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**AUTO TRIP GENERATION IN SMALL URBAN AREAS**

by

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TABLE OF CONTENTS

	Page
Abstract . . . . .	iv
Acknowledgement . . . . .	v
Purpose . . . . .	1
Data Collection . . . . .	2
Introduction to the Region . . . . .	3
Analysis of Data . . . . .	4
Results	
Home to Work Auto Trips . . . . .	5
Work to Home Auto Trips . . . . .	6
Home to Non-Work Auto Trips . . . . .	6
Non-Work to Home Auto Trips . . . . .	7
Non-Home to Non-Home Auto Trips . . . . .	7
Total Auto Trips . . . . .	7
Model Verification . . . . .	8
Conclusions . . . . .	9
Bibliography . . . . .	11
Appendix . . . . .	12
Figures	
Tables	

LIST OF FIGURES  
APPENDIX

Figure

- 1 Data Collection Districts
- 2 Study Region
- 3 Comparison of Calculated Trips with Actual  
Trips in Eastern Pennsylvania

LIST OF TABLES  
APPENDIX

Table

1	Percentage of Auto Trips to the Philadelphia C.B.D.
2	Percentage of Mass Transit Trips
3	Percentage of Truck Trips
4	Dwelling Unit Density and Residential Population Density
5	Variables Used to Describe Trip Generation
6a	Characteristics of Independent Variable
6b	Characteristics of Dependent Variable
7	Trip Generation Equations
8	Simple Correlation Coefficients
9	Summary of Land Use and Economic Variables by District
10	Summary of Internal-Internal and Internal-External Trips by Purpose
11	Summary of all Trips
12	Percentage of Trips Made to Outside the Region

ABSTRACT

AUTO TRIP GENERATION IN SMALL URBAN AREAS

The New Jersey Department of Transportation conducted a study to determine the economic, social and land use characteristics that generate traffic in small urban areas. Six auto trip purposes were analyzed: Home to Work, Work to Home, Home to Non-Work, Non-Work to Home, Non-Home to Non-Home and Total Trips. The Department of Transportation obtained all the data from the Delaware Valley Regional Planning Commission.

The results indicate that autos, population, total employment, retail employment and office employment are the most important generators of traffic for the small urban areas of southwestern New Jersey. The trip generation model developed for New Jersey was used to determine the number of auto trips made in eastern Pennsylvania. The results also indicate that the model is a fairly good predictor of auto trips for the small urban districts in the eastern Pennsylvania section of the Penn Jersey Transportation study area.

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## AUTO TRIP GENERATION IN SMALL URBAN AREAS

### Purpose

In the United States today about 70 percent of the population reside in urban areas. The other 30 percent live in small towns scattered around the United States. A small town is defined as a locality whose population is less than 25,000.<sup>1</sup> Most transportation planning studies devoted their time and effort to the large urbanized regions which included in it small urban areas e.g. Chicago Area Transportation Study. It is the purpose of this report to determine the economic, social and land use characteristics which generate traffic in small urban areas, without resorting to extensive field data collection procedures. Once the traffic models are determined it is hopeful that they can be applied to other small urban areas in order to predict the number of auto trips made in each district (zone). Knowing generation is only part of the problem, transportation studies use distribution models, such as the Gravity Model and Opportunity Model to distribute traffic by district in a region. For example, if we were to know that 1000 trips were generated from district 1, we can use one of the models to distribute the traffic from zone 1 to all other zones. By distributing the traffic in a region, transportation studies can subsequently assign the traffic pattern to various networks (highways). Thus one can understand the importance of determining the traffic generation in a district, as it

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<sup>1</sup>United States Census Population (1960) New Jersey

is one of the first steps in the transportation planning process.

### Data Collection

The Bureau of Safety and Traffic of the Division of Research and Evaluation at first proposed that a home interview and external cordon study be conducted for some small locality in New Jersey. The chief problem was the extensive use of personnel and related cost of such a study. This Bureau subsequently decided to obtain all the necessary data from the Penn Jersey Transportation study that was conducted in 1960. This was a standard origin and destination survey in the Philadelphia, Camden, Trenton, region of Pennsylvania and New Jersey (see Fig. 1). Four percent of the households were interviewed in heavily built up areas (Philadelphia) and a ten percent sample was taken in the suburban and rural areas.<sup>2</sup> The heads of the households were asked the purpose and the origin and destination of each trip. The economic and social characteristics were also obtained, e.g. number of autos, income, people per household, age of persons in household, number of workers in the family, etc. A personal interview and phone interview program were directed at a sample of business establishments of all types with a view to providing accurate information on the distribution of employment, by industry, in the area. A complete inventory of land use was taken from aerial photographs.

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<sup>2</sup>Penn Jersey Transportation (Now Delaware Valley Regional Planning Commission), "The State of the Region," Vol. 1, p. 15.

### Introduction to the Region

The Bureau of Safety and Traffic decided to study only the area of New Jersey included in the Penn Jersey Transportation study, excluding those regions which we considered close to downtown Philadelphia, Camden, and Trenton and exhibiting a large population density.

This region includes most of the districts in the counties of Gloucester, Camden, Burlington and Mercer (see Fig. 2).

The study area is suburban in nature with a net residential density of about eleven people per residential acre compared to the urbanized area of Philadelphia with a density of 180 people. Population in the study area is 554,338 (1960 census).

The Bureau of Safety and Traffic considered the following demographic statistics to define a small urban area; a population density of less than 20 people per residential acre and a dwelling unit density of less than 7 D.U.<sup>3</sup> per residential acre. Our limits for a small urban area are compatible with the limits that were set by the 1960 population census for urban regions. (See Table 4 for population and D.U. densities by district.)

The percentage of auto trips to the Philadelphia CBD from the study districts are less than one percent (Table 1). Three percent of the total person trips made within the study area were made by mass transit [bus, railroad, subway] (Table 2), and 13 percent of the total vehicular trips were made by truck (Table 3).

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<sup>3</sup>Dwelling Unit

### Analysis of Data

Data was analyzed by trip purpose, e.g., home to work, work to home, home to non-work, non-work to home, non-home to non-home, and total trips. The purpose of the trip was categorized into two groups, Internal-Internal and Internal-External. Internal-Internal trips are made between districts within the cordon line. Internal-External trips are those made from one district inside the study area to one district outside the study area. External-Internal, External-External were not analyzed, as it was not made available to us from the Penn Jersey Transportation Study. External-Internal auto trips are those made from any district outside the cordon line to any district within the study area. External-External auto trips are those trips that traverse the study, but do not have either its origin or destination within the cordon region. Only auto trips were evaluated as they represented over 85 percent of the total vehicular trips made. Economic, social and land use data were tabulated on a district wide basis, e.g., population, autos, total jobs, retail acreage, retail employment, office acreage, office employment, service institutional employment, and recreational employment (see Tables 5 and 6a, 6b). The Bureau of Safety and Traffic decided to evaluate the data on a district basis as opposed to a dwelling unit basis. It was believed that by analyzing it on a district wide basis, one would not have to resort to extensive field data collection to predict trip generations in other small urban regions. Previous transportation studies in urban areas did require a great deal of data collection such as, income, household size, number of people over 5 years

old, etc., to simulate trip productions and attractions.

It is the purpose of this report to identify and quantify the interactions between trip-making and economic, social and land use characteristics to predict future auto trips. This objective was accomplished by the use of a Step Wise Multiple Linear Regression Program (STRAP). This program determines the correlation between the dependent variable (home to work auto trips, etc.) with each of the independent variables (autos, population, etc.) and the correlation between each of the independent variables. Subsequently, the computer print-out in the first step a linear regression equation which includes the one variable that explains most of the auto trips, and in subsequent steps, other variables are printed out according to their importance to the equation.

### Results

Home to Work Auto Trips - Population per district and autos per district were used as the independent variables. Information on the number of workers/district were not available. The program results showed that the number of autos/district could describe, with sufficient accuracy, the number of home to work auto trips. The correlation was quite high with an  $R^2$  of 0.926; a standard error of estimate of 510.4 (Table 7).

An F value of 465.4,  $F_{.05} = 4.10$ , and  $\frac{S.E.E.}{\sqrt{Y}}$  of 0.158

$R^2$  describes the proportion of all trips explained by a variable of variables. In this case 92.6 percent of the trips were explained by using the number of autos per district as our independent variable

(Table 8). The standard error of estimate is a measure of the expected range of the dependent variable. For example, if we were to determine from our equation that the number of trips made in a district is 10,000 then we could be 95 percent confident the number of trips made will lie between  $(2 \times 510.4 = \pm 1020 \text{ trips})$  11,020 and 8080 trips per district.

The F Test is used to test the reliability of the regression equation. The regression equation could be statistically unsound if: (1) the assumed linearity of the equation is incorrect, (2) the variation is so random that in fact the partial regression coefficients could be zero and the dependent variable could be, in fact, a constant with variability. A linear regression equation with an F value that is greater than the value given in a statistic table would be considered significant.  $S.E.E./\bar{Y}$  is a ratio of the standard error of the estimate to the mean value of the dependent variable.

Work to Home Auto Trips - Only one independent variable was used to describe work-home auto trips. It is apparent that the total employment district is sufficient in determining the approximate number of work to home auto trips.  $R^2$  is equal to 0.964, the standard error of the estimate is equal to 327.3, F value is 977.3,  $F_{.05} = 4.10$

Home to Non-Work Auto Trips - Autos and population were used as the independent variables as in the case of Home to Work Auto Trips. The program results showed that the number of autos/district could describe with sufficient accuracy the number of Home to Non-Work Auto Trips.  $R^2$  (0.946),

S.E.E. (852.2), and F (647.6),  $F_{.05} = 4.10$ .

Non-Work to Home Auto Trips - The following independent variables were used as input data: Population/district, Retail Acreage/district, Retail Employment/district, Office Acreage/district, Office Employment/district, Institutional and Educational Employment/district, and Recreational Employment/district.

The program results showed that retail employment and population were the most significant variables in describing Non-Work to Home Auto Trips. It is interesting to note that Retail Employment is the most highly correlated variable (see Tables 7 and 8); it explained 78 percent of the auto trips. It could be interpreted as showing that the majority of Non-Work to Home trips are made from shopping purposes. Surprisingly, Retail Acreage was not found to be significant in predicting auto trips.  $R^2$  is 0.889, S.E.E. is 1214.0 and F is 36.1,  $F_{.05} = 3.23$ .

Non-Home to Non-Home Auto Trips - The same variables were used as for Non-Work to Home Trips. The program results showed that Retail Employment, Population and Office Employment were the most significant variables in describing the trips (see Table 7).  $R^2$ , S.E.E. and F are 0.902, 1081.0 and 3.5 respectively,  $F_{.05} = 2.84$ .

Total Auto Trips - The last trip purpose evaluated is total trips which includes all trip purposes. All the independent variables were used as input data. The program results showed that Autos, Total Employment, Retail Employment, and Office Employment were very significant. The most

highly correlated independent variable is autos/district which explained 85 percent of the trips made; then in the order of decreasing statistical significance are Retail Employment, Total Employment and Office Employment. The four independent variables explain 98 percent of the total trips made in this region with a S.E.E. of 2068 (see Tables 7,8, and 9).  $\frac{S.E.E.}{Y}$  of 0.090 and F of 11.3,  $F_{.05} = 2.61$ .

Work-Home Auto Trips comprised the greatest percentage of Internal-External Auto Trips (see Table 10). Over 890,000 auto trips/day are made from the districts analyzed in this region, of which 14.10 percent are made from Home-Work, 10.28 percent Work-Home, 28.52 percent Home-Non-Work, 26.08 percent Non-Work-Home and 21.02 percent Non-Home-Non-Home. About 79 percent of all the trips had either its origin or destination at home (see Table 11). There are about 30,000 more Home to Work trips than Work to Home trips and about 25,000 more Home to Non-Work trips than Non-Work to Home trips. This can be accounted for by noting that External-Internal Auto Trips were not included in the Penn Jersey Study.

Most of the trips made outside the study area (Internal-External Trips) were made from the districts bordering the cordon line (see Table 12). For example, 19.1 percent of the Auto Trips from district 757 (see Fig. 1) were made outside the cordon line.

#### Model Verification

The accuracy of the model was tested using 43 small urban districts of the eastern Pennsylvania section of the Penn Jersey Transportation Study

area. A comparison was made of the actual number of auto trips made in the districts of eastern Pennsylvania with the estimated auto trips from our model. Figure 3 shows that the auto trip generation equations for the six purposes can describe with reasonable accuracy the number of auto trips made in this region.

The total auto trip comparison was the most favorable. For example, 93% of the districts in eastern Pennsylvania had less than a 20% difference in actual to calculated (model) total auto trips. In the majority of the districts, the estimated value of the number of auto trips is higher than the "actual" value. Further investigation is necessary in eastern Pennsylvania to determine the number of mass transit trips made and the effect this may have had on the discrepancy of "actual" to "estimated" auto trips.

### Conclusions

1. The linear regression models developed proved to be an accurate simulator of trip productions for this study area. For all of the trip purposes, over 85 percent of the trips were explained by the variables enumerated in Table 7.

2. Economic variables were found to be quite significant in simulating Non-Work-Home, Non-Home-Non-Home and Total Auto Trips. Of all the land use variables, Retail Employment was found to be the most highly correlated with total trips and second to autos when all independent variables were compared. When transportation studies were conducted in large urban areas, retail land use characteristics were not found to be a

significant variable for simulating trip productions and attractions.

3. The five independent variables used to describe auto trips (Autos, Population, Total Employment, Retail Employment, Office Employment) can be easily obtained without resorting to an extensive home interview study. Autos, Population, and Total Employment can be obtained from the U. S. Census and secondary sources. This data can be updated for subsequent years. Retail and Office Employment can be obtained from sampling various business establishments in a district. Economic Employment Models can also be used to obtain data of Retail and Office Employment, etc.

4. From our analysis of the eastern Pennsylvania districts of the Penn Jersey Study area, it was found that the six auto trip generation equations can describe with reasonable accuracy the number of auto trips made in this region.

## BIBLIOGRAPHY

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A P P E N D I X

**FIGURE 1**  
**DATA COLLECTION DISTRICTS**

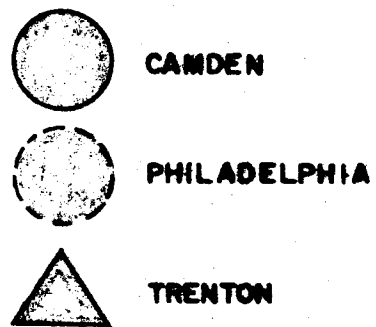
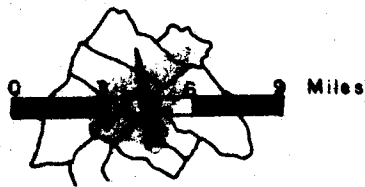
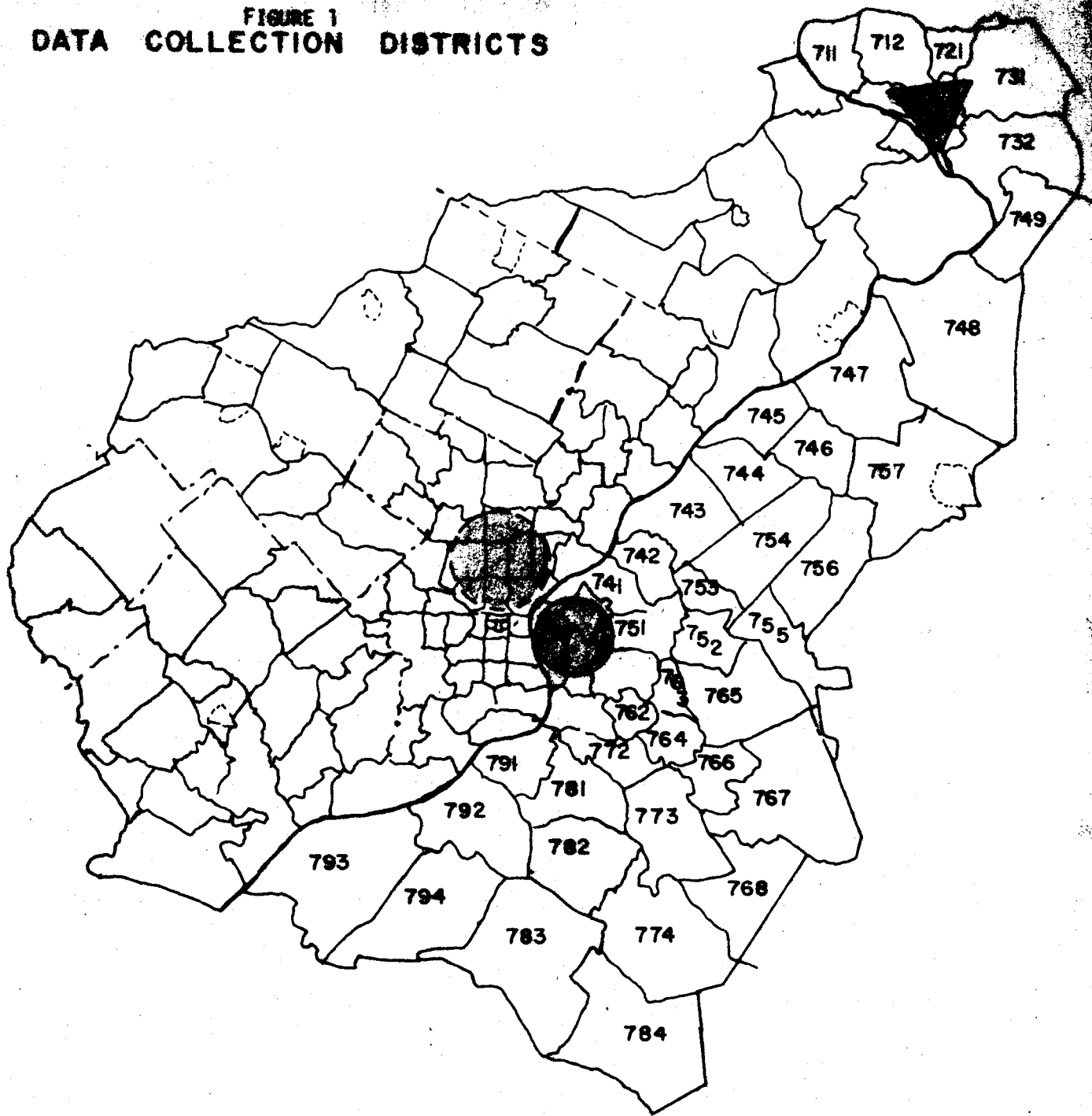
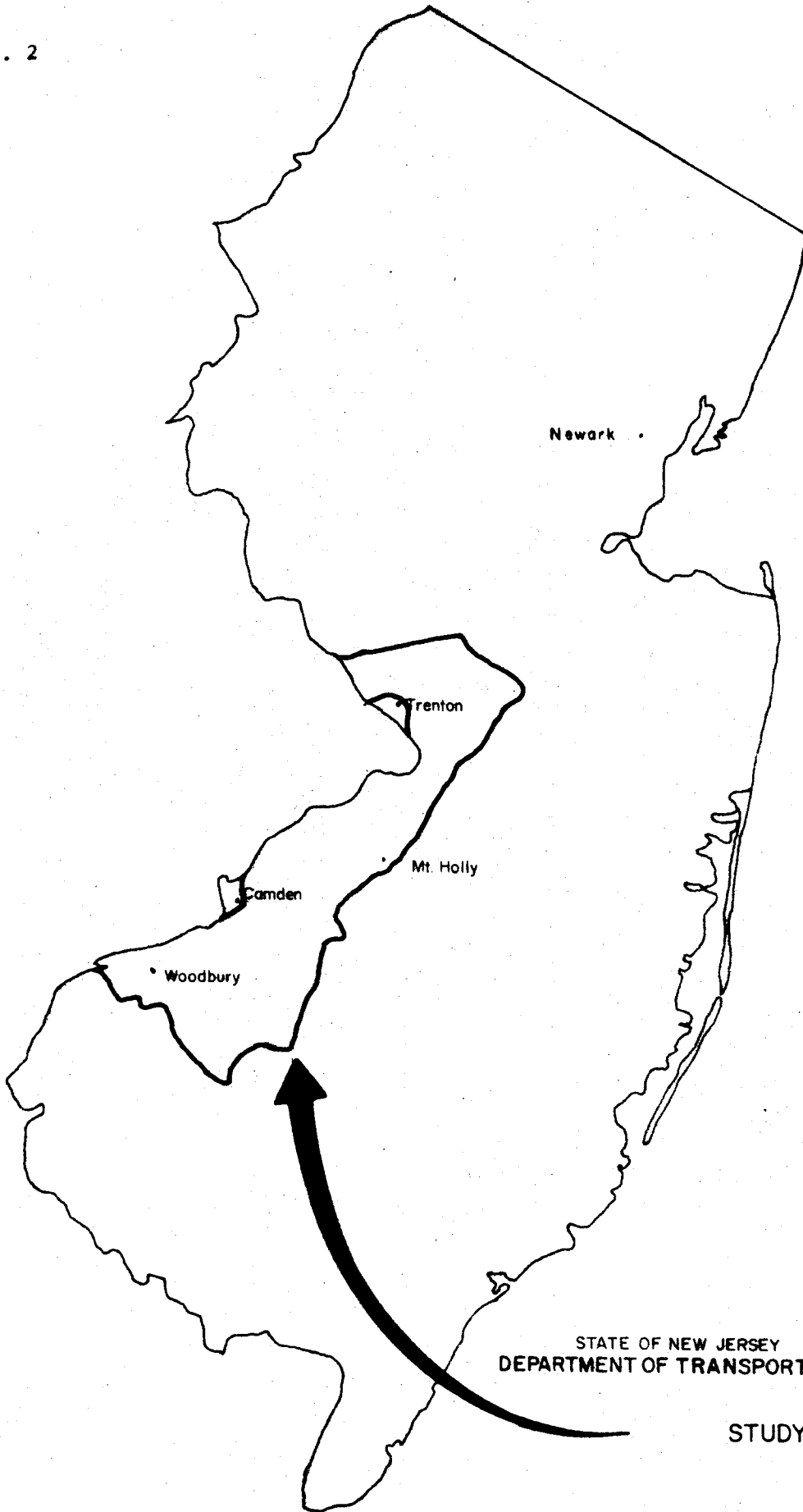
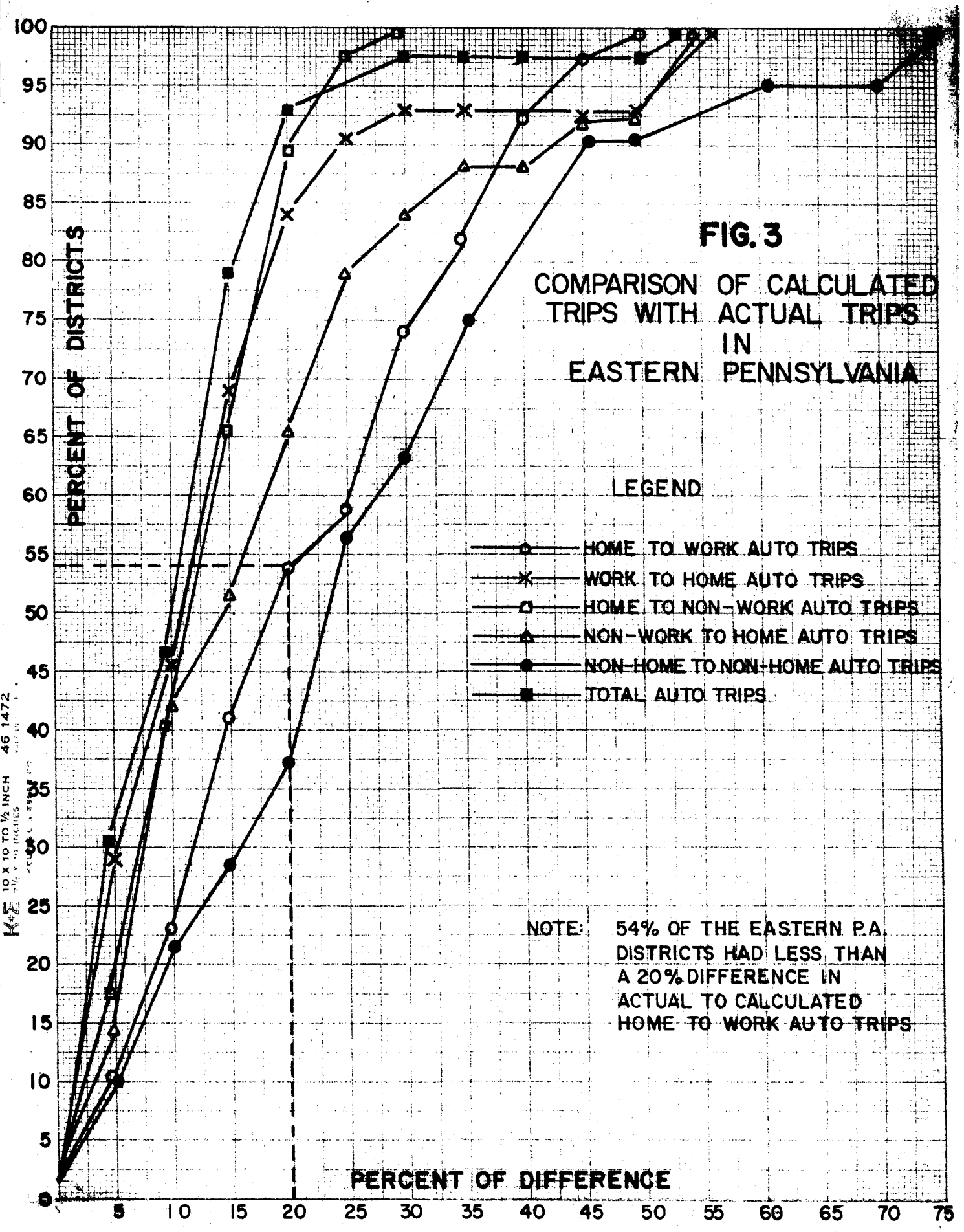


Fig. 2



STATE OF NEW JERSEY  
DEPARTMENT OF TRANSPORTATION

STUDY REGION



10 X 10 TO 1/2 INCH  
 46 1472  
 10 X 10 TO 1/2 INCH  
 46 1472

TABLE 1

PERCENTAGE OF AUTO TRIPS TO  
THE PHILADELPHIA C.B.D.

<u>District</u>	<u>Total Auto Trips</u>	<u>Auto Trips To Philadelphia</u>	<u>Percent of Auto Trips To Philadelphia</u>
711	9,549	0	0.00
712	44,762	11	0.02
721	20,087	27	0.13
731	54,085	20	0.04
732	44,755	11	0.02
741	29,672	321	1.08
742	19,297	231	1.20
743	27,116	320	1.18
744	21,406	75	0.35
745	12,736	75	0.59
746	13,405	278	2.07
747	38,218	155	0.41
748	14,504	87	0.60
749	23,664	0	0.00
751	33,634	721	2.14
752	22,461	336	1.50
753	17,656	209	1.18
754	29,633	350	1.18
755	6,805	125	1.84
756	4,330	100	2.33
757	37,643	142	0.38
762	30,942	351	1.13
763	26,628	490	1.84
764	15,494	169	1.09
765	13,944	161	1.15
766	16,411	331	2.02
767	34,276	287	0.84
768	5,547	20	0.36
772	26,977	429	1.59
773	18,904	195	1.03
774	5,984	60	1.00
781	45,640	374	0.82
782	21,344	327	1.53
783	12,823	101	0.79
784	44,741	190	0.42
791	11,415	116	1.02
792	19,298	51	0.26
793	10,744	20	0.02
794	4,705	10	0.21
Total	891,235	7,276	0.82

TABLE 2

PERCENTAGE OF MASS TRANSIT TRIPS

<u>District</u>	<u>Total Mass Transit Trips</u>	<u>Total Person Trips</u>	<u>Percent of Mass Transit Trips</u>
711	454	11,716	3.9
712	1,150	55,915	2.1
721	684	23,411	2.9
731	1,923	69,451	2.8
732	1,912	60,236	3.2
741	2,903	47,401	6.1
742	1,187	30,089	3.9
743	1,239	41,876	3.0
744	632	31,889	2.0
745	522	18,257	2.9
746	234	20,199	1.2
747	853	52,831	1.6
748	332	18,936	1.8
749	474	29,112	1.6
751	2,336	52,129	4.5
752	707	32,423	2.2
753	1,125	27,807	4.0
754	1,125	39,600	2.8
755	112	8,056	1.4
756	82	5,483	1.5
757	739	37,618	2.0
762	2,050	50,286	4.1
763	2,003	40,091	5.0
764	1,423	24,175	5.9
765	741	21,562	3.4
766	1,020	24,528	4.2
767	1,474	45,625	3.2
768	247	8,007	3.1
772	2,684	44,999	6.0
773	1,812	30,625	5.9
774	324	8,365	3.9
781	2,454	66,636	3.7
782	1,124	32,469	3.5
783	371	16,404	2.3
784	983	53,080	1.9
791	719	17,386	4.1
792	547	28,329	1.9
793	203	14,103	1.4
794	61	5,428	1.1
<b>Total</b>	<b>40,965</b>	<b>1,246,533</b>	<b>3.3</b>

TABLE 3

PERCENT OF TRUCK TRIPS

<u>District</u>	<u>Auto and Truck Trips</u>	<u>Truck Trips</u>	<u>Percent of Truck Trips</u>
711	10,243	694	6.78
712	50,143	5,381	10.73
721	21,952	1,865	8.50
731	58,943	4,858	8.24
732	51,766	7,011	13.54
741	35,824	6,152	17.17
742	22,806	3,509	15.39
743	31,695	4,579	14.45
744	23,828	2,422	10.16
745	17,117	4,381	25.59
746	17,220	3,815	22.15
747	43,999	5,781	13.14
748	17,838	3,334	18.69
749	27,364	3,700	13.52
751	40,047	6,413	16.01
752	25,000	2,539	10.16
753	22,519	4,863	21.60
754	32,302	2,669	8.26
755	7,732	927	11.99
756	5,494	1,164	21.19
757	42,955	5,312	12.37
762	35,902	4,960	13.82
763	30,912	4,284	13.86
764	17,477	1,983	11.35
765	16,248	2,304	14.18
766	19,470	3,059	15.71
767	38,567	4,291	11.13
768	6,185	638	10.32
772	31,791	4,814	15.14
773	21,762	2,858	13.13
774	7,391	1,407	19.04
781	51,944	6,304	12.14
782	22,431	1,087	4.85
783	14,920	2,097	14.05
784	50,920	6,179	12.13
791	13,885	2,470	17.79
792	21,327	2,029	9.51
793	12,607	1,863	14.78
794	5,036	331	6.57
Total	1,025,562	134,327	13.09

TABLE 4

DWELLING UNIT DENSITY AND  
RESIDENTIAL POPULATION DENSITY

<u>District</u>	<u>Dwelling Unit Density</u>	<u>Residential Population Density</u>
711	1.5	5.6
712	3.8	13.7
721	3.5	13.4
731	4.2	14.5
732	4.2	15.2
741	5.8	18.1
742	4.1	14.7
743	3.2	10.9
744	3.8	13.1
745	3.6	12.1
746	4.5	17.4
747	4.5	17.0
748	3.0	10.5
749	3.9	14.5
751	4.3	15.2
752	2.9	10.4
753	3.3	11.8
754	2.0	6.7
755	2.3	8.3
756	1.6	5.6
757	3.5	12.3
762	4.8	16.9
763	3.9	12.6
764	3.8	13.8
765	2.8	10.4
766	3.1	11.5
767	2.3	7.9
768	1.9	6.1
772	4.7	18.1
773	2.7	9.6
774	1.5	5.5
781	4.7	15.2
782	2.3	10.4
783	1.8	6.7
784	2.8	9.5
791	3.6	13.8
792	3.8	12.9
793	2.6	9.2
794	1.3	4.6
Total	3.44	11.66

TABLE 5

VARIABLES USED TO DESCRIBE TRIP GENERATION

<u>Dependent Variables</u>	<u>Description (trips per day)</u>
Home to work auto trips	Auto trips originating from home and destination work.
Home to non-work auto trips	Auto trips originating from home and destination other than work (e.g., shopping, business, recreation, etc.).
Work to home auto trips	Auto trips originating from work and destination home.
Non-work to home auto trips	Auto trips originating from other than work destination home.
Non-home to non-home auto trips	Auto trips whose origin and destination are not located at home (e.g., shopping to recreation, etc.).
Total auto trips	All auto trips made during a day.
District	A basic unit for giving geographic identification for most transportation data. The boundaries of the districts have been established to give the most reasonable correspondence possible with major units for data collection, such as Census Tracts.

TABLE 5 (Continued)

VARIABLES USED TO DESCRIBE TRIP GENERATION

<u>Independent Variables</u>	<u>Description (per district)</u>
Auto ownership	Number of autos per district.
Population	Population per district.
Total Employment	Number of jobs available per district.
Retail land use (acres)	Food stores, eating and drinking places, shopping, goods stores, auto dealers, gasoline stations, other retail sales and indoor theatres and amusements.
Retail employment	Those people employed in the above retail establishments.
Office land use (acres)	Hotels, motels, business services, office of public utilities, finance and insurance offices, professional services, and governmental services.
Office employment	Those people employed in office land use activities.
Education and institutional employment	Those people employed in the fields of education, museums, charitable, social, and religious organizations, (hospitals).
Recreational employment	Recreation areas: playgrounds, golf and country clubs.

TABLE 6a

CHARACTERISTICS OF INDEPENDENT VARIABLE

<u>Independent Variable</u>	<u>District Mean</u>	<u>Standard Deviation</u>	<u>Range</u>
Auto	4849.46	2471.55	1185-11,203
Employment	3411.90	2523.42	159-10,628
Retail Acreage	62.13	48.34	10.0-290.1
Retail Employment	689.79	494.84	23-1,601
Population	14216.36	7212.62	3202-31,699
Office Acreage	12.77	15.90	0.5-76.0
Office Employment	441.79	449.70	11-2,222
Educational-Instit. -Emp.	257.77	289.16	10-1,372
Recreational Employment	29.00	65.33	0-392

TABLE 6b  
CHARACTERISTICS OF DEPENDENT VARIABLE

<u>Dependent Variable</u>	<u>District Mean</u>	<u>Standard Deviation</u>	<u>Range</u>
Home-work	3223.21	1855.91	720-8580
Work-home	2349.44	1690.83	110-7520
Home-non-work	6515.59	3617.06	1592-16676
Non-work-home	5960.31	3547.04	874-14630
Non-home-non-home	4803.64	3306.19	501-13405
Total trips	22852.18	13006.58	4330-54085

TABLE 7

## TRIP GENERATION EQUATIONS

Trip Purpose	Equation	R <sup>2</sup>	Std. Error of Estimate	Y	*S.E.E. $\frac{Y}{Y}$	F
Home to Work Auto Trips/District	$Y = -281.659 + 0.723X_1$	0.926	510.4	3223.2	0.158	465.4
Work to Home Auto Trips/District	$Y = +105.361 + 0.658X_3$	0.964	327.3	2349.4	0.139	977.3
Home to Non-Work Auto Trips/District	$Y = -387.028 + 1.423X_1$	0.946	852.2	6515.6	0.131	647.6
Non-Work to Home Auto Trips/District	$Y = -48.898 + 4.001X_4 + 0.229X_2$	0.889	1214.0	5960.3	0.204	36.1
Non-Home to Non-Home Auto Trips/District	$Y = +205.174 + 3.814X_4 + 0.063X_2 + 2.413X_5$	0.902	1081.0	4803.6	0.225	3.5
Total Auto Trips/District	$Y = -488.859 + 2.874X_1 + 0.828X_3 + 6.870X_4 + 4.167X_5$	0.977	2067.7	22852.2	0.090	11.3

\* S.E.E. = Standard Error of Estimate

X<sub>1</sub> = Auto ownership/DistrictX<sub>4</sub> = Retail employment/DistrictX<sub>2</sub> = Population/DistrictX<sub>5</sub> = Office employment/DistrictX<sub>3</sub> = Employment/District



Table 9

SUMMARY OF LAND USE AND ECONOMIC VARIABLES BY DISTRICT

District	D E P E N D E N T V A R I A B L E						I N D E P E N D E N T V A R I A B L E										
	A U T O			T R I P S			P o p - u l a - t i o n			R e t a i l			O f f i c e			E d u c -	
	Home-Work-Home	Home-Non-Work-Home	Non-Home-Non-Home	Total Auto Trips	Autos	Population	Employment	Land Use (Acres)	Land Use (Acres)	Land Use (Acres)	Land Use (Acres)	Land Use (Acres)	Office Emp.	Office Emp.	Inst. Emp.	Re-crea. Emp.	
711	1482	2090	2207	1676	9549	1493	3467	3995	290.1	417	6.1	174	10	82			
712	6298	5469	10544	10117	44762	8128	21948	7892	75.5	1330	61.0	2222	1372	32			
721	2550	2367	5915	4385	20087	3167	8641	3057	46.1	521	17.1	676	27	45			
731	8531	7520	12165	9193	54085	11160	29994	10628	89.5	1043	28.6	811	208	9			
732	8580	4151	10398	6870	44755	11203	31699	5505	79.2	1507	5.7	424	621	64			
741	3494	3222	8373	7701	29672	6073	17492	4918	32.4	888	14.6	827	80	34			
742	2165	2740	4611	5244	19297	3453	9992	4324	51.0	884	3.9	244	230	2			
743	3827	2858	6633	5940	27116	6815	19191	4149	44.9	745	7.0	371	289	51			
744	3153	2482	5528	4427	21406	4524	13304	4212	43.3	651	6.4	311	133	5			
745	2000	1473	2424	2905	12736	3935	10010	2241	20.6	254	4.3	164	98	1			
746	2227	1312	3144	3121	13405	3231	9536	1323	52.8	360	15.6	209	52	1			
747	4469	5108	8890	12049	38218	5892	19383	8135	89.5	1465	38.2	1129	441	18			
748	2103	1977	3056	2885	14504	3344	9966	4556	48.2	610	5.2	171	201	16			
749	2977	2713	6677	5329	23664	3768	11486	3052	74.9	940	6.9	357	200	27			
751	3874	3873	8434	9300	33634	6210	17287	5553	105.7	1601	19.7	761	217	19			
752	2549	1987	6310	5781	22461	4911	12715	2364	42.3	894	11.8	310	691	1			
753	2896	1200	5263	3116	17656	4392	12913	2230	45.5	511	5.6	245	111	30			
754	3139	5149	6378	8445	29633	4844	12293	7466	83.8	949	76.0	759	180	8			
755	1228	592	2333	870	6805	1558	4734	463	33.7	105	2.4	99	42	8			
756	860	315	874	689	4330	1240	3620	309	30.9	178	0.8	11	46	1			
757	5438	4565	9366	7748	37643	6722	19586	5952	92.6	1409	26.4	1206	718	41			
762	3875	1164	9172	6968	30942	7429	21579	1726	39.5	500	8.3	595	216	1			
763	2365	1883	8777	6406	26628	5105	13456	2779	27.5	1120	11.6	778	204	1			
764	2600	1382	3577	2620	15494	4279	13732	2046	16.2	276	1.9	148	119	2			
765	2382	645	3270	2051	13944	4580	12960	707	34.7	130	2.2	110	10	4			

Table 9 (cont.)

Dis- trict	D E P E N D E N T V A R I A B L E					I N D E P E N D E N T V A R I A B L E					Re- crea. Emp.				
	Home Work	Home- Work	A U T O		Total Auto Trips	Autos	Pop- ula- tion	Employ- ment	R e t a i l			Re- tail Emp.	Of- fice Use Emp.	Educ- Inst. Emp.	
			Home- Non-Work	Home- Non-Work					Home- Non-Work	Home- Non-Work					Use (Acrs)
766	3081	731	4313	4710	3576	16411	4420	14416	981	106.3	337	8.3	191	193	1
767	4900	2487	10686	10600	5603	34276	6858	21414	3454	144.0	940	11.4	346	365	6
768	991	110	2502	1443	501	5547	1834	5275	159	10.0	23	0.5	40	34	2
772	4636	2050	8631	7504	4156	26977	6977	23785	2530	65.1	839	4.6	477	66	2
773	3350	1443	5988	5611	2512	18904	4652	14595	1910	59.4	328	9.8	198	710	1
774	1093	502	2411	1380	598	5984	1896	5278	585	23.8	167	1.5	51	10	1
781	4184	3486	9935	14630	13405	45640	6924	21224	5698	81.6	1867	14.7	1283	730	392
782	4294	987	7916	4500	3647	21344	6700	21728	1241	35.6	373	8.1	134	425	1
783	1956	852	4497	3275	2243	12823	3110	9231	910	57.7	194	4.1	146	20	118
784	5741	4409	13167	13013	8411	44741	8233	24981	6432	90.3	1408	31.8	768	621	43
791	1967	807	4713	2610	1318	11415	3140	10347	1116	21.0	162	1.0	87	110	1
792	2379	1944	5801	5462	3712	19298	3914	12494	3173	37.3	656	5.4	223	137	58
793	1351	3198	2593	2337	1265	10744	1830	5484	5009	89.7	207	6.1	162	69	1
794	720	385	1983	1058	559	4705	1185	3202	284	10.9	113	3.5	12	47	1

TABLE 10

SUMMARY OF INTERNAL-INTERNAL AND INTERNAL-EXTERNAL  
TRIPS BY PURPOSE

	<u>Internal-Internal Trips</u>	<u>Internal-External Trips</u>	<u>Total</u>
Home-Work %	116,025 92%	9,680 8%	125,705
Work-Home %	81,483 89%	10,145 11%	91,628
Home-Non-Work %	237,318 93%	16,790 7%	254,108
Non-Work-Home %	218,792 94%	13,660 6%	232,452
Non-Home-Non-Home %	183,238 98%	4,104 2%	187,342
Total Trips %	836,856 94%	54,379 6%	891,235

TABLE 11

SUMMARY OF ALL TRIPS

<u>H-W Auto Trips</u>	<u>% H-W Auto Trips</u>	<u>W-H Auto Trips</u>	<u>% W-H Auto Trips</u>	<u>H-W Auto Trips</u>	<u>%H-NW Auto Trips</u>	<u>NW-H Auto Trips</u>	<u>% NW-NW Auto Trips</u>	<u>NH-NH Auto Trips</u>	<u>%NH-NH Auto Trips</u>
125,705	14.10	91,628	10.28	254,108	28.52	232,452	26.08	187,342	21.02

TOTAL

891,235