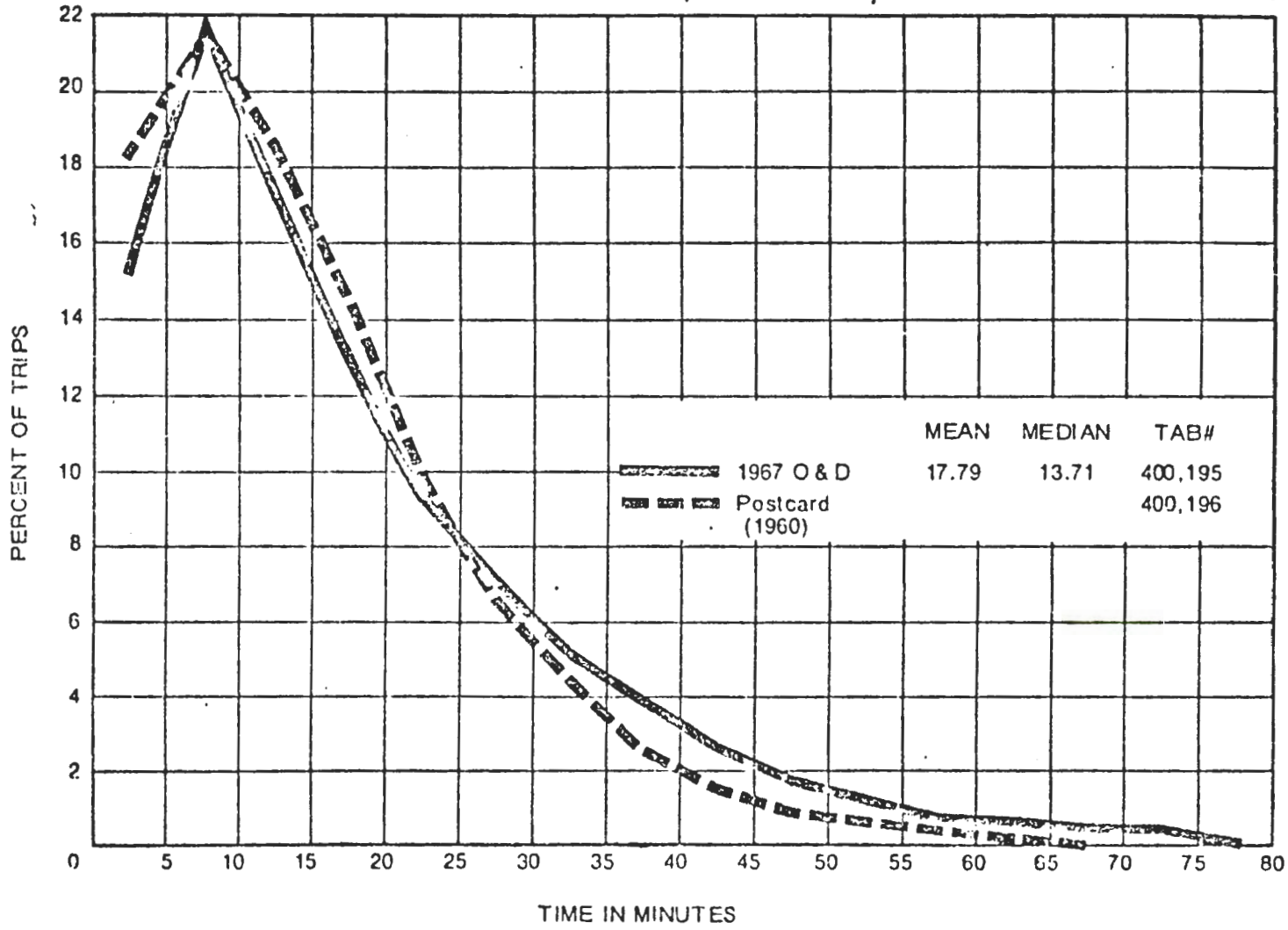


FIGURE C-9 (B)

LOS ANGELES REGIONAL TRANSPORTATION STUDY

TRIP FREQUENCY DISTRIBUTION

1960 - 1967

TRIP TYPE 3 (Other-Work) VEHICLE

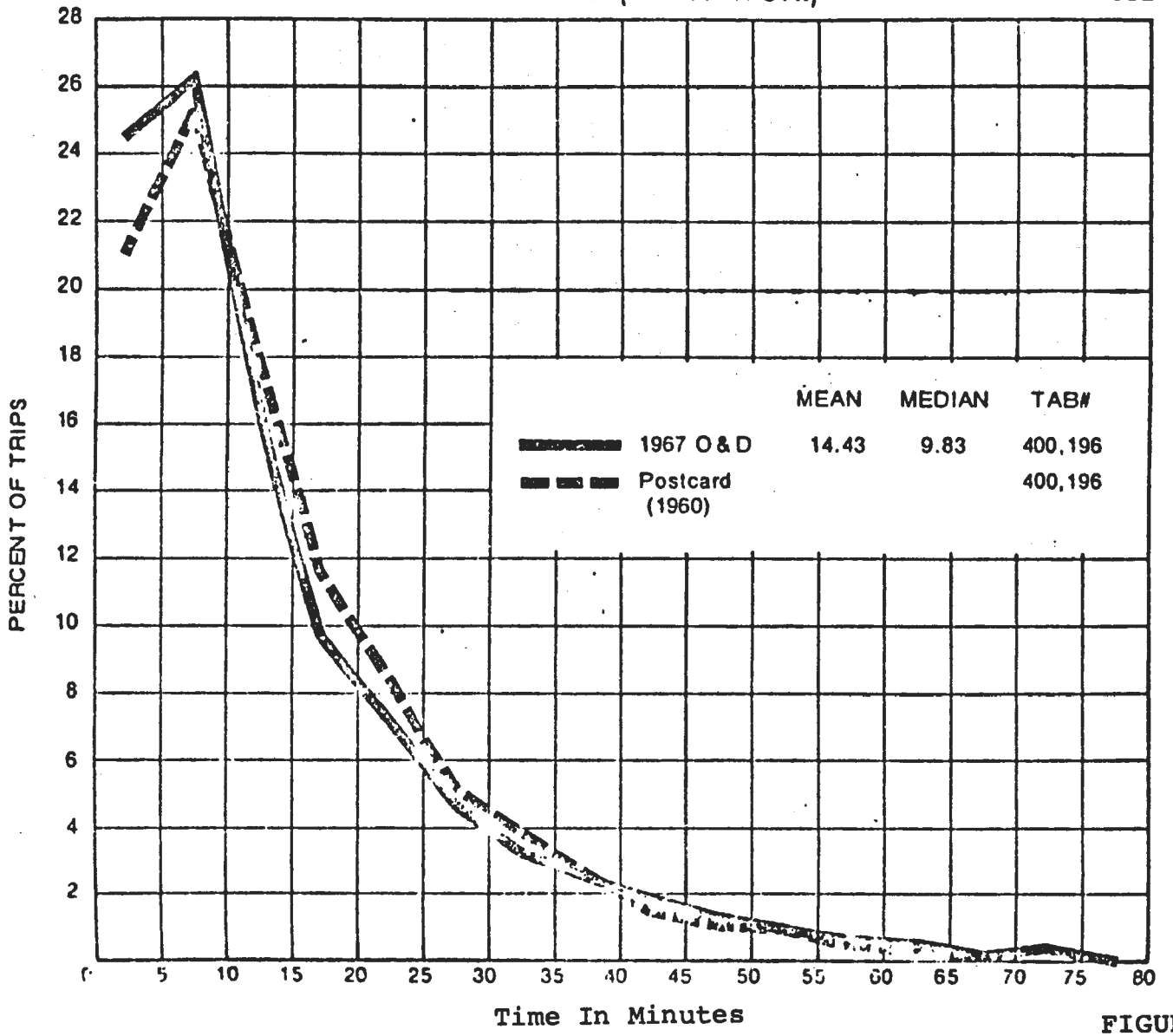


FIGURE C-9 (C)

LOS ANGELES REGIONAL TRANSPORTATION STUDY

TRIP FREQUENCY DISTRIBUTION

1960 - 1967

TRIP TYPE 1 (Home-Other) VEHICLE

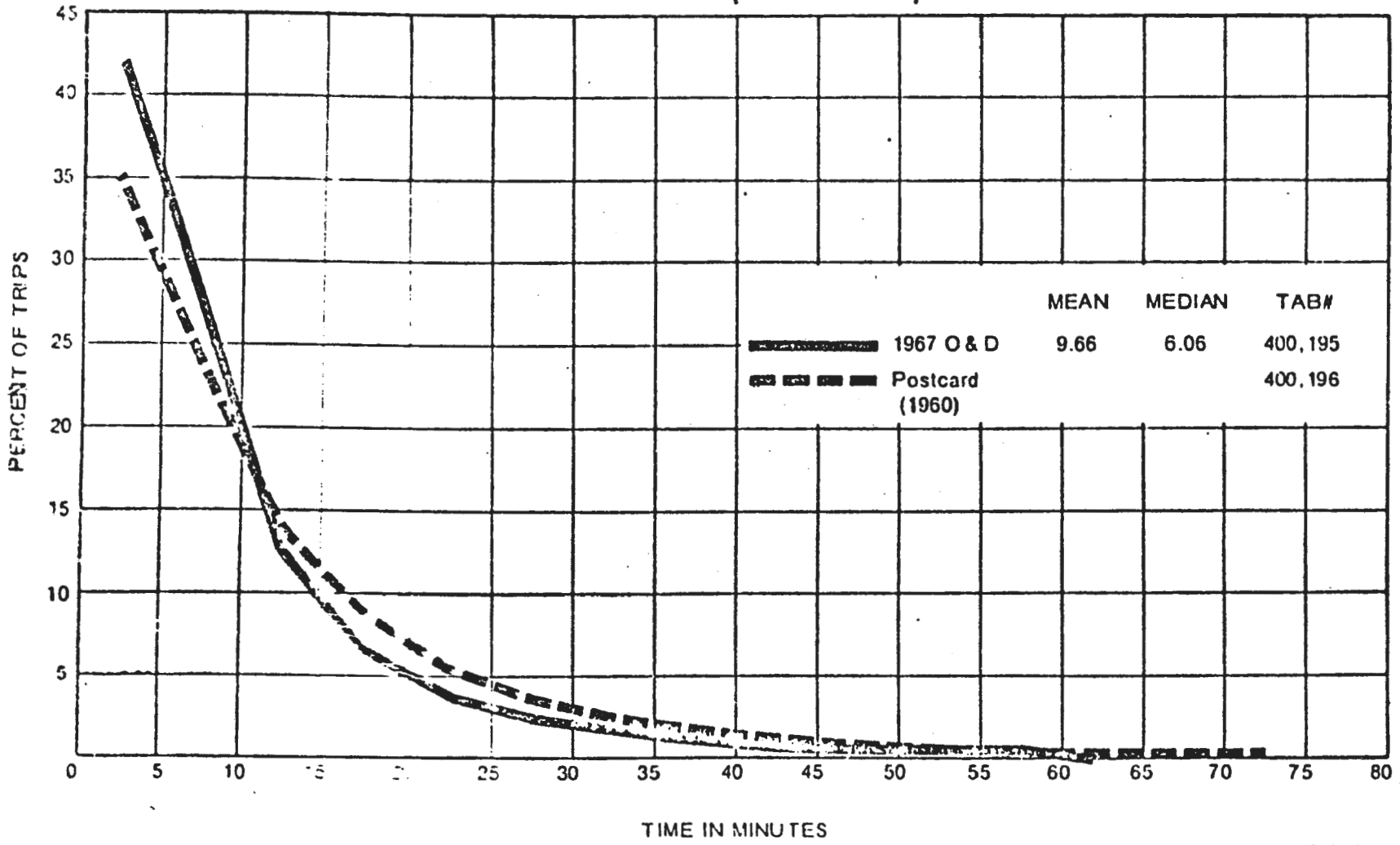


FIGURE C-9 (D)

LOS ANGELES REGIONAL TRANSPORTATION STUDY

TRIP FREQUENCY DISTRIBUTION

1960 - 1967

TRIP TYPE 2 (Other-Other) VEHICLE

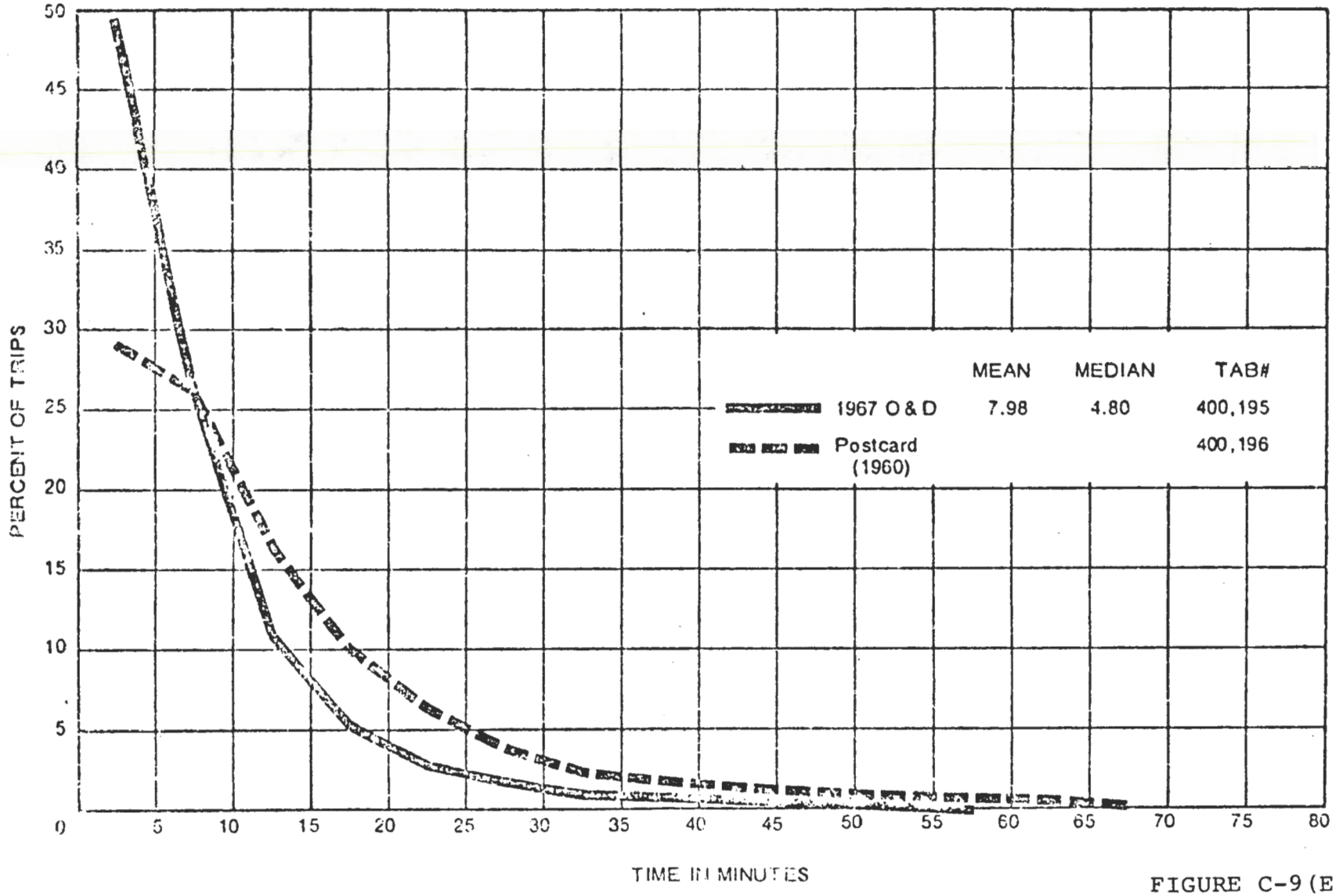


FIGURE C-9 (E)

LOS ANGELES REGIONAL TRANSPORTATION STUDY

TRIP FREQUENCY DISTRIBUTION

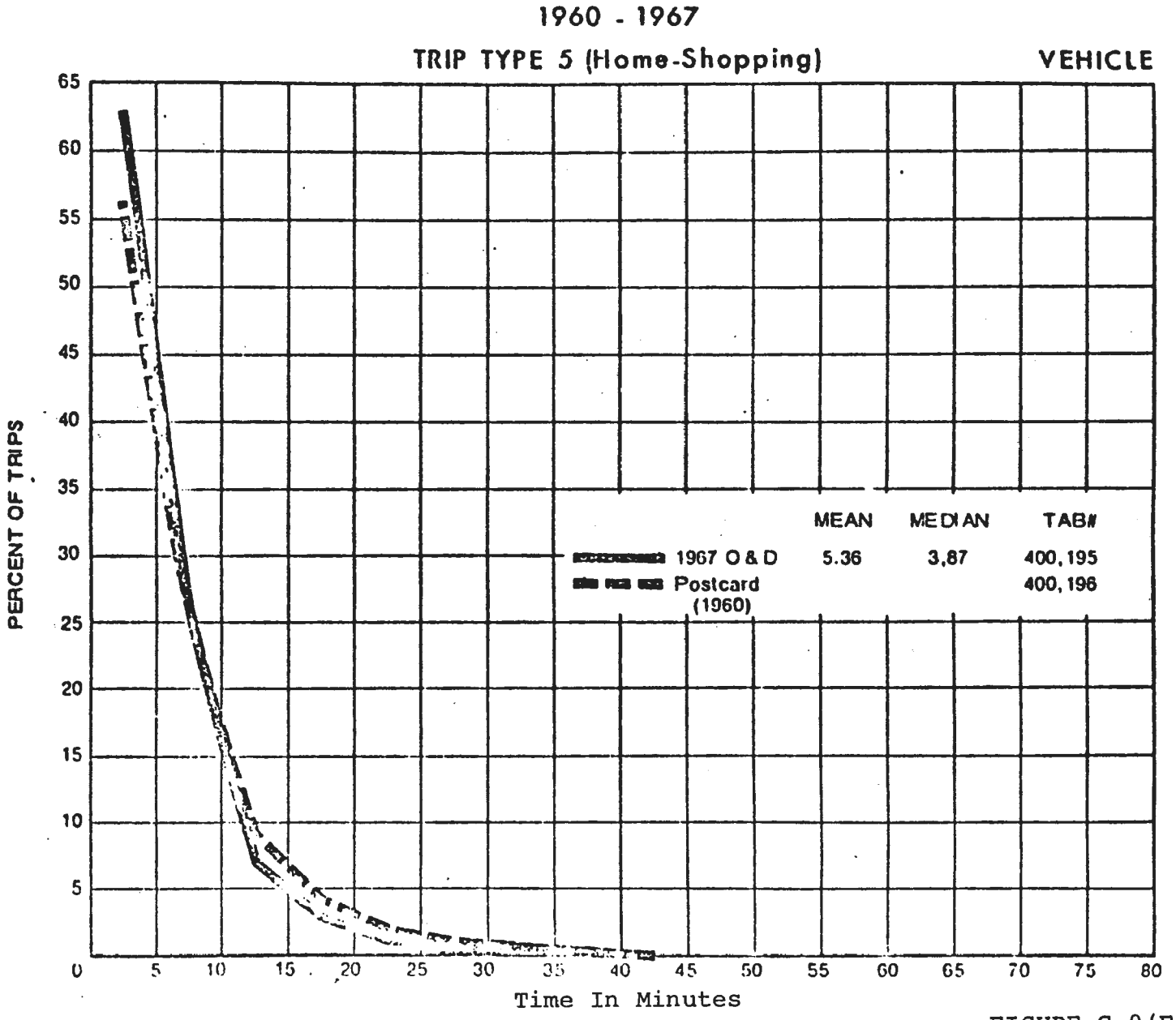
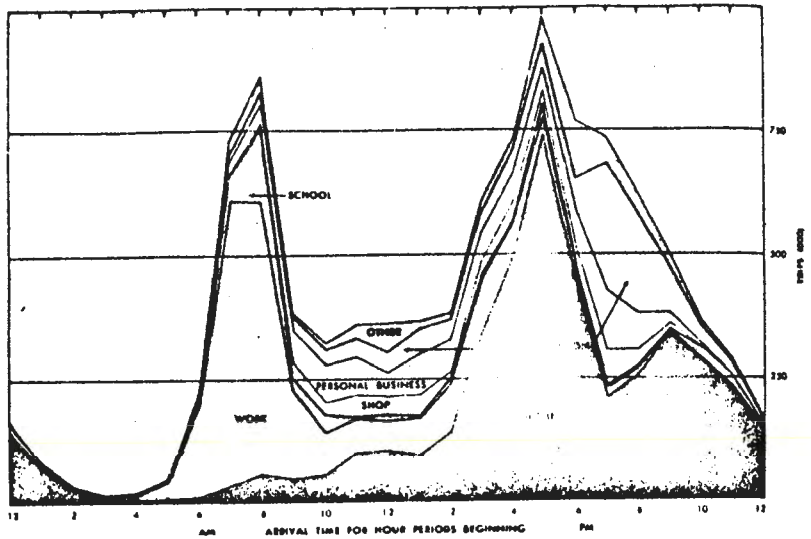
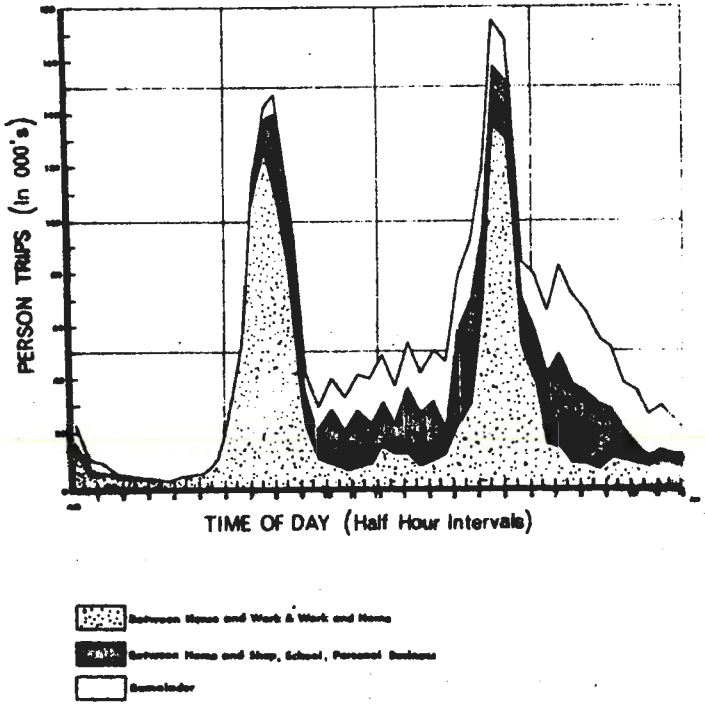


FIGURE C-9(F)

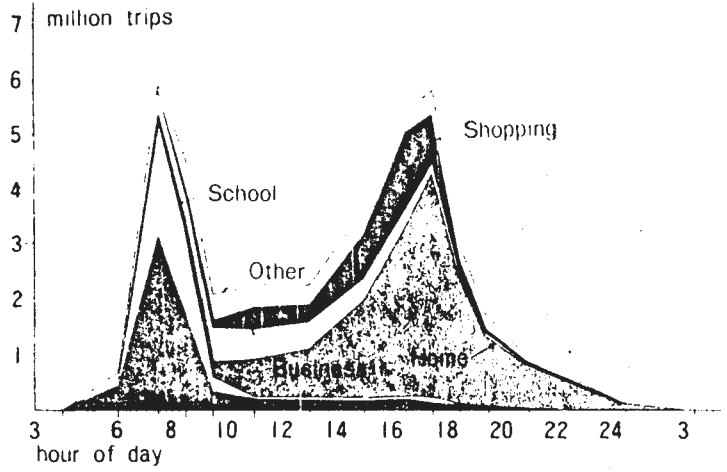
J. HOURLY TRAVEL VARIATIONS



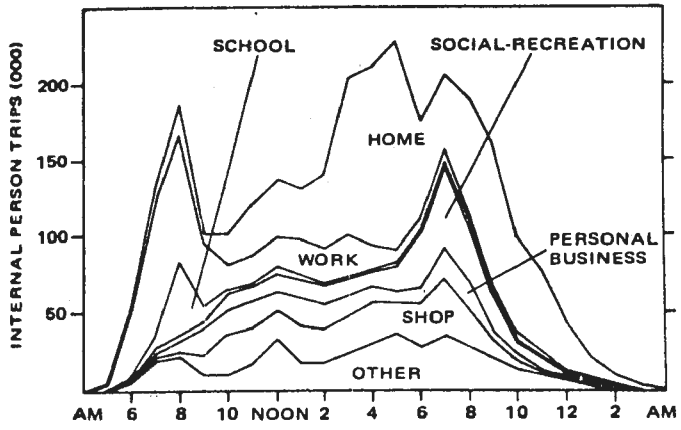
Chicago Area, 1956.



Metropolitan Toronto, 1964.



Tokyo, 1968.



Niagara Frontier, 1962.

HOURLY DISTRIBUTION OF TRIPS BY PURPOSE

FIGURE C-10

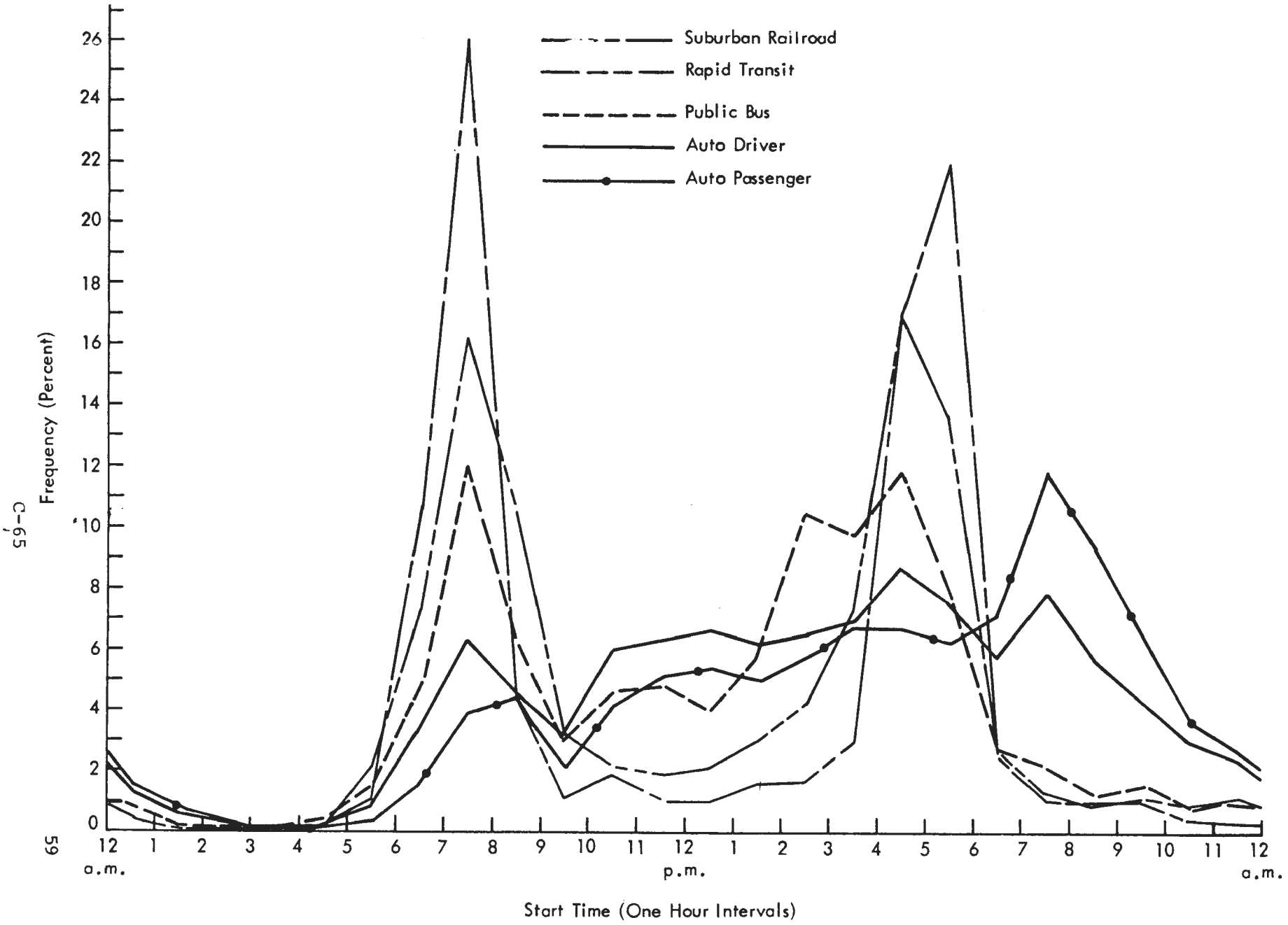


Figure 23 PERCENT FREQUENCY DISTRIBUTION OF TRIP ORIGINS BY PRIORITY MODE AND TIME OF DAY - 1970 WEEKDAY PERSON TRIPS
CHICAGO AREA TRANSPORTATION STUDY

FIGURE C-11

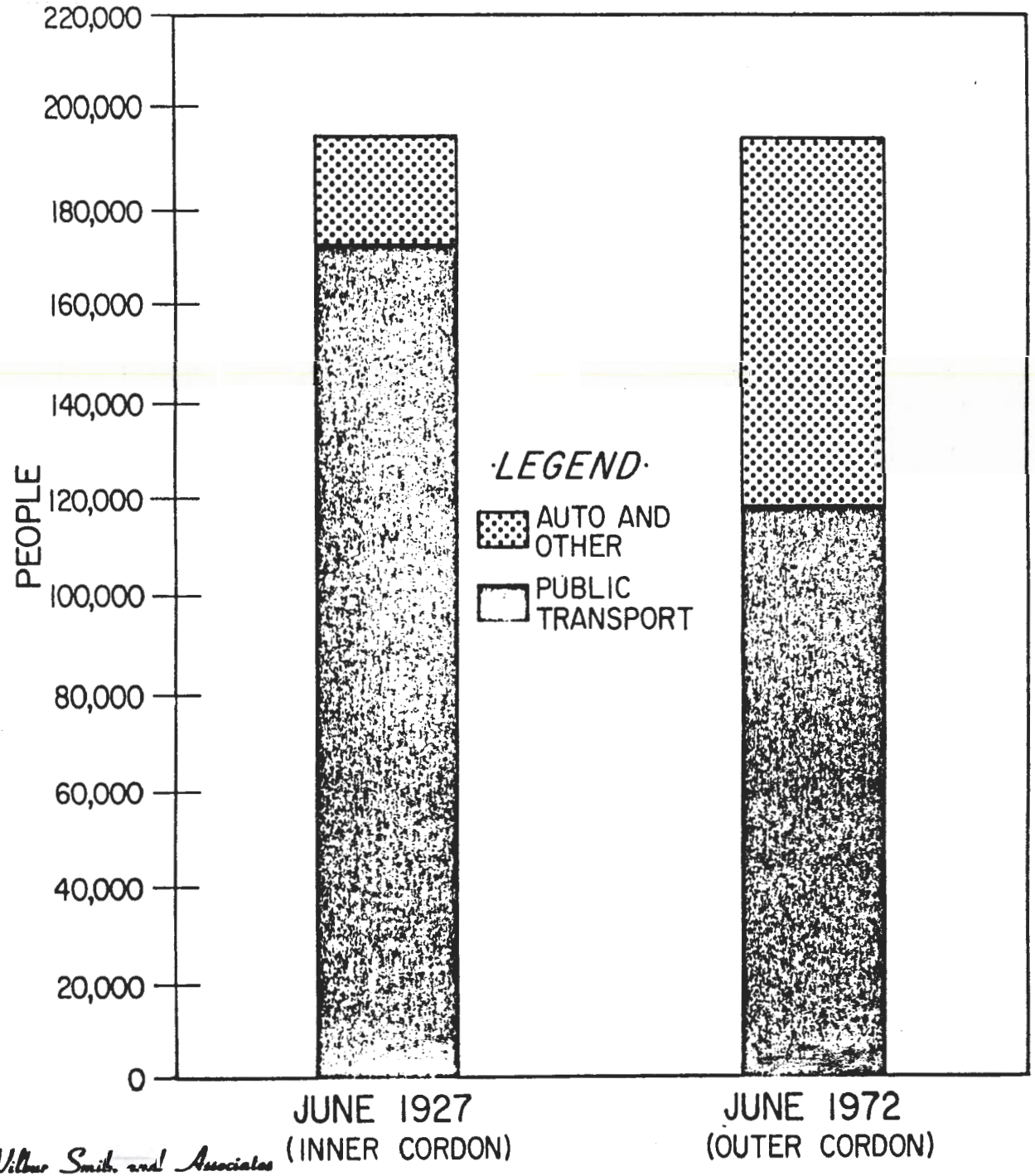
APPENDIX D

APPENDIX TO CHAPTER 4
(CENTRAL BUSINESS DISTRICT TRAVEL)

A. CBD EMPLOYMENT

B. GENERAL CHARACTERISTICS

(Alphabetical by City)

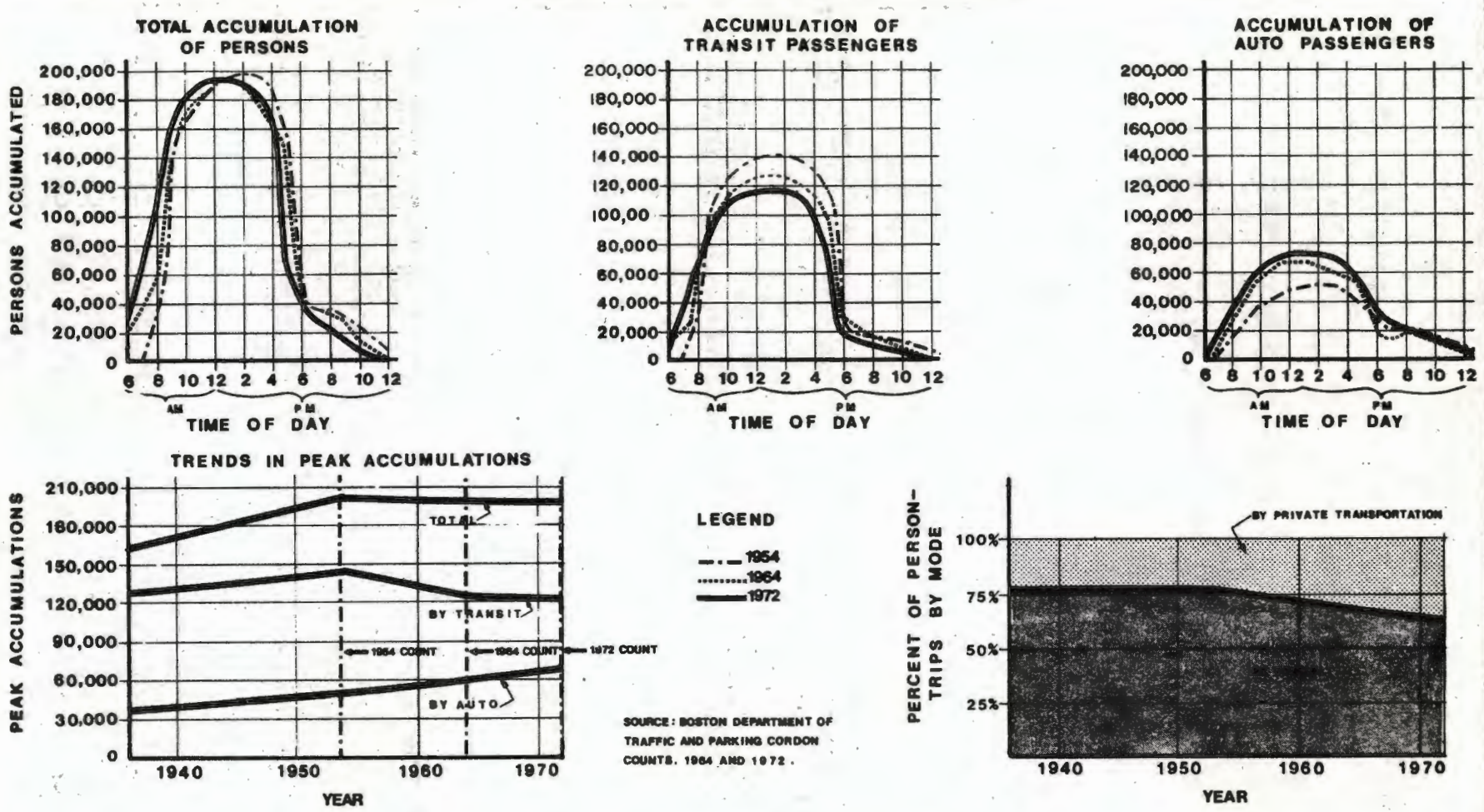


PEAK ACCUMULATION OF PEOPLE IN DOWNTOWN BOSTON 1927 AND 1972

SOURCE: An Access Arterial Parking Study in the Boston Metropolitan Area, Wilbur Smith and Associates, 1974.

Wilbur Smith and Associates

FIGURE D-1



TRENDS IN PERSONS ACCUMULATED IN BOSTON PROPER

Wilbur Smith and Associates

FIGURE D-2

Table D-1

SELECTED 1970 JOURNEY-TO-WORK CENSUS CHARACTERISTICS

OF 35 LARGEST METROPOLITAN AREAS

ITEM					
1.	Name	Atlanta	Baltimore	Boston	Buffalo
2.	SMSA Pop (x100)	1,390	2,071	2,754	1,349
3.	Urban Area Pop (x100)	1,172.8	1,579.8	2,652.6	1,086.6
4.	Total Employ. (x100)	562	777	1,063	484
	a) SMSA				
	b) Urbanized Area	481	597	1,033	394
	c) (a)-(b) Rural and Scattered Urban	81	180	30	90
5.	Living Outside SMSA -Working Inside	57	32	136	12
6.	a) CBD Employment-total (1000)	62	50	91	41
	b) Within SMSA	56	49	87	40
	c) Outside (b)-(a)	6	1	4	1
7.	Square Miles of CBD =6a/8=	1.20	0.53	1.00	0.80
8.	CBD Employment Density = Per Sq. Mile(x100)	51,667	94,877	91,000	51,250
9.	Total CBD Employment as % of SMSA Employ. = 6a/4 x 100 =	11.03%	6.43	8.56	8.47
10.	Estimated Participation Ratio = 4/2x100 =	40.43%	37.52	38.60	35.88

(a) May overstate participation since SCA population was not used.

SOURCE: Urban Data Book; U.S. Department of Transportation, November, 1975. Summarized from 1970 Census, Journey-to-Work.

Table D-1
(Cont'd)

ITEM							
1.	Name	Chicago	Cincinnati	Cleveland	Columbus	Dallas-Ft. Worth	Dayton
2.	SMSA Pop (x100)	6,978	1,385	2,064	916.2	2,318	850.2
3.	Urban Area Pop (x100)	6,714.5	1,110.5	1,959.9	790.0	2,015.6	685.9
4.	Total Employ. (x100)	2,989	486	776	345	627	313
	a) SMSA	2,833	396	739	318	546	226
	b) Urbanized Area	156	70	37	27	81	87
	c) (a)-(b) Rural and Scattered Urban						
5.	Living Outside SMSA -Working Inside	55	30	47	26	45	33
6.	a) CBD Employment-total (1000)	252	53	74	45	74	28
	b) Within SMSA	250	50	72	42	71	26
	c) Outside (b)-(a)	2	3	2	3	3	2
7.	Square Miles of CBD =6a/8=	1.55	0.80	1.10	0.90	1.40	0.80
8.	CBD Employment Density = Per Sq. Mile(x100)	162,581	66,250	67,273	50,000	52,857	35,000
9.	Total CBD Employment as % of SMSA Employ. = 6a/4 x 100 =	8.43	10.90	9.54	13.04	11.80	8.95
10.	Estimated Participation Ratio = 4/2x100 =	42.83	35.09	37.60	37.66	27.05	36.81

Table D-1
(Cont'd)

ITEM							
1.	Name	Denver	Detroit	Houston	Indianapolis	Kansas City	Los Angeles
2.	SMSA Pop (x100)	1,230	4,204	1,985	1,111	1,256	7,041
3.	Urban Area Pop (x100)	1,047.3	3,970.6	1,677.8	820.2	1,101.8	8,351.3
4.	Total Employ. (x100)	478	1,473	766	420	498	3,217
	a) SMSA						
	b) Urbanized Area	411	1,405	663	317	442	3,106
	c) (a)-(b) Rural and Scattered Urban	67	68	103	103	56	111
5.	Living Outside SMSA -Working Inside	12	42	24	21	23	79
6.	a) CBD Employment-total (1000)	45	87	105	60	37	143
	b) Within SMSA	44	86	104	57	35	138
	c) Outside (b)-(a)	1	1	1	3	2	5
7.	Square Miles of CBD =6a/8=	0.90	1.10	4.50	2.30	0.80	2.80
8.	CBD Employment Density = Per Sq. Mile(x100)	50,000	79,091	23,333	26,087	46,250	51,071
9.	Total CBD Employment as % of SMSA Employ. = 6a/4 x 100 =	9.41	5.91	13.70	14.29	7.43	4.45
10.	Estimated Participation Ratio = 4/2x100 =	38.86	35.04	38.59	37.80	39.65	45.69

Table D-1
(Cont'd)

	Name	Louisville	Miami	Milwaukee	Minneapolis St. Paul	New Orleans
2.	SMSA Pop (x100)	826.5	1,268	1,404	1,814	1,046
3.	Urban Area Pop (x100).	739.4	1,219.6	1,252.4	1,704.4	961.7
4.	Total Employ. (x100)	306	484	545	719	350
	a) SMSA					
	b) Urbanized Area	278	467	489	684	326
	c) (a)-(b) Rural and Scattered Urban	28	17	56	35	24
5.	Living Outside SMSA -Working Inside	26	34	19	36	21
6.	a) CBD Employment-total (1000)	49	26	49	94	74
	b) Within SMSA	45	23	47	90	70
	c) Outisde (b)-(a)	4	3	2	4	4
7.	Square Miles of CBD = 6a/8 =	2.40	0.40	1.00	1.50	1.20
8.	CBD Employment Density = Per Sq. Mile(x100)	20,417	65,000	49,000	62,667	61,667
9.	Total CBD Employment as % of SMSA Employ. = 6a/4 x 100 =	16.01	5.37	8.99	13.07	21.14
10.	Estimated Participation Ratio = 4/2x100 =	37.02	38.17	38.82	39.64	33.46

Table D-1
(Cont'd)

1. Name	New York	Philadelphia	Phoenix	Pittsburgh	Portland Oregon	Providence
2. SMSA Pop (x100)	11,572	4,882	968.0	2,401.	1,007	914.0
3. Urban Area Pop (x100)	16,206.8	4,021.0	863.3	1,846.0	824.9	795.3
4. Total Employ. (x100)	6,311	1,766	355	823	379	325
a) SMSA	5,894	1,471	322	645	317	285
b) Urbanized Area	417	295	33	178	62	40
c) (a)-(b) Rural and Scattered Urban						
5. Living Outisde SMSA -Working Inside	109	48	5	38	12	20
6. a) CBD Employment-total (1000)	921	128	22	76	33	22
b) Within SMSA	871	124	21	74	32	21
c) Outside (b)-(a)	50	4	1	2	1	1
7. Square Miles of CBD = 6a/8 =	4.00	2.54	1.00	0.55	0.40	0.50
8. CBD Employment Density = Per Sq. Mile(x100)	230,250	50,394	22,000	138,182	82,500	44,000
9. Total CBD Employment as % of SMSA Employ. = 6a/4 x 100 =	14.59	7.25	6.20	9.23	8.71	6.77
10. Estimated Participation Ratio = 4/2x100 =	54.53(a)	36.62	36.67	34.28	37.64	35.55

Table D-1
(Cont'd)

ITEM Name	St. Louis	San Antonio	San Diego	San Francisco Oakland	San Jose	Seattle	Tampa St. Petrs.	Washington D.C.
SMSA Pop (x100)	2,363	864.0	1,358	3,108	1,067	1,425	1,012.6	2,862
Urban Area Pop (x100)	1,882.9	772.5	1,198.3	2,987.6	1,025.3	1,238.1	863.9	2,481.5
Total Employ. (x100)	863	312	530	1,203	350	524	334	1,190
a) SMSA	698	281	468	1,126	339	465	285	1,056
b) Urbanized Area	165	31	62	77	11	59	49	134
c) (a)-(b) Rural and Scattered Urban								
Living Outside SMSA -Working Inside	31	10	7	73	35	20	10	64
a) CBD Employment-total (1000)	34	33	23	183	13	39	23	147
b) Within SMSA	32	32	22	178	12	38	22	143
c) Outside (b)-(a)	2	1	1	5	1	1	1	4
Square Miles of CBD =6a/8=	0.35	1.00	0.33	1.13	1.40	0.50	4.80	1.40
CBD Employment Density = Per Sq. Mile(x100)	95,775	33,000	70,769	162,234	9,286	78,000	4,792	105.000
Total CBD Employment as % of SMSA Employ. = 6a/4 x 100 =	3.94	10.58	4.34	15.21	3.71	7.44	6.87	12.35
Estimated Participation Ratio = 4/2x100 =	36.52	36.11	39.02	38.71	32.80	36.77	32.98	41.58

Table D-2

GROWTH TRENDS IN BOSTON PROPER

ITEM	YEAR 1954	1964	1972
Employment	N.A.	246,000	263,000
P.M. Peak Hour Cordon			
Persons by Transit	105,430	76,710	72,030
Persons by Auto	40,320	65,270	66,880
Pedestrians	5,690	3,430	4,460
Total Persons	151,440	145,410	143,370
Total Vehicles	25,900	39,260	40,000
Peak Accumulation (1)			
Persons by Transit	146,000	126,000	121,000
Persons by Auto	53,000	66,000	74,000
Total Persons	199,000	192,000	195,000
Total Vehicles	28,000	42,000	44,000

(1) Normalized to represent comparable accumulations at midnight. Excludes persons in CBD at 7:00 A.M., as well as persons who live and work in CBD.

N.A. = Not Available.

SOURCE: Cordon Data, Downtown Boston, 1954, 1964, 1972. Employment, Regional Framework, Boston Transportation Planning Review, October, 1972. Figures are for 1963 and 1970, respectively.

Table D-3

TRENDS IN PERSONS AND VEHICLES CROSSING BOSTON PROPER CORDON

7:00 A.M. to 12:00 Midnight

YEAR	NUMBER OF PERSONS				PER CENT ENTERING BY PUBLIC TRANSPORT	NUMBER OF PRIVATE VEHICLES ENTERING
	Public(1) Transport	Private(2) Transport	Pedestrian	Total		
1954	380,300	407,200	52,200	839,700	45	258,200
1964	252,300	524,900	35,100	812,300	31	344,700
1972	232,800	612,400	39,100	884,300	25	400,100

YEAR	NUMBER OF PERSONS				PER CENT BY PUBLIC TRANSPORT	NUMBER OF PRIVATE VEHICLES
	Public Transport	Private Vehicle(3)	Pedestrian	Total All Modes		
Morning Peak Hour (8:00 A.M. to 9:00 A.M.) Inbound:						
1954	99,362	37,609	4,136	141,107	70	23,829
1964	68,682	46,042	2,223	116,947	58	33,130
1972	61,945	50,194	2,597	114,736	53	36,308
Evening Peak Hour (4:30 P.M. to 5:30 P.M.) Outbound:						
1954	105,424	40,317	5,688	151,429	69	25,897
1964	76,709	65,271	3,430	145,410	52	39,263
1972	72,030	66,878	4,457	143,365	50	39,999

(1) Rapid transit, bus, and commuter railroad.
(2) Passenger cars, trucks, and taxis.
(3) Automobiles, trucks, and taxis.
SOURCE: Cordon Counts, Downtown Boston, 1954, 1964, 1972. (All counts are for the 17-hour period, 7:00 A.M. to 12:00 Midnight.)

Table D-4

POPULATION CHANGE ON A WEEKDAY, 1972-1973
Chicago Central Business District

A. Persons Downtown 7 A.M. to 7 P.M.

MODE	TOTAL ENTERING DOWNTOWN		MAXIMUM ACCUMULATION DOWNTOWN	
	Number	Percent of Total	Number	Percent of Total
*CTA Rapid Transit	*235,093	*29	* 91,707	*33
CTA Bus	106,377	13	39,048	14
*Suburban railroad	*110,723	*14	* 99,312	*35
Suburban bus	28,718	3	10,334	4
Mass transit subtotal	480,911	59	240,401	86
*Grade-separated transit subtotal	*345,816	*43	*191,019	*68
Auto and taxi	313,083	39	38,089	14
Service vehicle	19,421	2	1,205	-
TOTAL	813,415	100	279,695	100

B. Passengers entering CTA rapid transit stations in Cordon area, 24-hour period

State subway	
Lake/Randolph thru Roosevelt	53,650
Dearborn subway	
Lake Transfer thru LaSalle/Congress	41,050
Loop 'L'	
All entrances	52,350
TOTAL	147,050

C. Portions of CTA rapid transit traffic served by day and by night

7 AM to 7 PM	Inbound	84%	Outbound	82%
7 PM to 7 AM	Inbound	16%	Outbound	18%

Notes:

1. The central business district of Chicago (downtown) includes the area bounded by Lake Michigan, the Chicago River, and Roosevelt Road.
2. Data for table A are from the annual Cordon Count made in May 1972. Data for tables B and C are from CTA records and checks.
3. The number of people resident downtown is negligible in comparison to the daily in-migration.
4. Indications are developing that the existing Cordon lines no longer adequately represent the CBD. Substantial population changes related to CBD activity are now in progress immediately north and west of the present Cordon lines.

SOURCE: Chicago Transit Authority

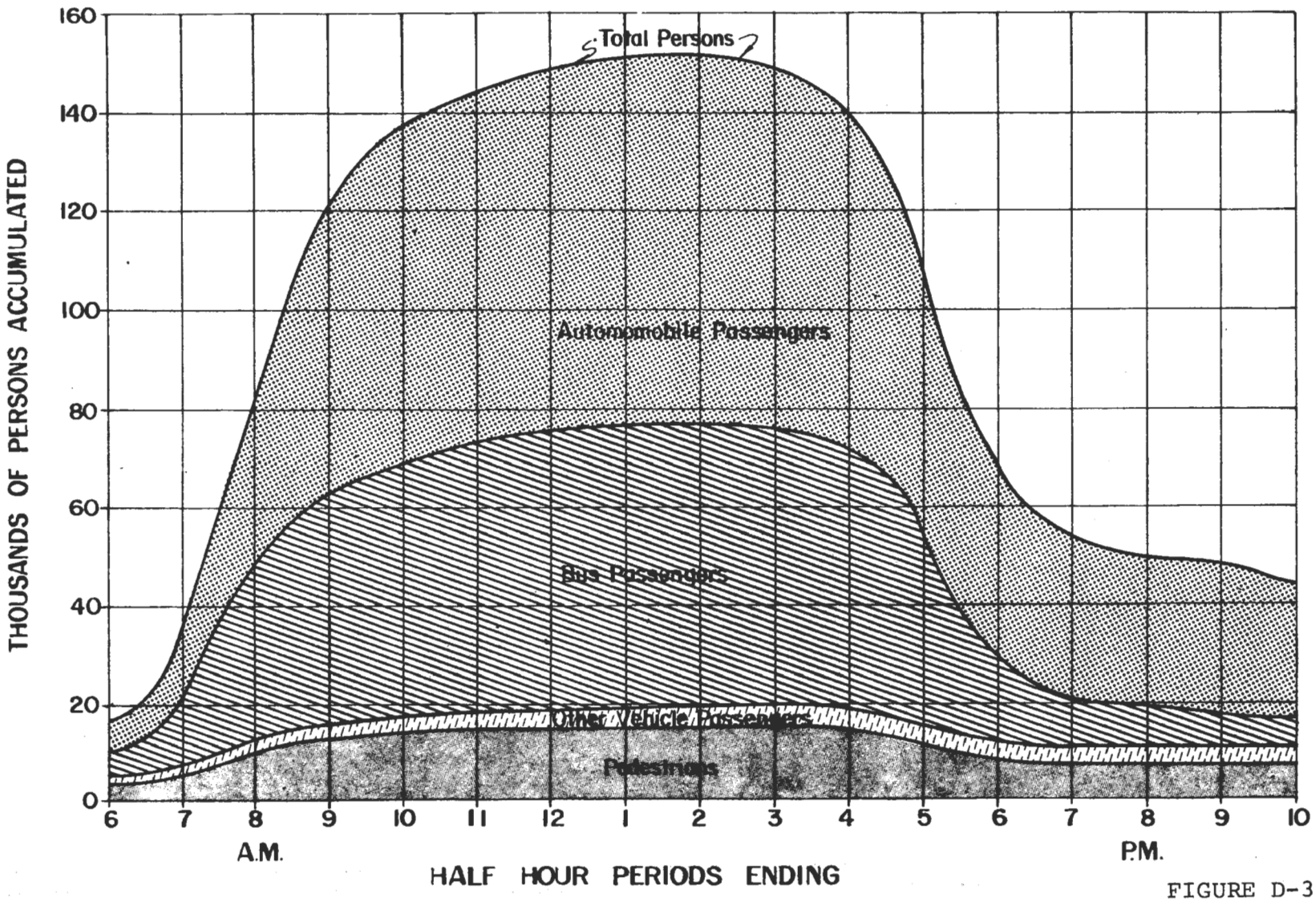


FIGURE D-3

PERSONS ACCUMULATED IN CORDON AREA, MAY 1974 (L.A.)

City of Los Angeles
DEPARTMENT OF TRAFFIC
S.S.(Sam) Taylor, City Traffic Engineer

PLATE 6

Peaking Patterns of Persons Entering the Manhattan CBD

	Percentage of each mode's inbound passengers carried during		Percentage of total inbound passengers carried by each mode during	
	Highest Hr	Highest 12 Hrs*	8-9 A.M.	24 Hrs
Railroad	45.6	93.1	9.7	5.4
Subway	31.0	89.7	70.0	56.5
Bus	22.4	86.5	8.1	8.1
Auto & taxi, truck	8.7	71.1	11.0	28.9
Ferry	26.6	91.0	1.2	1.1
All mechanical	**24.6**	**83.8**	**100.0**	**100.0**
Estimated pedestrians crossing cordon	11.9	91.1	+1.6	+5.4

Sources: Regional Plan Association, *CBD Cordon Crossings Analysis 1965*, Tri-State Regional Planning Commission, *Hub-Bound Travel 1971*.
*The highest 12 hrs are 6:00 A.M.-6:00 P.M. for rail and subway, 7:00 A.M.-7:00 P.M. for the surface modes and 8:00 A.M.-8:00 P.M. for pedestrians.

Hourly distribution to trips entering and leaving the Manhattan CBD

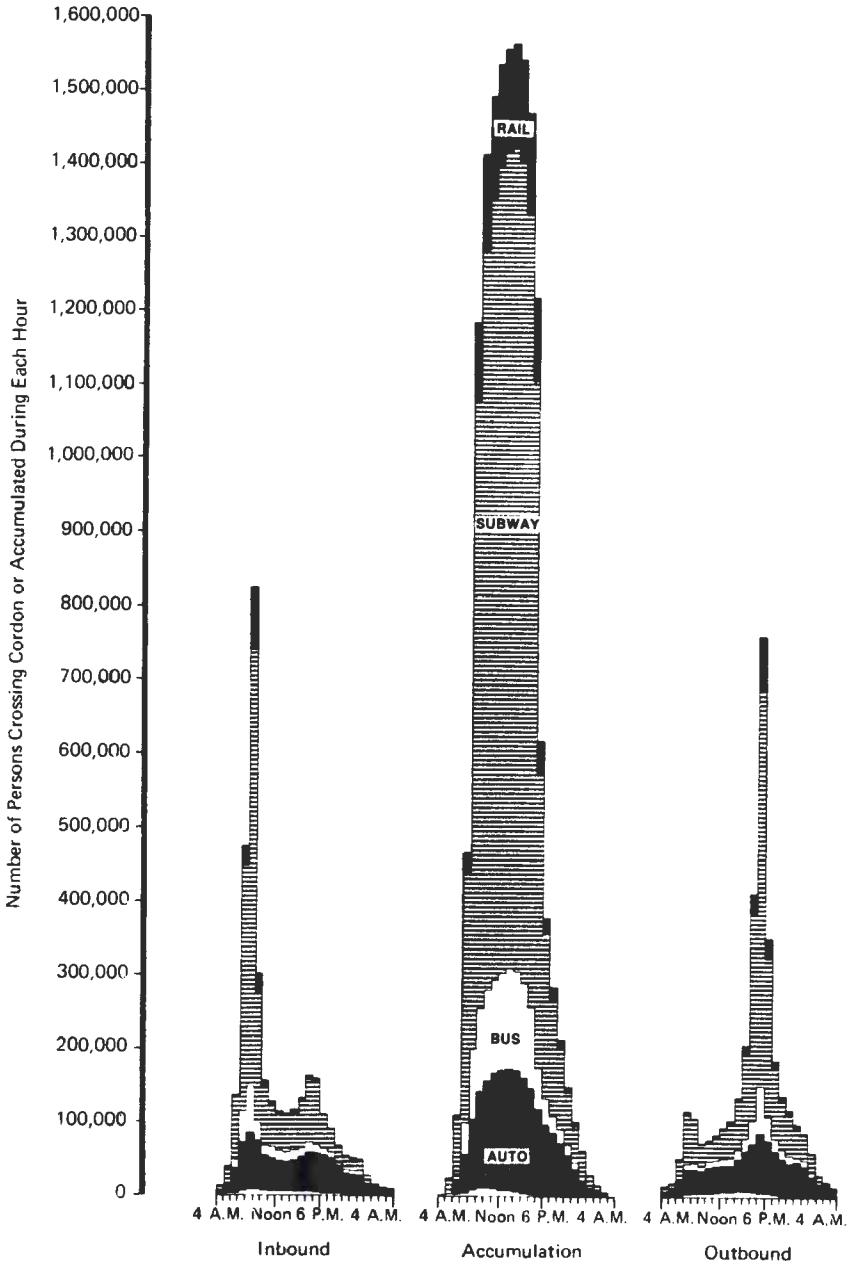


FIGURE D-4

SOURCE: Regional Plan Association

Table D-5

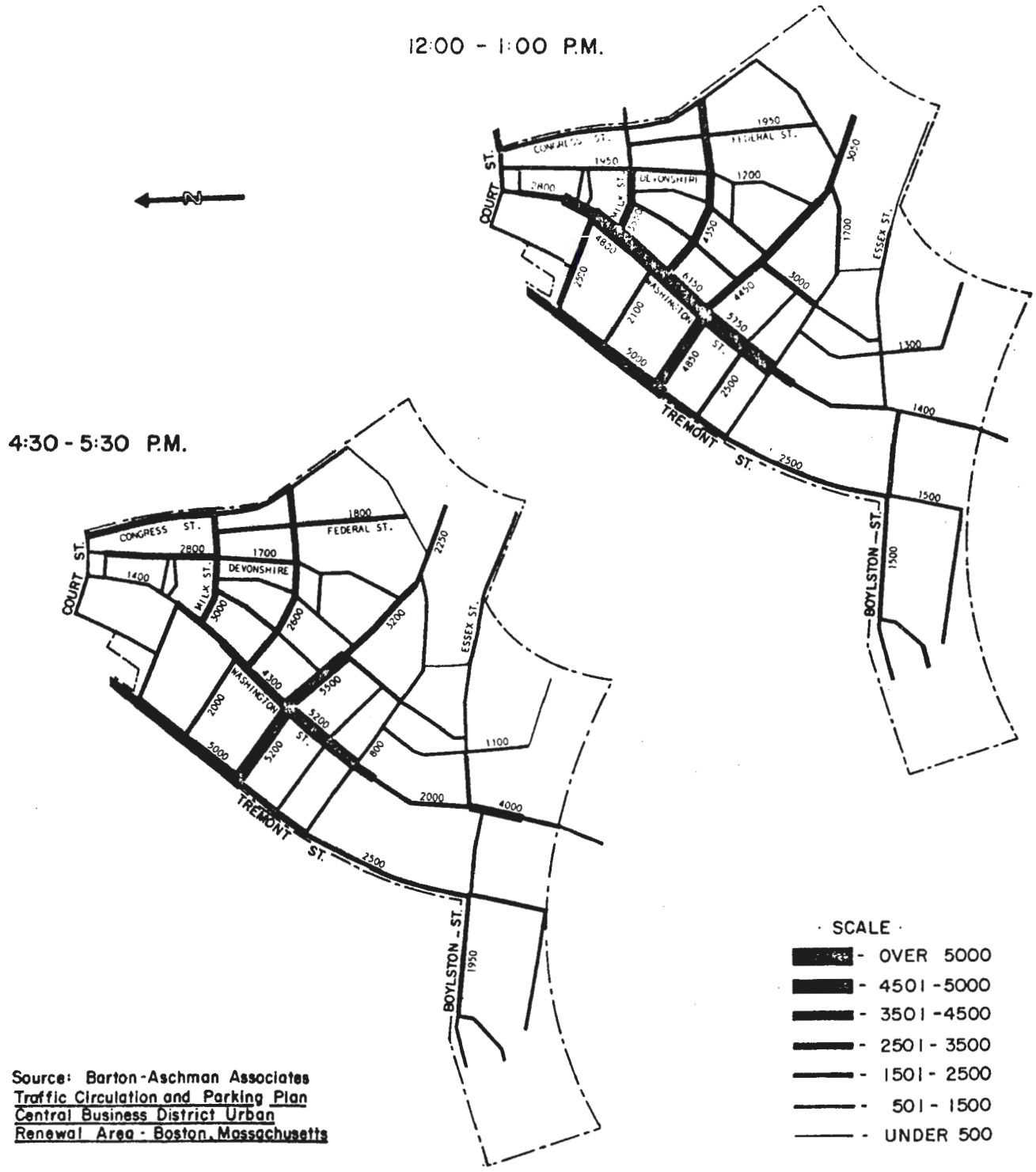
PEOPLE AND VEHICLES ENTERING THE HUB ON A TYPICAL BUSINESS DAY: 1924 - 1974
(Thousands)

PERSONS BY MODE	1924		1932		1940		1948		1956		1960		1963		1971		1973		1974	
Autos, Taxis & Trucks	331	14.1%	516	19.1%	519	18.9%	657	17.9%	838	25.0%	974	28.5%	846	25.7%	914	29.9%	931	30.9%	872	29.4%
Bus	-	-	40	1.5	150	4.6	290	7.8	243	7.4	243	7.3	252	7.6	256	8.1	232	7.7	230	7.8
Trolley	161	6.9	88	3.2	59	1.8	24	0.6	3	0.1	-	-	-	-	-	-	-	-	-	-
Rapid Transit	1,531	65.3	1,752	65.0	2,169	66.3	2,389	64.8	1,970	54.9	1,913	57.1	1,977	60.1	1,789	56.5	1,652	54.8	1,663	56.1
Railroad	217	9.3	216	8.0	206	6.3	283	7.6	233	7.0	203	7.0	177	5.4	172	5.4	168	5.6	170	5.7
Nonrail Ferry	103	4.4	85	3.2	68	2.1	48	1.3	36	1.1	36	1.1	38	1.2	36	1.1	31	1.0	30	1.0
TOTAL	**2,343**		**2,697**		**3,271**		**3,691**		**3,313**		**3,349**		**3,290**		**3,167**		**3,015**		**2,965**	
PERSONS BY SECTOR																				
N. of 60th Street	832	35.5%	1,046	38.8%	1,320	40.4%	1,599	43.3%	1,422	42.9%	1,441	43.0%	1,388	42.2%	1,279	40.4%	1,248	41.4%	1,221	41.0%
Brooklyn	899	38.4	946	35.1	1,074	32.8	1,124	30.5	950	28.7	922	27.5	919	27.9	876	27.6	792	26.2	782	26.3
Queens	237	10.1	355	13.1	538	16.5	602	16.3	613	18.5	641	19.2	615	18.7	659	20.8	645	21.4	646	21.7
New Jersey	335	14.3	309	11.5	302	9.2	326	8.8	292	8.8	306	9.1	328	10.0	316	10.0	298	9.9	297	10.0
Staten Island	40	1.7	41	1.5	37	1.1	40	1.1	36	1.1	39	1.2	40	1.2	37	1.2	32	1.1	31	1.0
TOTAL	**2,343**		**2,697**		**3,271**		**3,691**		**3,313**		**3,349**		**3,290**		**3,167**		**3,015**		**2,977**	
VEHICLES BY SECTOR																				
N. of 60th Street	122	60.9%	150	51.1%	191	54.5%	203	53.1%	259	49.9%	293	49.7%	273	48.8%	310	48.0%	323	49.0%	285	45.6%
Brooklyn	47	23.5	69	23.6	84	23.9	79	20.7	126	24.3	139	23.6	124	22.2	157	24.3	148	22.4	152	24.3
Queens	18	9.0	46	15.8	40	11.3	56	14.6	71	13.7	87	14.7	89	15.9	103	15.9	108	16.4	107	17.1
New Jersey	12	5.9	26	9.0	35	9.9	43	11.2	61	11.7	69	11.6	71	12.7	75	11.6	80	12.0	80	12.8
Staten Island	1	0.7	2	0.5	1	0.4	1	0.4	2	0.4	2	0.4	2	0.4	1	0.2	1	0.2	1	.2
TOTAL	**200**		**293**		**351**		**382**		**519**		**590**		**559**		**646**		**660**		**625**	

SOURCE: Tri-State Regional Planning Commission.
Hub-bound Travel, 1974. Interim Technical Report 4562-1205-6-1206.

C. PARKING AND PEDESTRIAN PATTERNS

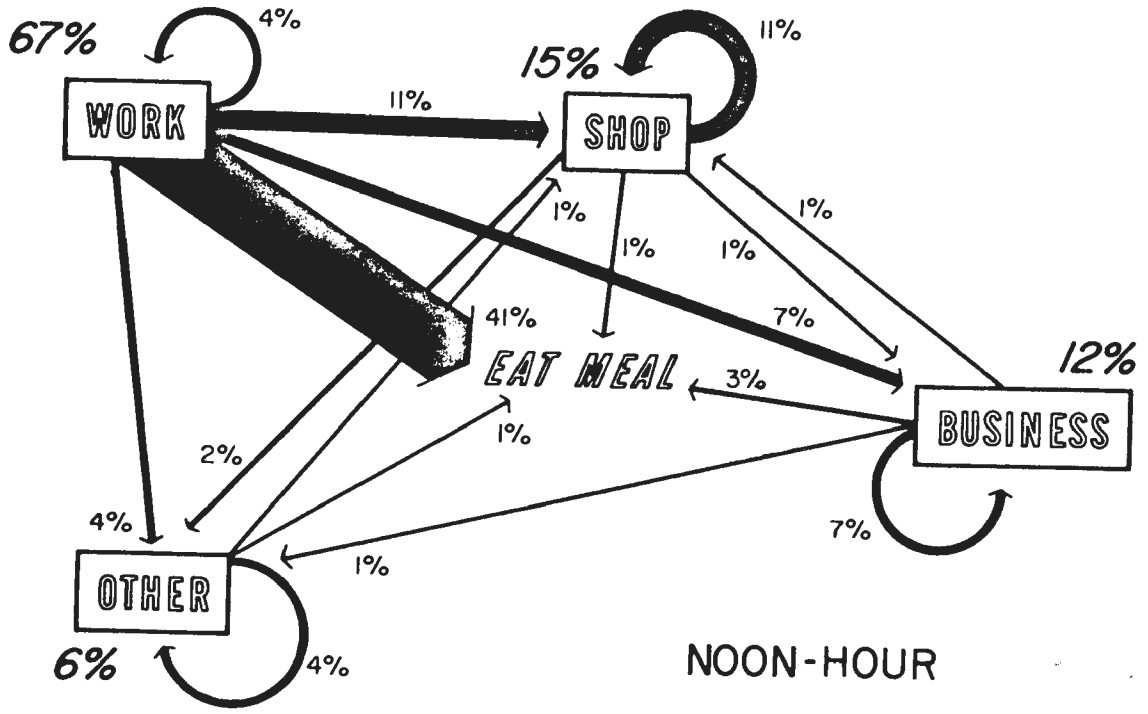
(Alphabetical by City)

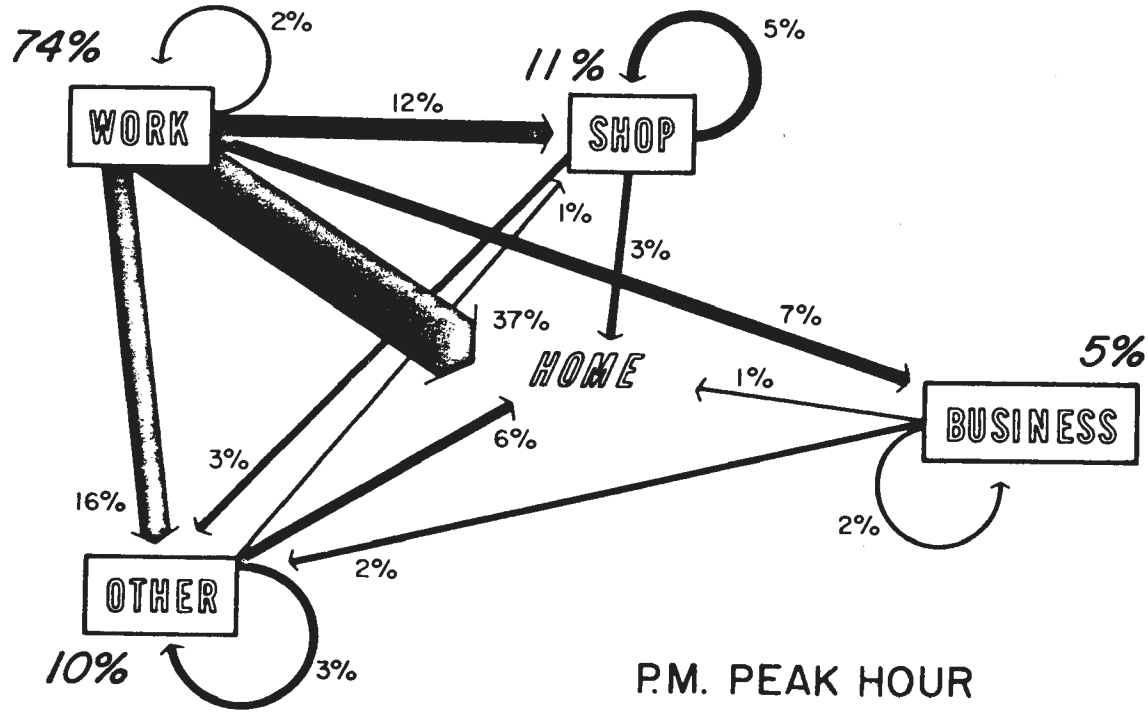


Source: Barton-Aschman Associates
Traffic Circulation and Parking Plan
Central Business District Urban
Renewal Area - Boston, Massachusetts

CENTER CITY BOSTON
PEDESTRIAN VOLUMES — 1963

FIGURE D-5





Source: Barton-Aschman Associates
Traffic Circulation and Parking Plan
Central Business District Urban
Renewal Area - Boston, Massachusetts

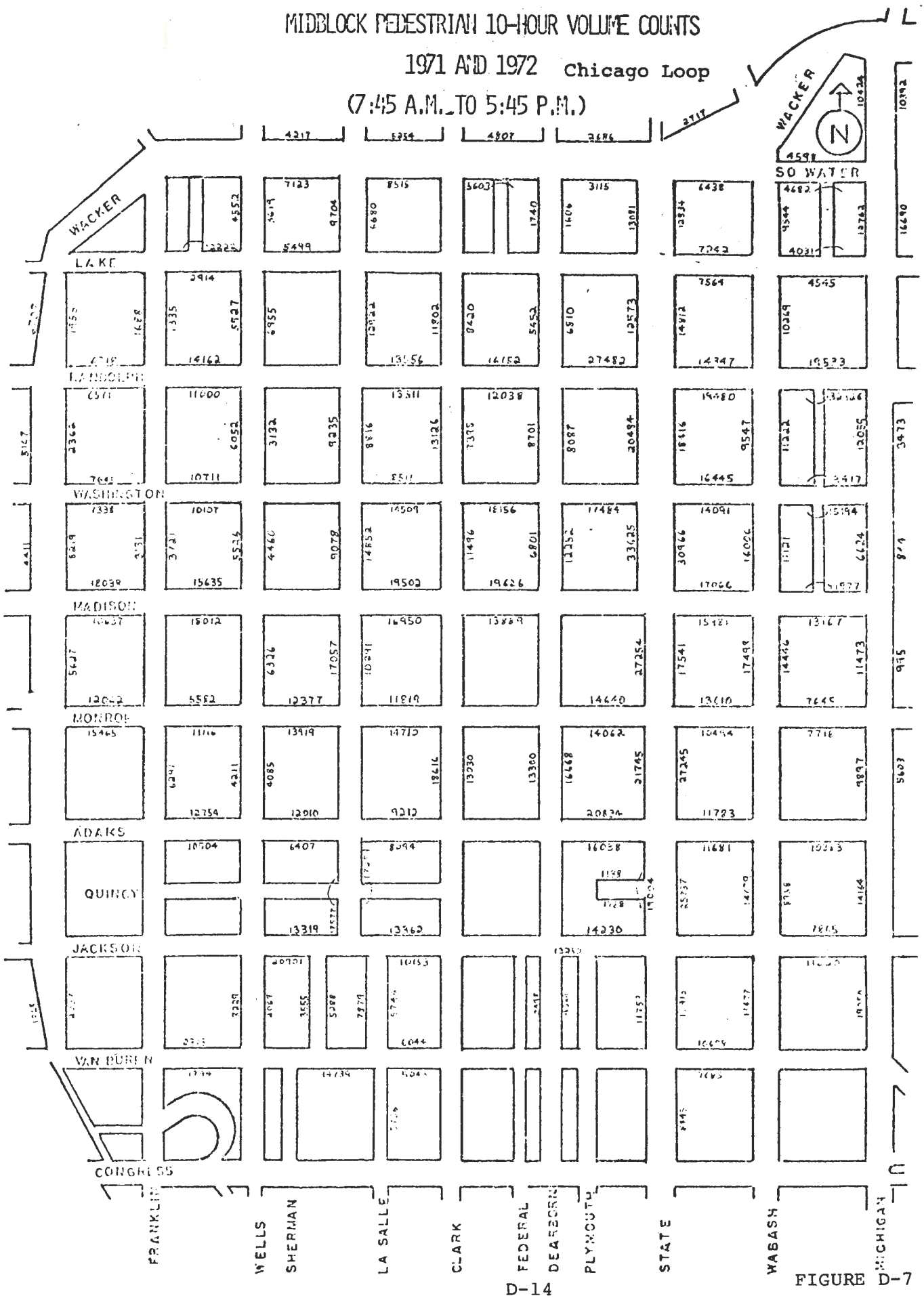
PEDESTRIAN TRIP PURPOSES
BOSTON CENTER CITY — 1963

FIGURE D-6

MIDBLOCK PEDESTRIAN 10-HOUR VOLUME COUNTS

1971 AND 1972 Chicago Loop

(7:45 A.M. TO 5:45 P.M.)



SOURCE: Chicago Loop Pedestrian Movement Study, 1973

FIGURE D-7

Table D-6

COMPARISON BETWEEN 1960'S AND 1970'S MIDBLOCK PEDESTRIAN COUNTS ON NORTH - SOUTH STREETS

Chicago Loop

LOCATION	DATE	TIME PERIOD COVERED	TOTAL VOLUME	% CHANGE	PEAK HOURS*			HIGHEST PEAK		% OF TOTAL
					A.M.	NOON	P.M.	HOUR	VOLUME	
State between Lake and Randolph	Wednesday, June 8, 1960	8:00 A.M. 6:00 P.M.	21,183	--	10-11	12-1	5-6	12-1 P.M.	2,938	13.9
State between Lake and Randolph	Monday, August 21, 1972	7:45 A.M. 5:45 P.M.	27,385	+29.3	10-11	12-1	3-4	3-4 P.M.	3,635	13.3
State between Randolph and Washington	Wednesday, June 15, 1960	8:00 A.M. 7:00 P.M.	41,881	--	10-11	12-1	1-2	12-1 P.M.	6,888	16.4
State between Randolph and Washington	Monday, August 2, 1971	8:00 A.M. 7:00 P.M.	42,798	+2.2	10-11	12-1	4-5	12-1 P.M.	6,208	14.5
State between Washington and Madison	Wednesday, June 15, 1960	8:00 A.M. 7:00 P.M.	76,952	--	10-11	12-1	1-2	12-1 P.M.	13,434	17.5
State between Washington and Madison	Thursday, November 9, 1972	8:00 A.M. 7:00 P.M.	71,603	-7.0	10-11	12-1	4-5	4-5 P.M.	10,423	14.6
State between Madison and Monroe	Wednesday June 15, 1960	8:00 A.M. 6:00 P.M.	55,975	--	10-11	12-1	1-2	12-1 P.M.	9,952	17.8
State between Madison and Monroe	Tuesday, August 15, 1972	7:45 A.M. 5:45 P.M.	44,795	-20.0	10-11	12-1	1-2	1-2 P.M.	7,704	17.2
State between Monroe and Adams	Wednesday, June 15, 1960	8:00 A.M. 7:00 P.M.	68,290	--	10-11	12-1	1-2	12-1 P.M.	11,618	17.0
State between Monroe and Adams	Wednesday, October 25, 1972	8:00 A.M. 7:00 P.M.	53,432	-21.8	10-11	12-1	1-2	12-1 P.M.	7,969	14.9
State between Adams and Jackson	Wednesday, June 8, 1960	8:00 A.M. 7:00 P.M.	46,578	--	10-11	12-1	1-2	12-1 P.M.	7,913	17.0
State between Adams and Jackson	Friday, October 27, 1972	8:00 A.M. 7:00 P.M.	49,274	+5.8	8-9	12-1	4-5	4-5 P.M.	7,772	15.8
State between Jackson and Van Buren	Wednesday, June 8, 1960	8:00 A.M. 6:00 P.M.	22,813	--	10-11	12-1	1-2	12-1 P.M.	3,704	16.2
State between Jackson and Van Buren	Monday, July 24, 1972	7:45 A.M. 5:45 P.M.	25,666	+12.5	10-11	12-1	1-2 5:00-5:45	1-2 P.M. 5-6 P.M.**	3,792 4,300**	14.8 --
Sherman between Jackson and Van Buren	Monday, March 1, 1965	8:00 A.M. 6:00 P.M.	9,011	--	8-9	12-1	4-5	12-1 P.M.	1,317	14.6
Sherman between Jackson and Van Buren	Thursday, October 26, 1972	8:00 A.M. 6:00 P.M.	8,938	-0.8	8-9	11-12	4-5	4-5 P.M.	2,932	32.8

* A.M. - Before 11:00 A.M.; Noon - 11:00 A.M. to 1:00 P.M.; P.M. - 1:00 P.M. on
** 5:45 - 6:00 P.M. volume estimated

SOURCE: City of Chicago, Chicago Loop Pedestrian Movement Study, 1973.

Table D-7

COMPARISON BETWEEN 1960'S AND 1970'S MIDBLOCK PEDESTRIAN COUNTS ON EAST - WEST STREETS

Chicago Loop

LOCATION	DATE	TIME PERIOD COVERED	TOTAL VOLUME	% CHANGE	PEAK HOURS* A.M.	NOON	P.M.	HIGHEST PEAK HOUR	VOLUME	% OF TOTAL
Randolph between Wabash and Michigan	Wednesday August 22, 1962	8:00 A.M. 7:00 P.M.	51,097	--	8-9	12-1	5-6	5-6 P.M.	7,701	15.1
Randolph between Wabash and Michigan	Monday August 9, 1971	8:00 A.M. 7:00 P.M.	59,436	+16.3	9-10	12-1	5-6	5-6 P.M.	8,475	14.3
Randolph between State and Wabash	Tuesday, June 14, 1960	8:00 A.M. 6:00 P.M.	31,237	--	8-9	12-1	5-6	5-6 P.M.	5,744	18.4
Randolph between State and Wabash	Monday, August 21, 1972	7:45 A.M. 5:45 P.M.	33,827	+8.3	8-9	12-1	5:00-5:45	5:00 P.M.-5:45 P.M.	4,322	12.8
Washington between Wabash and Michigan	Thursday August 23, 1962	8:00 A.M. 6:00 P.M.	22,707	--	8-9	12-1	5-6	5-6 P.M.	3,405	15.0
Washington between Wabash and Michigan	Friday August 25, 1972	7:45 A.M. 5:45 P.M.	24,611	+8.4	10-11	12-1	1-2	1-2 P.M.	3,006	12.2
Madison between Wabash and Michigan	Thursday August 23, 1962	8:00 A.M. 6:00 P.M.	16,402	--	8-9	12-1	1-2	12-1 P.M.	2,429	14.8
Madison between Wabash and Michigan	Tuesday July 11, 1972	7:45 A.M. 5:45 P.M.	25,144	+53.3	8-9	12-1	1-2	1-2 P.M.	4,478	17.8
Madison between State and Wabash	Tuesday, June 21, 1960	8:00 A.M. 6:00 P.M.	28,212	--	8-9	12-1	5-1	5-6 P.M.	4,282	15.2
Madison between State and Wabash	Tuesday, July 11, 1972	7:45 A.M. 5:45 P.M.	33,047	+17.1	8-9	12-1	1-2	1-2 P.M.	4,460	13.5
Madison between Clark and Dearborn	Friday December 7, 1962	8:00 A.M. 6:00 P.M.	45,825	--	8-9	12-1	5-6	12-1 P.M.	7,171	15.6
Madison between Clark and Dearborn	Monday August 28, 1972	7:45 A.M. 5:45 P.M.	33,515	-26.9	8-9	12-1	5:00-5:45	12-1 P.M. 5-6 P.M.**	4,319 4,910**	12.9 --
Monroe between Wabash and Michigan	Friday, August 31, 1962	8:00 A.M. 6:00 P.M.	20,687	--	8-9	12-1	1-2	12-1 P.M.	2,877	13.9
Monroe between Wabash and Michigan	Wednesday, July 19, 1972	7:45 A.M. 5:45 P.M.	15,363	-25.7	8-9	12-1	5:00-5:45	12-1 P.M. 5-6 P.M.**	2,052 2,270**	13.4 --
Monroe between State and Wabash	Wednesday, June 22, 1960	8:00 A.M. 6:00 P.M.	28,938	--	8-9	12-1	1-2	12-1 P.M.	4,342	15.0
Monroe between State and Wabash	Tuesday, August 15, 1972	7:45 A.M. 5:45 P.M.	24,104	-16.7	8-9	12-1	1-2	1-2 P.M.	3,402	14.1
Monroe between State and Dearborn	Wednesday, June 22, 1960	8:00 A.M. 6:00 P.M.	33,019	--	8-9	12-1	1-2	12-1 P.M.	5,520	16.7
Monroe between State and Dearborn	Tuesday, August 15, 1972	7:45 A.M. 5:45 P.M.	28,702	-13.1	8-9	12-1	1-2	1-2 P.M.	4,668	16.3

* A.M. - Before 11:00 A.M.; Noon - 11:00 A.M. to 1:00 P.M.; P.M. - 1:00 P.M. on
** 5:45 - 6:00 P.M. volume estimated

SOURCE: City of Chicago, Chicago Loop Pedestrian Movement Study, 1973.

Table D-7 (Cont.)

COMPARISON BETWEEN 1960'S AND 1970'S MIDBLOCK PEDESTRIAN COUNTS ON EAST - WEST STREETS

LOCATION	DATE	TIME PERIOD COVERED	TOTAL VOLUME	% CHANGE	PEAK HOURS* A.M.	NOON	P.M.	HIGHEST PEAK HOUR	VOLUME	% OF TOTAL
Adams between State and Wabash	Wednesday, June 22, 1960	8:00 A.M. 7:00 P.M.	29,634	--	8-9	12-1	5-6	12-1 P.M.	4,719	15.9
Adams between State and Wabash	Tuesday, October 24, & Wednesday, October 25, 1972	8:00 A.M. 7:00 P.M.	24,174	-18.4	8-9	12-1	5-6	8-9 A.M.	3,645	15.1
Adams between State and Dearborn	Wednesday, June 22, 1960	8:00 A.M. 7:00 P.M.	33,809	--	8-9	12-1	5-6	12-1 P.M.	5,445	16.1
Adams between State and Dearborn	Monday, November 20, 1972	8:00 A.M. 7:00 P.M.	38,983	+15.3	8-9	12-1	4-5	4-5 P.M.	5,615	14.4
Jackson between Wabash and Michigan	Tuesday August 28, 1962	8:00 A.M. 7:00 P.M.	22,362	--	8-9	12-1	5-6	8-9 A.M.	4,786	21.4
Jackson between Wabash and Michigan	Tuesday October 24, 1972	8:00 A.M. 7:00 P.M.	19,204	-14.1	8-9	12-1	4-5	4-5 P.M.	3,700	19.3
Van Buren between State and Wabash	Friday, June 24, 1960	8:00 A.M. 7:00 P.M.	26,426	--	8-9	12-1	5-6	5-6 P.M.	4,284	16.2
Van Buren between State and Wabash	Monday, October 23, 1972	8:00 A.M. 7:00 P.M.	19,359	-26.7	8-9	12-1	4-5	4-5 P.M.	3,253	16.8

* A.M. - Before 11:00 A.M.; Noon - 11:00 A.M. to 1:00 P.M.; P.M. - 1:00 P.M. on

Table D-8
PEAK HOUR PEDESTRIAN VOLUMES ON STATE STREET

Chicago

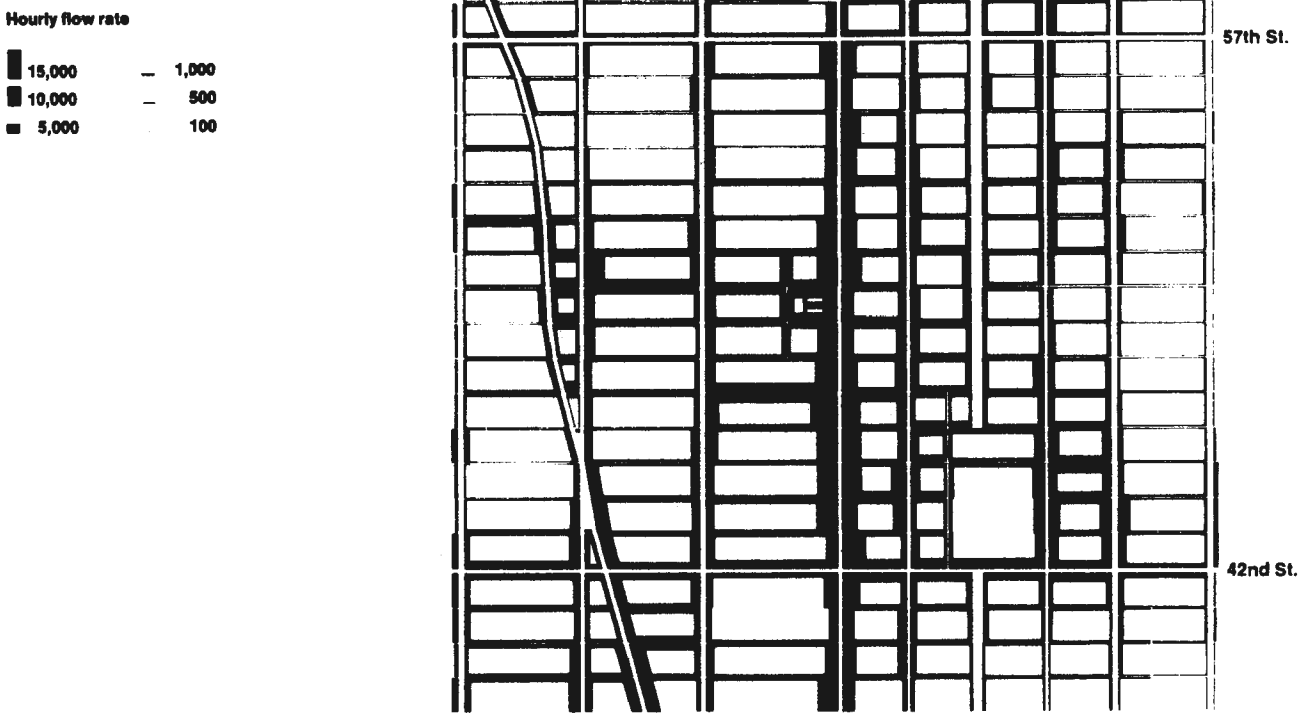
STREET	BETWEEN (SIDE OF STREET)	A.M. PEAK+		NOON PEAK+		P.M. PEAK+	
		HOUR	VOLUME	HOUR	VOLUME	HOUR	VOLUME
State	Wacker & Lake (E)	8-9	1,563	12-1	1,376	4:00-5:00	2,110
State	Wacker & Lake (W)	8-9	880	12-1	1,211	4:00-5:00	2,873
State	Lake & Randolph (E)	10-11	889	12-1	1,689	4:45-5:45 1:00-2:00	2,350 1,903
State	Lake & Randolph (W)	10-11	911	12-1	1,711	3:00-4:00	1,737
State	Washington & Madison (E)	10-11	1,927	11-12	3,301	4:00-5:00	4,876
State	Washington & Madison (W)	10-11	1,773	12-1	4,184	4:00-5:00	5,547
State	Madison & Monroe (E)	10-11	1,024	12-1	2,574	4:45-5:45 4:00-5:00	2,917 2,465
State	Madison & Monroe (W)	10-11	980	12-1	2,988	1:00-2:00	5,649
State	Monroe & Adams (E)	10-11	1,019	12-1	3,769	4:00-5:00	4,392
State	Monroe & Adams (W)	10-11	978	12-1	4,200	5:00-6:00	3,586
State	Adams & Jackson (E)	8-9	1,488	12-1	2,642	4:00-5:00	4,688
State	Adams & Jackson (W)	9-10	1,008	12-1	2,499	4:00-5:00	3,084
State	Jackson & Van Buren (E)	10-11	914	12-1	1,864	4:45-5:45 1:00-2:00	2,069 2,062
State	Jackson & Van Buren (W)	10-11	670	12-1	780	4:45-5:45 3:00-4:00	2,238 1,740

+ A.M. - Before 11:00 A.M.; Noon - 11:00 A.M. to 1:00 P.M.; P.M. - 1:00 P.M. on

SOURCE: City of Chicago, Chicago Loop Pedestrian Movement Study, 1973.

HOURLY PEDESTRIAN FLOW RATES
IN MIDTOWN MANHATTAN

A. Midday



B. Evening

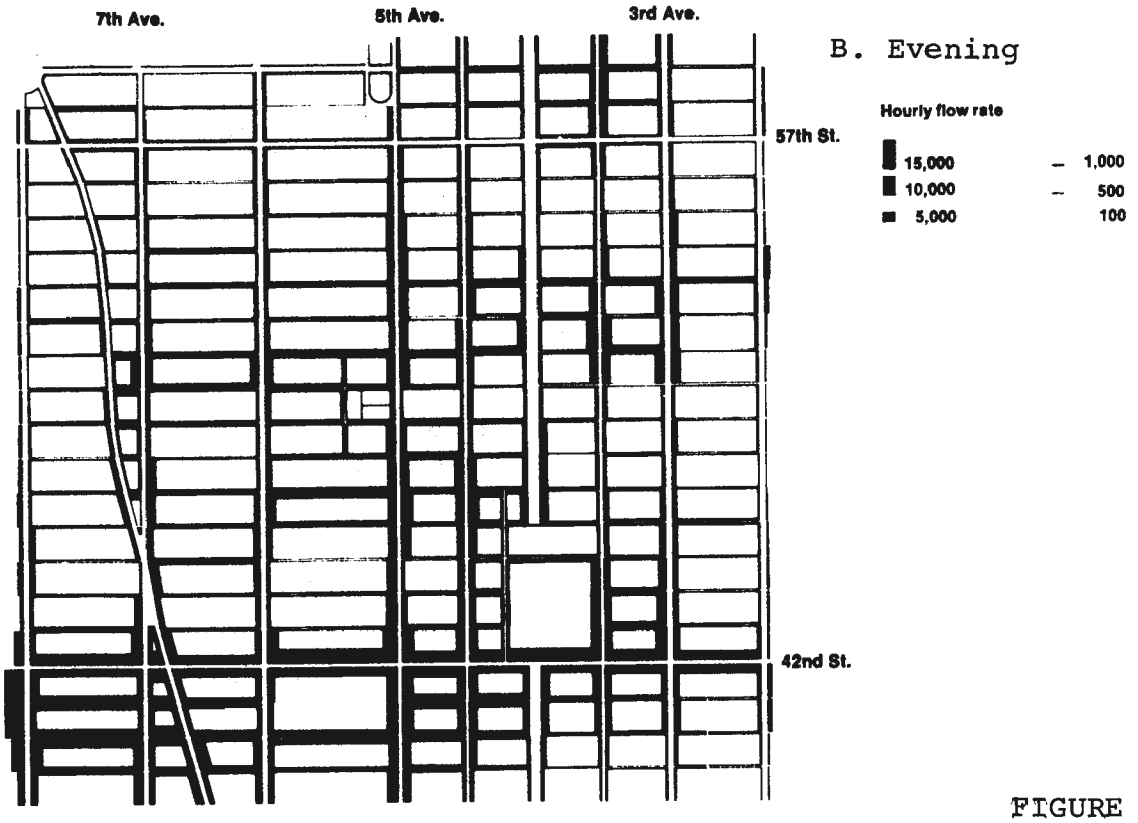
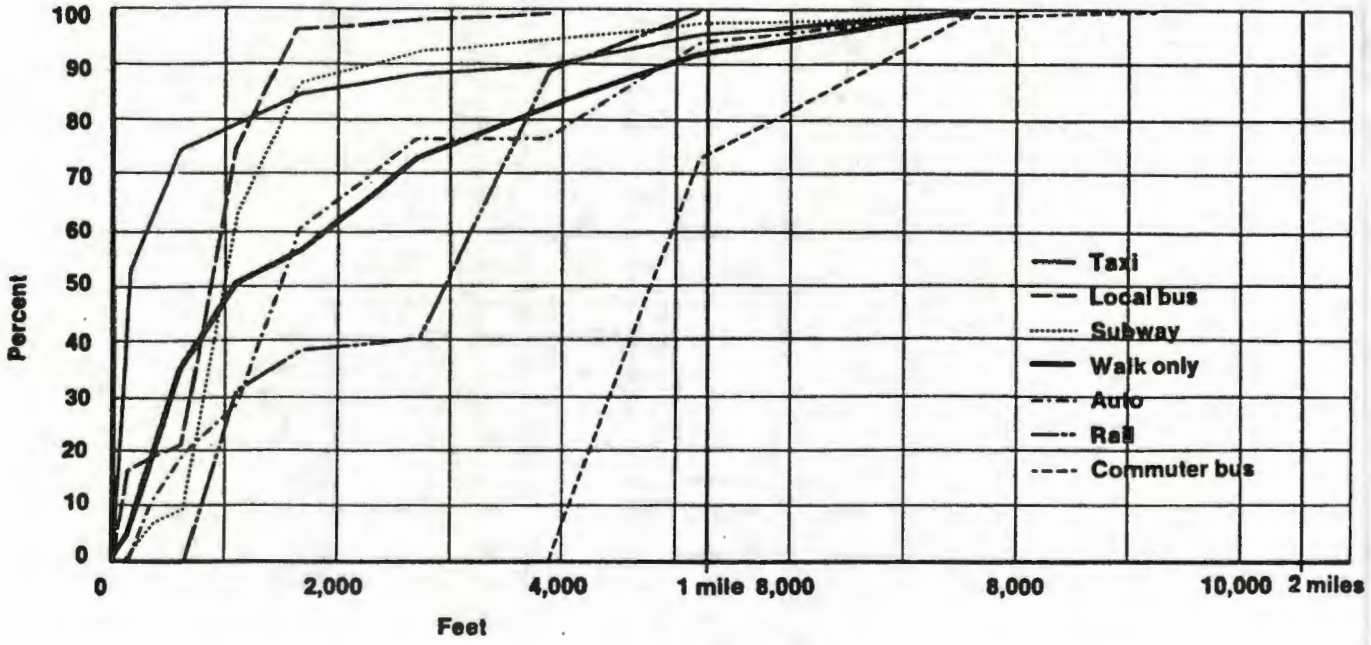


FIGURE D-8

SOURCE: Pushkarev, B. and Zupan, J. Urban Space for Pedestrians, 1976

CUMULATIVE WALKING DISTANCE DISTRIBUTION
AT TWO MANHATTAN OFFICE BUILDINGS

BY MODE



BY PURPOSE

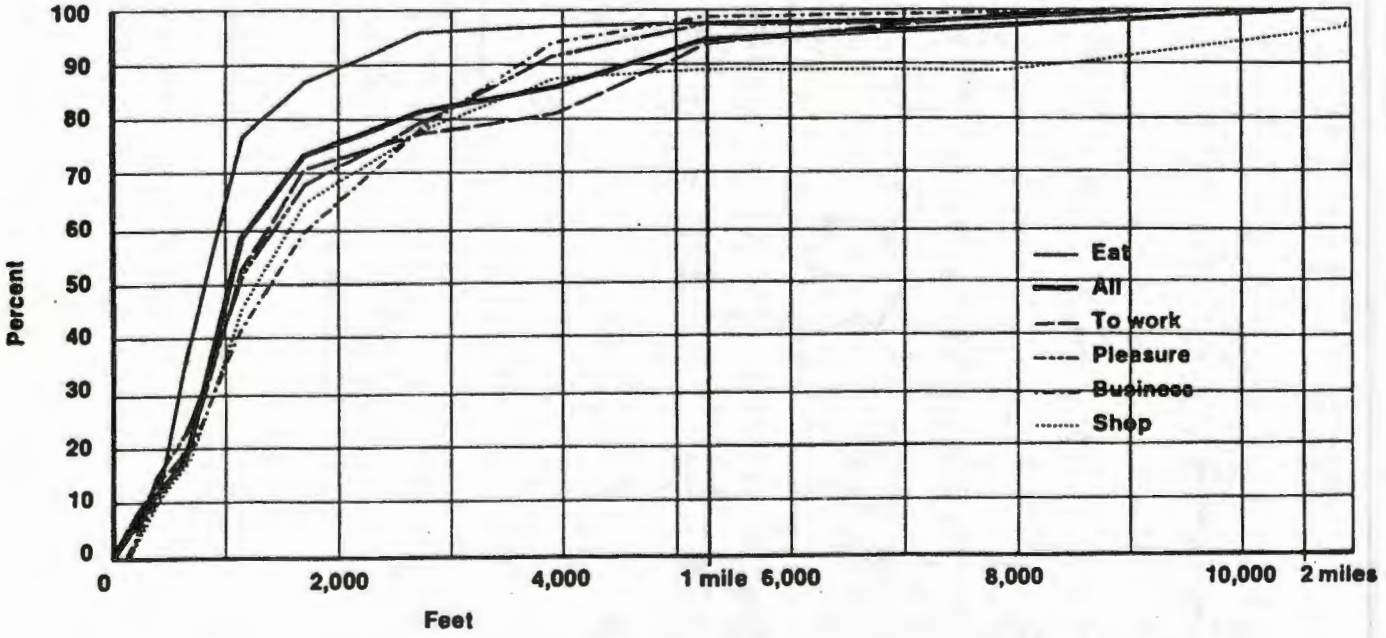
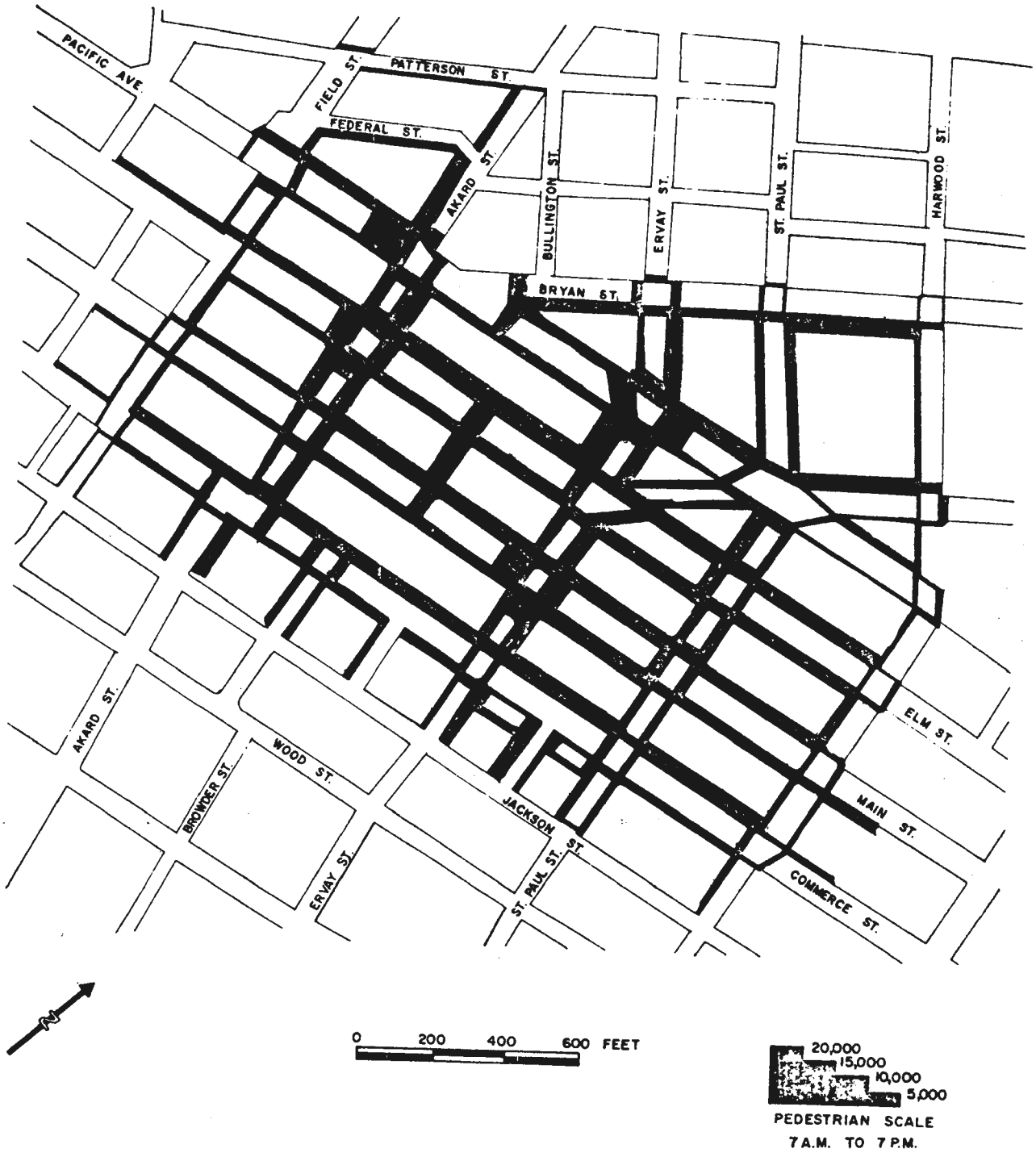


FIGURE D-9

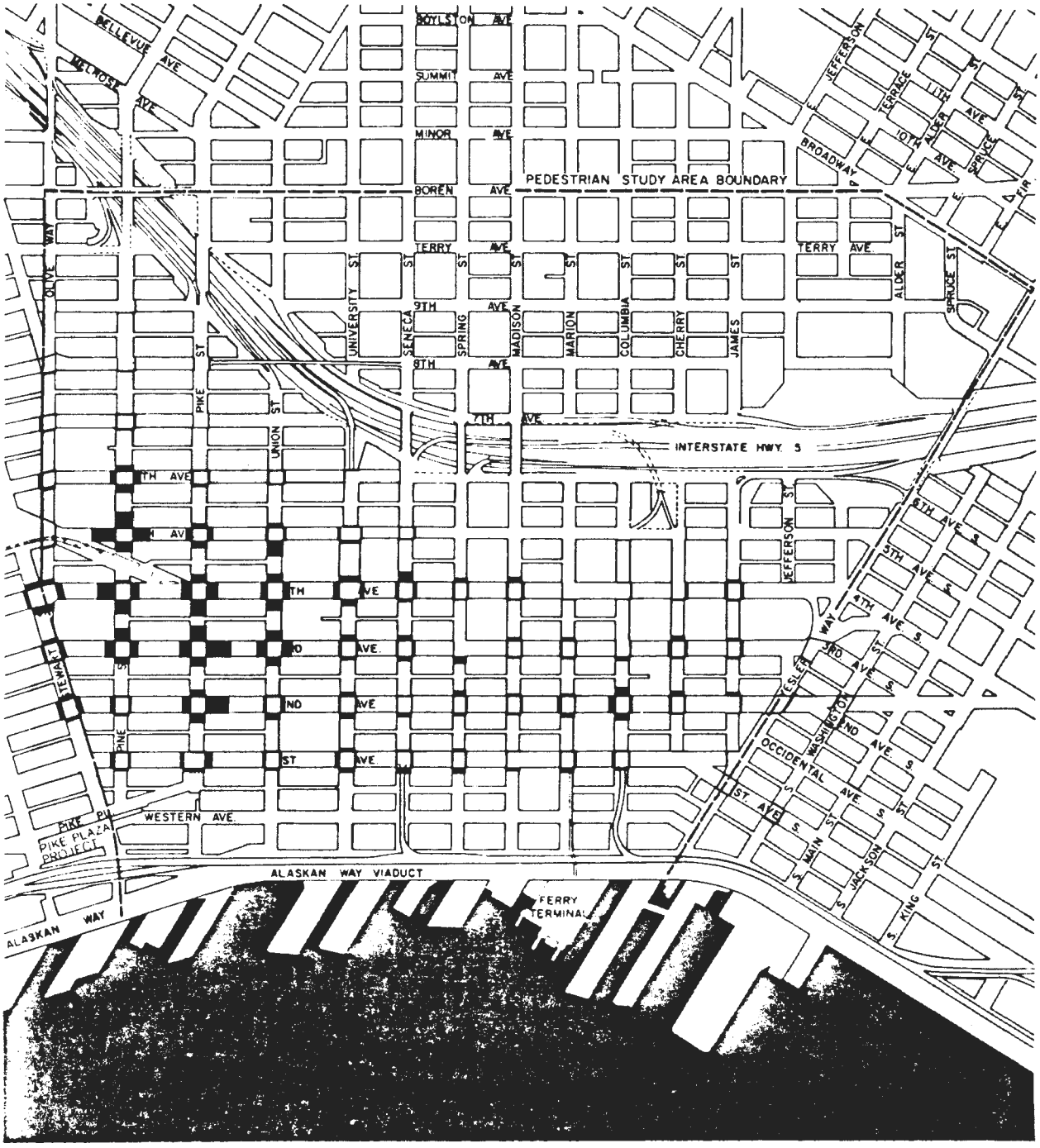
SOURCE: Pushkarev, B. and Zupan, J. - Urban Space for Pedestrians, 1976



CENTER CITY DALLAS
PEDESTRIAN VOLUMES — 1968

FIGURE D-10

SOURCE: Urban Transportation Concepts, Center City Transportation Project, Wilbur Smith and Associates, 1970.



CENTER CITY SEATTLE
PEDESTRIAN VOLUMES — 1970

FIGURE D-11

Table D-9

PEDESTRIAN TRIP GENERATION--1970
Seattle Central Business District

Pedestrian Trips Per Thousand Square Feet of Floor Space

	10 a.m. - 4 p.m.		4 p.m. - 6 p.m.	
Land Use	Total	Hourly Average	Total	Hourly Average
Office	5.1	0.85	1.8	0.90
Retail	15.6	2.60	4.8	2.40
Other	3.7	0.62	1.9	0.95

SOURCE: Center City Transportation Project Pedestrian Survey, 1970.

APPENDIX E

APPENDIX TO CHAPTER 5, 6, & 7
(SYSTEM USAGE CHARACTERISTICS)

A. URBAN TRANSIT SUMMARIES

Table E-1

RANK ORDER INDEX OF TRANSIT SYSTEMS BY POPULATION SIZE OF URBANIZED AREA, 1974

URBANIZED AREA	1970 URBANIZED AREA POPULATION	TRANSIT SYSTEM NAME
New York, NY - Northeastern New Jersey	16,206,841	Jamiaca Buses, Inc.(133) Manhattan and Bronx Surface Transit(2040) Operating Authority Metropolitan Suburban Bus Authority New York City Transit Authority (9539) Port Authority Trans-Hudson Corporation(298) Transport of New Jersey (1878)
Los Angeles-Long Beach, CA.	8,351,266	Long Beach Public (129) Transportation Company Santa Monica Municipal Bus Lines (104) Southern California Rapid Transit District (1850)
Chicago, IL-Northwestern Indiana	6,714,578	Chicago Transit Authority (3863) United Motor Coach Company (88)
Philadelphia, PA-NJ	4,021,066	Port Authority Transit Corporation of Pennsylvania and New Jersey(75) Southeastern Pennsylvania Transportation Authority City Transit Division (2430) Red Arrow Division (253) Penn Central Commuter Program (337) Reading Commuter Program (176)
Detroit, MI.	3,970,584	City of Detroit, Department of Transportation(1024)
San Francisco-Oakland, CA	2,987,850	Alameda-Contra Costa Transit Disctrict (824) Golden Gate Bridge, Highway and Transportation District (221) San Francisco Bay Area Transit District(212) San Francisco Municipal Railway (1024)
Boston, MA	2,652,575	Massachusetts Bay Transportation Authority (1890)
Washington, DC-MD-VA	2,481,489	Washington Metropolitan Area Transit Authority (2080)
Cleveland, Ohio	1,959,880	City of Shaker Heights, Department of Transportation (55) Cleveland Transit System (822) Maple Heights Transit
St. Louis, MO-IL	1,882,944	Bi-State Transit System (865)
Pittsburgh, PA	1,846,042	Port Authority of Allegheny County(1033
Minneapolis/St. Paul, MN	1,704,423	Twin Cities Area Metropolitan Transit Commission, Transit Operating Division (1013)
Houston, TX	1,677,863	Houston Transit System/ Rapid Transit Lines, Inc. (376)
Baltimore, MD	1,579,781	Maryland Department of Transportation Mass Transit Administration (988)
Dallas, TX	1,338,684	Dallas Transit System (469)
Milwaukee, WI	1,252,457	Milwaukee and Suburban Transport Corp. (523)
Seattle-Everett WA	1,238,107	City of Everett, Everett Transit System (19) Municipality of Metropolitan Seattle(600)
Miami, FL	1,219,661	Metropolitan Dade County Transit Agency (454)
San Diego, CA	1,198,323	San Diego Transit Corporation (346)
Atlanta, GA	1,172,778	Metropolitan Atlanta Rapid Transit Authority (870)
Cincinnati, OH-KY	1,110,514	Southwest Ohio Regional Transit Authority (Queen City Metro) (527) Transit Authority of Northern Kentucky (83)
Kansas City, MO-KS	1,101,787	Kansas City Area Transportation Authority (368)
Buffalo, NY	1,086,594	Niagara Frontier Transit Metro System, Inc. (528)
Denver, CO	1,047,311	Denver Metro Transit Regional Transportation District(344) Metro Division and Longmont "Mini" Metro Division Longmont "Mini"
San Jose, CA.	1,025,273	
New Orleans, LA	961,728	New Orleans Public Service, Inc. (520)
Phoenix, AR	863,357	Phoenix Transit Corp. (110)
Portland, OR-WA	824,926	Tri-County Metropolitan Transportation District of Oregon (422)
Indianapolis, IN	820,259	Indianapolis Public Transportation Corporation (233)
San Juan, PR	820,442	Metropolitan Bus Authority (390)
Providence, RI-MA	795,311	Rhode Island Public Transit Authority (187)
Columbus, OH	790,019	Central Ohio Transit Authority (244)
Louisville, KY-IN	739,396	Louisville Transit Company (179)
San Antonio, TE	722,513	San Antonio Transit System (277)
Dayton, OH	685,942	Miami Valley Regional Transit Transit Authority (168)
Fort Worth, TX	676,944	McDonald Transit, Inc. dba CITRAN (104)
Norfolk-Portmouth, VA	668,259	Tidewater Metro Transit(285)
Memphis, TN-MS	663,976	Memphis Area Transit Authority (300)
Sacramento, CA	633,732	Sacramento Regional Transit District (211) (1)
Fort Lauderdale, FL	613,797	No System
Rochester, NY	601,361	Regional Transit-Service(248)
Akron, OH	542,775	Metro Regional Transit Authority (73)
Jacksonville, FL	529,585	Jacksonville Transportation Authority (173)
St. Petersburg, FL	495,159	Central Pineallas Transit Authority (21)
Omaha, NE-IA	491,776	Transit Authority of the City of Omaha (181)
Toledo, OH-MI	487,789	Toledo Area Regional Authority (168)
Albany-Schenectady-Troy, NY	486,525	Capital District Transportation Authority (205)

Table E-1 (contd)

RANK ORDER INDEX OF TRANSIT SYSTEMS BY POPULATION SIZE OF URBANIZED AREA, 1974

URBANIZED AREA	1970 URBANIZED AREA POPULATION	TRANSIT SYSTEM NAME
Nashville-Davidson, TN	448,449	Metropolitan Transit Authority (177)
Syracuse, NY	376,169	CNY Centro, Inc. (166)
Tulsa, OK	371,499	Metropolitan Tulsa Transit Authority (90)
Wilmington, DE-NJ	371,267	Delaware Authority for Regional Transit (95)
El Paso, TX	337,471	Country Club Bus Lines, Inc. (11) El Paso City Lines (41) (2)
Tacoma, WA	332,471	Tacoma Transit System (125)
Wichita, KS	302,334	Wichita Metropolitan Transit Authority (51)
Albuquerque, NM	297,451	Albuquerque Transit System (67)
West Palm Beach, FL	287,561	Palm Beach County Transportation Authority (52)
Charlotte, NC	279,530	Charlotte City Transit System (Charlotte City Coach Lines, Inc.) (132)
Oxnard-Venture-Thousand Oaks, CA	244,653	South Coast Area Transit (26)
Columbia, SC	241,781	South Carolina Electric and Gas Company (55)
Harrisburg, PA	240,751	Cumberland-Dauphin-Harrisburg Transit Authority (92)
Charleston, SC	228,399	South Carolina Electric and Gas Company (45)
Chattanooga, TN-GA	223,580	Chattanooga Area Regional Transportation Authority (89)
Corpus Christi, TX	212,820	Corpus Christi Transit System (50)
Madison, WI	205,457	City of Madison Department of Transportation (Madison Metro) (141)
Huntington-Ashland, WV-KY-OH	167,583	Tri-State Transit Authority (58)
Binghamton, NY	167,224	Broome County Transit (31)
Savannah, GA	163,753	Savannah Transit Authority (70)
Stockton, CA	160,373	Stockton Metropolitan Transit District (52)
Charleston, WV	157,662	Kanawha Valley Regional Transportation Authority (61)
Greenville, SC	156,073	Greenville City Coach Lines, Inc. (41)
Lincoln, NE	153,443	Lincoln Transportation System (63)
Raleigh, NC	152,289	Raleigh City Coach Lines, Inc. (44)
Winston-Salem, NC	142,584	Winston-Salem Transit Authority (81)
Duluth-Superior, MN	138,352	Duluth Transit Authority (88)
New Bedford, MA	133,667	Union Street Railway Company (68)
Amarillo, TX	127,010	Amarillo Transit System (32)
Springfield, MO	121,340	City Utilities of Springfield (66)
Waco, TX	118,843	Waco Transit System (20)
Muskegon-Muskegon Heights, MI	105,716	Muskegon Area Transit System (14)
Seaside-Monterey, CA	93,284	Monterey Peninsula Transit (9)
Bay City, MI	78,097	Bay County Metropolitan Transit Authority
Lewiston-Auburn, ME	65,212	Hudson Bus Lines (59)
Not in an Urbanized Area	25,537	Chapel Hill Community Transit
Not in an Urbanized Area	24,864	Central West Virginia Transit Authority (13)
		CANADA
Montreal, Quebec	2,743,208	Montreal Urban Community Transit Commission (2241)
Toronto, Ontario	2,628,043	Toronto Transit Commission (2124)
Ottawa, Ontario	602,510	Ottawa-Carleton Regional Transit Commission (515)
Winnipeg, Manatoba	540,262	Winnipeg Transit System (497)
Edmonton, Alberta	495,702	City of Edmonton, Edmonton Transit System (535)
Calgary, Alberta	403,319	Calgary Transit (398)
Windsor, Ontario	258,643	Sandwich, Windsor and Amherstburg Railway Company (99)

SOURCE: American Public Transit Association, Transit Operating Report, 1974.

B. RAIL TRANSIT

(Alphabetical by Property)


RAPID TRANSIT LINES
OAK GROVE
MALDEN CENTER
WELLINGTON
SULLIVAN SQUARE
COMMUNITY COLLEGE
NORTH STATION
HAYMARKET
GOVERNMENT CTR
PARK STREET
STATE
WASHINGTON
SOUTH STATION
BROADWAY
ANDREW
NORTH QUINCY
WOLLASTON
QUINCY CENTER
LECHMERE
SCIENCE PARK
NORTH STATION
HAYMARKET
BOWDOIN
Blue Line
WONDERLAND
REVERE BEACH
BEACHMONT
SUFFOLK DOWNS
ORIENT HEIGHTS
WOOD ISLAND
AIRPORT
MAVERICK
AQUARIUM
Red Line
HARVARD
CENTRAL
KENDALL
CHARLES-MGH
NORTH
BOYLSTON
ARLINGTON
COPLEY
AUDITORIUM
KENMORE
Green Line
Orange Line
ESSEX
DOVER
NORTHAMPTON
DUDLEY
EGLESTON
GREEN
FOREST HILLS
PRUDENTIAL
SYMPHONY
NORTHEASTERN
BRIGHAM CIRCLE
HEATH
ARBORWAY
Huntington
COLUMBIA
SAVIN HILL
FIELDS CORNER
SHAWMUT
ASHMONT
MATTAPAN
Commonwealth
Beacon
RESERVOIR
BOSTON COLLEGE
CLEVELAND CIRCLE
RIVERSIDE
Under Construction
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
45 High Street, Boston, Massachusetts 02110

FIGURE E-1

Table E-2

MBTA RAIL TRANSIT PASSENGERS

December 1975

LINE	STATION	BOARDING PASSENGERS
Green	Boston College	11,987
	Beacon St.	8,843
	Highland Branch	8,433
	Huntington Ave.	14,791
	Kenmore	8,274
	Auditorium	5,911
	Symphony	1,573
	Prudential	2,271
	Copley	11,136
	Arlington	11,089
	Boylston	5,192
	Lechmere	6,327
Red	Ashmont	6,793
	Shawmut	1,521
	Fields Corner	4,494
	Quincy Center	8,168
	Wollaston	3,022
	North Quincy	3,415
	Savin Hill	1,952
	Columbia	4,690
	Andrew	4,209
	Broadway	4,075
	South Station Under	8,155
	Charles	5,992
	Kendall	4,721
	Central	8,677
	Harvard	20,806
Orange	Forest Hills	9,736
	Green	1,251
	Egleston	3,687
	Dudley	6,716
	Northampton	3,357
	Dover	4,229
	Essex	4,754
	Community College	2,144
	Sullivan Square	7,030
	Wellington	8,826
Blue	Bowdoin	2,209
	Aquarium	1,124
	Maverick	3,786
	Airport	1,267
	Wood Island Park	1,082
	Orient Heights	3,568
	Suffolk Downs	972
	Beachmont	1,648
	Revere Beach	1,418
	Wonderland	2,861
Interline:		
	Red-Green - Park	22,549
	Red-Orange - Washington	30,802
	Blue-Green - Gov't Ctr.	7,942
	Blue-Orange - State	11,403
	Orange-Green - Haymarket	7,120
	Orange-Green - North Station	8,133

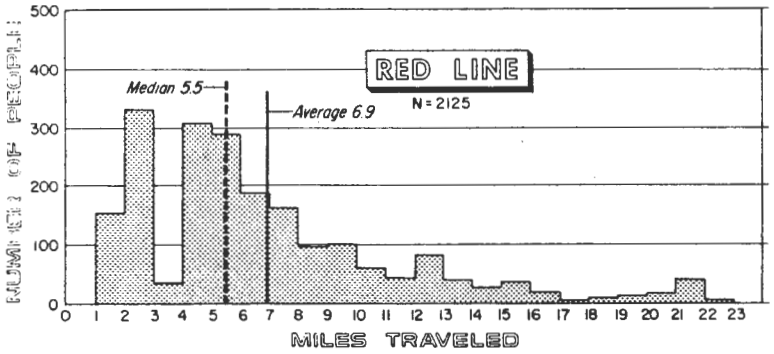
SOURCE: Massachusetts Bay Transportation Authority

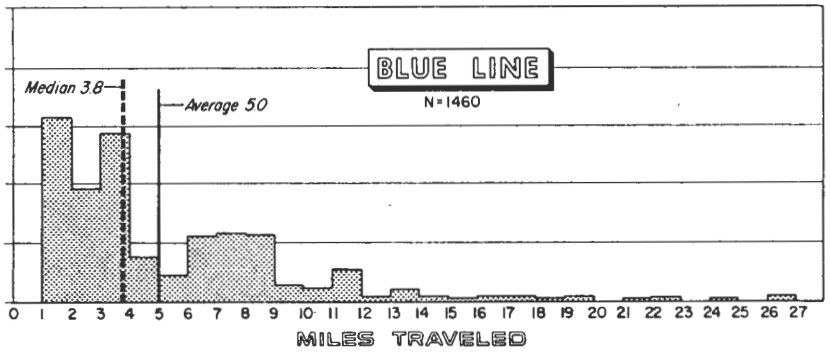
Table E-3

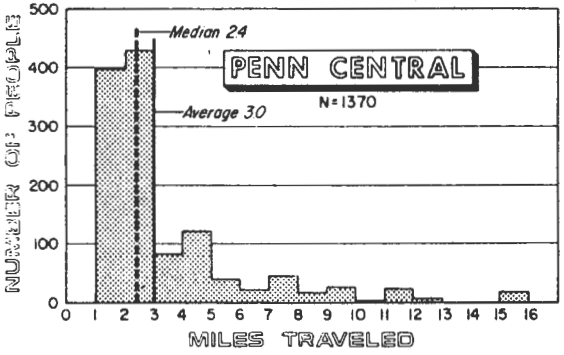
ARRIVAL MODES OF INBOUND (BOARDING) RAILROAD PASSENGERS
TYPICAL WEEKDAY - NOVEMBER, 1971
BOSTON METROPOLITAN AREA

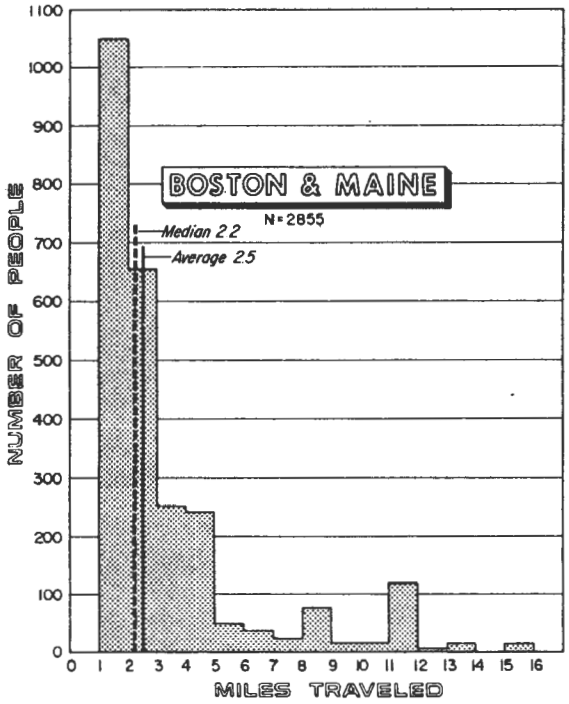
ITEM	BOSTON & MAINE		PENN CENTRAL		TOTAL	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Passengers From Parked Cars	2,100	23.9	1,270	37.6	3,370	27.7
Passengers Dropped Off	1,880	21.5	810	23.9	2,690	22.2
Passengers Walking In (or Bus)	4,790	54.6	1,300	38.5	6,090	50.1
TOTAL MBTA District	8,770	100.0	3,380	100.0	12,150	100.0
Outside MBTA District	1,990		420		2,410	
GRAND TOTAL	10,760		3,800		14,560	

SOURCE: Massachusetts Bay Transportation Authority









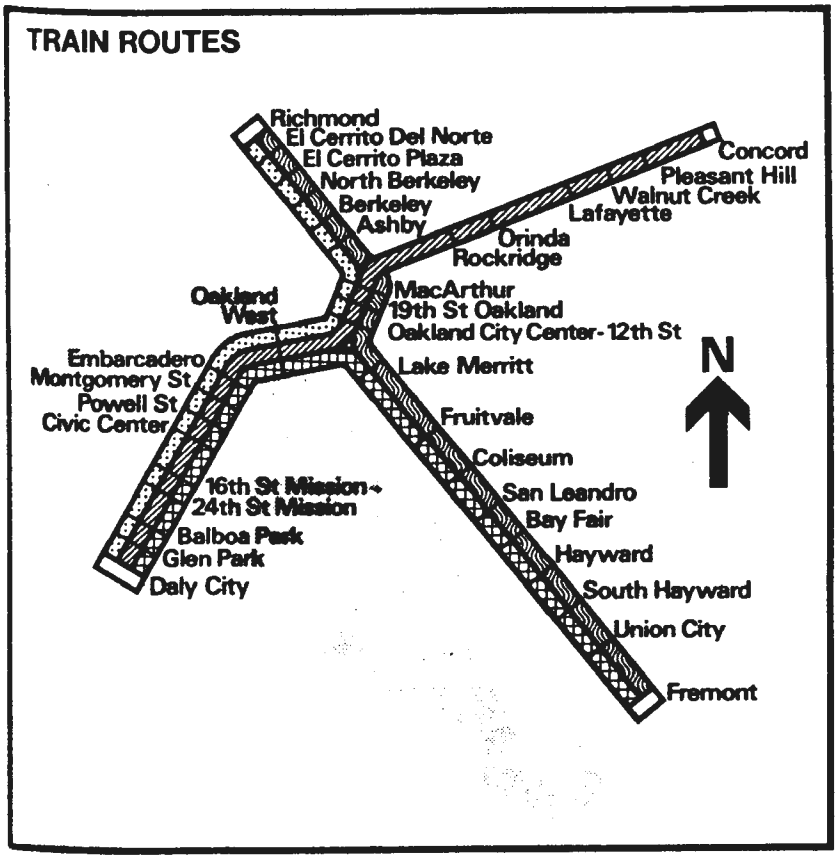
SOURCE: COMPILED FROM MBTA LICENSE PLATE SURVEY

DISTRIBUTION OF DISTANCES TRAVELED FROM TOWN OF ORIGIN TO STATION

1971 BOSTON SOURCE: *Wilbur Smith and Associates*

FIGURE E-2

BAY AREA RAPID TRANSIT SYSTEM



Routes	Monday-Saturday		Nights and Sunday
Concord-Daly City	through service		
Richmond-Daly City	through service	transfer at MacArthur	
Richmond-Fremont	through service		
Fremont-Daly City	through service	transfer at 12th St.-Oakland	
Richmond-Concord	transfer at MacArthur		

FIGURE E-3

Table E-4

AVERAGE DAILY BART TRIPS: MARCH 1976

	EASTBAY	WESTBAY	TRANSBAY	TOTAL	FEBRUARY AVERAGE	AVERAGE SINCE SEPT. 16, 1974
Off-Peak	21,298	14,493	24,892	60,683	60,884	54,561
AM Peak	9,548	8,567	12,587	30,702	31,476	33,004
PM Peak	9,838	8,961	13,215	32,014	31,254	33,444
TOTAL	40,684	32,021	50,694	123,399	--	--
	33.0%	25.9%	41.1%	100.0%		
February Average	41,936	30,473	51,205	--	123,614	--
Average Since 9/16/74	40,195	28,623	52,191	--	--	121,005

SOURCE: Bay Area Rapid Transit District

Table E-5

BART STATION RIDERSHIP
PASSENGERS IN AND OUT, SEPT. 1975

Station Ranking for the Month of September 1975

Average Passengers In and Out Per Day

RIDERS	STATION	RANK
42,642	Montgomery	1
22,136	Powell	2
15,540	Daly City	3
13,904	Civic Center	4
11,721	19th Street	5
10,051	Berkeley	6
8,817	12th Street	7
7,959	Concord	8
6,800	Balboa Park	17
6,642	Fremont	9
6,560	Walnut Creek	10
6,131	Hayward	11
6,075	Pleasant Hill	12
5,964	Fruitvale	14
5,999	Glen Park	13
6,579	Lake Merritt	20
5,182	May Fair	15
4,606	24th Mission	19
4,582	San Leandro	18
4,240	Coliseum	16
4,009	Lafayette	21
3,946	MacArthur	23
3,919	Rockridge	24
3,865	Union City	22
3,545	E. C. Del Norte	25
3,418	Crinda	26
3,393	16th Mission	27
3,160	South Hayward	29
2,956	Richmond	30
2,953	E. C. Plaza	28
2,651	North Berkeley	32
2,453	Oakland West	31
2,333	Ashby	33

SOURCE: Bay Area Rapid Transit District
Compiled by the Institute of Transportation and Traffic Engineering, University of California

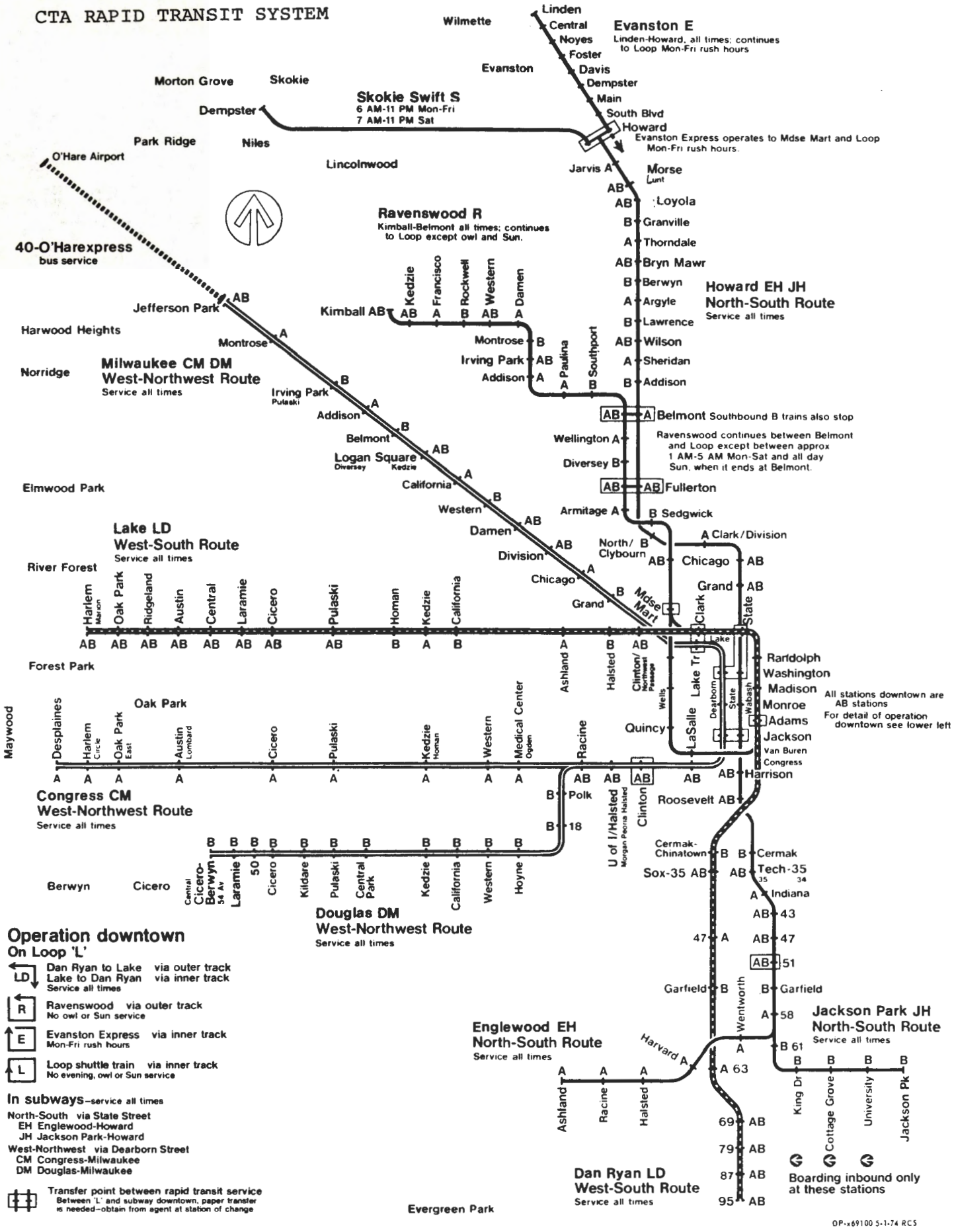
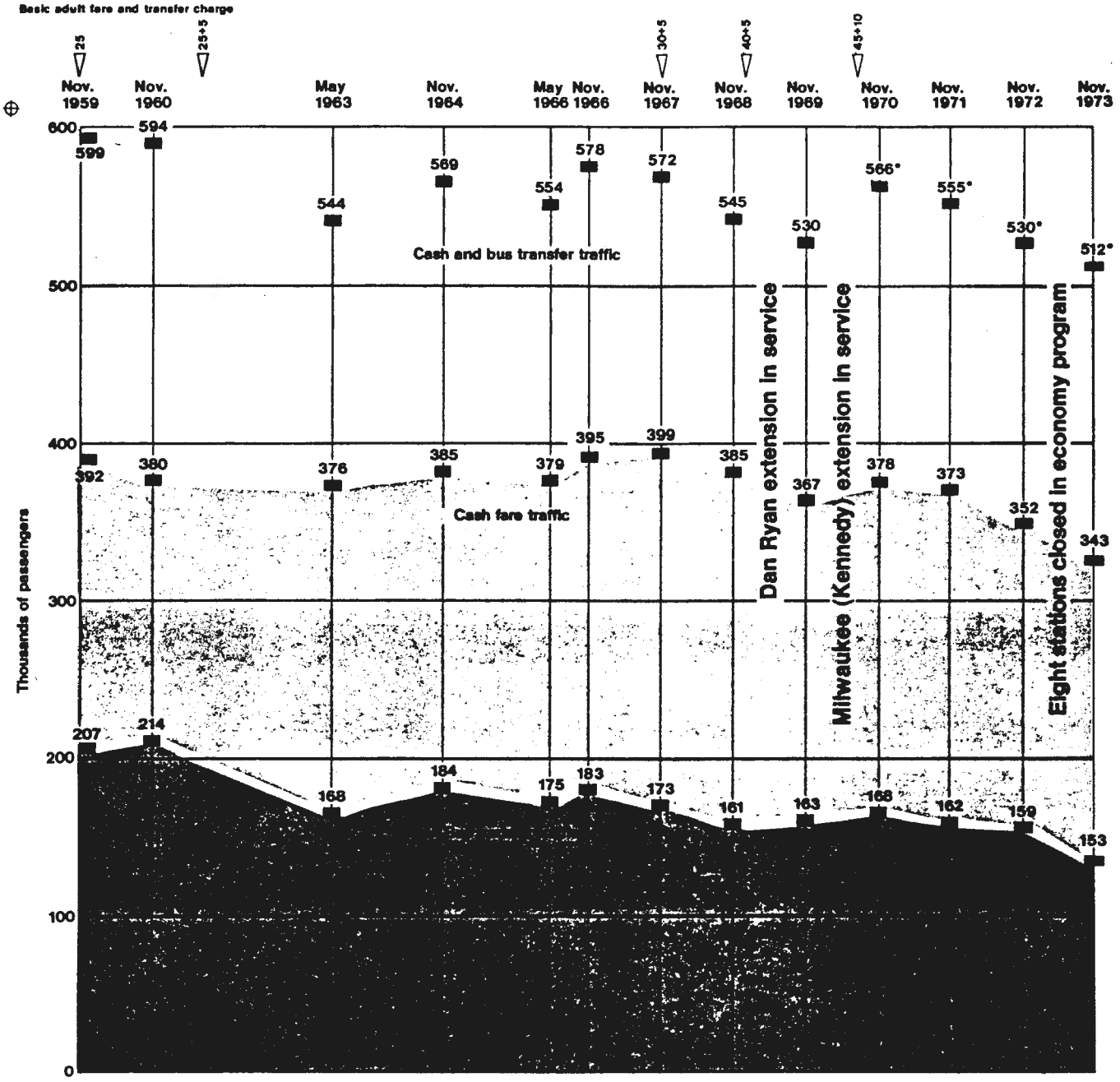

CTA RAPID TRANSIT SYSTEM
Evanston E
Linden-Howard, all times; continues to Loop Mon-Fri rush hours
Skokie Swift S
6 AM-11 PM Mon-Fri
7 AM-11 PM Sat
Evanston Express operates to Mdse Mart and Loop Mon-Fri rush hours.
Ravenswood R
Kimball-Belmont all times; continues to Loop except owl and Sun.
40-O'Harexpress
bus service
Howard EH JH
North-South Route
Service all times
Milwaukee CM DM
West-Northwest Route
Service all times
Lake LD
West-South Route
Service all times
Ravenswood continues between Belmont and Loop except between approx 1 AM-5 AM Mon-Sat and all day Sun, when it ends at Belmont.
All stations downtown are AB stations
For detail of operation downtown see lower left
Congress CM
West-Northwest Route
Service all times
Douglas DM
West-Northwest Route
Service all times
Englewood EH
North-South Route
Service all times
Jackson Park JH
North-South Route
Service all times
Dan Ryan LD
West-South Route
Service all times
Boarding inbound only at these stations
Operation downtown
On Loop 'L'
Dan Ryan to Lake via outer track
Lake to Dan Ryan via inner track
Service all times
Ravenswood via outer track
No owl or Sun service
Evanston Express via inner track
Mon-Fri rush hours
Loop shuttle train via inner track
No evening, owl or Sun service
In subways—service all times
North-South via State Street
EH Englewood-Howard
JH Jackson Park-Howard
West-Northwest via Dearborn Street
CM Congress-Milwaukee
DM Douglas-Milwaukee
Transfer point between rapid transit service
Between 'L' and subway downtown, paper transfer is needed—obtain from agent at station of change
Linden
Central
Noyes
Foster
Davis
Dempster
Main
South Blvd
Howard
Wilmette
Evanston
Morton Grove
Skokie
Dempster
Park Ridge
Niles
O'Hare Airport
Lincolnwood
Jarvis A
Morse
Loyola
Granville
Thorndale
Bryn Mawr
Berwyn
Argyle
Lawrence
Wilson
Sheridan
Addison
Kimball
Kedzie
Francisco
Rockwell
Western
Damen
Montrose
Irving Park
Addison
Paulina
Southport
Jefferson Park
Harwood Heights
Norridge
Montrose
Irving Park
Pulaski
Addison
Belmont
Logan Square
Diversey
Kedzie
California
Western
Damen
Division
Chicago
Grand
Elmwood Park
River Forest
Forest Park
Oak Park
Maywood
Berwyn
Cicero
Belmont Southbound B trains also stop
Wellington A
Diversey B
Fullerton
Armitage A
Sedgwick
Clark/Division
North/ Clybourn
Chicago
Grand
Mdse Mart
Clark
State
Lake
Randolph
Washington
Madison
Monroe
Adams
Jackson
Van Buren
Congress
Harrison
Roosevelt
Clinton
Halsted
Ashland
Clinton/ Northwest Passage
Lake Tr
Wells
LaSalle
Dearborn
State
Wabash
Quincy
Harlem
Oak Park
Ridgeland
Austin
Central
Laramie
Cicero
Pulaski
Homan
Kedzie
California
Desplaines
Harlem
Oak Park
Austin
Cicero
Pulaski
Kedzie
Western
Medical Center
Racine
Polk
18
Cermak-Chinatown
Cermak
Sox-35
Tech-35
Indiana
43
47
51
Garfield
Wentworth
58
61
63
Harvard A
Ashland
Racine
Halsted
King Dr
Cottage Grove
University
Jackson Pk
69
79
87
95
Evergreen Park
OP-x69100 5-1-74 RCS

FIGURE E-4

TRENDS IN RAPID TRANSIT RIDERSHIP
BY TYPE OF RIDER - CHICAGO TRANSIT AUTHORITY



Source of data: November, 1959 to November, 1972 - studies on file in book #3 of Graphics and Statistics section.
November, 1973 - Table IV, line 260 (p. 7)
*Includes other (non-revenue) riders.

SOURCE: Chicago Transit Authority.

FIGURE E-5

Table E-6

1970 OBSERVED CHARACTERISTICS (a)
OF SELECTED EXISTING RAPID TRANSIT ROUTE SEGMENTS
Chicago Route Segments

ROUTE	LENGTH MILES	DAILY PASSENGER MILES	PASSENGER MILES PER MILE
	(Major Segments)		
Howard (Howard-Grand)	9.4	727,400	77,400
Dan Ryan (95th-Cermak)	9.1	603,300	66,300
Jackson-Englewood (Jackson Park-Harrison)	8.6	466,300	54,200
Milwaukee (Jefferson Park-Grand)	8.2	371,000	45,300
Lake (Harlem-Clinton)	7.5	284,900	38,000
Congress (Des Plaines-Clinton)	8.3	208,900	25,000
Ravenswood (Kimball-Merchandise Mart)	8.2	206,700	25,300
Congress (Des Plaines-Central)	2.6	45,400	17,400
Lake (Harlem-Central)	2.1	31,200	14,800
Jackson (Jackson Park-61st)	2.0	27,300	13,600
Evanston (Linden-South Boulevard)	3.2	33,500	10,500

SOURCE: Chicago Transit Authority
Statistic RP-X71022;
November, 1970

Table E-7

STATION VOLUMES 1974
Entering, Weekday in Volume Order
Chicago Transit Authority

	Station	Route	Passengers	'L'-subway transfers
	95	W-S	22,500	
	Washington	N-S	20,150	3,800
	Washington	W-NW	15,000	
	Jackson	N-S	13,750	
5	Jefferson Park	W-NW	12,600	
	Adams/Wabash	Loop	10,550	
	Monroe	N-S	10,550	
	79	W-S	10,350	
	Chicago	N-S	10,150	
10	Howard	N-S	9,750	
	Monroe	W-NW	9,200	
	Randolph/Wabash	Loop	9,200	
	69	W-S	8,800	
	Madison/Wabash	Loop	7,950	
15	Jackson	W-NW	7,900	
	U of I/Halsted	W-NW	7,750	
	87	W-S	7,450	
	Logan Square	W-NW	7,450	
	Loyola	N-S	6,750	
20	Fullerton	N-S	6,600	
	Ashland	N-S	6,500	
	Clark/Lake	Loop	6,000	3,300
	Grand	N-S	5,800	
	Jackson Park	N-S	5,500	
25	Morse	N-S	5,500	
	State/Lake	Loop	5,500	2,600
	Bryn Mawr	N-S	5,400	
	Lake Transfer	W-NW	5,300	3,950
	Quincy/Wells	Loop	5,100	
30	Austin	W-S	4,900	
	Belmont	N-S	4,850	
	Harlem	W-S	4,650	
	Division	W-NW	4,500	
	Clinton	W-NW	4,450	
35	47	N-S	4,250	
	Kimball	Rav.	4,200	
	Wilson	N-S	4,150	
	Belmont	W-NW	4,050	
	Irving Park	W-NW	4,050	
40	Sox/35	W-S	4,000	
	Tech/35	N-S	4,000	
	Clark/Division	N-S	3,850	
	Desplaines	W-NW	3,850	
	Dempster	Skokie	3,550	
45	Merchandise Mart	Rav.	3,550	
	Polk	W-NW	3,550	
	Addison	W-NW	3,500	
	Davis	Evan.	3,500	
	Cicero (Douglas)	W-NW	3,450	
50	Clinton/NW Passage	W-S	3,450	
	Central	W-S	3,400	
	Cicero/Berwyn	W-NW	3,350	
	Cottage Grove	N-S	3,350	
	Madison/Wells	Loop	3,300	
55	63	W-S	3,250	
	Granville	N-S	3,200	
	Roosevelt	N-S	3,200	
	Damen	W-NW	3,150	
	Halsted	N-S	3,150	
60	Garfield	W-S	3,100	
	51	N-S	3,100	
	Medical Center	W-NW	2,850	
	43	N-S	2,800	
	LaSalle/Van Buren	Loop	2,800	
65	Addison	N-S	2,750	
	Sheridan	N-S	2,750	
	Thorndale	N-S	2,750	
	Pulaski	W-S	2,700	
	Western	Rav.	2,700	
70	LaSalle	W-NW	2,600	

Average traffic per station =3650

	Station	Route	Passengers	'L'-subway transfers
	Harrison	N-S	2,350	
	Kedzie (Congress)	W-NW	2,350	
	Berwyn	N-S	2,300	
	Lawrence	N-S	2,250	
75	Oak Park	W-S	2,250	
	47	W-S	2,250	
	Austin	W-NW	2,200	
	Western (Milwaukee)	W-NW	2,200	
	Cicero	W-S	2,150	
80	Montrose	W-NW	2,150	
	Cermak/Chinatown	W-S	2,100	
	North/Clybourn	N-S	2,100	
	Argyle	N-S	2,050	
	California (Douglas)	W-NW	2,050	
85	California (Milwaukee)	W-NW	2,000	
	King Drive	N-S	2,000	
	Linden	Evan.	1,900	
	Irving Park	Rav.	1,850	
	Cermak	N-S	1,800	
90	Chicago	W-NW	1,800	
	Randolph/Wells	Loop	1,800	
	Indiana	N-S	1,750	
	Racine	N-S	1,750	
	Garfield	N-S	1,700	
95	Kedzie	Rav.	1,700	
	Laramie	W-S	1,650	
	Cicero (Congress)	W-NW	1,600	
	Jarvis	N-S	1,600	
	Main	Evan.	1,600	
100	Ashland	W-S	1,550	
	Oak Park	W-NW	1,550	
	Diversey	Rav.	1,500	
	Pulaski (Congress)	W-NW	1,500	
	Montrose	Rav.	1,450	
105	Racine	W-NW	1,450	
	61	N-S	1,450	
	Pulaski (Douglas)	W-NW	1,400	
	18	W-NW	1,400	
	Addison	Rav.	1,350	
110	Damen	Rav.	1,350	
	Ridgeland	W-S	1,350	
	University	N-S	1,350	
	Central	Evan.	1,300	
	Homan	W-S	1,300	
115	Central Park	W-NW	1,200	
	Kedzie (Douglas)	W-NW	1,200	
	Western (Douglas)	W-NW	1,200	
	Grand	W-NW	1,150	
	Harlem	W-NW	1,150	
120	58	N-S	1,150	
	Chicago	Rav.	1,100	
	Western (Congress)	W-NW	1,100	
	Armitage	Rav.	1,000	
	Halsted	W-S	1,000	
125	Hoyne	W-NW	1,000	
	Laramie	W-NW	1,000	
	Rockwell	Rav.	1,000	
	Wentworth	N-S	950	
	Southport	Rav.	900	
130	Harvard	N-S	850	
	Noyes	Evan.	850	
	South Blvd.	Evan.	850	
	Dempster	Evan.	750	
	Kedzie	W-S	750	
135	Wellington	W-S	750	
	California	W-S	650	
	Francisco	Rav.	650	
	Kildare	W-NW	600	
	Foster	Evan.	550	
	Sedgwick	Rav.	500	
141	Paulina	Rav.	450	
	Total		512,350	13,650
	Avg. per station		3,650	

Table E-8

CLEVELAND RAPID TRANSIT RIDERSHIP

Rapid Transit Station	Year 1974	Year 1975	Increase or Decrease 1975 vs 1974 Amount	Percent
Windermere	1,316,839	1,255,826	61,013*	4.6*
Superior	380,207	362,895	17,312*	4.6*
East 120th-Euclid	82,988	79,709	3,279*	4.0*
University Circle	715,242	706,485	8,757*	1.2*
East 105th Street	243,263	234,057	9,206*	3.8*
East 79th Street	145,811	124,482	21,329*	14.6*
East 55th Street	151,326	132,012	19,314*	12.8*
Campus	104,373	107,019	2,646	2.5
Subtotal - East Side	3,140,049	3,002,485	137,564*	4.6*
West 25th Street	251,175	236,246	14,929*	5.9*
West 65th Street	194,135	183,536	10,599*	5.5*
West 98th-Detroit	418,122	402,184	15,938*	3.8*
West 117th-Madison	609,171	573,639	35,532*	5.8*
Triskett	566,366	531,312	35,054*	6.2*
West Park	540,375	510,027	30,348*	5.6*
Puritas	635,594	629,897	5,697*	0.9*
Brookpark	649,178	664,647	15,469	2.4
Airport	416,727	363,765	52,962*	12.7*
Subtotal - West Side	4,280,843	4,095,253	185,590*	4.3*
Total - East & West	7,420,892	7,097,738	323,154*	4.3*
Cleveland Union Terminal (Public Square)	3,927,352	3,787,257	140,095*	3.6*
SYSTEM TOTAL	11,348,244	10,884,995	463,249*	4.1*
System Fare Change		(10-5-75)		

SOURCE: Cleveland Regional Transit Authority

* Decrease

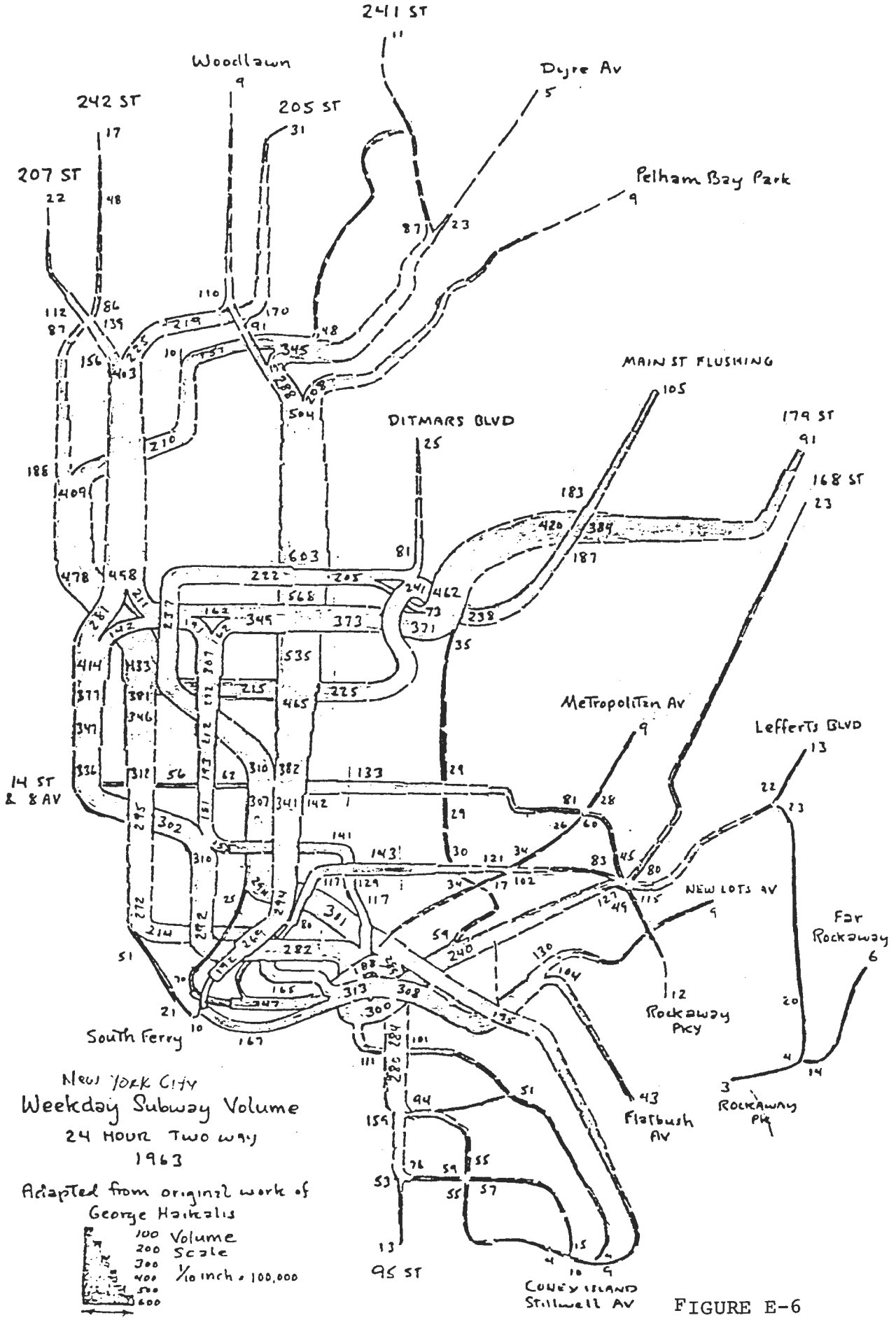

241 ST
Woodlawn
Dyre Av
242 ST
205 ST
207 ST
Pelham Bay Park
MAIN ST FLUSHING
DITMARS BLVD
179 ST
168 ST
Metropolitan Av
Lefferts Blvd
14 ST & 8 AV
NEW LOTS AV
Far Rockaway
Rockaway Pky
South Ferry
Flatbush Av
Rockaway Pk
95 ST
Coney Island Stillwell Av
New York City
Weekday Subway Volume
24 Hour Two way
1963
Adapted from original work of George Haikalis
100 Volume
200 Scale
300
400
500
600
1/10 inch = 100,000

FIGURE E-6

Table E-9

RANKING OF RAPID TRANSIT STATIONS
IN ORDER OF
ANNUAL TURNSTILE REGISTRATIONS
New York City
Fiscal Year, 1974
(Ending 6/30/74)

Rank	Station	Fares (000's)		Line
1.	Dean St.	62	SS	Franklin Shuttle
2.	Ft. Hamilton Pky	65	SS	Culver Shuttle
3.	Edgemere	65	HH	Rockaway Line
4.	Broad Channel	75	HH	Rockaway Line
5.	62 St.	89 *	B	West End Line
6.	Playland	100	HH	Rockaway Line
7.	Franklin Ave.	109	SS	Franklin Shuttle
8.	22 Ave.	109	F	Culver Line
9.	Seaside	123	HH	Rockaway Line
10.	Aqueduct	135	HH	Rockaway Line
11.	Frank Ave.	137	HH	Rockaway Line
12.	Cypress Hills	139	J	Jamaica El
13.	13th Ave.	141	SS	Culver Shuttle
14.	Queens Blvd.	146	J	Jamaica El
15.	Bushwick Ave.	173	LL	14 St - Canarsie Line
16.	215 St - Bway	183	#1	Broadway IRT
17.	Court Sq.	196	GG	Bklyn-Queens Crosstown
18.	Howard Beach	201	HH	Rockaway Line
19.	Bowery	207	J	Centre St Line
20.	Metropolitan Ave	218	J	Jamaica El
21.	Straiton Ave	236	HH	Rockaway Line
22.	Botanic Garden	236	SS	Franklin Shuttle
23.	B. 116 St.	239	HH	Rockaway Line
24.	Gaston Ave	243	HH	Rockaway Line
25.	Holland	258	HH	Rockaway Line
26.	Alabama Ave.	264	J	Jamaica El
27.	Wyckoff Ave.	266 *	M	Myrtle Ave
28.	Wavecrest	287	HH	Rockaway Line
29.	Seneca Ave.	301	M	Myrtle Ave.
30.	Park Place	318	SS	Franklin Shuttle
31.	Oxford St.	318	A	Lefferts El
32.	121 St.	322	J	Jamaica El
33.	Van Alst	325	GG	Bklyn-Queens Xtown
34.	Fulton St	329	GG	Bklyn-Queens Xtown
35.	Atlantic Ave.	333	LL	Canarsie
36.	111 St.	336	J	Jamaica El
37.	Morris Park	352	5	Dyre Ave Line
38.	102nd St.	353	J	Jamaica El
39.	Whitlock Ave.	355	6	Pelham Line
40.	Greenwood Ave.	390	A	Lefferts El

Rank	Station	Fares (000's)		Line
41.	Elderts Lane	391	J	Jamaica El
42.	Bronx Park East	398	2	White Plains Rd El
43.	Zerega Ave	407	6	Pelham Line
44.	Central Ave.	415	M	Myrtle Ave El
45.	Middletown Rd.	448	6	Pelham Line
46.	Livonia Ave	450	LL	Canarsie Line
47.	Beebe Ave	476	RR	Astoria Line
48.	Boyd Ave	477	A	Lefferts El
49.	Norwood Ave	480	J	Jamaica El
50.	Ave I	483	F	Cluver El
51.	Woodhaven Blvd.	486	J	Jamaica El
52.	Ave U	499	F	Culver El
53.	Junius St	501	2	New Lots El
54.	Forest Parkway	505	T	Jamaica El
55.	Beverly Rd	509	D	Brighton Line
56.	Pelham Parkway	511	5	Dyre Ave Line
57.	138th St	515	4	Jerome Ave Line
58.	Cleveland St	526	J	Jamaica El
59.	E. 238 St	534	2	White Plains Rd.
60.	Forest Ave	534	J	Jamaica El
61.	Bay 50th St	540	B	West End
62.	Flushing Ave	544	GG	Bklyn-Queens Xtown
63.	Van Siclen	545	J	Jamaica El
64.	Hudson St.	545	A	Lefferts El
65.	160 St	548	J	Jamaica El
66.	E. 143 St.	558	6	Pelham Line
67.	25 St	559	RR	4th Ave Line
68.	86 St	561	N	Sea Beach Line
69.	Ave P	570	F	Culver El
70.	65 St	580	E	Queens Blvd. Line
71.	Baychester Ave.	586	5	Dyre Ave. Line
72.	Crescent St.	587	J	Jamaica El
73.	Bedford Park	592	4	Jerome Ave El
74.	Ave. U	617	N	Sea Beach Line
75.	York St	624	F	Housten St Line
76.	Lenox Terminal	644	3	Lenox Ave Line
77.	Montrose Ave	646	LL	14th St Line
78.	New Lots Rd	647	LL	Canarsie Line
79.	20th Ave	651	N	Sea Beach Line
80.	W. 8th St	652	D,F	Coney Island

Rank	Station	Fares (000's)		Line
81.	New Utrecht Ave	675	N	Sea Beach Line
82.	25th Ave	675	B	West End Line
83.	Ft. Hamilton Parkway	676	F	Culver Line
84.	Ave H	685	D	Brighton Line
85.	E. 105 St	686	LL	Canarsie Line
86.	Knickerbocker Ave	686	M	Myrtle El
87.	75 Ave.	687	E	Queens Blvd Line
88.	207 St	690	1	Bway IRT
89.	Far Rockaway	694	HH	Rockaway Line
90.	Broadway	696	GG	Bklyn-Queens Xtown
91.	Van Sicklen Ave	700	F	Culver El
92.	Classon Ave	703	GG	Bklyn-Queens Xtown
93.	Wilson Ave	704	LL	14th St Line
94.	Ave X	707	F	Culver El
95.	Ave N	708	F	Culver El
96.	E. 219 St	709	2	White Plains Rd El
97.	Dyre Ave	721	5	Dyre Ave Line
98.	Burke Ave	724	2	White Plains Rd El
99.	Longwood Ave	728	6	Pelham Line
100.	3 Ave	730	LL	14th St Line
101.	69 St/Fisk	740	7	Flushing Line
102.	Canal St.	742	6	Lexington Avenue Line
103.	Sutter Ave	746	LL	Canarsie Line
104.	Sutphin Blvd	746	J	Jamaica El
105.	Van Siclen Ave	754	A	Liberty Ave El
106.	238th St/Bway	757	1	Broadway IRT
107.	Franklin St	760	1	7th Ave IRT
108.	71st St	762	B	West End Line
109.	9th Ave	768	B	West End Line
110.	Chauncey St	781	J	B'way-Bklyn El
111.	Bergen St	796	2	Brooklyn IRT
112.	Van Siclen Ave	801	2	New Lots El
113.	Lafayette Ave	805	A	Fulton St Line
114.	Lorimer St	808	J	B'way-Bklyn El
115.	President St	813	3,4	Nostrand Ave Line
116.	225 St/B'way	822	1	Broadway IRT
117.	Canal/Centre	826	J	Centre St Line
118.	Kings Highway	828	F	Culver Line
119.	Hewes Street	834	J	B'way-Bklyn El
120.	Prospect Ave	835	RR	Fourth Ave Line

Rank	Station	Fares (000's)		Line
121.	Grand St	840	LL	14th St Line
122.	145 St/Lenox	844	2	Lenox Ave Line
123.	Myrtle/Willoughby	844	GG	Bklyn-Queens Xtown
124.	Halsey St.	845	LL	14th St Line
125.	155th St	855	A	8th Ave Line
126.	103rd St	859	AA	8th Ave Line
127.	Neck Road	863	D	Brighton Line
128.	Smith-9th	863	F	Culver Line
129.	Metropolitan Ave.	867	M	Myrtle El
130.	Kosciusko St.	807	J	B'way-Bklyn El
131.	Franklin Ave	878	A	Fulton St Line
132.	Ocean Parkway	886	D	Brighton Line
133.	Fresh Pond Rd.	890	M	Myrtle El
134.	45th Rd.	912	7	Flushing Line
135.	8th Ave.	926	N	Sea Beach Line
136.	18th Ave.	932	B	West End Line
137.	Intervale Ave	935	2	Westchester Ave El
138.	Cypress Ave	939	6	Pelham Line
139.	20th Ave	941	B	West End Line
140.	55th St	942	B	West End Line
141.	36th St	945	GG	Queens Blvd. Line
142.	15th St	956	F	Culver Line
143.	E. 225th St	959	2	White Plains Rd El
144.	Overlook Terrace	960	A	Eighth Ave Line
145.	Morgan Ave	962	LL	14th St Line
146.	Jefferson St	974	LL	14th St Line
147.	Rockaway Blvd.	975	A	Liberty Ave El
148.	E. 180 St.	978	2	White Plains Rd Line
149.	Shepherd Ave	980	A	Fulton St Line
150.	135th St	982	A	Eighth Ave Line
151.	Gun Hill Rd.	984	2	White Plains Rd Line
152.	79th St.	985	B	West End Line
153.	Canal St	994	1	7th Ave IRT
154.	Park Place	1002	2	7th Ave IRT
155.	Kings Highway	1008	N	Sea Beach Line
156.	Woodlawn	1009	4	Jerome Ave Line
157.	Graham Ave	1023	LL	14th St Line
158.	Buhre Ave	1031	6	Pelham Line
159.	Ditmas Ave	1034	F	Culver El
160.	East N. Y.	1035	A,J,LL	Int. Div. Tsfr.

Rank	Station	Fares (000's)		Line
161.	Union St	1040	RR	Fourth Ave Line
162.	Clinton/Washington	1044	GG	Bklyn-Queens Xtown
163.	St. Lawrence Ave.	1047	6	Pelham Line
164.	Cortelyou Rd.	1062	D	Brighton Line
165.	Mosholu Pky	1065	4	Jerome Ave Line
166.	Allerton Ave	1074	2	White Plains Rd El
167.	Liberty Ave	1076	A	Fulton St Line
168.	155th St	1089	D	Concourse Line
169.	Rockaway Ave	1098	2	New Lots El
170.	Fort Hamilton Pky	1115	N	Sea Beach Line
171.	Spring St	1124	6	Lexington Ave
172.	High St	1130	A	Eighth Ave Line
173.	E. 241st St	1134	2	White Plains Rd Line
174.	Parkside	1137	D	Brighton Line
175.	E. 233 St	1138	2	White Plains Rd Line
176.	Grant Ave	1142	A	Liberty Ave El
177.	De Kalb Ave	1143	LL	14th St Line
178.	E. 149th St	1143	6	Pelham Line
179.	Ft. Hamilton Pky	1143	B	West End Line
180.	50th St	1145	B	West End Line
181.	183rd St	1146	4	Jerome Ave Line
182.	53rd St	1154	RR	Fourth Ave Line
183.	Bedford-Nostrand	1155	GG	Bklyn-Queens Xtown
184.	18th Ave	1171	N	Sea Beach Line
185.	Cortlandt St.	1176	I	West Side IRT
186.	Clinton/Washington	1180	A	Fulton St Line
187.	Prince St	1182	RR	BMT Broadway Line
188.	Beverly Rd	1192	3,4	Nostrand Ave Line
189.	77th St	1199	RR	Fourth Ave Line
190.	110th St	1200	A	Eighth Ave Line
191.	New Lots	1202	2	New Lots El
192.	Gun Hill Road	1210	5	Dyre Ave Line
193.	163rd St	1211	A	Eighth Ave Line
194.	45th St	1229	RR	Fourth Ave Line
195.	18th Ave	1229	F	Culver Line El
196.	116th St	1238	A	Eighth Ave Line
197.	Nostrand Ave.	1245	2	IRT Brooklyn Line
198.	Westchester Sq.	1250	6	Pelham Line
199.	22nd Ave	1250	N	Sea Beach Line
200.	52nd St	1254	7	Flushing Line

Rank	Station	Fares (000's)		Line
201.	Castle Hill	1264	6	Pelham Line
202.	110th St	1267	2	Lenox Ave Line
203.	242nd St	1271	1	Broadway IRT
204.	72 St	1271	A	Eighth Ave Line
205.	231 St	1274	1	Broadway IRT
206.	Ave M	1290	D	Brighton Line
207.	Halsey St	1292	5	Broadway Bklyn El
208.	7th Ave	1300	D	Brighton Line
209.	Bay Parkway	1314	B	West End Line
210.	Dyckman St	1323	1	Broadway IRT
211.	36 Ave	1327	RR	Astoria Line
212.	Flushing Ave	1333	J	Bway Bklyn El
213.	Clark St	1344	2	Bklyn IRT
214.	Pelham Parkway	1345	2	White Plains Rd Line
215.	191 St	1347	1	Bway IRT
216.	23rd St, Ely Ave	1349	E	Queens Blvd Line
217.	Kingsbridge Rd	1357	4	Jerome Ave Line
218.	Metropolitan/Lorimer	1363	J,LL	Int Div. Tsfr.
219.	Rector St	1369	1	7th Ave IRT
220.	Northern Blvd	1373	GG	Queens Blvd. Line
221.	Pennsylvania Ave	1375	2	New Lots Line
222.	Brooklyn Museum	1375	2	Brooklyn IRT
223.	Mt Eden Ave	1393	4	Jerome Ave Line
224.	Ave J	1399	D	Brighton Line
225.	Bleecker St	1400	6	Lexington Ave Line
226.	Bergen St	1402	F	Culver Line
227.	183rd St	1406	D	Concourse Line
228.	Bway/Myrtle	1425	J	Bway Bklyn El
229.	18th St	1429	1	7th Ave IRT
230.	86th St	1451	RR	Fourth Ave Line
231.	Freeman St	1456	2	Westchester Ave El
232.	111th St	1461	7	Flushing Line
233.	Spring St	1464	A	Eighth Ave Line
234.	Nassau Ave	1464	GG	Bklyn Queens Xtown
235.	Carroll St	1466	F	Culver Line
236.	Ralph Ave	1470	A	Fulton St Line
237.	Lefferts Blvd	1476	A	Liberty Ave El
238.	Pacific St	1480	N,RR	Fourth Ave Line
239.	Gates Ave	1485	J	Bway Bklyn El
240.	Kingston Ave	1487	2	Bklyn IRT

Rank	Station	Fares (000's)		Line
241.	149th St	1491	2,4	Jerome Ave Line
242.	Bedford Ave	1496	LL	14th St Line
243.	145th St	1502	1	Bway IRT
244.	Van Wyck	1512	E	Queens Blvd Line
245.	175th St	1514	D	Concourse Line
246.	96th St	1521	A	Eighth Ave Line
247.	Vernon Jackson	1528	7	Flushing Line
248.	7th Ave	1541	F	Culver Line
249.	Elder Ave	1547	6	Pelham Line
250.	Rockaway Ave	1549	A	Fulton St Line
251.	138 St, 3 Ave	1555	6	Pelham Line
252.	Sterling St	1579	3,4	Nostrand Ave Line
253.	Willets Pt Blvd	1597	7	Flushing Line
254.	176th St	1603	4	Jerome Ave Line
255.	Winthrop St	1616	3,4	Nostrand Ave Line
256.	33rd St (Rawson)	1619	7	Flushing Line
257.	Bay Ridge Ave	1621	RR	Fourth Ave Line
258.	Brook Ave	1627	6	Pelham Line
259.	57th St	1629	B	6th Ave Line
260.	Dyckman St	1636	A	8th Ave Line
261.	95th St	1641	RR	Fourth Ave Line
262.	Hoyt Ave	1644	RR	Astoria Line
263.	86th St	1647	A	8th Ave Line
264.	116th St-Lenox	1653	Z	7th Ave IRT
265.	161 St	1666	D	Concourse Line
266.	81st St	1667	A	8th Ave Line
267.	9 St & 4 Ave	1693	RR,F	Inter Div Trsfr. Sta.
268.	Canal St	1699	RR	BMT-Bway Line
269.	40th St (Lowery)	1716	7	Flushing Line
270.	59th St	1731	RR	4th Ave Line
271.	Kingsbridge Rd.	1738	D	Concourse Line
272.	Lawrence St	1742	RR	4th Ave Line
273.	Saratoga Ave	1743	2	New Lots El
274.	Rockaway Parkway	1755	LL	14th St Line
275.	Greenpoint Ave.	1766	GG	Bklyn-Queens Xtown
276.	Grand Army Plaza	1790	2	Brooklyn IRT
277.	125th St.	1794	1	Bway IRT
278.	Ave. U	1796	D	Brighton Line
279.	46th St.	1809	7	Flushing Line
280.	Fordham Rd.	1811	4	Jerome Ave. Line

Rank	Station	Fares (000's)		Line
281.	Bedford Park Blvd.	1815	D	Concourse Line
282.	157th St.	1823	1	Broadway IRT
283.	Prospect Park	1844	D	Brighton Line
284.	Jackson Ave	1857	2	White Plains Rd Line
285.	36th St	1869	RR	4th Ave. Line
286.	Kingston-Throop Ave	1881	A	Fulton St. Line
287.	Marcy Ave.	1900	J	Bway-Bklyn El
288.	Church Ave	1917	D	Brighton Line
289.	Euclid Ave.	1961	A	Fulton St Line
290.	181 St.	1974	1	Bway IRT
291.	Grand St	1980	D	Houston St Line
292.	Elmhurst Ave.	1981	GG	Queens Blvd. Line
293.	City Hall	1993	RR	Bway BMT
294.	Newkirk Ave	1999	D	Brighton Line
295.	Utica Ave.	2028	A	Fulton St Line
296.	Steinway St	2038	GG	Queens Blvd. Line
297.	104th St.	2047	7	Flushing Line
298.	Hunts Point Ave	2074	6	Pelham Line
299.	167th St.	2075	4	Jerome Ave Line
300.	Second Ave.	2085	F	Houston St Line
301.	Sound View Ave.	2089	6	Pelham Line
302.	28th St	2094	RR	Broadway BMT
303.	Rector St.	2102	RR	Broadway BMT
304.	Sutter Ave (Rutland)	2107	2	New Lots Line
305.	207th St	2109	A	Eighth Ave Line
306.	Simpson St.	2113	2	White Plains Rd Line
307.	Pelham Bay Park	2117	6	Pelham Bay Line
308.	177th St.	2141	2	White Plains Rd Line
309.	168 St	2158	J	Jamaica El
310.	Newkirk Ave	2163	4,5	Nostrand Ave Line
311.	170th St.	2175	D	Concourse Line
312.	Myrtle Ave	2198	LL	14th St Line
313.	30th Ave (Grand Ave)	2207	RR	Astoria Line
314.	Chambers St.	2213	1	7th Ave IRT
315.	46th St.	2217	7	Flushing Line
316.	181st St.	2227	A	Eighth Ave Line
317.	Bway, Astoria	2279	RR	Astoria Line
318.	Christopher St.	2307	1	7th Ave IRT
319.	170th St.	3312	4	Jerome Ave
320.	28th St.	2328	1	7th Ave IRT

Rank	Station	Fares (000's)		Line
321.	174th St.	2332	2	White Plains Rd Line
322.	Nevins St	2334	2	Bklyn IRT
323.	Grand Ave	2346	GG	Queens Blvd Line
324.	125 St-Lenox	2347	2	Lenox Ave Line
325.	Queensboro Plaza	2359	7,RR	Astoria/Flushing Lines
326.	Houston St.	2362	1	7th Ave IRT
327.	110th St	2386	6	Lex Ave Line
328.	East Broadway	2387	F	Houston St.
329.	Brighton Beach	2440	D	Brighton Line
330.	67th Ave	2442	GG	Queens Blvd. Line
331.	Church Ave.	2470	4.5	Nostrand Ave. Line
332.	Hoyt St.	2533	2	Brooklyn IRT
333.	Tremont Ave	2558	D	Canarsie Line
334.	49th Ave - Hunters Point	2561	7	Flushing Line
335.	East 177th St.	2574	6	Pelham Line
336.	Franklin Ave	2623	2	Bklyn IRT
337.	Prospect Ave	2633	2	White Plains Rd Line
338.	1st Ave	2636	LL	14th St. Line
339.	50th St	2658	A	8th Ave Line
340.	49th St.	2675	RR	Bway BMT
341.	167th St.	2679	D	Concourse Line
342.	Hoyt-Schermerhorn St	2685	A,GG	Fulton St Line
343.	Bway-Lafayette St	2736	D,F	Houston St Line
344.	Burnside Ave.	2777	4	Jerome Ave Line
345.	Queens Plaza	2780	E	Queens Blvd. Line
346.	90th St. Elmhurst Ave.	2795	7	Flushing Line
347.	Stillwell Ave.	2821	B,D,F,N	Coney Island Terminal
348.	Sutphin Blvd.	2849	E	Queens Blvd Line
349.	Nostrand Ave.	2881	A	Fulton St. Line
350.	Fordham Rd.	2888	D	Concourse Line
351.	116th St.	2895	1	Bway IRT
352.	61st St	2899	7	Flushing Line
353.	Cortlandt St.	2910	RR	Bway BMT
354.	79th St.	2971	1	Bway IRT
355.	205th St.	3001	D	Concourse Line
356.	8th St.	3031	RR	Bway BMT
357.	23rd St.	3036	1	7th Ave IRT
358.	Fifth Ave	3039	E	Queens Blvd Line
359.	82nd St	3042	7	Flushing Line
360.	103rd St.	3061	6	Lex. Ave Line

Rank	Station	Fares (000's)		Line
361.	23rd St	3088	AA	8th Ave Line
362.	116th St	3098	6	Lex Ave Line
363.	110th St (Cathedral Pkwy)	3105	AA	8th Ave Line
364.	103rd St	3133	1	Bway IRT
365.	Junction Blvd.	3145	7	Flushing Line
366.	135th St-Lenox Ave	3156	2	Lenox Ave Line
367.	66th St.	3157	1	Bway IRT
368.	Astor Place	3257	6	Lex Ave Line
369.	Canal St	3268	A	8th Ave Line
370.	Church Ave	3306	D	Brighton Line
371.	South Ferry	3313	1	Bway IRT
372.	De Kalb Ave	3321	D,B,N,RR	
373.	96th St	3332	6	Lex. Ave Line
374.	Ditmars Blvd.	3340	RR	Astoria Line
375.	Seventh Ave.	3342	D,E	Queens Blvd Line
376.	137th St	3349	1	Bway IRT
377.	Sheepshead Bay	3377	D	Brighton Line
378.	125th St	3483	4,5,6	Lex Ave Line
379.	161st St-River Ave.	3564	D	Concourse Line
380.	23rd St.	3633	RR	Bway BMT
381.	168th St-Bway	3678	1,A	Int. Div Tsfr.
382.	86th St	3718	2	7th Ave IRT
383.	63rd Drive	3779	GG	Queens Blvd. Line
384.	Fifth Ave.	3849	D,E	Queensboro Line
385.	Woodhave Blvd.	3886	GG	Queens Blvd. Line
386.	Delancey & Essex St	4046	F,J,K	Int. Div. Tsfr.
387.	145th St	4218	A	8th Ave Line
388.	Kings Highway	4307	D	Brighton Line
389.	Whitehall St	4308	RR	Bway BMT
390.	149th St & Third Av	4432	2	White Plains Road Line
391.	Flatbush Ave.	4494	4	Nostrand Ave Line
392.	Canal & Lafayette Sts.	4539	N	Bway BMT
393.	Parsons Blvd.	4554	E,F.	Queens Blvd. Line
394.	14th St - Sixth Ave	4565	LL,F	Int. Div. Tsfr. Sta.
395.	Atlantic Ave	4578	D,2,4	Int. Div. Tsfr. Sta.
396.	23rd St.	4726	F	Sixth Ave Line
397.	Jay St-Borough Hall	4732	A,F.	IND Brooklyn
398.	175th St.	4771	A	8th Ave Line
399.	125th St.	4807	A	8th Ave Line
400.	28th St.	4912	6	Lex Ave Line

Rank	Station	Fares (000's)		Line
401.	14th St - 8th Ave	4924	A,LL	Int. Div. Tsfr Sta
402.	33rd St	5195	6	Lex Ave Line
403.	57th St	5315	RR	Bway BMT
404.	169th St	5340	E	Queens Blvd. Line
405.	Union Turnpike	5474	E	Queens Blvd. Line
406.	50th St	5485	1	7th Ave IRT
407.	14th St	5710	1	7th Ave IRT
408.	Broad St	5750	J	Centre St Line
409.	Continental Ave	5802	E	Queens Blvd. Line
410.	77th St	5923	6	Lex Ave Line
411.	Bowling Green	6067	4	Lex Ave Line
412.	72nd St	6166	1,2	Bway IRT
413.	Utica Ave	6315	2	IRT Brooklyn Line
414.	Borough Hall	6517	4,RR	Int. Div. Tsfr. Sta
415.	51st St	6645	6	Lex Ave Line
416.	96th St	6772	1,2	Bway IRT
417.	68th St	6859	6	Lex Ave Line
418.	Wall St & Broadway	6877	4	Lex Ave Line
419.	Wall & William Sts	6973	2	7th Ave IRT
420.	23rd St	7084	6	Lex Ave Line
421.	Roosevelt Ave	7122	7,E	Int. Div. Tsfr. Sta.
422.	Chambers St	7398	4,J	Int. Div. Tsfr. Sta.
423.	West 4th St	7409	A,D	6th & 8th Ave Lines
424.	Fifth Ave	7652	E	Queens Blvd. Line
425.	Chambers St	8970	A	8th Ave Line
426.	179th St	8994	E	Queens Blvd. Line
427.	Lexington Ave	9413	E	Queens Blvd. Line
428.	86th St	9466	6	Lex Ave Line
429.	42nd St	10531	7,D,F	Int. Div. Tsfr. Sta
430.	Columbus Circle	10857	1,D,A	Int. Div. Tsfr. Sta
431.	Main St, Flushing	13319	7	Flushing Line
432.	34th St	13678	A	8th Ave Line
433.	59th St-Lexington	14076	6,RR	Int. Div. Tsfr. Sta.
434.	42nd St.	14841	A	8th Ave Line
435.	50th St	15131	D,F	Sixth Ave Line
436.	B'way-Nassau/Fulton	15445	A,J,2,4	Int. Div. Tsfr. Sta.
437.	Union Square	16507	6,LL,RR	Int. Div. Tsfr. Sta.
438.	Pennsylvania Station	17943	1	7th Ave. IRT
439.	34th St & Sixth Ave	25328	D,F,RR	Int. Div. Tsfr. Sta.
440.	Times Square	26024	1,7,RR	Int. Div. Tsfr. Sta.
441.	Grand Central	31772	6,7	Int. Div. Tsfr. Sta.

* * * *

SOURCE: Transportation Planning Department, Metropolitan Transportation Authority, New York.

Table E-10

PATCO - DISTRIBUTION BY ACCESS MODE

STATION	PERSON TRIPS	ACCESS MODE							
		Walk	Apt. Bus	Public Bus	Auto Drop-off	Drove Alone	Car-Pool	No Response	TOTAL
Lindenwold	2,127	14.2	0.2	0.8	22.0	52.1	9.7	1.0	100.0
Ashland	1,332	9.4	0.1	0.3	23.0	57.3	9.2	0.7	100.0
Haddonfield	2,127	14.1	0.2	0.8	22.0	52.1	9.7	1.0	100.0
Westmont	1,452	16.1	0.3	0.1	15.9	58.5	8.4	0.7	100.0
Collingswood	1,062	31.5	0.1	0.3	16.8	45.3	5.4	0.6	100.0
Ferry Avenue	1,462	11.6	0.1	1.8	15.9	60.3	9.8	0.5	100.0
Broadway	237	29.3	3.8	28.9	20.4	14.2	3.4	-	100.0
City Hall	295	27.8	0.7	32.9	14.6	21.0	3.0	-	100.0
All Stations in New Jersey	10,094	16.0	0.3	2.3	19.6	52.4	8.7	0.7	100.0

SOURCE: Delaware River Port Authority Surveys, 1969-1970. Summarized in Peat, Marwick, Mitchell & Co., Fringe Parking and Intermodal Passenger Transportation: Operational Experience in Five Cities, November, 1971.

Table E-11

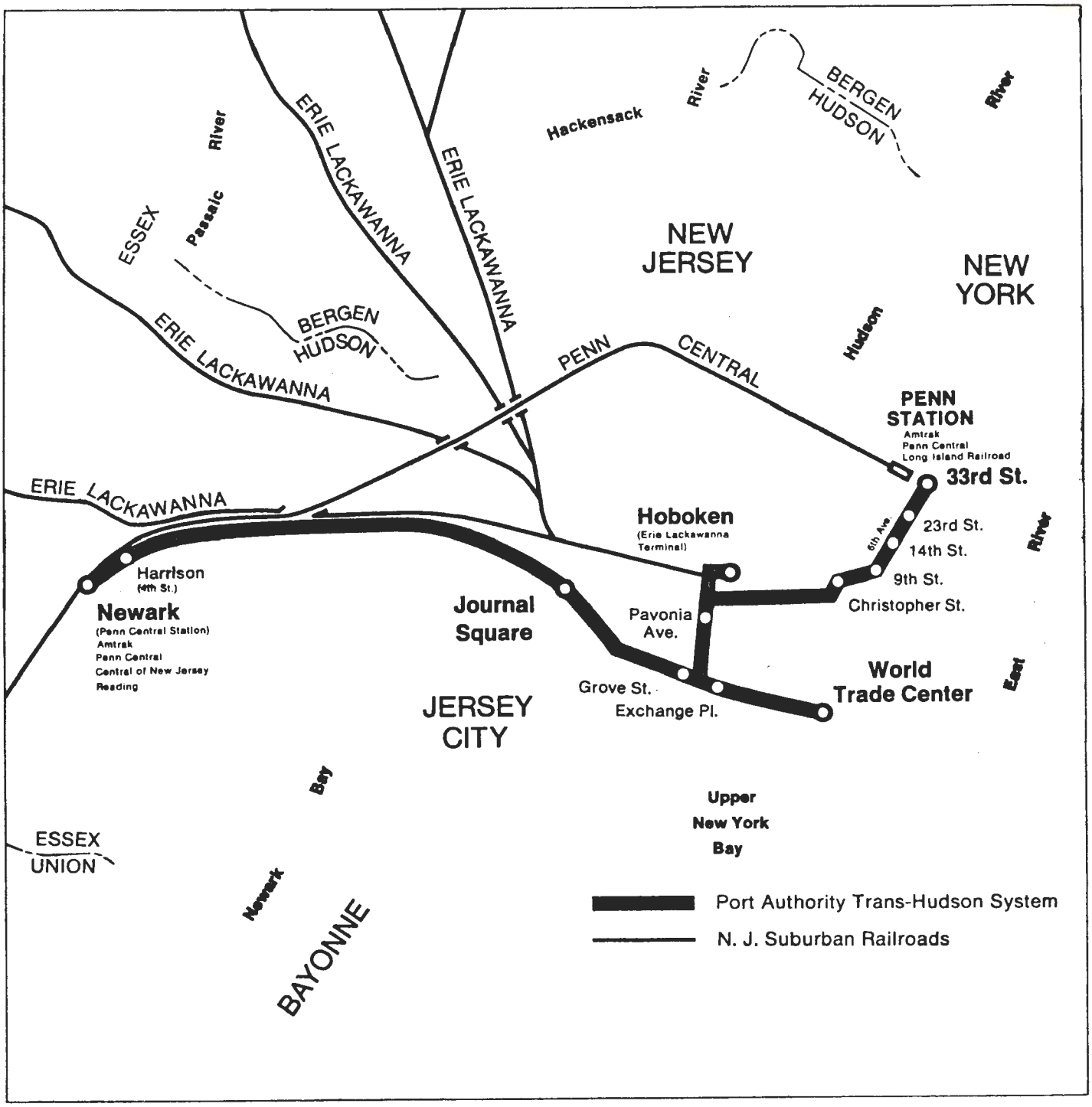
PRIOR MODES OF TRAVEL - PATCO

STATION	AUTOMOBILE		PUBLIC TRANSPORTATION				DID NOT COMMUTE	NO RESPONSE
	Drive	Car-Pool	Apt.[1] Bus	Public Bus	Camden Bridge Train	PRSL[2]		
Lindenwold	37.3	5.1	-	36.2	1.6	6.7	13.1	-
Ashland	44.8	7.5	0.3	30.1	0.9	0.8	12.0	3.5
Haddonfield	39.0	5.7	0.6	34.4	1.6	1.7	11.9	4.9
Westmont	34.0	4.4	1.0	41.0	2.0	1.5	12.0	4.0
Collingswood	28.4	3.5	1.9	48.3	2.1	1.5	9.8	4.5
Ferry Avenue	37.3	4.9	0.8	39.9	3.0	.8	10.6	2.6

(1) Bus service provided by an apartment house for the use of residents.
(2) Pennsylvania-Reading Seashore Line.

SOURCE: Delaware River Port Authority Surveys, 1969-1970. Summarized in Peat, Marwick, Mitchell & Co., Fringe Parking and Intermodal Passenger Transportation: Operational Experience in Five Cities, November, 1971.

Port Authority Trans-Hudson (PATH) System



The Port Authority Trans-Hudson Corporation/111 Eighth Avenue/ New York 10011/ Room 302

FIGURE E-7

Table E-12

SUMMARY OF TURNSTILE READINGS AT PATH STATIONS
ON SELECTED WEEKDAYS IN THE FALL, 1975

New York Side

STATION	TIME PERIOD	TOTAL ENTRANCE COUNTS Number	Percent
World Trade Center Terminal			
Wednesday, October 1			
	24 Hours	40,436	100.0
	7-10 AM	2,100	5.2
	4-7 PM	29,010	71.7
Christopher Street			
Tuesday, September 30			
	24 Hours	903	100.0
	7-10 AM	200	22.1
	4-7 PM	488	54.0
9th Street			
Tuesday, September 30			
	24 Hours	2,052	100.0
	7-10 AM	233	11.4
	4-7 PM	755	36.7
14th Street			
Tuesday, September 30			
	24 Hours	3,032	100.0
	7-10 AM	303	10.0
	4-7 PM	1,549	51.1
23rd Street			
Tuesday, September 30			
	24 Hours	2,942	100.0
	7-10 AM	126	4.3
	4-7 PM	2,029	69.0
30th & 33rd Streets			
Thursday, October 2			
	24 Hours	17,648	100.0
	7-10 AM	1,045	5.9
	4-7 PM	10,582	59.9
SUB-TOTAL NEW YORK PATH STATIONS			
Total	24 Hours	67,013	100.0
	7-10 AM	4,007	6.0
	4-7 PM	44,413	66.3

(continued)

Table E-12 (cont.)

SUMMARY OF TURNSTILE READINGS AT PATH STATIONS
ON SELECTED WEEKDAYS IN THE FALL, 1975 (CONTD.)

New Jersey

STATION / TIME PERIOD	TOTAL ENTRANCE COUNTS Number	Percent
Hoboken Terminal		
Upper and Lower Levels		
Wednesday, October 29		
24 Hours	30,108	100.0
7-10 AM	25,628	85.1
4-7 PM	1,166	3.9
Pavonia Avenue		
Wednesday, November 12		
24 Hours	367	100.0
7-10 AM	232	63.2
4-7 PM	43	11.7
Exchange Place		
Thursday, October 30		
24 Hours	3,419	100.0
7-10 AM	1,656	48.4
4-7 PM	963	28.2
Grove Street		
Thursday, October 30		
24 Hours	5,998	100.0
7-10 AM	2,899	48.3
4-7 PM	986	16.4
Journal Square		
Thursday, October 23		
24 Hours	17,196	100.0
7-10 AM	9,135	53.1
4-7 PM	2,399	14.0
Harrison		
Tuesday, November 18		
24 Hours	2,120	100.0
7-10 AM	975	46.0
4-7 PM	585	27.6
Newark		
Tuesday, October 28		
24 Hours	20,426	100.0
7-10 AM	11,946	58.5
4-7 PM	3,343	16.3
SUB-TOTAL NEW JERSEY PATH STATIONS		
Total 24 Hours	79,634	100.0
7-10 AM	52,471	65.9
4-7 PM	9,485	11.9
TOTAL ALL STATIONS		
Total 24 Hours	146,647	100.0
7-10 AM	56,478	38.5
4-7 PM	53,898	36.8

Table E-13

SUMMARY OF TURNSTILE READINGS AT NEW YORK AND NEW JERSEY PATH STATIONS ON SELECTED WEEKEND DAYS IN FALL, 1975 (CONTD.)

24 Hour Total

NEW YORK STATIONS	SATURDAY, OCTOBER 4, 1975 Total Entrance Counts	SUNDAY, OCTOBER 5, 1975 Total Entrance Counts
World Trade Center Terminal	4,927	3,444
Christopher Street	214	118
9th Street	1,404	793
14th Street	1,873	833
23rd Street	398	233
33rd Street	7,823	5,325
TOTAL NEW YORK	16,639	10,746

NEW JERSEY STATIONS	SATURDAY, NOVEMBER 8, 1975 Total Entrance Counts	SUNDAY, NOVEMBER 9,1975 Total Entrance Counts
Hoboken Terminal	4,347	2,694
Exchange Place	264	164
Grove Street	3,599	2,345
Journal Square	7,737	4,574
Harrison	562	366
Newark	5,617	3,466
TOTAL NEW JERSEY	22,126	13,609

SOURCE: PATH Turnstile Readings - Fall 1975

SEPTA High Speed and Rail Commuter System

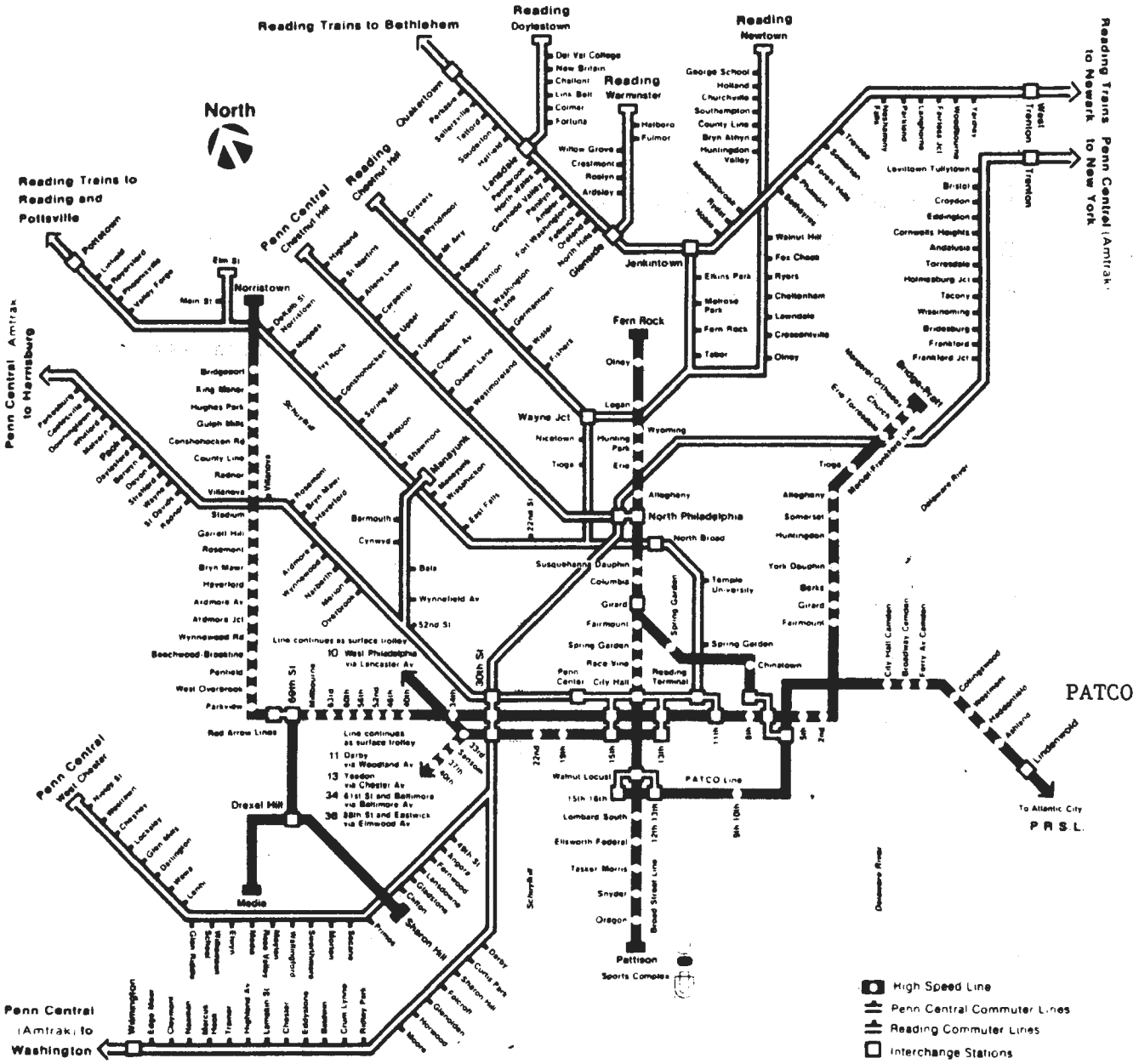


FIGURE E-8

Table E-14

RAPID TRANSIT RIDERSHIP

SEPTA - WEEKDAYS, 1975

BROAD STREET SUBWAY

Stations are arranged in order from north to south.

Station	Average Weekday Boardings
Fern Rock	4,881
Olney	18,581
Logan	3,596
Wyoming	3,602
Hunting Park	3,343
Erie	8,690
Allegheny	3,535
North Philadelphia	5,872
Susquehanna-Dauphin	3,139
Columbia	7,280
Girard	4,078
Fairmount	1,026
Spring Garden	5,169
Race-Vine	3,274
City Hall	23,473
Walnut-Locust	6,299
Lombard-South	2,624
Ellsworth-Federal	3,140
Tasker-Morris	3,747
Snyder	5,888
Oregon	4,120
Pattison	2,508
Total	127,865

Ridge Avenue Spur (Broad Street Line)

Stations are arranged in order from north to south.

Station	Average Weekday Boardings
Spring Garden	54
Vine	104
8th and Market	3,235
Total	3,393
Total Broad Street Line	131,258

(continued)

Table E-14 (cont.)

DAILY RAPID TRANSIT RIDERSHIP
SEPTA - 1975

Market-Frankford Line

Stations are arranged in order from west to northeast.

Station	Average Weekday Boardings
69th	17,041
Millbourne	689
63rd	2,202
60th	6,274
56th	5,557
52nd	8,134
46th	3,839
40th	4,302
34th	4,111
30th-31st	13,108
15th	32,517
13th	13,706
11th	8,524
8th	17,256
5th	6,341
2nd	2,626
Fairmount	941
Girard	4,013
Berks	1,663
York-Dauphin	1,567
Huntingdon	2,033
Somerset	2,765
Allegheny	7,812
Tioga	1,892
Erie-Torresdale	6,202
Church	736
Margaret-Orthodox	7,122
Bridge-Pratt	23,067
Total Market-Frankford Line	206,040

SOURCE: A. Sloan - SEPTA.

Table E-15

PATCO RIDERSHIP BY STATION

(1970-1975)

STATION	1970 TYPICAL WEEKDAY TURNSTILE COUNT	1975 TYPICAL WEEKDAY TURNSTILE COUNT	INCREASE	PER CENT INCREASE
Lindenwold	3,115	5,474	2,359	75.7
Ashland	1,661	2,786	1,125	67.7
Haddonfield	2,758	3,356	598	21.7
Westmont	1,842	2,263	421	22.9
Collinswood	1,492	1,923	431	28.9
Ferry Avenue	2,252	3,586	1,334	59.2
Broadway	1,466	1,504	38	2.6
City Hall	2,053	2,521	468	22.8
Subtotal N.J.	16,639	23,413	6,774	40.7
8th	6,166	7,836	1,670	27.1
9th/10th	475	633	158	33.3
12th/13th	2,138	2,697	559	26.1
15th/16th	4,674	6,686	2,012	43.0
Subtotal Phila.	13,453	17,852	4,399	32.7
TOTAL	30,092	41,265	11,173	37.1

SOURCE: Delaware River Port Authority.

Table E-16

SUMMARY OF SUBWAY PASSENGERS
ENTERING AND LEAVING
THE BLOOR-DANFORTH AND YONGE-UNIVERISTY LINES

Toronto - 1976

STATION	MAXIMUM HOUR *		ALL DAY		
	TO	FROM	TO	FROM	TOTAL
Bathurst	3,355	3,868	24,567	27,738	52,305
Bay	4,334	4,697	17,877	18,793	36,670
Bloor-Yonge	5,654	5,079	28,561	29,282	57,843
Broadview	2,437	2,181	13,253	13,594	26,847
Castle Frank	653	842	4,288	4,526	8,814
Chester	509	566	2,998	2,939	5,937
Christie	840	1,065	5,960	5,812	11,772
College	3,479	3,973	21,875	23,023	44,898
Coxwell	1,248	1,510	9,104	10,820	19,924
Davisville	2,293	2,028	9,971	12,094	22,065
Donlands	797	1,056	5,238	4,399	9,637
Dufferin	2,076	1,972	12,242	12,288	24,530
Dundas	3,446	3,181	18,733	19,573	38,306
Dundas West	2,065	1,594	11,725	11,535	23,260
Eglinton	6,878	8,300	35,548	42,836	78,384
Finch	7,645	5,568	21,548	23,353	44,901
Greenwood	557	1,605	4,801	5,804	10,605
High Park	1,286	1,037	5,368	4,602	9,970
Islington	6,867	6,362	28,999	31,373	60,372
Jane	2,569	2,059	12,029	10,832	22,861
Keele	1,326	1,279	6,115	5,639	11,754
King	9,921	12,468	26,172	33,897	60,069
Lansdowne	2,101	1,585	11,501	9,912	21,413
Lawrence	2,621	2,179	12,472	11,648	24,120
Main	3,382	2,757	12,087	12,702	24,789
Museum	551	882	4,012	4,261	8,273
Old Mill	847	676	2,614	2,740	5,354
Osgoode	2,544	2,318	7,134	6,674	13,808
Ossington	2,281	2,490	13,795	13,582	27,377
Pape	3,696	4,110	18,205	20,766	38,971
Queen	9,136	7,098	42,251	37,457	79,708
Queen's Park	3,327	5,093	11,301	14,579	25,880
Rosedale	1,004	622	4,659	4,805	9,464
Royal York	2,369	2,047	9,775	10,236	20,011
Runnymede	1,519	1,568	8,662	9,008	17,670
St. Andrew	4,468	4,601	11,220	11,089	22,309
St. Clair	4,048	4,402	24,613	26,880	51,493
St. George	1,732	2,105	13,812	12,086	25,898
St. Patrick	3,059	3,974	9,717	11,447	21,164
Sheppard	3,607	3,231	15,465	15,854	31,319
Sherbourne	1,793	2,175	10,603	11,209	21,812
Spadina	3,035	2,560	14,050	14,669	28,719
Summerhill	411	1,107	3,159	4,201	7,360
Union	3,552	3,287	18,177	18,654	36,831
Victoria Park	4,502	4,415	18,048	18,691	36,739
Warden	6,754	5,992	27,216	29,222	56,438
Wellesley	2,400	1,806	12,736	12,427	25,163
Woodbine	1,587	1,841	8,201	8,617	16,818
York Mills	2,779	2,482	12,751	13,297	26,048
TOTAL			685,208	721,465	1,406,673

* Maximum Hour During Rush Hour Only

SOURCE: Toronto Transit Commission.

Table E-17
PASSENGERS AT WELLESLEY STATION

(On Train Pass. Between Wellesley and Bloor Stns.)

Year	Total Pass. Both Directions 6 A.M. - 2 A.M.	SB Arrivals - A.M. Rush			NB Departures - P.M. Rush		
		Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour	Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour
1954	192,154	26,397	7,377	29,508	26,483	7,505	30,020
1955	189,404	23,047	9,001	36,004	25,854	8,011	32,044
1956	205,120	29,584	8,745	34,980	24,806	7,654	30,616
1957	202,731	30,111	8,569	34,276	27,876	9,088	36,352
1958	198,870	29,421	9,530	38,120	29,549	9,269	37,076
1959	200,128	31,682	9,498	37,992	29,305	9,319	37,276
1960	191,037	30,211	9,063	36,252	29,755	9,177	36,708
1961	187,356	29,979	8,567	34,268	28,583	8,671	34,684
1962	177,894	28,875	8,529	34,116	27,853	8,454	33,816
1963 x	183,174	27,141	7,612	30,448	27,006	8,034	32,136
1964	177,260	27,340	7,568	30,272	25,433	7,876	31,504
1965	182,245	26,506	7,683	30,732	26,699	8,146	32,584
1966 *	202,404	29,862	8,964	35,856	27,341	8,052	32,208
1967	204,149	29,316	8,679	34,716	29,796	8,908	35,632
1968 a	203,385	27,756	8,084	32,336	29,257	9,352	37,408
1969	202,404	27,328	7,549	30,196	29,097	8,546	34,184
1970	199,552	29,011	8,392	33,568	30,485	9,259	37,036
1971	218,433	29,506	8,297	33,188	27,989	9,346	37,384
1972	226,692	29,587	8,360	33,440	30,330	9,002	36,008
1973 b	239,705	33,433	9,757	39,028	30,495	8,986	35,944
1974 c	261,815	34,465	10,079	40,316	35,238	10,515	42,060
1975	265,498	34,498	9,474	37,896	36,248	10,724	42,896

NOTE:

(X) - Max. 15 Minute Volume Multiplied By 4.

Yearly figures are the average of the three maximum counts in that year.
x - University Subway Opened February 28, 1963.
* - Bloor-Danforth Subway Opened February 26, 1966.
a - Bloor-Danforth Extensions Opened May 11, 1968.
b - Yonge extension to York Mills Station opened March 31, 1973.
c - Yonge extension to Finch Station opened March 30, 1974.

SOURCE: T.T.C. Planning Department

Table E-18
PASSENGERS AT SPADINA STATION

(On Train Pass. Between Spadina and St. George Stns.)

Year	Total Pass. Both Directions 6 A.M. - 2 A.M.	EB Departures - A.M. Rush			WB Arrivals - P.M. Rush		
		Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour	Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour
1966 *	106,120	14,216	4,428	17,712	14,628	5,115	20,460
1967	122,922	16,193	4,804	19,216	15,822	5,070	20,280
1968 a	141,272	18,156	5,791	23,164	18,165	5,652	22,608
1969	145,926	17,816	5,785	23,140	18,281	5,496	21,984
1970	152,586	18,439	5,990	23,960	20,472	6,196	24,784
1971	161,462	19,242	5,637	22,548	18,848	6,095	24,380
1972	173,396	21,809	6,517	26,068	19,356	5,953	23,812
1973 b	195,341	21,986	6,658	26,632	21,876	6,600	26,400
1974 c	196,569	22,236	6,524	26,096	21,688	6,410	25,640
1975	193,277	22,625	6,785	27,140	23,258	7,031	28,124

NOTE:

(X) - Max. 15 Minute Volume Multiplied By 4.

Yearly figures are the average of the three maximum counts in that year.

* - Bloor-Danforth Subway Opened February 26, 1966.
a - Bloor-Danforth Extensions Opened May 11, 1968.
b - Yonge Extension to York Mills Station opened March 31, 1973.
c - Yonge Extension to Finch Station opened March 30, 1974.

SOURCE: T.T.C. Planning Department

Table E-19
PASSENGERS AT SHERBOURNE STATION

(On Train Pass. Between Sherbourne and Yonge Stns.)

Year	Total Pass. Both Directions 6 A.M. - 2 A.M.	WB Departures - A.M. Rush			EB Arrivals - P.M. Rush		
		Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour	Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour
1966 *	106,896	13,879	4,112	16,448	14,506	4,227	16,908
1967	109,201	14,863	4,491	17,964	14,158	4,389	17,556
1968 a	128,060	17,022	5,010	20,040	16,552	5,169	20,676
1969	133,312	18,281	5,687	22,748	17,958	5,477	21,908
1970	143,519	18,339	5,576	22,304	19,149	5,830	23,320
1971	151,338	20,494	6,336	25,344	20,208	5,974	23,896
1972	161,982	20,621	5,963	23,852	19,314	5,920	23,680
1973 b	179,028	22,132	6,672	26,688	20,368	6,409	25,636
1974 c	192,682	24,097	7,239	28,956	21,964	6,590	26,360
1975	184,072	22,242	6,588	26,352	19,812	6,272	25,088

NOTE:

(X) - Max. 15 Minute Volume Multiplied By 4.

Yearly figures are the average of the three maximum counts in that year.

* - Bloor-Danforth Subway Opened February 26, 1966.
a - Bloor-Danforth Extensions Opened May 11, 1968.
b - Yonge Extension to York Mills Station opened March 31, 1973.
c - Yonge Extension to Finch Station opened March 30, 1974

SOURCE: T.T.C. Planning Department

Table E-20
PASSENGERS AT ROSEDALE STATION

(On Train Pass. Between Rosedale and Bloor Stns.)

Year	Total Pass. Both Directions 6 A.M. - 2 A.M.	SB Departures - A.M. Rush			NB Arrivals - P.M. Rush		
		Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour	Max. Hour	Max. 15-Min.	(X) Pro-rated Max. Hour
1954)							
1955)	No Counts Taken At Rosedale Stn. During This Period.						
1956)							
1957	Counts Taken RH Only.	26,738	7,475	29,900	26,748	8,230	32,920
1958)							
1959)	No Counts Taken At Rosedale Stn. During This Period.						
1960)		26,281	7,635	30,540	25,907	8,509	34,036
1961)	These Counts	24,161	7,035	28,140	23,085	6,713	26,852
1962)	Taken	24,398	7,042	28,168	22,494	7,030	28,120
1963 x)	Only In	28,782	8,139	32,556	26,528	8,686	34,744
1964)	Rush Hours	27,169	8,026	32,104	25,470	8,600	32,400
1965)		26,322	8,359	33,436	28,145	8,548	34,192
1966 *	177,706	25,108	7,966	31,864	25,359	8,821	35,284
1967	179,544	24,145	6,966	27,864	25,328	7,674	30,696
1968 a	166,029	23,264	7,105	28,420	24,808	8,263	33,052
1969	160,525	21,237	6,871	27,484	21,721	6,495	25,980
1970	169,004	21,873	6,194	24,776	21,595	6,527	26,108
1971	170,042	22,613	6,212	24,848	21,280	6,882	27,528
1972	171,749	22,655	6,636	26,544	20,520	6,051	24,204
1973 b	201,313	25,530	7,691	30,764	22,457	7,310	29,240
1974 c	223,878	27,374	8,715	34,860	25,137	7,402	29,608
1975	234,218	27,996	8,840	35,360	25,829	7,452	29,808

NOTE:

(X) - Max. 15 Minute Volume Multiplied By 4.

Yearly figures are the average of the three maximum counts in that year.
x - University Subway Opened February 28, 1963.
* - Bloor-Danforth Subway Opened February 26, 1966.
a - Bloor-Danforth Extensions Opened May 11, 1968.
b - Yonge Extension to York Mills Station opened March 31, 1973
c - Yonge Extension to Finch Station opened March 30, 1974.
SOURCE: T.T.C. Planning Department

Table E-21
PASSENGERS AT MUSEUM STATION

(On Train Pass. Between St. George and Museum Stns.)

YEAR	TOTAL PASS. BOTH DIRECTIONS 6 A.M. - 2 A.M.	SB ARRIVALS - A. M. RUSH			NB DEPARTURES- P. M. RUSH		
		MAX. 15-Min.	MAX. HOUR	(X) PRO-RATED MAX. HOUR	MAX 15-Min.	MAX. HOUR	(X) PRO-RATED MAX. HOUR
1966 (a)	78,349	4,022	12,271	16,088	4,562	14,672	18,248
1967	55,517	3,506	10,792	14,024	4,251	12,076	17,004
1968 (b)	54,719	4,200	13,722	16,800	4,070	12,517	16,280
1969	55,744	3,907	13,474	15,628	4,075	12,953	16,300
1970	55,455	4,048	13,625	16,192	4,158	13,662	16,632
1971	59,351	4,592	14,153	18,368	4,005	13,422	16,020
1972	60,198	4,194	13,752	16,776	4,112	12,935	16,448
1973 (c)	66,884	4,876	15,093	19,504	3,983	12,907	15,932
1974 (d)	64,149	4,833	15,843	19,332	3,877	13,116	15,508
1975	69,970	4,366	15,564	17,464	5,094	15,581	20,376

NOTE: (X) Max. 15 minute volume multiplied by 4.

Yearly figures are the average of the three maximum counts in that year.

(a)- Bloor-Danforth Subway opened February 26, 1966.
- Separate operation commenced September 4, 1966. Figures used in 1966 occurred during integrated operation.

(b)- Bloor-Danforth extensions opened May 11, 1968.

-Yonge-University Subway Trains cutback to Union Station from 10 p.m. commenced June 24, 1968.

(c)-Yonge extension to York Mills Station opened March 31, 1973.

(d)-Yonge extension to Finch Station opened March 30, 1974

SOURCE: T.T.C. Planning Department

Table E-22

MODAL SPLIT OF TRANSIT PATRONS USING ISLINGTON SUBWAY STATION

Mode	ALL DAY (6:30 A.M. to 12:00 M.N.) Arriving At Subway Station 1974 Pass.	%	1975 Pass.	%	Departing From Subway Station 1974 Pass.	%	1975 Pass.	%
Bus	22,086	67%	25,512	70%	25,688	77%	28,859	79%
Kiss-N-Ride	2,684	8%	2,072	6%	2,226	7%	1,933	5%
Park-N-Ride	2,267	7%	3,030	8%	2,304	7%	2,981	8%
Local	6,052	18%	5,979	16%	2,994	9%	2,876	8%
Total	33,089	100%	36,593	100%	33,212	100%	36,649	100%
	A.M. MAXIMUM HOUR							
Bus	3,715	56%	4,270	58%	2,900	93%	2,968	93%
Kiss-N-Ride	590	9%	612	8%	125	4%	114	4%
Park-N-Ride	842	13%	1,090	15%	10	-	21	1%
Local	1,501	22%	1,441	19%	76	3%	82	2%
Total	6,648	100%	7,413	100%	3,111	100%	3,185	100%
	P.M. MAXIMUM HOUR							
Bus	3,518	76%	3,365	80%	4,451	70%	4,698	73%
Kiss-N-Ride	166	4%	143	3%	335	5%	263	4%
Park-N-Ride	95	2%	93	2%	773	12%	751	12%
Local	852	18%	618	15%	798	13%	689	11%
Total	4,631	100%	4,219	100%	6,357	100%	6,401	100%

Note: (1) Maximum Hours are based on Bus Passenger movement in the heavy direction

(2) Bus Passengers include G.C.L. and Independents

(3) Kiss-N-Ride figures include passenger movements in the vicinity of the Subway Station

(4) Park-N-Ride figures represent the total persons entering and exiting the parking lots

(5) Local passenger volumes are determined by the difference between total passengers counted and the counts of all other modes.

SOURCE: T.T.C. Planning Department

Table E-23

MODAL SPLIT OF TRANSIT PATRONS USING WARDEN SUBWAY STATION

Mode	ALL DAY (6:30 A.M. to 12:00 M.N.) Arriving At Subway Station 1974 Pass.	%	1975 Pass.	%	Departing From Subway Station 1974 Pass.	%	1975 Pass.	%
Bus	24,189	81%	26,102	80%	27,119	87%	27,130	86%
Kiss-N-Ride	2,743	9%	2,507	8%	1,621	5%	1,288	4%
Park-N-Ride	2,040	7%	2,329	7%	1,912	6%	2,244	7%
Local	997	3%	1,761	5%	561	2%	809	3%
TOTAL	29,969	100%	32,699	100%	31,213	100%	31,471	100%
	A.M. MAXIMUM HOUR							
Bus	5,645	79%	5,302	71%	2,539	96%	2,362	98%
Kiss-N-Ride	757	11%	715	10%	15	1%	24	1%
Park-N-Ride	594	8%	635	9%	4	-	8	-
Local	140	2%	723	10%	81	3%	33	1%
TOTAL	7,136	100%	7,375	100%	2,639	100%	2,427	100%
	P.M. MAXIMUM HOUR							
Bus	2,678	90%	2,066	88%	4,708	82%	4,941	84%
Kiss-N-Ride	125	4%	67	3%	386	7%	269	5%
Park-N-Ride	98	3%	79	3%	538	9%	537	9%
Local	99	3%	139	6%	86	2%	139	2%
TOTAL	3,000	100%	2,351	100%	5,718	100%	5,886	100%

NOTE: (1) Maximum Hours are based on Bus Passenger movement in the heavy direction.

(2) Bus Passengers include G.C.L. and Independents.

(3) Kiss-N-Ride figures include passenger movements in the vicinity of the subway station.

(4) Park-N-Ride figures represent the total persons entering and exiting the parking lots.

(5) Local passenger volumes are determined by the difference between total passengers counted and the counts of all other modes.

SOURCE: T.T.C. Planning Department

Table E-24

MODAL SPLIT OF TRANSIT PATRONS USING

FINCH SUBWAY STATION

Mode	Arriving At Subway Station 1974 Pass.	%	1975 Pass.	%	Departing From Subway Station 1974 Pass.	%	1975 Pass.	%
ALL DAY (6:30 A.M. to 12:00 M.N.)								
Bus	18,439	70%	22,167	71%	18,530	77%	22,195	81%
Kiss-N-Ride	1,815	7%	1,986	6%	997	4%	819	3%
Park-N-Ride	1,822	7%	2,397	8%	1,898	8%	2,319	8%
Local	4,273	16%	4,844	15%	2,658	11%	2,102	8%
TOTAL	26,349	100%	31,394	100%	24,083	100%	27,435	100%
A.M. MAXIMUM HOUR								
Bus	4,076	60%	4,748	63%	1,385	86%	1,439	98%
Kiss-N-Ride	865	13%	708	9%	49	3%	21	1%
Park-N-Ride	699	10%	898	12%	4	-	4	-
Local	1,167	17%	1,222	16%	176	11%	20	1%
TOTAL	6,807	100%	7,576	100%	1,614	100%	1,484	100%
P.M. MAXIMUM HOUR								
Bus	1,699	79%	1,892	76%	3,499	70%	4,136	72%
Kiss-N-Ride	56	3%	89	4%	308	6%	220	4%
Park-N-Ride	52	2%	53	2%	503	10%	727	13%
Local	357	16%	444	18%	702	14%	664	11%
TOTAL	2,164	100%	2,478	100%	5,012	100%	5,747	100%

SOURCE: T.T.C. Planning Department

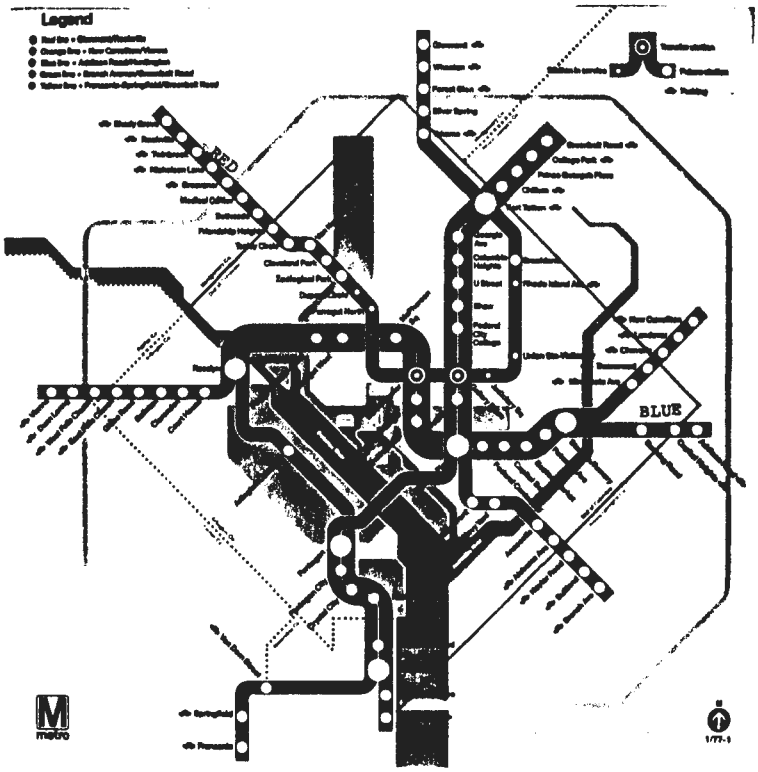
NOTE: (1) Maximum Hours are based on Bus Passenger movement in the heavy direction.

(2) Bus Passengers include G.C.L. and Independents.

(3) Kiss-N-Ride figures include passenger movements in the vicinity of the subway station.

(4) Park-N-Ride figures represent the total persons entering and exiting the parking lots.

(5) Local passenger volumes are determined by the difference between total passengers counted and the count of all other modes.



Metro Station Entrance Locations

STATION	ENTRANCE(S)	HANDICAPPED ENTRANCE (ELEVATOR)
		* Handicapped facility at Gallery Place not open
The Following Stations on the Red Line are Now Operating		
Rhode Island Avenue	Rhode Island Ave. & 8th St., N.E.	Rhode Island Ave. & 8th St., N.E.
Union Station-Visitor Center	Mass Ave. & 1st St., N.E. West Portico of Visitor Center Amtrak Terminal (Union Station)	Mass. Ave. & 1st St., N.E.
Judiciary Square	South Side of F St. between 4th & 5th Sts., N.W. East Side of 4th St. between D & E Sts., N.W.	F St. between 4th and 5th Sts., N.W.
Gallery Place	*SE corner of 7th & G Sts., N.W. SE corner of 9th & G Sts., N.W.	*SE corner of 7th & G Sts., N.W.
Metro Center	SE corner of 11th & G Sts., N.W. SE corner of 13th & G Sts., N.W.	NE corner of 12th & G Sts., N.W.
Farragut North	NE corner of Conn. Ave. & L St., N.W. SE corner of Conn. Ave. & K St., N.W. SW corner of Conn. Ave. & L St., N.W.	SE corner of Conn. Ave. & K St., N.W.
Dupont Circle	SW corner of Conn. Ave. at Dupont Circle & 19th St., N.W.	SW corner of Conn. Ave. & Q St., N.W.
The Following Stations on the Blue Line are Scheduled to Open During the Summer of 1977		
National Airport	Opposite the North Terminal	Opposite the North Terminal
Crystal City	North of 18th St. between Clark St. and Jeff Davis Hwy. Crystal Square Complex	North of 18th St., East of Clark St.
Pentagon City	East side of Hayes St. between Army-Navy & 15th St. West side of Hayes St. between Army-Navy & 15th St.	East side of Hayes St. between Army-Navy and 15th St.
Pentagon	At bus island at SE face of Pentagon Concourse level opposite Woodward & Lothrop	East end of bus island
Arlington Cemetery	North & South sides of Memorial Dr., west of Jeff Davis Hwy.	North side of Memorial Drive, west of Jeff Davis Hwy.
Rosslyn	West side of North Moore between 19th & Wilson East side of Ft. Myer Dr. between 19th & Wilson	East side of N. Moore between 19th & Wilson
Foggy Bottom	NW corner of 23rd and Eye Sts., N.W.	North side of Eye between 23rd & 24th Sts., N.W.
Farragut West	SE corner of 17th & Eye Sts., N.W. NW corner of 18th & Eye Sts., N.W.	NW corner of 18th & Eye Sts., N.W.
McPherson Square	SW corner of 14th & Eye Sts., N.W.	SW corner of 14th & Eye Sts., N.W.
Metro Center (Transfer Station)	SE corner of 13th & G Sts., N.W. NE corner of 12th & G Sts., N.W. SW corner of 12th & F Sts., N.W. SE corner of 11th & G Sts., N.W.	East side of 12th St., north of G St., N.W.
Federal Triangle	West side of 12th St. between Penn. & Constitution Aves., N.W.	West side of 12th St. between Penn. & Constitution Aves., N.W.
Smithsonian	SW corner of 12th St. & Independence Ave., S.W. North side of Jefferson Dr., West of 12th St., S.W. (On Mall)	North of Independence Ave., west of 12th St., S.W.
L'Enfant Plaza	DOT courtyard between 6th & 7th Sts., S.W. East of 7th St. and North of C St., S.W.	West of 7th St. between railroad crossing and C St., S.W.
Federal Center, S.W.	SW corner of D & 3rd Sts., S.W.	SW corner of D & 3rd Sts., S.W.
Capitol South	West of 1st St., between C & D Sts., S.W.	West of 1st St., between C & D Sts., S.W.
Eastern Market	East of 7th St. and South of Penn. Ave., S.E.	East of 7th St. and South of Penn. Ave., S.E.
Potomac Avenue	East side of 14th St., S.E. between Potomac Ave. & G St., S.E.	East side of 14th St., S.E. between Potomac Ave. & G St., S.E.
Stadium/Armory	19th St. & Burke St., S.E. 19th St. & C St., S.E.	19th & C Sts., S.E.

FIGURE E-9

Table E-25

WEEKDAY METRO-RAIL RIDERSHIP
June 1977

STATION	BOARDING PASSENGERS
Dupont Circle	4,871
Farragut North	7,822
Metro Center	5,351
Gallery Place	1,266
Judiciary Square	3,338
Union Station	5,493
Rhode Island Avenue	4,195
Total (Escalater)	32,236
Elevator	2
TOTAL	32,238

SOURCE: Washington Metropolitan Area Transit Authority

C. HIGHWAY TRANSPORTATION

Table E-26

TYPICAL URBAN FREEWAY AND EXPRESSWAY VOLUMES
(MAXIMUM LOAD POINTS)

	CITY	1970 URBANIZED AREA POPULATION	FACILITY	NO. OF LANES	YEAR	AVERAGE DAILY TRAFFIC
1.	Atlanta, Ga.	1,172,778	I-85 N. of US 19		1974	91,200
			I-75 N. of US 78-278		1974	141,600
			I-75 S. of US 78-278		1974	124,800
			I-20 W. of US 23		1974	111,900
			I-285 S. of US 78		1974	75,300
			I-20 E. of CBD at Moreland Ave.		1975	105,100
			I-75 S. of CBD at University Ave.		1975	110,800
			I-20 W. of CBD at Mozley Dr.		1975	78,600
			I-75 N. of CBD (N. of I-85)		1975	72,800
			I-85 N. of I-75 at Monroe Dr.		1975	90,100
2.	Boston, Mass.	2,652,575	I-93 (Central Artery)	6	1974	135,000
			Route 1 at Tobin Bridge	4	1974	65,100
			I-90 (Mass. Pike)	6-8	1974	60,000
			I-93- North of City	6-8	1974	60,000
			Storrow Drive	6	1974	85,000
			I-93 at Stoneham Town Line	6-8	1975	80,300
			S.E. Expressway at Southampton	6-8	1975	129,000
			Rte. 128 at Burlington Town Line	8	1975	86,400
3.	Buffalo, N.Y.	1,086,594	I-190		1970	60,000
			Kensington Expressway		1970	56,000
			I-90		1970	57,000
4.	Chicago, Ill.	6,714,578	Dan Ryan Expressway, I-90,94	14	1973	250,000
			Adlai Stevenson Expwy., I-55	6-8	1973	123,000
			Eisenhower Expwy. at Western	8	1973	177,000
			JFK Expwy. at Western	10	1973	226,000
			Lake Shore Drive at Aldine	8	1973	118,000
			Tri-State Tollway at Dempster	6	1973	75,000
			Edens Expwy. at Foster	6	1973	125,000
			Tri-State, I-294, at I-94	6	1972	83,100
			JFK Expwy at I-94	10	1972	242,000
			Eisenhower Expwy (I-90) at Kedzie	8	1972	200,000
			Stevenson (I-55) at California	6-8	1972	131,400
			Edens Expwy. (I-94) at Peterson	6	1972	133,100
			Lake Shore Dr. at 49th	6-8	1975	61,100
			Lake Shore Dr. at Aldine	6	1975	117,000
			Eisenhower Expwy. betw. Sacramento and Homan	8	1972	200,000
			Dan Ryan Expwy. betw. 43rd & 47th	14	1972	262,000
			Edens Expwy. betw. Peterson and Cicero	14	1972	133,100
5.	Cleveland, Ohio	1,959,880	I-90 (Lakeland Freeway)		1972	94,000

Table E-26 (cont.)
TYPICAL URBAN FREEWAY AND EXPRESSWAY VOLUMES
(MAXIMUM LOAD POINTS)

	CITY	1970 URBANIZED AREA POPULATION	FACILITY	NO. OF LANES	YEAR	AVERAGE DAILY TRAFFIC
6.	Dallas, Ft. Worth, Texas	1,338,684	I-35-77 North of CBD		1974	139,000
			I-35-77 South of CBD		1974	89,000
			I-20 - I-30 East of CBD		1974	100,000
			US-75 North of CBD		1974	92,000
			I-635 North of CBD		1974	111,000
			Dallas-Ft. Worth Turnpike		1974	40,000
			I-30, Ft. Worth, near Henderson CBD		1975	86,600
			I-35, W. Ft. Worth, North of Poly Fwy.		1975	91,300
			Airport Fwy. East of I-35 W.		1975	81,400
			US-80, 180, 377-West of CBD		1974	80,000
			I-81		1974	77,000
			Dallas-Ft. Worth Tpke.		1974	40,000
7.	Denver, Col.	1,047,311	I-25 between 38th Ave. & I-70	6	1974	145,000
			I-225 Between I-25 & Washington St.	6	1974	105,000
			US-6 Between Lowell Blvd. & Federal Blvd.		1974	83,000
			I-70		1971	96,000
			Denver Valley Hwy (I-25)		1971	125,000
			West 6th Ave. Freeway		1971	86,000
8.	Detroit, Mich.	3,970,584	Ford Freeway (I-94) at Chrysler Fwy.	6	1975	161,500
			Jeffries Freeway (I-96) at Warren		1974	72,100
			Southfield Fwy (M39) at Plymouth Rd	6	1973	142,100
			Lodge (M-10) at Pallister	6	1972	173,000
			Fisher Fwy. at Lodge	6-8	1972	118,100
9.	Houston, Texas	1,677,863	I-45 Gulf at Velasco	8	1976	156,500
			I-45 Gulf at Woodbridge	6	1976	106,600
			US-59 Eastex at Buffalo Bayou	8	1976	112,900
			US-59 Southwest at Montrose	10	1976	145,900
			US-59 Southwest at Rice Ave.	8	1976	162,700
			I-45 North, S. of North Loop	8	1976	121,900
			I-10 East, W. of Waco Street	8	1976	117,600
			I-610 West at Buffalo Bayou	8-10	1976	174,400
			I-10 Katy, E. of Taylor Street	10	1976	109,500
			I-10 East, E. of McCarty	8	1976	89,800
			I-610 North, E. of N. Main	8	1976	125,300
			I-610 South, W. of Main	8	1976	100,300
			I-610 South, W. of Telephone	8	1976	88,800
			I-10 East at Elysian	8	1976	75,400
			I-610 East at Ship Channel	10	1976	76,300
10.	Jacksonville, Fla.	529,585	US-17 at Willow Branch Ave.		1969	37,200
			I-10 at Willow Branch Ave.		1969	62,300
			I-10 West of Stockson Street		1969	99,300
			I-95 at 6th Street		1969	78,800
			20th Street Expwy., E. of I-95		1969	43,600
			Southside Expwy. at Hendricks	8	1969	83,800
11.	Kansas City, Mo.	1,101,787	I-70 West of CBD		1976	77,700
			I-35 South of CBD		1976	81,500
			I-70 East of CBD		1976	96,800
			I-29/55 North of CBD		1976	54,100
			I-435 at I-70		1974	71,700

(Continued)

Table E-26 (cont.)

TYPICAL URBAN FREEWAY AND EXPRESSWAY VOLUMES
(MAXIMUM LOAD POINTS)

	CITY	1970 URBANIZED AREA POPULATION	FACILITY	NO. OF LANES	YEAR	AVERAGE DAILY TRAFFIC
12.	Los Angeles, Calif.	8,351,266	I-10 Santa Monica at Western Ave.	8-14	1975	243,000
			I-405 San Diego	8	1975	159,000
			US-101 Ventura	8	1975	196,000
			Cal. 11, Harbor at Olympia	8	1975	215,000
			Cal. 7, Long Beach at Santa Ana	8	1975	135,000
			I-5 Santa Ana	8	1975	196,000
			US-101, Hollywood at Glendale Blvd.	8	1975	201,000
			I-5, Golden State at Washington	8	1975	173,000
			Pasadena at Stadium Way	6	1975	133,000
13.	Miami, Fla.	1,219,661	I-95-N-S Expwy.- N. of N.W. 69th St.	8	1975	169,200
			I-195 Airport, East of Airport	6	1975	67,400
			East-West Expwy., E. of NW 72nd St.	6	1975	60,300
			East-West Expwy., W. of Le Jeune		1975	66,300
			Palmetto Expwy at Flagler Street		1975	87,700
14.	Milwaukee, Wis.	1,252,457	North-South Fwy. at Wisconsin		1975	90,310
			North-South Fwy. at Greenfield		1975	96,770
			East-West Fwy. at 26th Street		1975	93,280
			Zoo Freeway at Wisconsin		1975	40,000
			Airport Freeway at 68th		1975	62,300
15.	New Orleans, La.	961,728	I-10, North of US-90		1975	99,500
			US-90, Pontchartrain Freeway		1970	77,000
			I-610		1975	32,830
16.	New York, N.Y.	16,206,841	I-287, Verrazano Narrows Bridge	6	1970	88,000
			I-95, Cross Bronx Expressway (Major Deegan Expressway)	6	1967	121,000
			I-87, Major Deegan Expressway at Jerome Ave.	6	1960	111,000
			George Washington Bridge	14	1973	219,600
			Lincoln Tunnel	6	1974	97,300
			Holland Tunnel	4	1974	61,400
			Triborough Bridge	8	1973	78,500
			Queensboro Bridge	10-11	1973	138,100
			Queens Midtown Tunnel	4	1973	68,000
			Williamsburg Bridge		1973	80,000
			Manhattan Bridge		1973	73,400
			Brooklyn Bridge		1973	102,800
			Brooklyn Battery Tunnel	4	1974	48,100
			Long Island Expwy., I-495, at Queens Blvd.	6	1974	165,000
			I-87, Major Deegan Expwy. at Fordham Ave.	6	1974	115,000
			I-95, Cross Bronx Expwy at Jerome Ave.	6	1974	143,000
			I-278, Staten Island Expwy at Slosson Ave.	6-8	1974	85,000
			I-278, Brooklyn Queens Expressway	6	1974	135,000
			FDR Drive at 59th Street	6	1974	117,000
17.	Philadelphia, Pa.	4,021,066	Ben Franklin Bridge		1972	63,300
			Walt Whitman Bridge		1972	84,400
			Vine Street Expressway	6	1963	67,000
			Schuykill Expressway	6	1963	110,000

(Continued)

Table E-26 (cont.)

TYPICAL URBAN FREEWAY AND EXPRESSWAY VOLUMES
(MAXIMUM LOAD POINTS)

	CITY	1970 URBANIZED AREA POPULATION	FACILITY	NO. OF LANES	YEAR	AVERAGE DAILY TRAFFI(
18.	Pittsburgh, Pa.	1,846,042	Penn Lincoln Parkway	4-6	1973	76,600
			I-279, Ft. Pitt Tunnel		1973	88,000
			I-95 (City Line)		1973	68,000
19.	Richmond, Va.	416,563	I-95		1973	43,000
			Richmond-Petersburg Turnpike		1973	66,000
			I-64		1973	46,000
20.	Sacramento, Calif.	633,732	I-80		1975	95,000
			I-5		1975	35,000
			Cal. 99 Freeway		1975	110,000
			U.S. 50 Parkway		1975	60,000
21.	San Diego, Calif.	1,198,323	I-805 at Route 8		1975	83,000
			I-5 at Wabash Blvd.		1975	130,000
			I-8 at Route 15		1975	161,000
			Cal. 15 at Market Street		1975	58,000
			Cal. 94 at Junction 805		1975	94,000
22.	San Francisco, Calif.	2,987,850	Oakland-Bay Bridge (I-80)	10	1973	184,000
			James Lick Freeway (U.S. 101)	8	1975	113,400
			Southern Freeway (I-280)	8	1969-73	114,000
			Golden Gate Bridge (U.S. 101)	6	1969-73	92,000
			Cal. 17 (Eastshore Freeway)	8	1974	130,000
			U.S. 101 at I-380	8	1975	113,400
23.	San Jose, Calif.	1,025,273	Bayshore Freeway near Nimitz Fwy.	6-8	1973	100,000
			Junipero Sierra Fwy. near Lawrence Expressway	6-8	1973	83,000
			Nimitz Freeway (US 101) near Park Avenue	6-8	1973	101,000
24..	Seattle, Wash.	1,238,107	I-5 North of Denny Way	12	1975	169,300
			I-5 North of S. Dearborn Street	12	1975	166,700
			Alaskan Way Viaduct at Yesler Way	4	1975	56,000
25.	Springfield, Mass.	514,308	I-91 at CBD	6	1974	59,700
			I-291 at CBD	6	1974	63,300
26.	Washington, D.C.	2,481,489	Shirley Hwy. (N. of 4 Mill River)	6-8	1975	136,000
			I-495 Beltway (Md. 97)	6	1972	85,000
			Center Leg Freeway	6-8	1975	68,000
			I-95 Bridge (over Potomac)	8+	1975	142,700
			Balt. Wash. Parkway (District Line)	6	1975	101,300
			Woodrow Wilson Bridge	6	1975	97,800
			S.W. Freeway at 8th Street	8	1975	118,300
			Theodore Roosevelt Bridge	6	1975	55,800
			Anacostia Freeway at Howard Road	6	1975	95,100

Table E-27

SUMMARY OF TEMPORAL TRAFFIC VOLUME VARIATIONS
(COEFFICIENTS OF VARIATION)

LOCATION	MONDAY-FRIDAY MEAN VOLUME	MONDAY-FRIDAY CV	MONDAY-SUNDAY MEAN VOLUME	MONDAY-SUNDAY CV	CLUSTERS CV (BASED ON 7-DAYS) 2-DAY	3-DAY	5-DAY	7-DAY	SAT. ONLY	SUN. ONLY
Dade County										
NW 27th Ave. NB	21,125	.066	19,640	.148	.109	.083	.052	.031	.034	.067
NW 27th Ave. SB	18,685	.073	17,530	.144	.110	.080	.060	.042	.045	.073
S Dixie Hwy. WB	30,155	.054	28,410	.114	.091	.078	.052	.040	.057	.072
S Dixie Hwy. EB	29,185	.078	27,310	.136	.109	.092	.067	.054	.053	.096
Boston										
NE Expwy. (Revere) SB(1)	26,905	.062	25,500	.108	.084	.070	.050	.037	.053	.096
NE Expwy. (Revere) NB	25,415	.098	23,890	.157	.129	.111	.091	.078	.150	.166
SE Expwy. Boston SB	59,965	.076	56,700	.130	.109	.084	.067	.053	.121	.128
SE Expwy. Boston NB	67,600	.078	64,575	.111	.093	.077	.061	.054	.085	.097
Connecticut										
Rt. 124, New Canaan	8,420	.126	7,790	.183	.147	.124	.094	.082	.130	.156
Charter Oak Bridge,Hartford	16,975	.106	15,460	.201	.154	.120	.086	.070	.146	.151
Bissell Bridge,So. Windsor	9,640	.107	8,410	.259	.215	.173	.112	.064	.134	.140
Putnam Bridge,Wethersfield	13,285	.097	12,190	.182	.151	.125	.089	.071	.136	.147
Illinois (one-way)										
I-90 and I-94										
Dan Ryan - Congress	98,470	.051	96,440	.071	-	-	-	-	.065	.063
Dan Ryan at Garfield	113,970	.060	110,380	.085	-	-	-	-	.047	.073
Dan Ryan (W. Spur at 95)	31,175	.086	30,710	.092	-	-	-	-	.052	.069
Calumet S. of 95	33,945	.108	31,865	.154	-	-	-	-	.105	.106
Stevenson at Pulaski	46,740	.065	28,250	.093	-	-	-	-	.111	.133
Kennedy W. of Edens	56,045	.051	42,670	.058	-	-	-	-	.076	.103
Lake Shore at Foster	42,015	.060	41,100	.175	-	-	-	-	.051	.067

(1) Less than one year count.
NOTE: CV = Coefficient of Variation.

SOURCE: Urban Traffic Volume Counting Manual, 1975
Wilbur Smith and Associates

Table E-28

SOME REPORTED COEFFICIENTS OF VARIATION--SEASONAL AND DAILY VARIATIONS

A. Urban Studies

1. Springfield, Massachusetts Comprehensive Transportation Study, Wilbur Smith and Associates, May, 1969.

TYPICAL ROADWAY	DAILY VOLUME	MONTHLY C.V.	DAILY C.V.
Inter-Urban	22,000	14.0	4.0
Rural	4,000	19.0	14.0
Semi-Rural	17,000	14.0	7.0
Urban	12,000	7.0	12.0

2. Report by Petroff and Kancler, Public Roads, December, 1968.

PERMANENT COUNT STATIONS	C.V. (Per Cent)
6 Stations in Memphis	5.9
12 Stations in St. Louis	5.4
10 Stations in Detroit	6.3

3. British Ministry of Transport, RRL Report No. 427.

ROADWAYS	COUNT DURATION				1 - WEEK	1 - WEEK
	24-Hr.	48-Hr.	5-Day	7-Day	Quarterly	6 Times /Year
ADT ≥ 500	36.0	33.0	29.0	23.01	15.0	12.5
ADT ≥ 2,000	24.0	24.0	22.0	18.0	12.0	7.0

Table E-29

FREEWAY SERVICE IN THE NEW YORK REGION

	Freeway Route Miles, 1971	Freeway Lane Miles, 1971	Lane Miles per 1,000 Motor Vehicles	Route Miles per Sq. Mile Built-up Land[a]	Percent Area Served by Freeways[b]	Percent VMT on Freeways, 1963	Fatalities per 100,000,000 VMT, 1964	
							Freeways	Non-Freeways
New York City	**210.5**	**1,266**	**.72**	**1.5**	**84**	**40[c]**	**1.6**	**3.1**
Manhattan	33.5	204	.88	2.6	100	43	1.0	13.0
Brooklyn	34.5	207	.39	1.0	68	30	2.1	11.0
Bronx	44.0	267	1.01	2.5	100	47	2.8	14.1
Queens	80.5	490	.77	1.5	90	47	1.3	5.2
Staten Island	18.0	98	.86	.9	75	—	—	2.8
Environs	**1,394.5**	**6,967**	**1.17**	**.7**	**n.a.**	**26[d]**	—	—
Long Island	240.5	1,264	.95	.7	n.a.	30[d]	1.5	4.6
Northern N.Y.S.	510.5	2,258	2.44	1.8	n.a.	43[d]	3.4	4.8
New Jersey	402.5	2,310	.83	.6	n.a.	19[d]	2.0	4.3
Connecticut	241.0	1,135	1.29	.6	n.a.	31[d]	2.5	3.0
Region Total (31 counties)	**1,605.0**	**8,233**	**1.06**	**.8**	**n.a.**	**30[d]**	**2.1**	**5.4**

[a] Built-up land includes all land in lots with buildings, exclusive of streets, parks, etc.
[b] Area within 1 mile of freeways, existing or under construction.
[c] Probably over estimated, due to under-assessment of travel in the CBD.
[d] Only within intensively developed area, excluding outer counties and parts of counties.
Sources: Regional Plan Association and Tri-State Regional Planning Commission

APPENDIX F - BIBLIOGRAPHY

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☆U.S. GOVERNMENT PRINTING OFFICE: 1979-281-568/324