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# Statewide Transportation Analysis & Research

MICHIGAN'S STATEWIDE  
TRANSPORTATION MODELING SYSTEM

AMTRAK MARKET AREA ANALYSIS  
SYSTEM APPLICATION

STATEWIDE TRANSPORTATION  
PLANNING PROCEDURES  
REPORT #21



MICHIGAN DEPARTMENT OF TRANSPORTATION

# MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

BUREAU OF TRANSPORTATION PLANNING

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TRANSPORTATION MODELING SYSTEM

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JOHN P. WOODFORD, DIRECTOR

October 27, 1976

Mr. Sam F. Cryderman, Deputy Director  
Bureau of Transportation Planning  
Michigan Department of State Highways  
and Transportation  
P.O. Box 30050  
Lansing, Michigan 48909

Dear Mr. Cryderman:

In the past few years, the AMTRAK operation in Michigan has experienced growth in utilization of service. With this growth, the potential for additional AMTRAK service has been recognized. Under the Rail Passenger Act, the federal government requires that an extensive market area analysis be completed before initiation of any new AMTRAK service. Compliance with this regulation would require massive data collection, manpower, and money.

This report deals with the actual application of Michigan's Statewide Transportation Modeling System as related to the analysis of two proposed AMTRAK corridors in the state. The project was selected in order to test the system's capability in analyzing the various socio-economic characteristics, trip generators, and locations required to produce an accurate market area study. In using the Statewide Transportation Modeling System, the major problems involved in a market area analysis can be resolved through the application of an existing comprehensive data base and a process that automatically analyzes the relationship between people and elements in society such as rail stations. The system has also shown potential for use in market area studies involving all other forms of transportation such as air, bus, etc.

This report was prepared by Richard E. Esch of the Statewide Transportation Planning Procedures Section.

Sincerely,

R. J. Lilly, Administrator  
Highway Planning Division



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- Report #4 - Proximity of Automobile Injury Accidents to Hospitals
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- Volume IV - AASHTO Report
- Volume IV-A - Michigan Statewide Modeling System - Synopsis
- Volume V - Part A - Reformation - Trip Data Bank Preparation
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- Volume VI-A - Environmental Sensitivity Computer Mapping
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- Volume VII-A - Capacity Adequacy Forecasting Model
- Volume VII-B - Modeling Major Facility Opening Impact on DHV
- Volume VIII - Public and Private Facility File
- Volume VIII-A - Conversion of Industrial Expansion File
- Volume IX - Socio-Economic Data File
- Volume IX-A - Mapping Socio-Economic Data with SYMAP
- Volume IX-B - Conversion of the Agricultural Census File
- Volume IX-C - Tax Rate and Assessed Valuation Information
- Volume IX-D - School District Data File
- Volume X-A - Travel Impact Analysis Procedures
- Volume X-A-1 - Automated Desireline Plotting
- Volume X-B - Social Impact Analysis Procedures
- Volume X-C - Economic Impact Analysis Procedures
- Volume XI - Computer Run Times
- Volume XIII - Michigan Goes Multi-Modal
- Volume XIII-A - Multi-Modal Mobility and Accessibility Analysis
- Volume XIII-B - 1972 Statewide Rail Network - Summary Tabulations
- Volume XIV-A - Commodity Flow Matrix - Ann Arbor Railroad
- Volume XIV-B - Commodity Flow Matrix - Penn Central Railroad

Volume XIV-C - Commodity Flow Matrix - Michigan Railroads 1% Sample  
Volume XV-A - Railroad Financial Impact Analysis  
Volume XV-B - Railroad Community Impact Analysis  
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Volume XVIII - Outline Analysis Program

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BY

RICHARD E. ESCH

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## PREFACE

Interest in passenger rail service in the United States has been on a rapid decline over the past few decades. AMTRAK was created with the hope that passenger rail service could become a more systematically run railroad operation.

Michigan has experienced some growth in rail passenger use as the following figures indicate:

1973 - 157,220

1974 - 265,015

1975 - 525,844

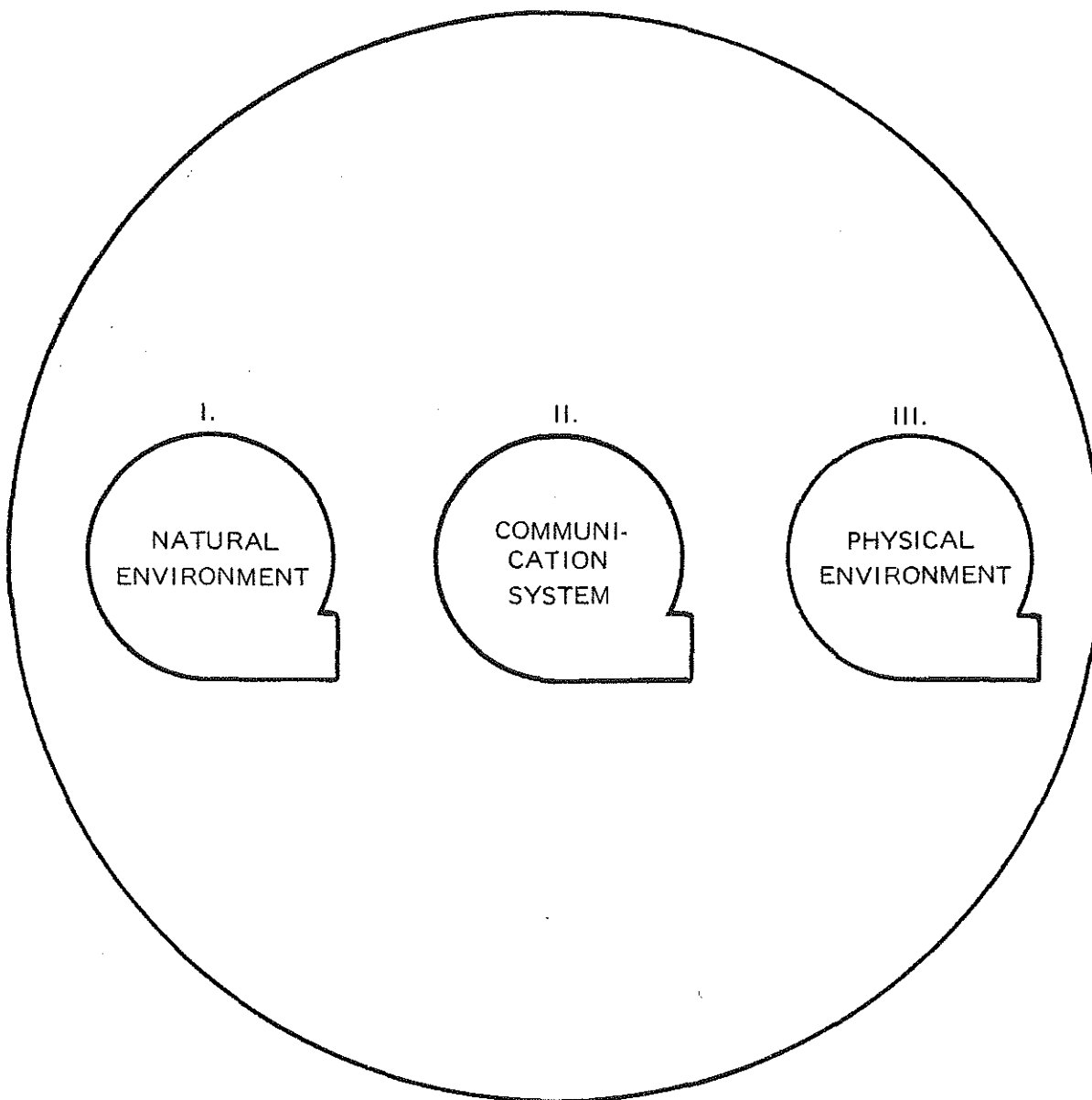
1976 - 424,763 (Jan. thru Aug.)

Other states have also had some success which often creates interest in the addition of other rail service. If any state desires to add additional AMTRAK service, they must complete a market area study for the proposed corridor as stated in Section 403(b) of the Rail Passenger Act. This market area study identifies eight or nine analytical processes which require reasonably extensive manpower if the accessibility of selected socio-economic groups to proposed rail stations is considered.

During the past four years, Michigan has developed a Statewide Transportation Modeling System which has been used to analyze proposed regional transportation plans. This system includes an extensive data base as indicated in Figure 1. Most of the information, such as the socio-economic characteristics of the population, the proposed location of rail stations, and the existing transportation network, are immediately available for analysis. Finally, the system will also allow any user to rapidly analyze the



# SOCIETY



I. STATEWIDE  
SOCIO-ECONOMIC  
DATA FILE

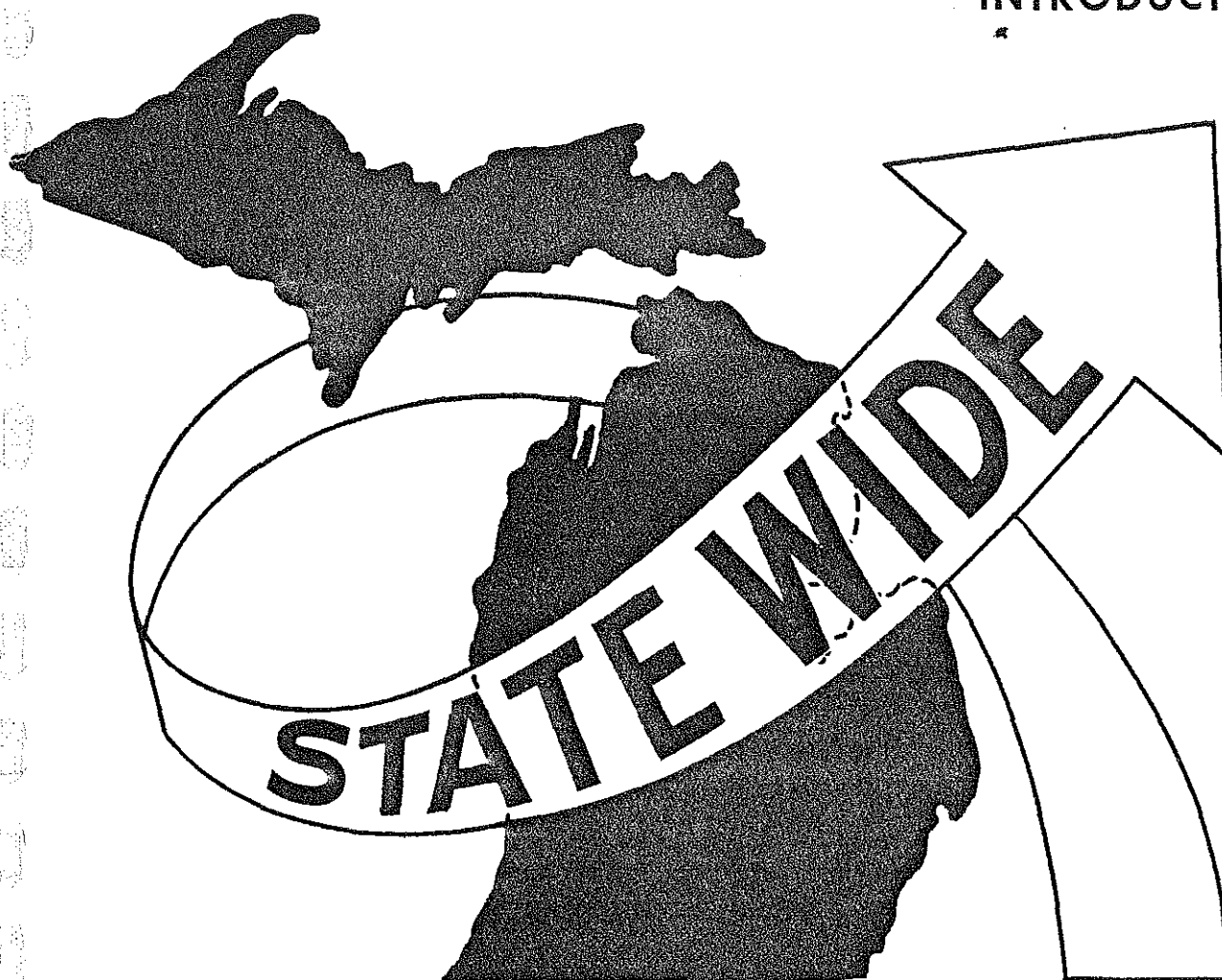
II. STATEWIDE  
TRANSPORTATION  
NETWORK

III. STATEWIDE  
PUBLIC & PRIVATE  
FACILITY FILE

accessibility of any proposed rail station to various socio-economic statistics. It is for the above reasons that those states which have developed a Statewide Transportation Modeling System often receives multiple benefits from system development.

This report deals with the actual application of Michigan's Statewide Transportation Modeling System as related to the analysis of two proposed AMTRAK corridors in the state. This analysis will also serve to demonstrate the multiple benefits available as the result of the development of a system such as this.

INTRODUCTION

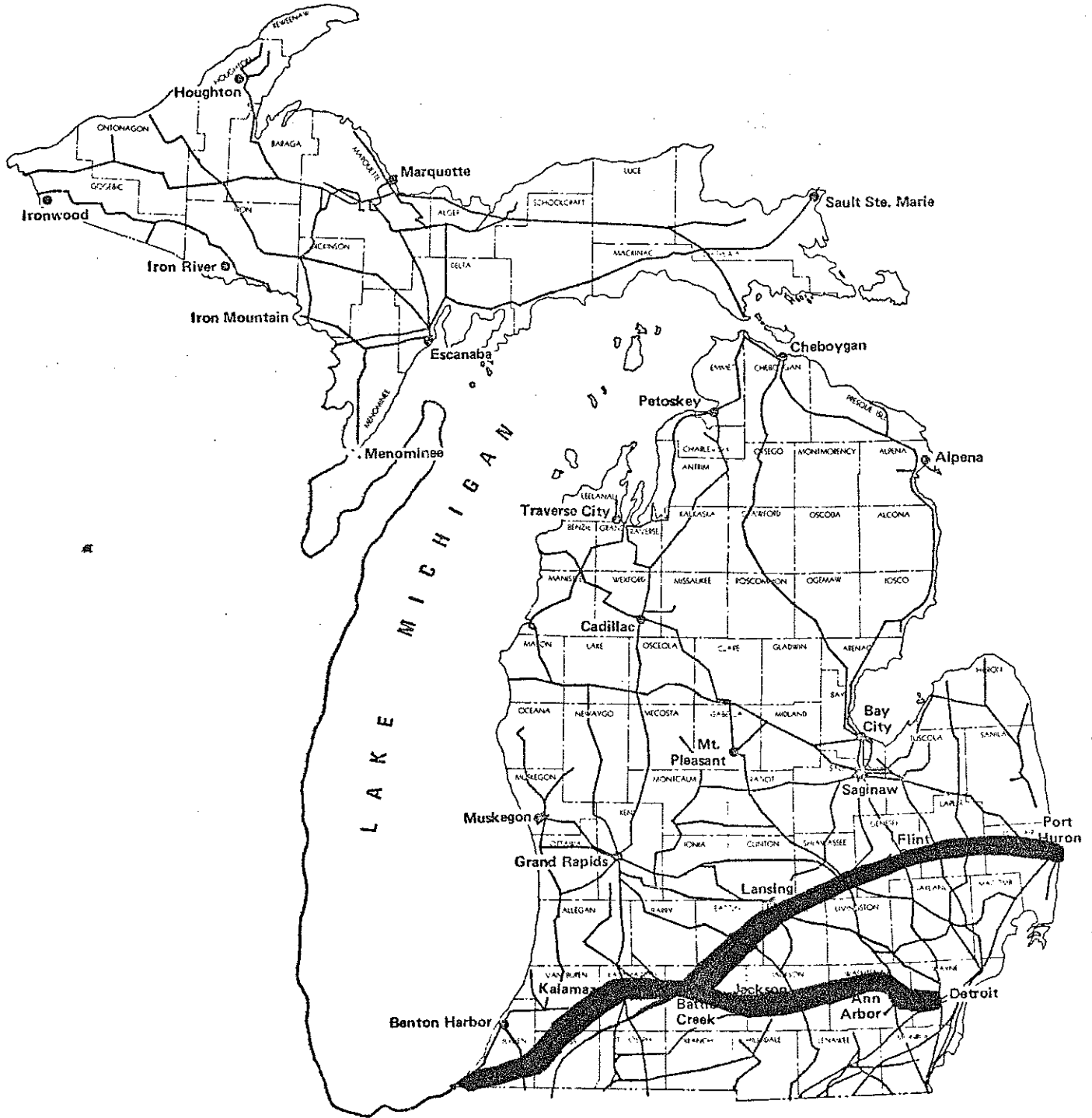


## INTRODUCTION

Michigan has approximately 6,500 miles of rail line. Figure 2 is a map showing the location of these rail lines. Those identified with the dashed line are existing AMTRAK lines. During the last several years, Michigan has experienced rapid growth in passenger use on these lines. This report will not deal with how, why, or the cost associated with this growth. It will deal more with a secondary aspect in that this growth has caused additional interest in adding new AMTRAK service in the State of Michigan. Federal requirements in the Rail Passenger Act state that any agency wishing to add new AMTRAK service must complete extensive market area analysis. The federal act states that this study should include the following type of analysis at a minimum:

1. Detailed population figures for the cities to be served to include the population of the surrounding area which might reasonably be expected to use the train;
2. Determination as to whether these populations are growing, declining, or remaining stagnant;
3. Analysis of the economic/demographic groupings within the areas considered to include adequate measurement of the need, ability, and desire of various groups to travel between points on the proposed route and other points on the AMTRAK system. Analysis of disposable income should be included;
4. Detailed figures reflecting existing public transportation -- bus and air -- from each of the points served to other points on the route or on the AMTRAK system, to include a comparison of existing frequencies, schedules, and costs to the traveler;
6. Analysis of "special" markets such as colleges, military installations, and scenic/tourist attractions of more than local interest;
7. Based on the above analyses, an estimate of the ridership level by day-of-week, month, and year, taking into account seasonality factors and such variables as holidays, recreational seasons, school vacations, etc.;

FIGURE 2  
MICHIGAN'S RAILROAD NETWORK



8. An estimate of revenue from tickets, dining, and other sources such as main and express;
9. A schedule pattern, based on actual operating conditions, should be established which will provide the greatest chance of maximizing revenue;
10. Any historical data available, such as past ridership, statistics, and schedules;
11. Any additional relevant information such as track conditions, station conditions, etc.

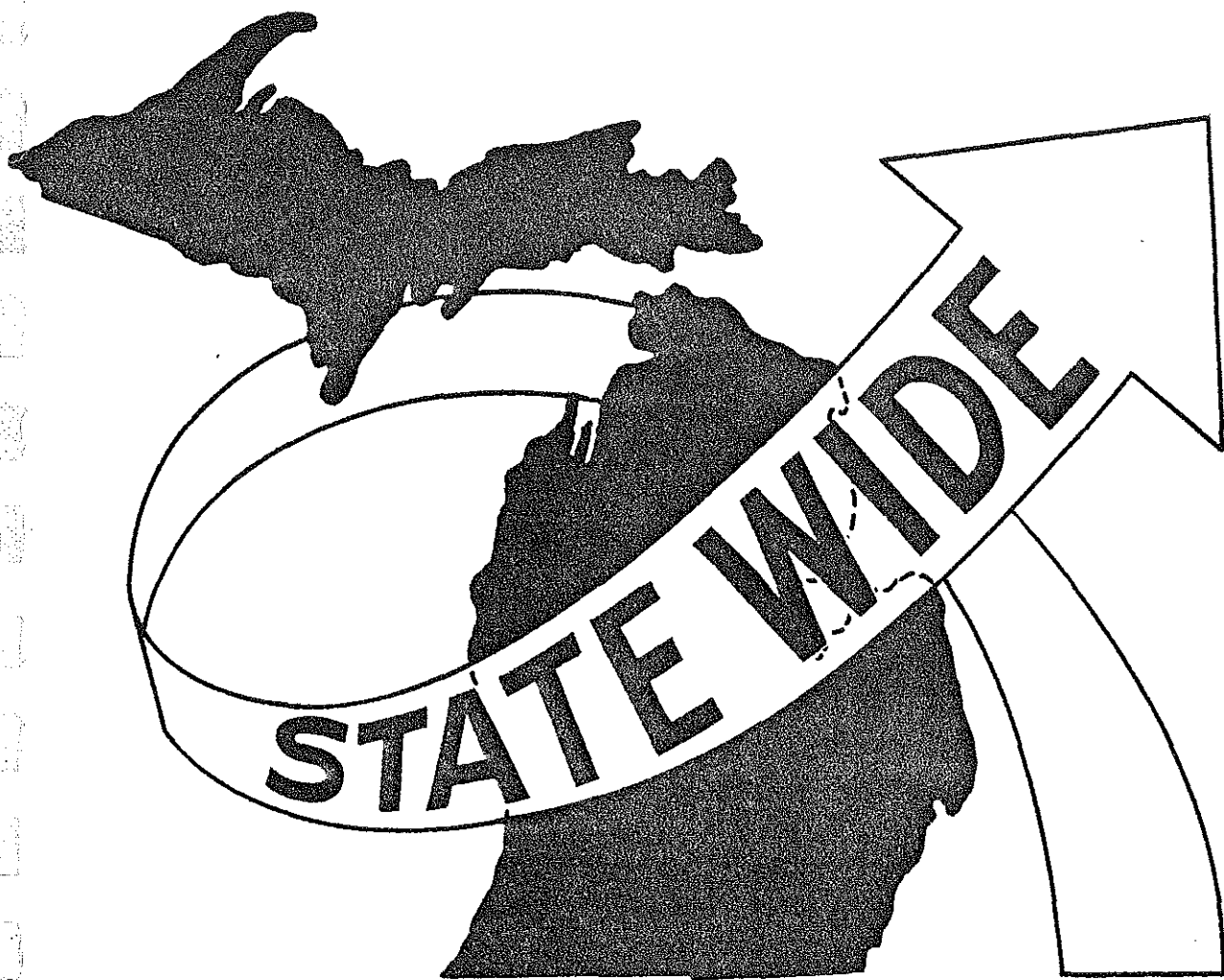
After reviewing the data and analytical requirements identified in the above eleven categories, the following information and analytical processes appear to be needed if any state is to supply the information necessary to initiate new AMTRAK service:

1. Extensive socio-economic characteristics of the population in and near each of the proposed rail stations;
2. Extensive information of the type of special facilities or traffic generators or attractors in the corridor;
3. Ability to identify the accessibility of these people and facilities to proposed passenger station using the travel times on existing networks for various modes.

These data needs in themselves would be a major undertaking for any state organization and the market area analysis would be extremely costly; therefore, this report will deal with an automated system of market area analysis that has its origin in Michigan's Statewide Transportation Modeling System. The next section will identify what portions of the statewide model have multiple applications when used to complete market area analysis for AMTRAK studies.

The final section of this document deals with the actual application of the system on two proposed rail passenger corridors in Michigan.

SYSTEM ANALYSIS PROCESS



## SYSTEM DEVELOPMENT

In the introduction, three basic needs were identified as being necessary to complete a systematic study of any proposed AMTRAK corridor. They were:

1. Socio-Economic Data
2. Special Trip Generators
3. Travel Time Data

These three elements in themselves are exactly the type of data and analytical processes readily available where any state agency has taken the time to develop a Statewide Transportation Modeling System.

In Figure 3, a diagram of Michigan's modeling system appears. All of the socio-economic data required for most AMTRAK market area analyses is available in the socio-economic file identified by the first arrow in Figure 3. This file contains all the information from the 1970 Census of Population and the 1970 Census of Housing. Additional data is also available from the following censuses:

1. Census of Wholesale Trade - 1972
2. Census of Retail Trade - 1972
3. Census of Selected Service Industries - 1972
4. Census of Manufacturers - 1972

This type of information will allow the Department to analyze up to 1,500 pieces of socio-economic data related to market area characteristics. The age, income, education, and employment information required for AMTRAK analysis will come from this file.



# MICHIGAN'S STATEWIDE TRANSPORTATION MODELING SYSTEM

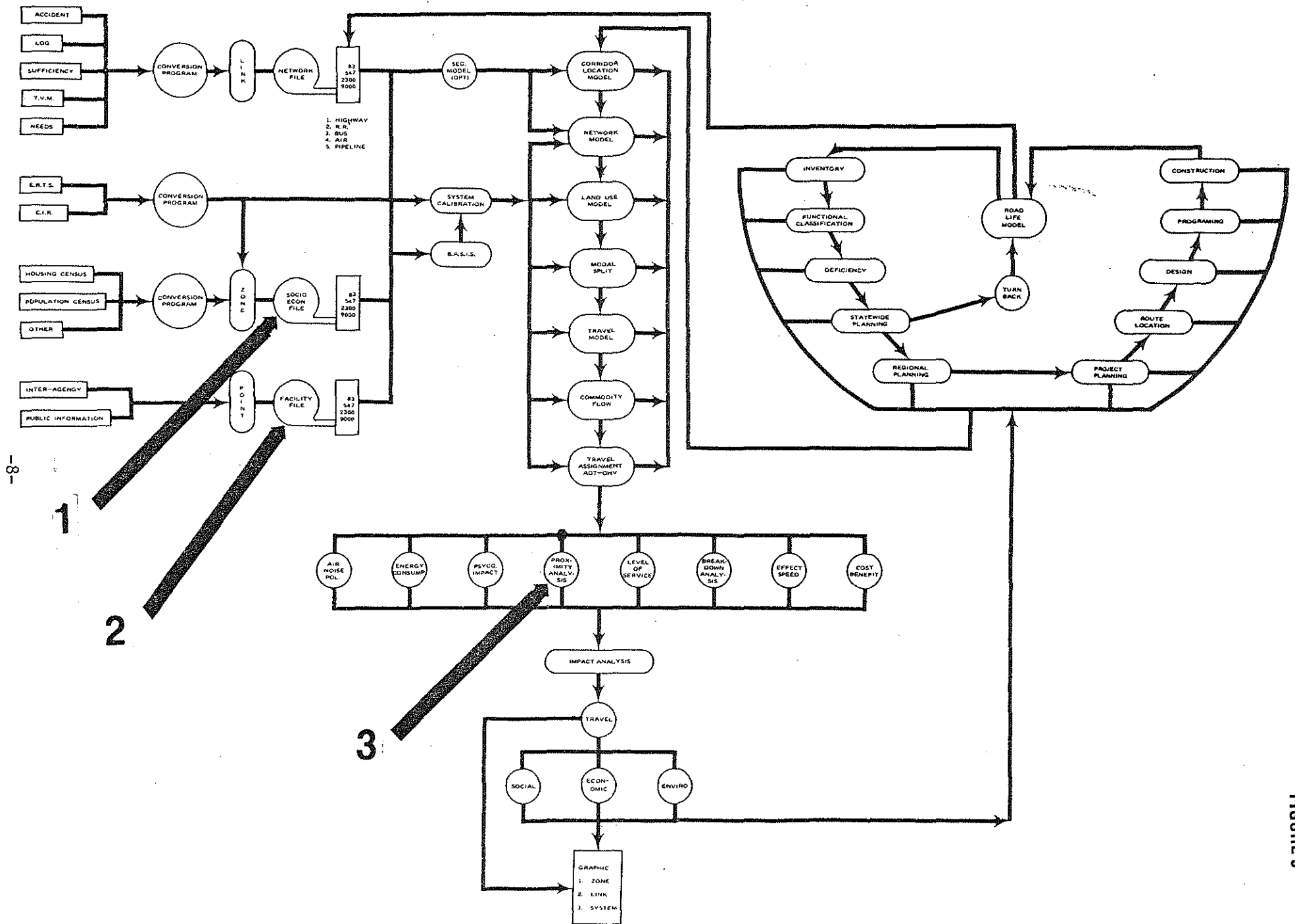


FIGURE 3

A list of the statewide facility file presently used as input to the regional transportation impact analytical process appears in Figure 4 and is identified by the second arrow in Figure 3. This list includes most types of facilities that are affected directly as the result of transportation network changes and this same information can be used to complete analysis related to the special generators required as part of an AMTRAK study.

All of the socio-economic and facility file data is available at the 547 zone level appearing in Figure 5. This travel analysis zone system is the level of detail used to do statewide and regional transportation planning in Michigan.

Michigan's statewide modeling process is also used to evaluate the selected social impacts identified in Figure 6. An important part of these measurements is the accessibility analysis performed using a computer program called proximity analysis identified by the third arrow in Figure 3. This program is a portion of the statewide modeling system that actually completes the market area study by analyzing the relationship between proposed rail stations and various socio-economic characteristics and special generators.

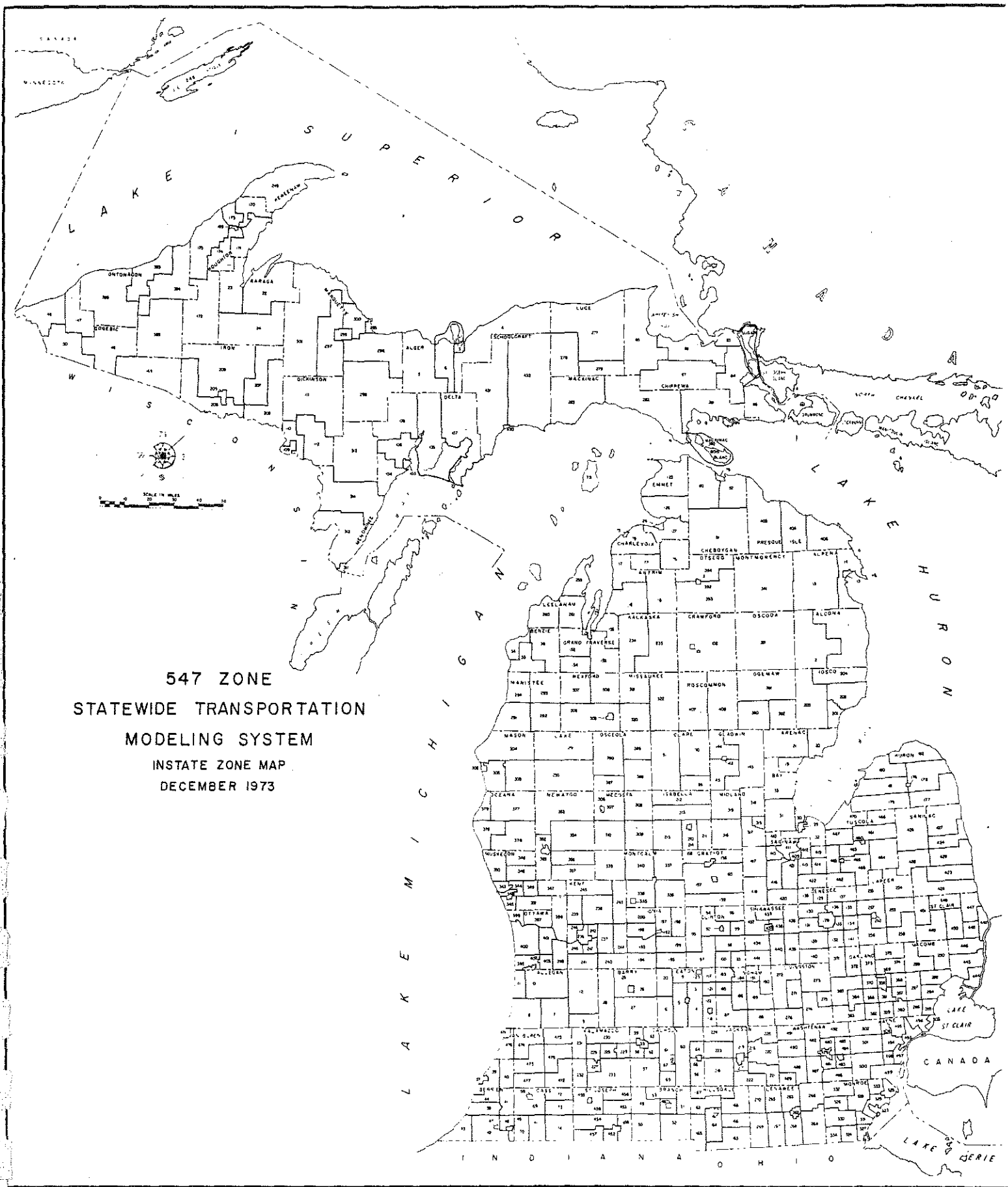
The driving times between each of the 547 statewide zones used in proximity analysis come from skimmed trees which are central to the logic behind most travel modeling processes. A brief explanation of the skim tree process follows.

Once a highway network has been created, a computer program named TPTREE chooses the "path of least resistance" from each zone to every other zone. These trees are chosen so as to minimize a user-specified variable of separation (total travel time, total travel distance, total travel cost) between zones. If the travel analysis required building trees only for use with this,

# STATEWIDE FACILITY FILE

AIRPORTS  
AMBULANCE SERVICE  
BANKS  
BUS TERMINALS  
CAMP GROUNDS, PUBLIC AND PRIVATE  
CERTIFIED INDUSTRIAL PARKS  
CITIES OVER 5,000 POPULATION AND 30,000 POPULATION  
CIVIL DEFENSE TERMINALS  
COLLEGES, PUBLIC COMMUNITY  
COLLEGES AND UNIVERSITIES, PUBLIC AND PRIVATE  
COMMERCIAL CENTERS, MAJOR  
CONVENTION CENTERS  
DENTISTS  
ELECTRICAL GENERATING PLANTS  
GAME AREAS  
GOLF COURSES  
GRAIN ELEVATORS  
HEALTH SCREENING CLINICS, EPSDT  
HIGH SCHOOLS  
HISTORIC SITES  
HOMES FOR THE AGED  
HORSEBACK ENTERPRISES  
HOSPITALS  
ICE ARENAS  
MANUFACTURERS  
MARINAS  
MENTAL HEALTH CENTERS  
NEWSPAPERS, DAILY  
NEWSPAPERS, WEEKLY AND BIWEEKLY  
NURSING HOMES  
OIL PROCESSING AND STORAGE PLANTS  
PHARMACIES  
PHYSICIANS  
POLICE DEPT'S, STATE AND LOCAL  
PORTS  
RAIL TERMINALS  
SECRETARY OF THE STATE OFFICES  
SEWAGE TREATMENT FACILITIES  
SKI RESORTS  
SNOWMOBILE TRAILS  
SOCIAL SERVICES OFFICES  
STATE PARKS  
STATE POLICE POSTS  
TOURIST ATTRACTIONS  
TRAILER ON FLAT CAR TERMINALS  
TRANSIT SYSTEMS, BUS  
TREASURY OFFICES  
TRUCK TERMINALS  
UNEMPLOYMENT OFFICES  
WEATHER SERVICE STATIONS-NATIONAL  
WHOLESALE TRADE CENTERS

FIGURE 5



547 ZONE  
STATEWIDE TRANSPORTATION  
MODELING SYSTEM  
INSTATE ZONE MAP  
DECEMBER 1973

# SOCIAL IMPACT MEASUREMENTS

PEOPLE ACCESSIBLE TO HEALTH CARE \*

PEOPLE ACCESSIBLE TO RECREATIONAL ACTIVITIES \*

PEOPLE ACCESSIBLE TO EDUCATIONAL OPPORTUNITIES \*

PEOPLE ACCESSIBLE TO PUBLIC SERVICES \*

AIR POLLUTION

NOISE POLLUTION

SAFETY

SOCIAL DISRUPTION

PSYCHOLOGICAL IMPACT

DRIVING TIME CONSUMPTION

\* AVAILABLE BY AGE, INCOME, RACE

it is possible to build selected trees only from the study analysis zones (proposed rail stations) to all other zones in the system. Next, a program named TPSKIM calculates the actual minimum of this separation variable for each zone to zone pair, in effect "skimming" the tree. For an example of a selected tree plot from Zone 28 to all other zones, see Figure 7. The numbers along each link denote the average time in hundredths of a minute necessary to go from the centroid of Zone 28 to the end of the link, thus the times are cumulative for each zone-to-zone path. The speeds used to build the tree are average speeds derived from speed studies. For example if a rail station were proposed for Zone 28 in Figure 7, the people living in Zone 9 are 41 minutes away; in Zone 10, 59 minutes; etc.

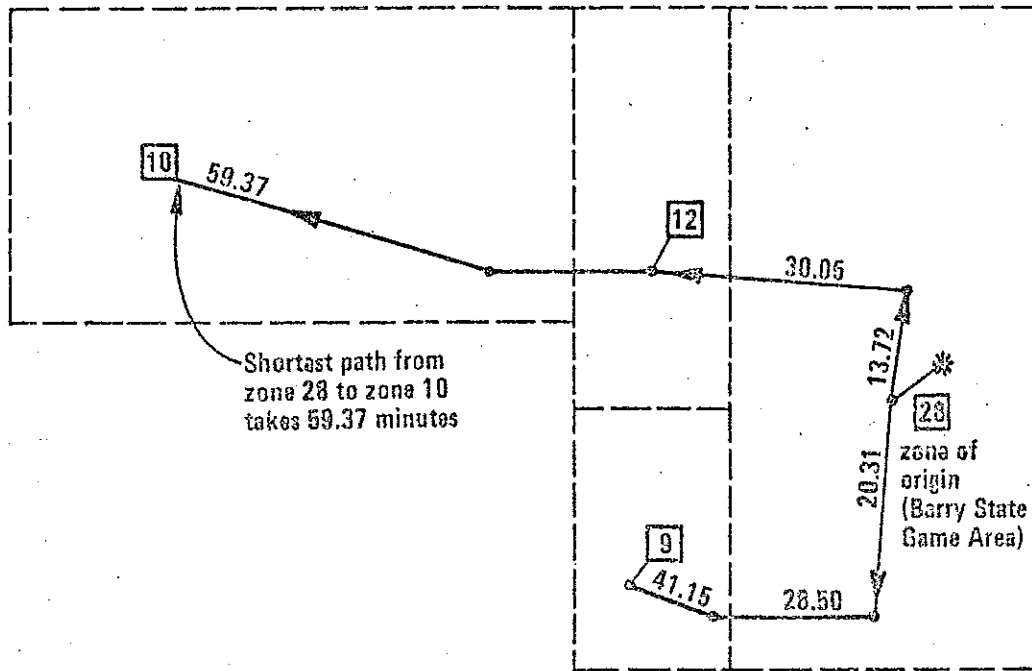
The user may request any of three types of summaries each with a different point of view, but only two program options were employed for the AMTRAK study. The first gives the analysis zone's, or rail station's, relationship to the zones or population around it. The proximity analysis process output in Figure 8 summarizes for each analysis zone and for each time band:

1. The percent of total socio-economic statistic occurring in the band;
2. A list of zones in the band;
3. The number of servers (rail stations) within the band;
4. The number of people per server in the band (total population of the band divided by the number of servers in the band).

The second option treats each zone in the system in turn and summarizes the impact of the analysis zones on it. This type of analysis indicates how accessible all people or zones are to rail stations. Server proximity indicates for each zone in the system and for each time band:

FIGURE 7

Portion of skimmed tree plot using zone 28 (\*) as zone of origin.  
Numbers on links are cumulative driving time from (\*) to end  
of link



TREE PLOT

STATEWIDE PROXIMITY ANALYSIS

PROXIMITY OF POPULATION

DATA FOR ZONE 151  
 POPULATION = 20690  
 NUMBER OF RAIL TERMS = 10  
 TOTAL CAPACITY = 0

POPULATION	0- 15	0- 15
PERCENT OF TOTAL POPULATION	20690	20690
RAIL TERMS	0.233	0.233
POPULATION /RAIL TERMS	10	10
	2069.00	2069.00

ZONE	TIME AWAY
151	0

POPULATION	15- 30	0- 30
PERCENT OF TOTAL POPULATION	22912	43602
RAIL TERMS	0.258	0.491
POPULATION /RAIL TERMS	120	130
	190.00	335.40

ZONE	TIME AWAY
152	19
153	26
154	30
155	17
261	18

POPULATION	30- 45	0- 45
PERCENT OF TOTAL POPULATION	23606	67408
RAIL TERMS	0.268	0.760
POPULATION /RAIL TERMS	180	310
	132.00	217.45

ZONE	TIME AWAY
18	36
35	45
36	38
234	40
259	44
260	33
507	44

OPTION 1



1. The number of analysis zones in the band;
2. Number of service units (rail stations) in the band;
3. Total service capacity in the band, e.g., number of beds per hospital, total capacity is recorded as zero in travel mode accessibility.

A sample of the output for the second option appears in Figure 9. Information similar to the data in Figures 8 and 9 is the type of analysis required to do market area studies for extended AMTRAK service. The next section of this report will deal with the actual selection of socio-economic and facility file data requirements for Michigan's AMTRAK study.

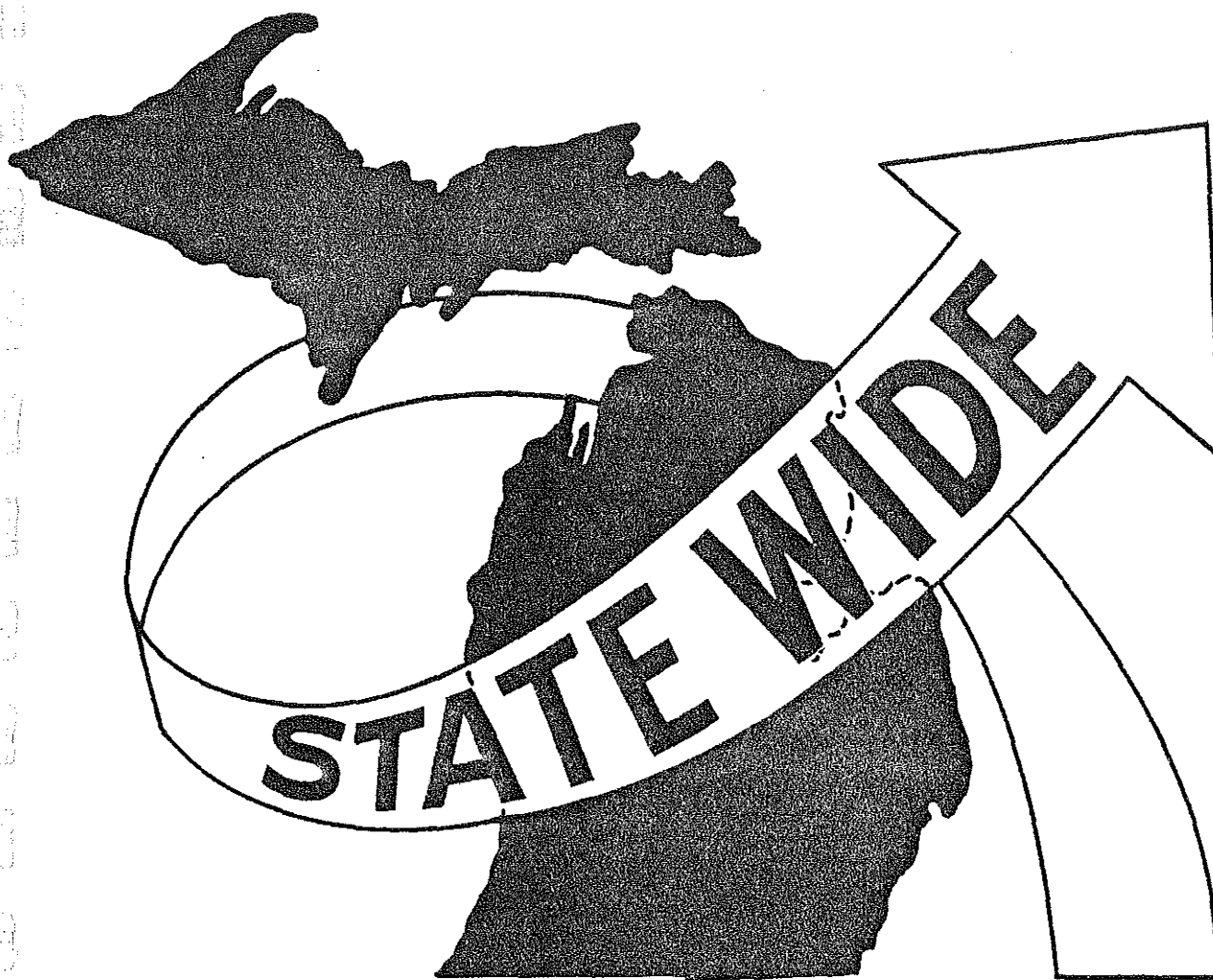
STATEWIDE PROXIMITY ANALYSIS

SERVER PROXIMITY

ZONE	SERVICE	ZONES	RAIL TERMS	CAPACITY	POPULATION	/RAIL TERMS	POPULATION	/CAPACITY
1 0-	15MIN.	1	40	0	148.20		0.00	
1 0-	30MIN.	1	40	0	148.20		0.00	
1 0-	45MIN.	4	90	0	65.87		0.00	
1 0-	60MIN.	5	110	0	53.89		0.00	
2 0-	15MIN.	0	0	0	0.00		0.00	
2 0-	30MIN.	0	0	0	0.00		0.00	
2 0-	45MIN.	1	40	0	29.63		0.00	
2 0-	60MIN.	3	100	0	11.85		0.00	
3 0-	15MIN.	2	80	0	45.96		0.00	
3 0-	30MIN.	2	80	0	45.96		0.00	
3 0-	45MIN.	3	160	0	20.43		0.00	
3 0-	60MIN.	3	180	0	20.43		0.00	
4 0-	15MIN.	1	40	0	50.95		0.00	
4 0-	30MIN.	1	40	0	50.95		0.00	
4 0-	45MIN.	1	40	0	50.95		0.00	
4 0-	60MIN.	1	40	0	50.95		0.00	
5 0-	15MIN.	1	100	0	22.76		0.00	
5 0-	30MIN.	2	170	0	13.39		0.00	
5 0-	45MIN.	3	180	0	12.64		0.00	
5 0-	60MIN.	5	310	0	7.34		0.00	
6 0-	15MIN.	2	80	0	7.21		0.00	
6 0-	30MIN.	3	180	0	3.21		0.00	
6 0-	45MIN.	3	180	0	3.21		0.00	
6 0-	60MIN.	5	310	0	1.86		0.00	
7 0-	15MIN.	1	20	0	548.05		0.00	
7 0-	30MIN.	7	270	0	40.60		0.00	
7 0-	45MIN.	19	520	0	21.08		0.00	
7 0-	60MIN.	37	930	0	11.79		0.00	
8 0-	15MIN.	1	40	0	207.00		0.00	
8 0-	30MIN.	1	40	0	207.00		0.00	

OPTION 2

MARKET AREA STUDY APPLICATION



## SYSTEM APPLICATION

This section deals with the actual evaluation of two possible AMTRAK corridor locations between Lansing and Detroit. In order to establish a new rail passenger corridor for AMTRAK service, the previously mentioned market area study would need to be completed.

This project is the one the Michigan Department of State Highways and Transportation has selected to test out the applicability of using the state-wide transportation modeling system to complete market area analysis for a proposed AMTRAK addition. The computer analysis procedures discussed in the previous section will now be applied in the evaluation of the two proposed AMTRAK corridors appearing in Figures 10 and 11. The actual steps required to complete the analysis are defined in Figure 12. The work flow in this diagram will be used as a guide for the discussion of the process.

First, the following socio-economic data, by zone, was selected from the Statewide Socio-Economic File identified in Figure 12:

1. Population (Present) - 1970
2. Population (Future) - 2000
3. Age - 1-18
4. Age - 18-29
5. Age - 30-39
6. Age - 40-49
7. Age - 50-64
8. Age - 65 and over
9. Employment - Professional & Technical

SOUTHERN CORRIDOR

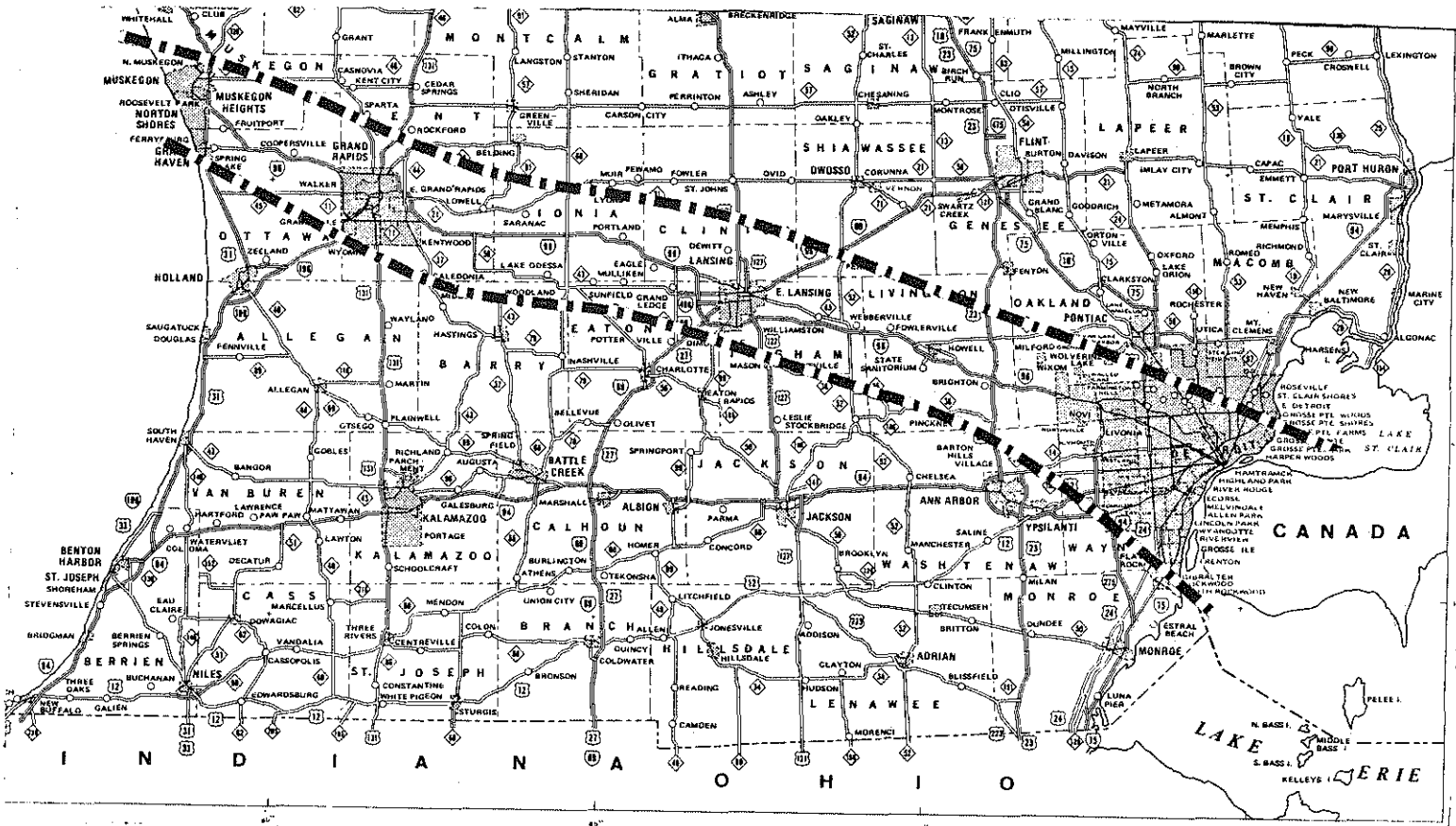


FIGURE 10

NORTHERN CORRIDOR

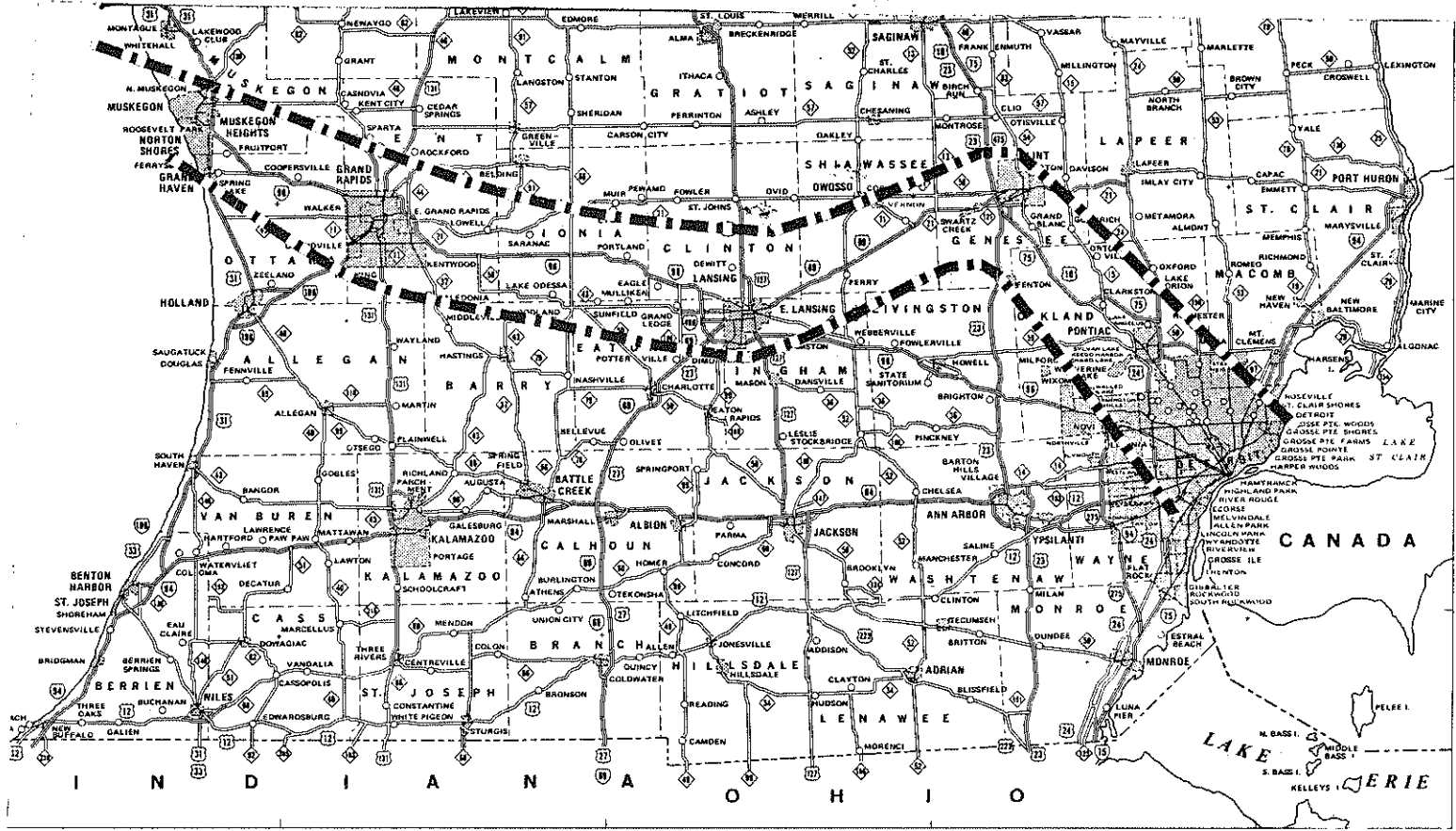
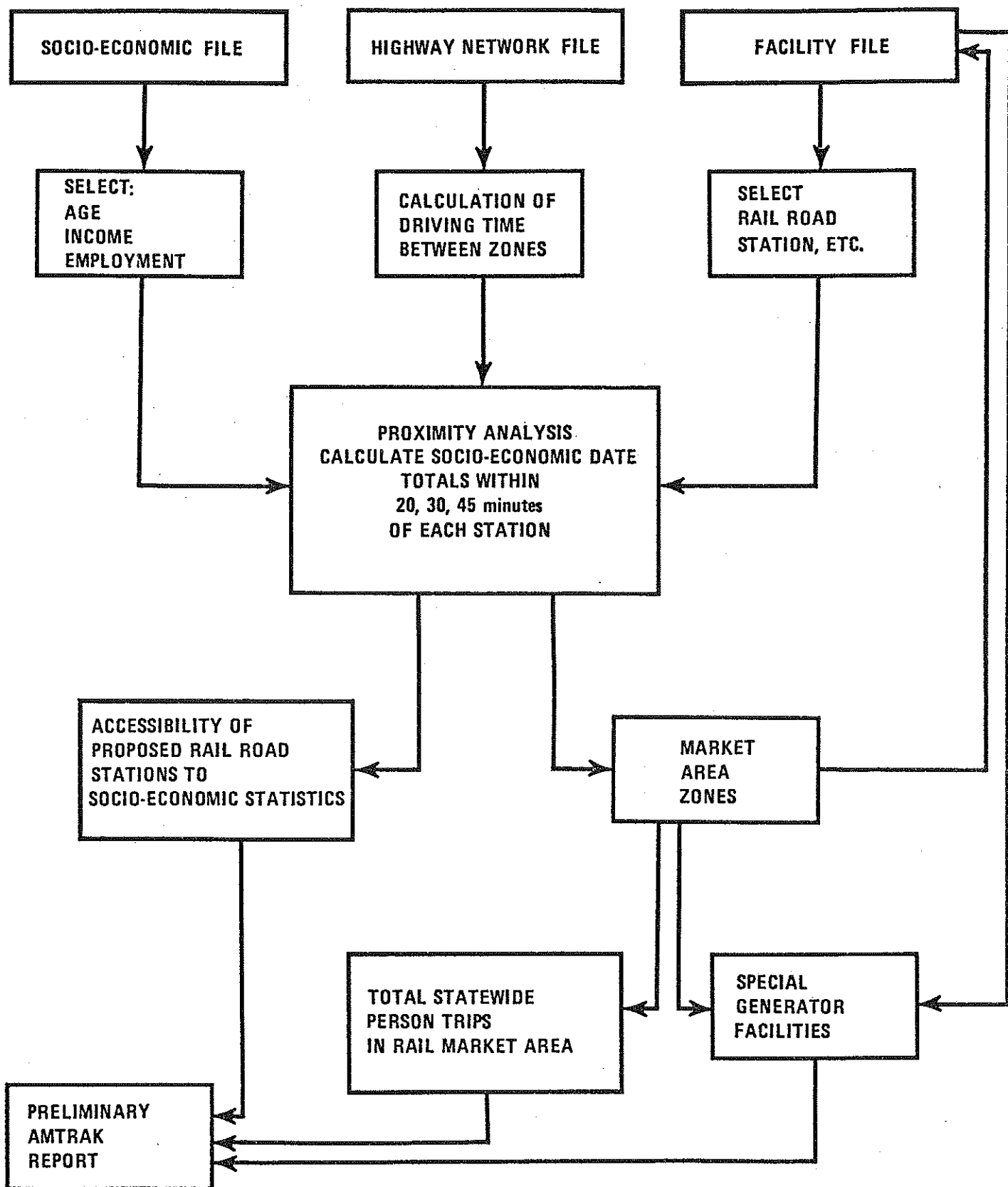


FIGURE 11

FIGURE 12

ANALYSIS PROCESS



10. Employment - Sales Workers & Clerical
11. Employment - Craftsmen, Foremen, & Farm Laborers
12. Employment - Service Workers & Private Household Workers
13. Employment - College & University Students
14. Income - 0-\$5,000
15. Income - \$5,000-\$9,999
16. Income - \$10,000-\$14,999
17. Income - \$15,000-\$24,999
18. Income - \$25,000 and over

This selected information for all zones in the state was placed on a special computer data file for future analysis. The next type of information required to complete the analysis was the identification of the zone location for each of the proposed AMTRAK stations within each corridor. The zone locations for each proposed corridor are listed below. Existing rail station locations are also available from the statewide facility file identified in Figure 4 if comparison between the existing AMTRAK market areas and proposed market areas is useful.

Station Southern Route (see Figure 10)

	<u>Zone</u>
Muskegon	342
Grand Rapids	236
Lake Odessa	194
Lansing	183
Brighton	274
Plymouth	502
Detroit	493

Station Northern Route (see Figure 11)

	<u>Zone</u>
Muskegon	342
Grand Rapids	236



Lake Odessa	194
Lansing	183
Durand	435
Fenton	140
Pontiac	358
Royal Oak	360
Detroit	493

Driving time information comes from the analysis of the existing highway network. The driving time analysis mentioned in the previous section results in a computer tape with the zone-to-zone driving time in minutes for the existing highway system. As indicated in Figure 12, these three pieces of information are now used by the proximity analysis process to evaluate the relation of socio-economic characteristics to the proposed rail stations in first the southern corridor and finally in the northern corridor. This computer analysis process generated information for each rail station and a summary for each corridor similar to Figures 8 and 9. This resulted in a large amount of computer output which after detailed analysis was summarized into parts of the "Preliminary AMTRAK Report in Appendix 'A'".

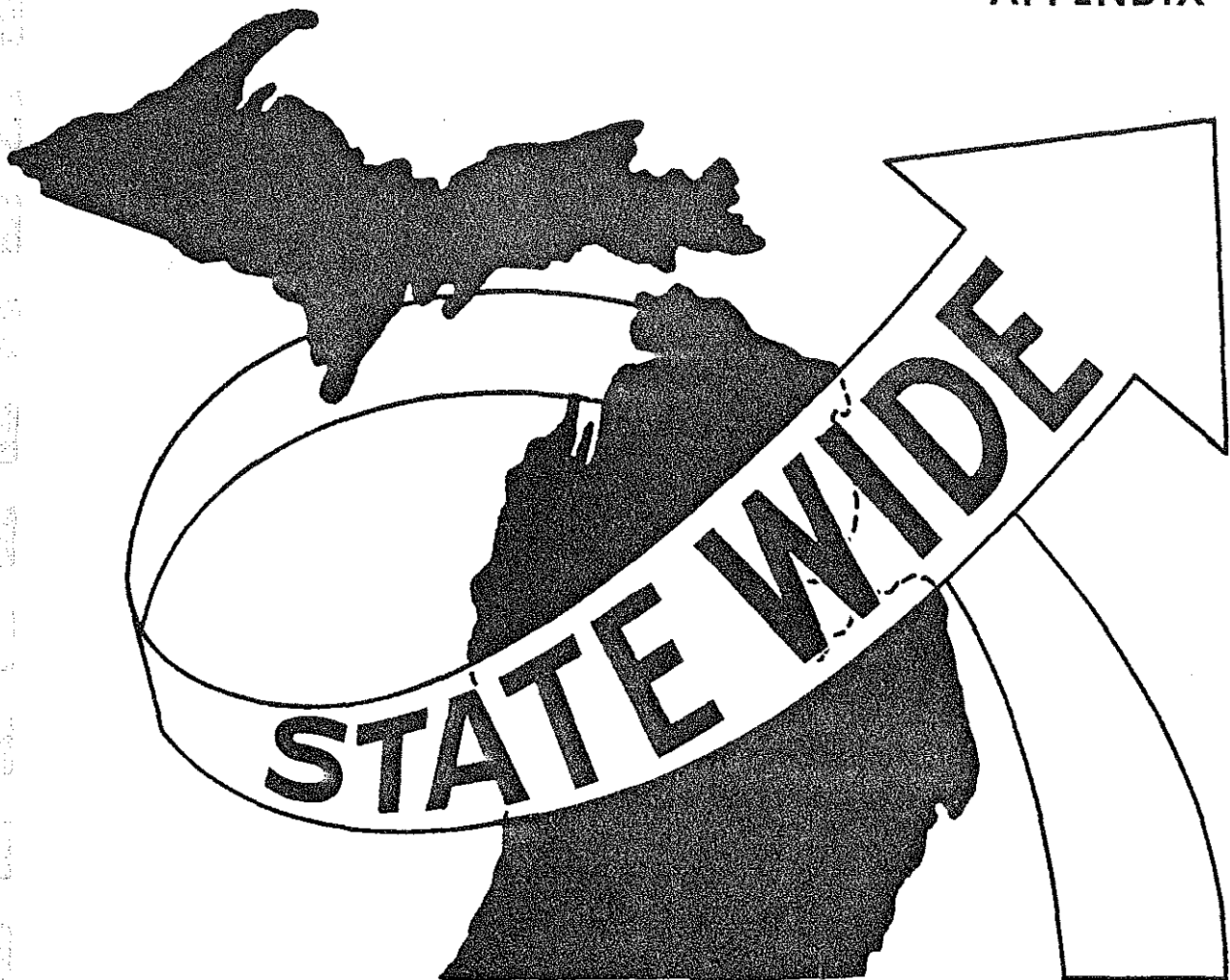
Once the proximity analysis runs have been completed, the zones in the market area of each proposed rail station were identified. These again were summarized in Appendix "A" and "B" of the "Preliminary AMTRAK Report".

These identified market area zones are then used to complete the special generator analysis. When doing a special generator analysis study, only those facilities of interest should be selected from the list appearing in Figure 4. In this study, the colleges, airports, and tourist attractions were the facilities selected. The list of these facilities include all facilities in the whole state. Using the market area zones previously

identified from the proximity analysis runs, a computer process now automatically selects only those colleges, airports, and tourist attractions that are within a specific driving time of each rail station or corridor.

Now that the market area zones have been identified for each corridor and the special generators and socio-economic characteristics summarized, it is necessary to evaluate potential ridership. Because this same analytical process is used in statewide and regional transportation planning, person trip information is also available on a zone-to-zone basis. The same market area person trip data appearing in Table 6 and 7 of the "Preliminary AMTRAK Report" in Appendix "A".

APPENDIX "A"



## APPENDIX "A"

### PRELIMINARY DRAFT OF: AMTRAK MARKET AREA ANALYSIS

This preliminary draft of the market area analysis completed for the proposed northern and southern AMTRAK corridor between Grand Rapids and Detroit identified in Figures 10 and 11 has been included in this document so that the reader has an opportunity to see how the actual computer analysis output could be applied in the evaluation of these projects.

The initial pages of this preliminary draft deal with the evaluation of the age, income, and employment data for the market area of each of the corridors. The market area zones for each of the corridors are identified in Appendix "A" and "B" of this draft. The location of each of these zones is identified in Figure 5. This zone list is used to summarize the state-wide model person trip data appearing on pages 39 and 40 of this section.

1. POPULATION

1a. Southern Route

The existing (1970) population for each potential rail passenger station service area is portrayed in Table 1. The southern route consists of seven potential stations with a combined population of 3,191,112 within 20 minutes travel time of the seven stations, 4,839,983 within 30 minutes and 5,983,654 within 45 minutes.

The station with the most-populated service area is Detroit with 1,868,752 and 2,906,924 persons within 20 and 30 minutes of the station, respectively. The least populated service area is Lake Odessa with 20 and 30 minute populations of 10,659 and 27,170.

1b. Northern Route

The northern route consists of nine potential stations with a combined population of 3,734,565 within 30 minutes and 6,069,334 within 45 minutes.

The station with the most populated service area is Detroit with 1,264,670 and 1,799,322 persons within 20 and 30 minutes of the station, respectively. The Royal Oak station has a similar 20 minute service area population, but a considerably smaller 30 minute population. The least populated service area is Lake Odessa followed by Durand which has 20 and 30 minute populations of 25,776 and 100,701.

2. POPULATION CHANGE

2a. Southern Route

The population change estimated to occur at each potential station is presented in Table 2. The 30 minute service area for the southern route is growing at a

rate of one to two percent per year and is expected to experience an increase of some 700,000 between 1970 and 1980.

All stations comprising the southern route have 20 and 30 minute service areas which are experiencing population growth with the exception of the Detroit 20 minute service area. The fastest growing service area is the Brighton area which is increasing at a rate of 3 percent per year at the present time and expected to continue increasing at a 3 percent annual rate between now and 1980. The slowest growing area is Lake Odessa which is increasing at a one percent rate. Of particular note is the Detroit station 20 minute service which actually experienced a slight population decline between 1970 and 1975 and is expected to continue declining in population between now and 1980.

#### 2b. Northern Route

The 30 minute service area for the northern route is growing at a slightly higher rate than the southern route, 7.2 versus 6.5 and is expected to continue growing at a faster rate, 7.8 versus 7.4, between now and 1980. Numerically the northern route will realize a population growth of over 780,000 between 1970 and 1980, a figure somewhat higher than that estimated for the southern route.

All potential stations in the northern corridor have 20 and 30 minute service areas which will continue to grow, with the exception of the Detroit 20 minute service area which will remain about the same. The fastest growing station is Pontiac which is currently growing at the rate of 2 1/2 percent per year and is expected to continue to do so through 1980. The slowest growing 30 minute service area is Detroit which is increasing at one percent per year. The Detroit 20 minute service area is actually decreasing by 2,969 persons between 1970 and 1980.

### 3. ECONOMIC-DEMOGRAPHIC GROUPINGS

The economic and demographic characteristics of persons residing in the service areas of the potential stations provide an important indication of the residents' need, ability and desire to use the service. The Michigan Department of State Highways and Transportation conducted a "Survey of Amtrak Users in Michigan" in April-July 1975. The following analysis is oriented to those characteristics that were found to be significant in producing rail passenger ridership. Socio-economic data for each of the 1-20 minute and 21-30 minute service areas is included in Tables 1, 3 and 4. Additional data is included in Table 5 for the combined 0-45 minute service areas of all potential stations.

#### 3a. Age Groups

The 1975 ridership survey found that the 18-29 age group represents the largest percentage of all users and has the largest percentage of heavy users. The 30-39 age group is the second highest group followed by the 50-64 age group.

#### 3a1. Southern Route

In 1970, there were 1,384,067 persons in the 18-29, 30-39 and 50-64 age groups residing in the 1-20 minute service areas of the seven potential stations. The corresponding figures for the 21-30 minute and 0-45 minute service areas are 708,438 persons and 1,092,725 persons respectively. In the overall 1-20, 21-30 and 1-45 minute service areas, the 18-29 age group accounts for approximately 18 percent of the population followed by the 50-64 age group with approximately 15 percent and the 30-39 age group with approximately 10 percent.

The number of persons within each age group for each service area generally correspond to overall percentage figures with the exception of the Lansing area. The large enrollment of students at Michigan State University results in a larger

percentage of persons within the 18-29 age group -- 28 percent as compared to approximately 18 percent for the other service areas.

### 3a2. Northern Route

In 1970, there were 1,620,572 persons residing in the 1-20 minute service areas of the nine potential stations that were included in the 18-29, 30-39 and 50-64 age group. The corresponding figures for the 21-30 minute and 0-45 minute service area are 556,605 and 1,113,100 respectively.

The Detroit and Royal Oak stations combined account for over 50 percent of the total population of all the stations and 50 percent of the population in each age group. Otherwise, the trends for the Northern Route are similar to those for the Southern Route.

### 3b. Employment by Category

The 1975 ridership survey found that students and the professional/managerial group accounted for the bulk of heavy users. Information on the two groups is included in Table 3. The "White Collar One" group corresponds to the professional/managerial category.

### 3b1. Southern Route

In 1970, there were 226,122 persons employed in the white collar one employment category in the 1-20 minute service areas of the seven potential stations. The corresponding figure for the 21-30 minute and 1-45 minute service areas is 161,362 and 476,299 respectively. The white collar one category accounts for approximately 20 percent of the white collar one, white collar two, blue collar and service employment in all of the 1-20 minute service areas. Individual 1-20 minute service areas that accounted for a larger percentage are Lansing with 27 percent, and



Plymouth with 24 percent. Detroit has the largest number of white collar workers in the 1-20 minute service area with 113,279 followed by Plymouth with 37,627 and Lansing and Grand Rapids with approximately 29,000 each.

There are 120,083 college students in the seven 1-20 minute service areas, and 71,660 in the 21-30 minute service areas. In the overall 1-45 minute service area there are 222,615 college students. The largest number of students are located in the Detroit area (81,820 in the 1-30 service area) followed by Lansing with 39,967. Plymouth with 19,691 and Grand Rapids with 15,757.

### 3b2. Northern Route

There are 296,776 persons employed in the white collar one employment category in the 1-20 minute service area of the nine potential stations. The corresponding figures for the 21-30 minute and 1-45 minute service areas are 98,517 and 550,711 respectively. The white collar one category accounted for 31 percent of the white collar one, white collar two, blue collar and service employment of the Pontiac 0-20 minute service area as compared to a overall 27 percent for the nine stations.

There are 139,774 college students in the nine 1-21 minute service areas, 33,592 in the 21-30 minute service areas and 230,224 in the combined 1-45 minute service area. The Royal Oak and Pontiac areas account for a large number of students -- 38,606 and 14,849 students, respectively, in the 1-30 minute service areas.

### 3c. Income by Category

The 1975 ridership survey found that it was nearly impossible to make overall generalizations concerning income-ridership relationships except on a city by city basis. Persons earning an individual income of under \$5,000 accounted for many of the users. This category includes most college students. The 1975 ridership survey

found that a large percentage of all users owned or normally had use of an automobile. Since auto availability is highly correlated with household income, it would indicate that higher income households tend to use the service on a relatively frequent basis.

3c1. Southern Route

In the seven 0-20 minute service areas, 15 percent of the households earn \$0-\$5,000; 27 percent earn \$5,000-\$9,999; 31 percent earn \$10,000-\$14,999; 22 percent earn \$15,000-\$24,999; and, 5 percent earn \$25,000 and over. Generally the household income is slightly higher for the 21-30 service areas. Variations among service areas is relatively small. Brighton and Plymouth do, however, have somewhat higher income levels while Muskegon and Detroit have somewhat lower averages.

3c2. Northern Route

The percent of households within each income range is similar to data for the southern route. Royal Oak and Fenton have somewhat higher incomes while Durand has a somewhat lower figure.

Table 1. Population by Age Group Residing in the Twenty and Thirty Minute Service Areas for Each Proposed Rail Passenger Station, 1970

Station	Under 18		18-29		30-39		40-49		50-64		65 and Over		Total Population	
	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30
<u>Muskegon to Lansing Segment</u>														
Muskegon	54,299	14,130	23,110	5,176	14,150	4,113	16,816	4,129	20,964	4,177	12,941	2,225	142,280	33,950
Grand Rapids	131,992	35,362	64,640	13,601	37,170	10,692	40,261	8,963	48,451	8,449	34,428	4,974	356,942	82,041
Lake Odessa	4,277	6,103	1,762	2,689	1,194	1,864	948	1,808	1,414	2,240	1,064	1,807	10,659	16,511
Lansing	93,881	31,297	81,147	13,034	29,652	8,953	27,903	7,980	31,538	9,459	18,153	6,183	282,273	76,906
Subtotal	284,449	86,892	170,658	34,500	82,166	25,622	85,928	22,880	102,367	24,325	66,586	15,189	792,154	209,408
<u>Lansing to Detroit Segment (Southern Route)</u>														
Brighton	33,595	52,464	14,086	51,915	10,400	19,330	9,723	15,988	10,104	16,172	5,694	9,693	83,602	165,562
Plymouth	184,173	90,256	72,725	38,724	57,647	27,673	61,409	33,789	48,443	32,191	22,207	13,096	446,604	235,729
Detroit	617,275	394,808	328,357	175,681	177,355	123,349	229,059	141,907	309,759	138,956	206,947	63,471	1,868,752	1,038,172
Subtotal	835,043	537,528	415,168	266,320	245,402	170,352	300,191	191,684	368,306	187,319	234,848	86,260	2,398,958	1,439,463
<u>Lansing to Detroit Segment (Northern Route)</u>														
Durand	10,486	31,218	4,467	12,288	3,104	9,249	2,734	9,228	3,008	8,243	1,977	4,699	25,776	74,925
Fenton	17,147	121,643	6,202	57,675	5,489	36,508	5,085	36,104	4,658	38,963	2,803	22,992	41,384	313,885
Pontiac	151,741	53,751	67,593	22,324	45,744	18,445	52,341	13,259	49,805	10,744	24,657	3,891	391,881	122,414
Royal Oak	430,520	36,106	207,777	13,391	131,882	9,909	155,715	14,645	185,119	13,046	107,687	5,946	1,218,700	93,043
Detroit	419,053	204,329	220,664	87,441	120,268	60,881	157,731	75,967	209,601	73,051	137,353	32,983	1,264,670	534,652
Subtotal	1,028,947	447,047	506,703	193,119	306,487	134,992	373,606	149,203	452,191	144,047	274,477	70,511	2,942,411	1,138,919
<u>Muskegon to Detroit Total</u>														
Southern Route	1,119,492	624,420	585,826	300,820	327,568	195,974	386,119	214,564	470,673	211,644	301,434	101,449	3,191,112	1,648,871
Northern Route	1,313,396	533,939	677,361	227,619	388,653	160,614	459,534	172,083	554,558	168,372	341,063	85,700	3,734,565	1,348,327

Source: U.S. Department of Commerce, Bureau of the Census

Table 2. Population Residing in the Twenty and Thirty Minute Service Areas for Each Potential Rail Passenger Station: 1970, 1975 and 1980

Station	1970			1975			1970-1975 % Change	1980			1975-1980 % Change
	1-20	21-30	1-30	1-20	21-30	1-30		1-20	21-30	1-30	
<u>Muskegon to Lansing Segment</u>											
Muskegon	142,280	33,950	176,230	147,449	36,845	184,294	4.6	155,066	40,089	195,155	5.9
Grand Rapids	356,942	82,041	438,983	377,377	90,087	467,464	6.9	402,143	98,807	500,950	7.2
Lake Odessa	10,659	16,511	27,170	11,093	17,250	28,343	4.3	11,667	18,169	29,836	5.3
Lansing	282,273	76,906	359,179	307,662	82,324	389,986	8.6	334,986	88,174	423,160	8.5
Subtotal	792,154	209,408	1,001,562	843,581	226,506	1,070,087	6.8	903,862	245,239	1,149,101	7.4
<u>Lansing to Detroit Segment (Southern Route)</u>											
Brighton	83,602	165,562	249,164	93,970	195,362	289,332	16.1	105,581	227,049	332,630	15.0
Plymouth	446,604	235,729	682,333	458,387	273,053	731,440	7.2	492,389	317,002	809,391	10.7
Detroit	1,868,752	1,038,172	2,906,924	1,852,758	1,215,498	3,068,256	5.5	1,842,119	1,408,625	3,250,744	5.9
Subtotal	2,398,958	1,439,463	3,838,421	2,405,115	1,683,913	4,089,028	6.5	2,440,089	1,952,676	4,392,765	7.4
<u>Lansing to Detroit Segment (Northern Route)</u>											
Durand	25,776	74,925	100,701	27,113	82,505	109,618	8.9	28,826	91,401	120,227	9.7
Fenton	41,384	313,885	355,269	47,175	337,900	385,075	8.4	52,061	368,694	420,755	9.3
Pontiac	391,881	122,414	514,295	426,873	151,375	578,248	12.4	469,120	183,973	653,093	12.9
Royal Oak	1,218,700	93,043	1,311,743	1,311,000	100,287	1,411,287	7.6	1,430,117	109,355	1,539,472	9.1
Detroit	1,264,670	534,652	1,799,322	1,261,745	629,172	1,890,920	5.1	1,261,701	719,200	1,980,901	4.8
Subtotal	2,942,411	1,138,919	4,081,330	3,073,909	1,301,239	4,375,148	7.2	3,241,825	1,472,623	4,714,448	7.8
<u>Muskegon to Detroit Total</u>											
Southern Route	3,191,112	1,648,871	4,839,983	3,248,696	1,910,419	5,159,115	6.6	3,343,951	2,197,915	5,541,866	7.4
Northern Route	3,734,565	1,348,327	5,082,892	3,917,490	1,527,745	5,445,235	7.1	4,145,687	1,717,862	5,863,549	7.7

Source: Michigan Department of State Highways and Transportation; Statewide Transportation Planning Procedures Section

Table 3. Employment by Category Residing in the Twenty and Thirty Minute Service Areas for Each Potential Rail Passenger Station, 1970

Station	White Collar One <sup>1/</sup>		White Collar Two <sup>2/</sup>		Blue Collar <sup>3/</sup>		Service <sup>4/</sup>		College Students <sup>5/</sup>		Total	
	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30
<u>Muskegon to Lansing Segment</u>												
Muskegon	9,893	2,093	10,367	2,333	21,604	5,739	6,543	1,293	3,171	490	51,578	11,948
Grand Rapids	28,553	4,691	36,607	6,126	50,144	14,233	16,570	3,271	13,421	2,336	145,295	30,657
Lake Odessa	445	1,088	544	1,076	2,219	2,432	298	876	88	187	3,594	5,657
Lansing	29,700	4,529	32,235	5,819	32,229	13,401	15,663	3,058	38,734	1,233	148,561	28,040
Subtotal	68,591	12,401	79,753	15,354	106,196	35,805	39,074	8,496	55,414	4,246	349,028	76,302
<u>Lansing to Detroit Segment (Southern Route)</u>												
Brighton	6,625	25,878	6,146	14,676	13,012	15,201	3,220	8,242	1,556	29,016	30,559	93,013
Plymouth	37,627	29,322	42,633	23,000	62,526	27,855	16,972	8,690	11,575	8,116	171,333	96,983
Detroit	113,279	93,761	170,730	107,477	272,088	150,975	97,304	38,069	51,538	30,282	704,939	420,564
Subtotal	157,531	148,961	219,509	145,153	347,626	194,031	117,496	55,001	64,669	67,414	906,831	610,560
<u>Lansing to Detroit Segment (Northern Route)</u>												
Durand	1,190	4,430	1,540	5,505	4,902	13,034	842	2,968	328	1,261	8,802	27,198
Fenton	2,652	19,866	2,722	23,471	7,101	51,403	1,588	13,325	675	8,325	14,738	116,390
Pontiac	42,731	10,966	33,921	9,477	44,073	17,173	15,152	3,760	12,192	2,657	148,069	44,033
Royal Oak	102,493	7,496	120,652	9,747	165,384	13,777	53,943	3,428	36,210	2,396	478,682	36,844
Detroit	79,119	43,358	117,054	53,187	184,557	80,316	64,575	20,209	34,955	14,707	480,260	211,707
Subtotal	228,185	86,116	275,889	101,387	406,017	175,703	136,100	43,690	84,360	29,346	1,130,551	436,172
<u>Muskegon to Detroit Total</u>												
Southern Route	226,122	161,362	299,262	160,507	453,822	229,836	156,570	63,497	120,083	71,660	1,255,859	686,862
Northern Route	296,776	98,517	355,642	116,741	512,213	211,508	175,174	52,186	139,774	33,592	1,479,579	512,473

Notes: 1/Includes Professional, Technical and Kindred Workers/Managers and Administrators except Farm.

2/Includes Sales Workers/Clerical and Kindred Workers.

3/Includes Craftsmen, Foreman and Kindred Workers/Farm Laborers and Foremen.

4/Includes Service Workers/Private Household Workers.

5/Includes students attending Public and Private Colleges and Universities.

Source: U.S. Department of Commerce, Bureau of the Census

Table 4. Annual Household Income in the Twenty and Thirty Minute Service Areas for Each Proposed Rail Passenger Station, 1970

Station	Under \$5,000		\$5,000-\$9,999		\$10,000-\$14,999		\$15,000-\$24,999		\$25,000 and Over		Total Households	
	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30	1-20	21-30
<u>Muskegon to Lansing Segment</u>												
Muskegon	5,779	1,147	12,400	3,081	10,875	2,908	5,407	1,173	1,182	156	35,643	8,465
Grand Rapids	12,329	2,020	26,693	6,501	28,012	7,183	15,934	3,175	4,613	514	87,581	19,393
Lake Odessa	575	641	1,043	1,331	741	1,221	313	644	35	123	2,707	3,960
Lansing	8,251	2,658	17,865	5,674	20,809	6,331	15,348	3,756	3,739	672	66,012	19,091
Subtotal	26,934	6,466	58,001	16,587	60,437	17,643	37,002	8,748	9,569	1,465	191,943	50,909
<u>Lansing to Detroit Segment (Southern Route)</u>												
Brighton	2,184	3,877	5,181	8,768	6,818	10,713	5,530	10,166	1,111	3,543	20,824	37,067
Plymouth	6,744	4,041	20,352	9,918	38,348	16,030	35,082	19,343	6,573	10,494	107,099	59,826
Detroit	84,977	20,229	131,460	52,003	131,729	92,333	93,593	81,551	22,254	17,350	464,013	263,466
Subtotal	93,905	28,147	156,993	70,689	176,895	119,076	134,205	111,060	29,938	31,387	591,936	360,359
<u>Lansing to Detroit Segment (Northern Route)</u>												
Durand	931	1,928	2,048	5,432	2,168	6,076	1,106	4,116	156	707	6,409	18,259
Fenton	1,010	10,571	2,648	22,711	3,530	24,090	2,499	17,095	530	3,569	10,217	78,036
Pontiac	8,676	1,835	19,747	5,137	27,252	11,059	27,197	9,990	14,020	1,605	96,892	29,626
Royal Oak	40,718	1,536	71,649	4,539	90,928	8,066	78,997	7,652	22,893	1,446	305,185	23,239
Detroit	55,256	10,534	87,189	27,296	90,562	47,904	65,464	41,102	16,690	8,473	315,161	135,309
Subtotal	106,591	26,404	183,281	65,115	214,440	97,195	175,263	79,955	54,289	15,800	733,864	284,469
<u>Muskegon to Detroit Total</u>												
Southern Route	120,839	34,613	214,994	87,276	237,332	136,719	171,207	119,808	39,507	32,852	783,879	411,268
Northern Route	133,525	32,870	241,282	81,702	274,877	114,838	212,265	88,703	63,858	17,265	925,807	335,378

Source: U.S. Department of Commerce, Bureau of the Census

Table 5. Population, Annual Household Income and Employment in the Forty-Five Minute Service Area for the Southern and Northern Routes, 1970

Characteristic	Southern Route	Northern Route
<u>Age</u>		
Under 18	2,191,208	2,226,056
18-29	1,092,725	1,113,100
30-39	659,533	669,095
40-49	737,789	746,018
50-64	821,623	830,035
65 and Over	480,776	485,030
Total <sup>1/</sup>	5,983,654	6,069,334
<u>Annual Household Income</u>		
Under \$5,000	187,960	190,681
\$5,000 - \$9,999	376,294	382,651
\$10,000 - \$14,999	461,010	467,138
\$15,000 - \$24,999	356,917	359,092
\$25,000 and Over	93,512	93,748
Total	1,475,693	1,493,310
<u>Employment</u>		
White Collar No. 1 <sup>2/</sup>	476,299	477,197
White Collar No. 2 <sup>3/</sup>	546,955	550,711
Blue Collar <sup>4/</sup>	851,794	869,268
Service <sup>5/</sup>	266,116	270,035
College Students <sup>6/</sup>	222,615	230,224
Total	2,363,779	2,397,434

Notes: 1/The 1975 and 1980 population estimates for the southern route are 6,421,625 and 6,938,000 respectively. For the northern route, the figures are 6,510,687 and 7,028,282.

2/Includes Professional, Technical and Kindred Workers/Managers and Administrators except Farm.

3/Includes Sales Workers/Clerical and Kindred Workers.

4/Includes Craftsmen, Foreman and Kindred Workers/Farm Laborers and Foremen.

5/Includes Service Workers/Private Household Workers.

6/Includes students attending Public and Private Colleges and Universities.

Source: U.S. Department of Commerce, Bureau of the Census

### Amtrak Ridership Estimates

The following two tables present estimated Amtrak ridership for the potential northern and the southern routes. The estimates were based upon estimated daily person trips between all potential 30 minute service areas as obtained from the Statewide Transportation Planning Procedures Section. For service areas ranging up to approximately 50 miles apart, it was assumed that there would be 5 daily riders between the smaller areas and 10 daily riders between the larger areas. It was also assumed that Amtrak ridership would account for 1 percent of all person trips between stations from 50 to 100 miles apart, 2 percent of all person trips for stations from 100 to 150 miles apart and 3 percent of all person trips for stations more than 150 miles apart.

It is difficult to estimate ridership for the Muskegon-Grand Rapids to Detroit corridor. There is not any existing Michigan Amtrak service that is directly comparable to the corridor. Yet, there was not sufficient time to examine other corridors throughout the nation that may be somewhat comparable. Previous C&O service in the corridor carried only a handful of daily passengers even with three round trips per day.

It was particularly difficult to estimate ridership between Detroit and its suburbs such as Pontiac and Royal Oak. Although the person trips between these service areas is very high, the closeness of the stations should discourage many potential trips especially with only one round trip per day.

The estimates, given more time, could be analyzed in more detail. The estimates do, however, clearly present a significant magnitude of difference between ridership on the northern and southern routes. The level of accuracy for estimates between particular stations is however open to question.



Table 6. Estimated Average Daily Person Trips Between Potential Rail Passenger Station for Southern Route, 1975

From Station	To Station							Total
	Muskegon	Grand Rapids	Lake Odessa	Lansing	Brighton	Plymouth	Detroit	
Muskegon	---	6,981	83	131	31	28	53	7,307
Grand Rapids	6,981	---	3,509	1,051	108	79	135	11,863
Lake Odessa	83	3,509	---	2,183	51	30	46	5,902
Lansing	131	1,051	2,183	---	3,689	683	765	8,502
Brighton	31	108	51	3,689	---	21,021	9,797	34,697
Plymouth	28	79	30	683	21,021	---	139,352	161,193
Detroit	53	135	46	765	9,797	139,352	---	150,148
Total	7,307	11,863	5,902	8,502	34,697	161,193	150,148	379,612

Source: Michigan Department of State Highways and Transportation, Statewide Transportation Planning Procedures Section.

Table 7. Estimated Average Daily Person Trips Between Potential Rail Passenger Station for Northern Route, 1975

From Station	To Station									Total
	Muskegon	Grand Rapids	Lake Odessa	Lansing	Durand	Fenton	Pontiac	Royal Oak	Detroit	
Muskegon	---	6,981	83	131	17	28	26	30	35	7,331
Grand Rapids	6,981	---	3,509	1,051	73	96	71	83	89	11,953
Lake Odessa	83	3,509	---	2,183	43	43	27	32	30	5,950
Lansing	131	1,051	2,183	---	3,736	1,887	529	687	474	10,678
Durand	17	73	43	3,736	---	8,868	601	204	158	13,700
Fenton	28	96	43	1,887	8,868	---	9,127	3,397	1,204	24,650
Pontiac	26	71	27	529	601	9,127	---	64,777	26,987	102,145
Royal Oak	30	83	32	687	204	3,397	64,777	---	202,308	271,518
Detroit	35	89	30	474	158	1,204	26,987	202,308	---	231,285
Total	7,331	11,953	5,950	10,678	13,700	24,650	102,145	271,518	231,285	679,210

Source: Michigan Department of State Highways and Transportation, Statewide Transportation Planning Procedures Section

# Estimated Daily Ridership Northern Route

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From/To Station	Muskegon	Grand Rapids	Lakeland Lansing	Lansing	Durand	Fenton	Pontiac	Royal Oak	Detroit	Total
Muskegon	-	10	2	5	1	2	2	2	2	2
Grand Rapids	-	-	5	21	2	2	3	2	6	6
Lakeland Lansing			-	5	1	1	1	2	2	2
Lansing				-	5	5	11	14	19	5
Durand					-	5	5	4	3	1
Fenton						-	5	5	10	2
Pontiac							-	5	5	1
Royal Oak								-	5	5
Detroit									-	5
<b>TOTAL</b>		10	7	31	9	15	27	34	52	18

Annual Ridership 67,525  
 Monthly Ridership 5,627

# Estimated Daily Ridership Southern Route

From / To Station	From / To			Station		Plymouth	Detroit	TOTAL
	Muskegon	Grand Rapids	W.K.P. (Grand Rapids)	Lansing	Burlington			
Muskegon	—	10	2	5	2	2	2	23
Grand Rapids	—	—	5	21	4	3	6	39
W.K.P.	—	—	—	5	1	1	2	9
Lansing	—	—	—	—	5	14	19	38
Burlington	—	—	—	—	—	5	5	10
Plymouth	—	—	—	—	—	—	5	5
<b>TOTAL</b>		<b>10</b>	<b>7</b>	<b>31</b>	<b>12</b>	<b>25</b>	<b>39</b>	<b>124</b>

Annual Ridership 45,260  
 Monthly Ridership 3,771

Appendix A. Statewide Traffic Analysis Zones Comprising the Twenty and Thirty Minute Service Areas for Each Proposed Rail Passenger Station

Station	20 Minute Service Area	21-30 Minute Service Area
<u>Muskegon to Lansing Segment</u>		
Muskegon	342 <sup>1/2</sup> , 344, 345, 348, 349 399	343, 346, 350, 351
Grand Rapids	236 <sup>1/2</sup> , 237, 239, 241, 242 246, 247, 248	238, 244, 396, 397, 398, 401
Lake Odessa	120, 194 <sup>1/2</sup> , 195	192, 193, 240
Lansing	93, 100, 117, 121, 123 183 <sup>1/2</sup> , 184, 185, 186	92, 97, 98, 113, 114, 118, 119 122, 187, 189, 190, 191, 199 441
<u>Lansing to Detroit Segment (Southern Route)</u>		
Brighton	271, 273, 274, 275 <sup>1/2</sup> 365, 492	140, 272, 276, 364, 479, 480 482
Plymouth	363, 501, 502 <sup>1/2</sup> , 504	359, 362, 484, 485, 500
Detroit	493 <sup>1/2</sup> , 495, 496, 497, 503	285, 286, 360, 367, 494, 498 499
<u>Lansing to Detroit Segment (Northern Route)</u>		
Durand	435 <sup>1/2</sup> , 436, 438, 440	130, 433, 434, 437
Fenton	139, 140 <sup>1/2</sup> , 371	128, 131, 132, 133, 273, 275
Pontiac	358 <sup>1/2</sup> , 361, 366, 367, 368 369, 370, 373, 374, 375	287, 364, 372
Royal Oak	286, 359, 360 <sup>1/2</sup> , 362, 495	363, 504
Detroit	493 <sup>1/2</sup> , 496, 497, 503	285, 494, 498, 499

Notes: <sup>1/2</sup>/Traffic Analysis Zone in which the proposed rail passenger station is located.

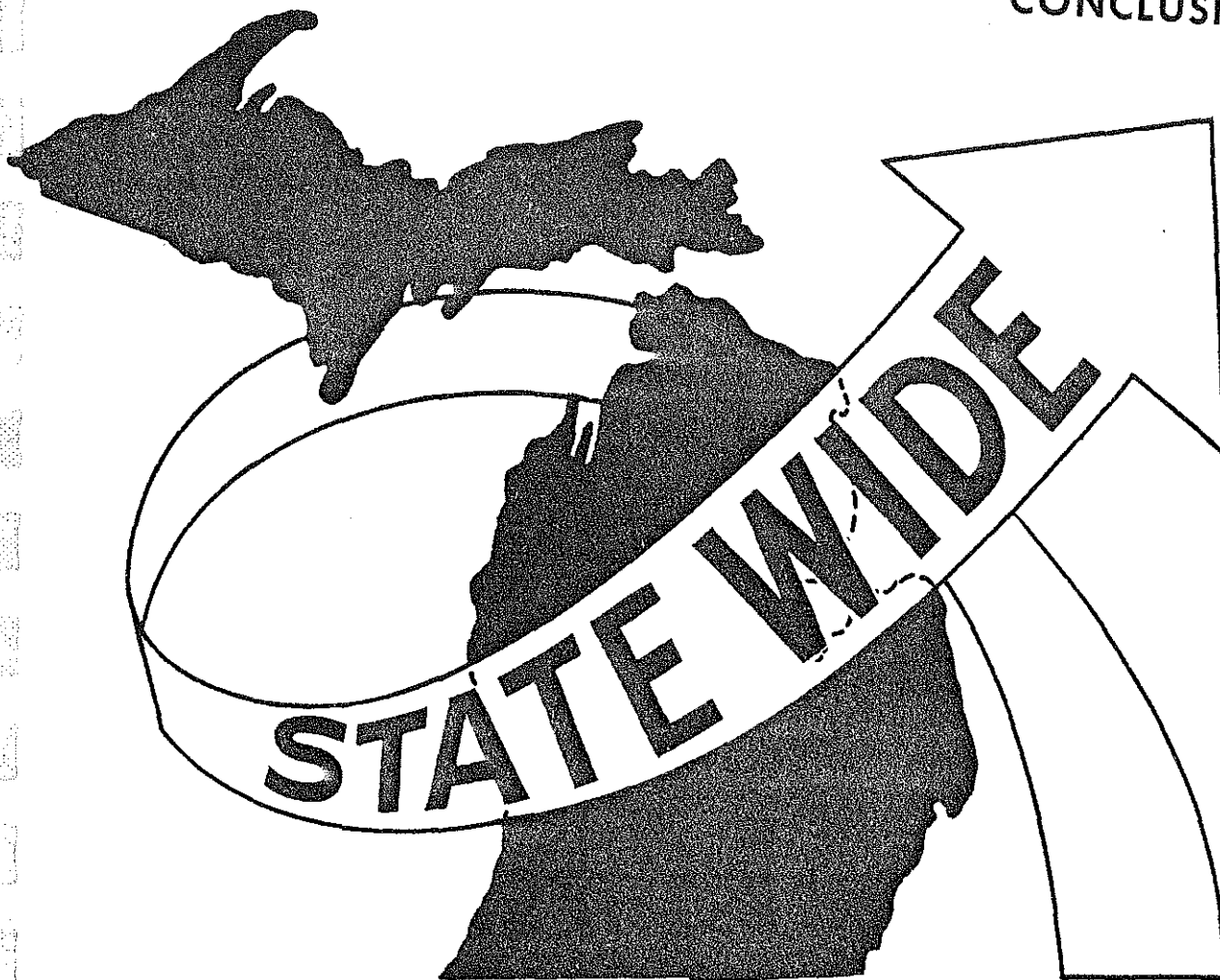
Source: Michigan Department of State Highways and Transportation, Statewide Transportation Planning Procedures Section and Mass Transportation Planning Section.

Appendix B. Statewide Traffic Analysis Zones Comprising the 31 to 45 Minute Service Areas for the Northern and Southern Routes

Corridor	Traffic Analysis Zone
Northern Route	12, 25, 26, 27, 92, 94, 95, 96, 99, 115, 116, 129, 134, 135, 136, 138, 141, 188, 196, 197, 200, 219, 224, 243, 245, 252, 256, 257, 271, 272, 274, 284, 288, 289, 325, 333, 339, 347, 352, 355, 376, 378, 395, 400, 402, 420, 421, 422, 439, 479, 480, 482, 483, 484, 485, 492, 500, 501, 502
Southern Route	12, 25, 26, 27, 92, 94, 95, 96, 99, 115, 116, 128, 131, 132, 133, 139, 196, 197, 200, 219, 224, 243, 245, 284, 287, 288, 325, 332, 333, 339, 347, 352, 355, 358, 361, 366, 368, 369, 370, 371, 372, 373, 376, 378, 395, 400, 402, 433, 434, 435, 437, 440, 481, 486, 487, 490, 491

Source: Michigan Department of State Highways and Transportation, Statewide Transportation Planning Procedures Section and Mass Transportation Planning Section.

CONCLUSION



## CONCLUSION

The basis for a market area analysis is to match people and their needs with the most efficient and cost-effective mode of transportation. While no one will dispute the necessity of or benefits gained by such a study, the methods utilized to achieve the study were costly and time consuming. Through this report, a new means, the Statewide Transportation Modeling System, to the ultimate end has been established.

The preceding report documents the application of the Statewide Transportation Modeling System as an efficient tool in developing a realistic market area analysis. The analysis can also be accomplished in less time and at less expense. While the system has been applied to a market area analysis for the AMTRAK operation in this report, the system also has the capability of performing market area studies for all forms of transportation such as air and bus. In fact, the Statewide Transportation Modeling System has potential for multiple usage outside the market area analysis field.

For more information on this report or other applications of the Statewide Transportation Modeling System, contact:

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