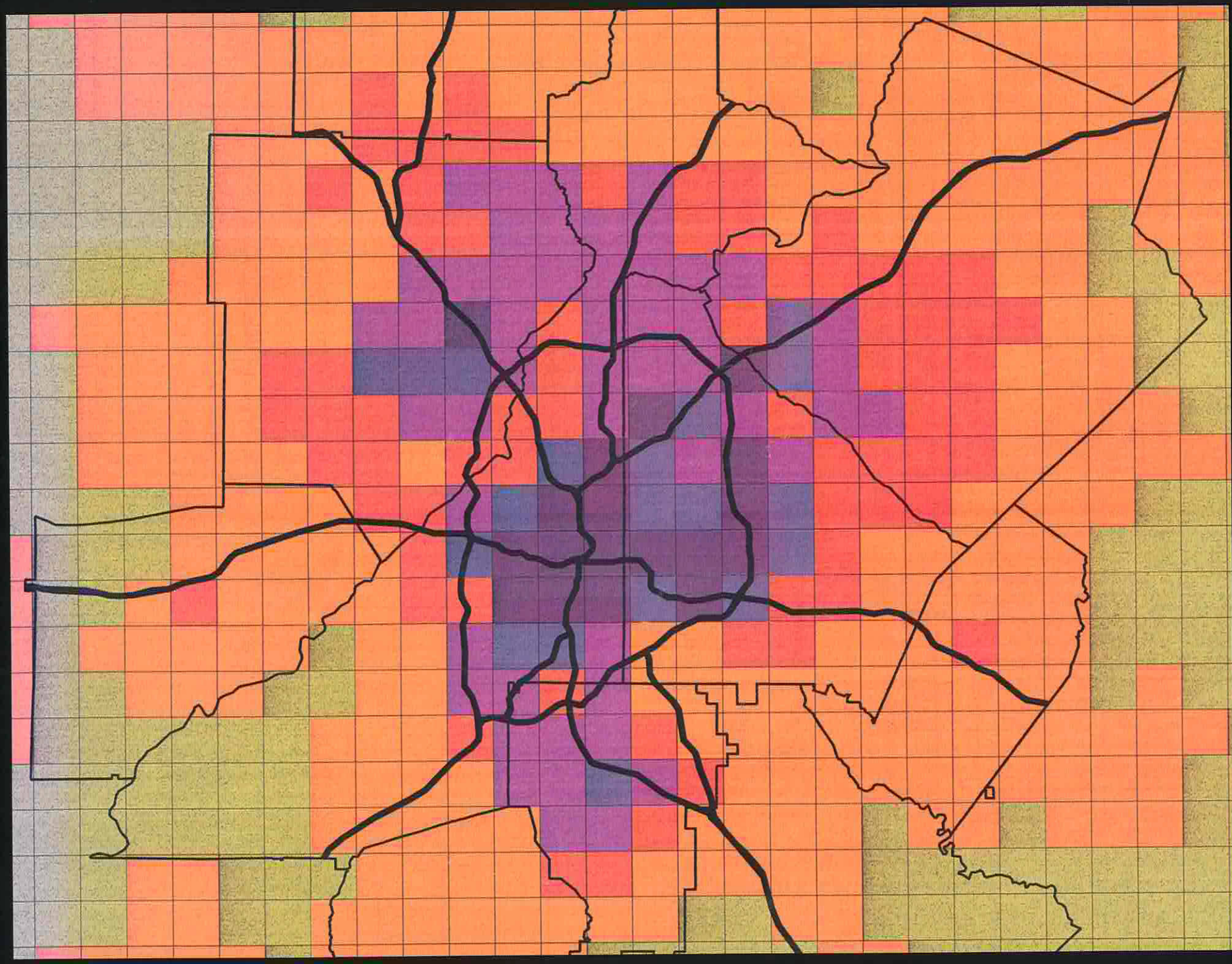
Census Mapbook For Transportation Planning



U.S.Department of Transportation
Federal Highway Administration
Office of Policy

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-PL-94-035		

4. Title and Subtitle	5. Report Date
Census Mapbook for Transportation Planning	December 1994
	6. Performing Organization Code
7. Author(s)	8. Type of Report and Period Covered
9. Performing Organization Name and Address GIS/Trans., Ltd. 8555 16th Street, Suite 320 Silver Spring, MD 20910	10. Type of Report and Period Covered 11. Type of Report and Period Covered
12. Sponsering Agency Name and Address Federal Highway Administration HPM-40 Office of Highway Information Management 400 7th Street, SW Washington, D.C. 20590	13. Type of Report and Period Covered 14. Type of Report and Period Covered

15. Supplementary Notes

For more information, phone 202-366-0160

16. Abstract

Geographic display of Census data in transportation planning and policy decisions are compiled in a report of 49 maps, depicting use of the data in applications such as travel demand model development and model validation, population forecasting, corridor analysis, and transit route planning. The report has compiled maps from many different types of agencies. The maps were compiled from Metropolitan Planning Organizations (MPOs), State Departments of Transportation (DOTs), transit agencies, and others.

17. Key Words	18. Distribution Statement
Decennial Census Transportation Planning Geographic Information Systems	For additional copies, please contact FHWA R&T Report Center phone: 703-285-2144 fax: 703-285-2919

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21 No. of Pages	22. Price
Not Applicable	Not Applicable		

Form DOT F1700.7(8-72) Reproduction of complete page authorized

U.S. Department of Transportation
Federal Highway Administration

Census Mapbook for Transportation Planning

Based on Data from Contributing National, State and Local Governmental Agencies

Prepared by:
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Silver Spring, Maryland

Prepared for:
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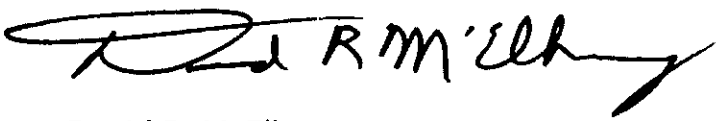
Foreword

Transportation has always been tied to geography, and now, technology can help planners, transportation professionals, and decision makers see, in graphic terms, these linkages. Data are not useful in and of themselves, but are needed to examine trends, evaluate forecasts, improve new forecasts, and make decisions about transportation improvements, and transportation programs. Census data have played a critical role in transportation planning over three decades, and new computer tools make the data more understandable and make it "come alive" for a wider audience. Mapping and geographic information systems (GIS) software and color output devices are now affordable to even the smallest agencies. This selection of maps displaying Census data is a demonstration of the increasing use of geographic information systems in the transportation arena. This report shows how several agencies are using the technology, with the goal that these mechanisms and tools gain increasing use in the field.

We would like to thank all the agencies who contributed maps for this report. Without their participation, our ability to portray this growing field would have been severely limited.



David R. McElhaney

Director, Office of Highway Information Management

Introduction

Data from the U.S. decennial census of population and housing have become a standard resource used in many transportation applications, at national, regional, and local levels. Questions on the journey-to-work have been included in the Census since 1960, and basic demographic variables such as total population, total workers, household size, household structure and household income are also critical items to transportation planners.

The utility of decennial census data has improved greatly over time, particularly with the advent of CD-ROM technology and the speed of microcomputers. Small area data are now widely available on desktops, and in a user-friendly format. Even as recently as the 1980 census, data users relied on mainframe computers, printed reports, and microfiche.

The 1990 census data products used most frequently by transportation professionals are: (1) summary tape files, (2) microdata, and (3) geographic files. This compilation of maps primarily shows uses of the summary tabulations and geographic files.

These maps were compiled to show a broad range of the use of census data in transportation. Most were submitted by Metropolitan Planning Organizations (MPOs) and State Departments of Transportation (DOTs). The geographic units represented range from counties, to tracts and traffic analysis zones (TAZs), to 4 km grids for air quality analysis, to network links. Applications included are population, transportation, and air quality forecasting; congestion management programs; carpool and rideshare programs; transit and bicycle route planning and analysis; and paratransit demand estimation.

Geographic information systems (GIS) are becoming very inexpensive and very user-friendly. GIS is a tool that allows information from a wide variety of sources to be integrated based on location, and then analyzed and summarized in a map or other graphical display. By the year 2000, GIS will be standard software for all transportation planning agencies, much as spreadsheet software was in the 1980's.

This publication provides examples for State DOTs and MPOs of how similar agencies are using GIS with census data, and to familiarize decision makers with this important technology and census data resources.

There are two additional sections to this introduction: a short description of the census data most often used in transportation applications, and a list of resources for obtaining and using census data.

Summary Tabulations

Summary Tape File 1 and Summary Tape File 3

The Summary Tape Files (STF) from the 1990 census include STF1, STF2, STF3, and STF4; however, STF1 and STF3 are the most commonly used, and are widely available on CD-ROM. STF2 and STF4 include detailed tabulations by race and Hispanic origin that are rarely used in transportation. STF1 is from the 100 percent count and includes information on household relationship, sex, race and Hispanic origin, age and marital status. The housing data on STF1 include tenure (own or rent), structure type (single family or multi-family), home value or monthly rent, and vacancy characteristics.

STF3 is from the sample count or census "long form," which in 1990, was a sample of 1 in 6 households nationwide. The long form included the same basic demographic and housing items as the short form, as well as additional questions on social and economic characteristics and many housing characteristics. Of particular interest to transportation planners, the economic section includes such items as labor force status, place of work and journey to work, and income. The housing section includes a question on the number of vehicles available to each household.

The 1990 Census Transportation Planning Package (CTPP) and its 1980 predecessor, the Urban Transportation Planning Package (UTPP)

The CTPP is a set of tabulations of 1990 census data tailored to meet the data needs of transportation planners. While standard census products report data by residential geography, the CTPP includes many tables by workplace geography, and for worker characteristics. Tables that are especially useful are the "flow data" that show both the population and commuting characteristics from a specific residential area to a specific workplace area, for example, from Neighborhood X to Downtown Y.

The CTPP, considered a "special tabulation," was produced by the Bureau of the Census under the sponsorship of State Departments of Transportation under a pooled funding arrangement with the American Association of State Highway and Transportation Officials. Funding for the development of the CTPP was provided by the Federal Highway Administration and the Federal Transit Administration. The CTPP has nationwide coverage, and includes a statewide element and an urban element.

The UTPP was produced with the 1980 census data, but only for major metropolitan areas that contracted individually with the Bureau of the Census. The structure of the UTPP is similar to the CTPP, with tabulations for residence geography, workplace geography, and for the flow between residence and workplace.

Subject Summary Tape File 20, "Journey to Work in the United States"

This subject file includes three- and four-way cross tabulations concentrating on travel mode and travel time to work with demographic characteristics such as age, sex, race and Hispanic origin, and earnings. The file only includes data for large geographic units, with totals for the United States and for metropolitan areas. Information for central cities in metropolitan areas is also included.

Public Use Microdata Sample (PUMS)

The PUMS files include a sub-sample of records containing essentially all the 1990 census data collected about individual persons in a sample household and the characteristics of the housing unit. All personal identifiers are removed, and the geographic unit reported is fairly large, with a minimum of 100,000 persons in each Public Use Microdata Area (PUMA). There are three PUMS files from the 1990 census: a 5-percent file, a 1-percent file, and a 3-percent "elderly" file.

Microdata files enable the data user to prepare custom tabulations, rather than rely on those tabulations designed for standard or special products. Most tabulations in STFs are restricted to two-way and three-way cross tabulations, but with the microdata, a regression model using five or more variables can be constructed and tested.

Geographic Files

The Bureau of the Census with the assistance of the U.S. Geological Survey built the Topologically Integrated Geographic Encoding and Referencing (TIGER) database to automate the full range of cartographic and geographic processes for data collection, tabulation, and dissemination of the 1990 decennial census. The result is a computer database containing every street and road in the United States, the name of most roads, address ranges for many street segments, and 1980 and 1990 census geographic area codes. The TIGER file provides the geographic structure, the relationship of one geographic area to other geographic areas, that allows the user to assign a structure to the correct census block, block group, census tract, place, county or state.

Additional Resources

For more information about Census data in transportation, these documents may be helpful.

Myers, Dowell. *Analysis with Local Census Data: Portraits of Change.* Academic Press, Inc., San Diego, 1992.

Pisarski, Alan E. *New Perspectives in Commuting.* Report FHWA-PL-92-026, FHWA, U.S. Department of Transportation, 1992.

Rossetti, Michael A. and Eversole, Barbara S. *Journey to Work Trends in the United States and Its Major Metropolitan Areas, 1960-1990.* Report FHWA-PL-94-012, FHWA, U.S. Department of Transportation, 1993.

Census Data and Urban Transportation Planning in the 1980s. Transportation Research Record 981, Transportation Research Board, National Research Council, Washington, D.C., 1984.

Using 1990 Census Data to Support Transportation Planning and Policy Development. Brochure FHWA-PD-94-036, FHWA, U.S. Department of Transportation, 1994.

Proceedings, GIS-T '94, Geographic Information System for Transportation Symposium, Norfolk, Va. 1994, American Association of State Highway and Transportation Officials.

Summary Report, GIS-T '94, Geographic Information System for Transportation Symposium, Norfolk, Va. 1994, American Association of State Highway and Transportation Officials.

For more information on ordering Census data:

To order STF, SSTF, TIGER, PUMS on computer tapes and CD-ROMs:

Customer Services
Bureau of the Census
Washington, DC 20233-0800
301-457-4100
FAX: 301-457-4714

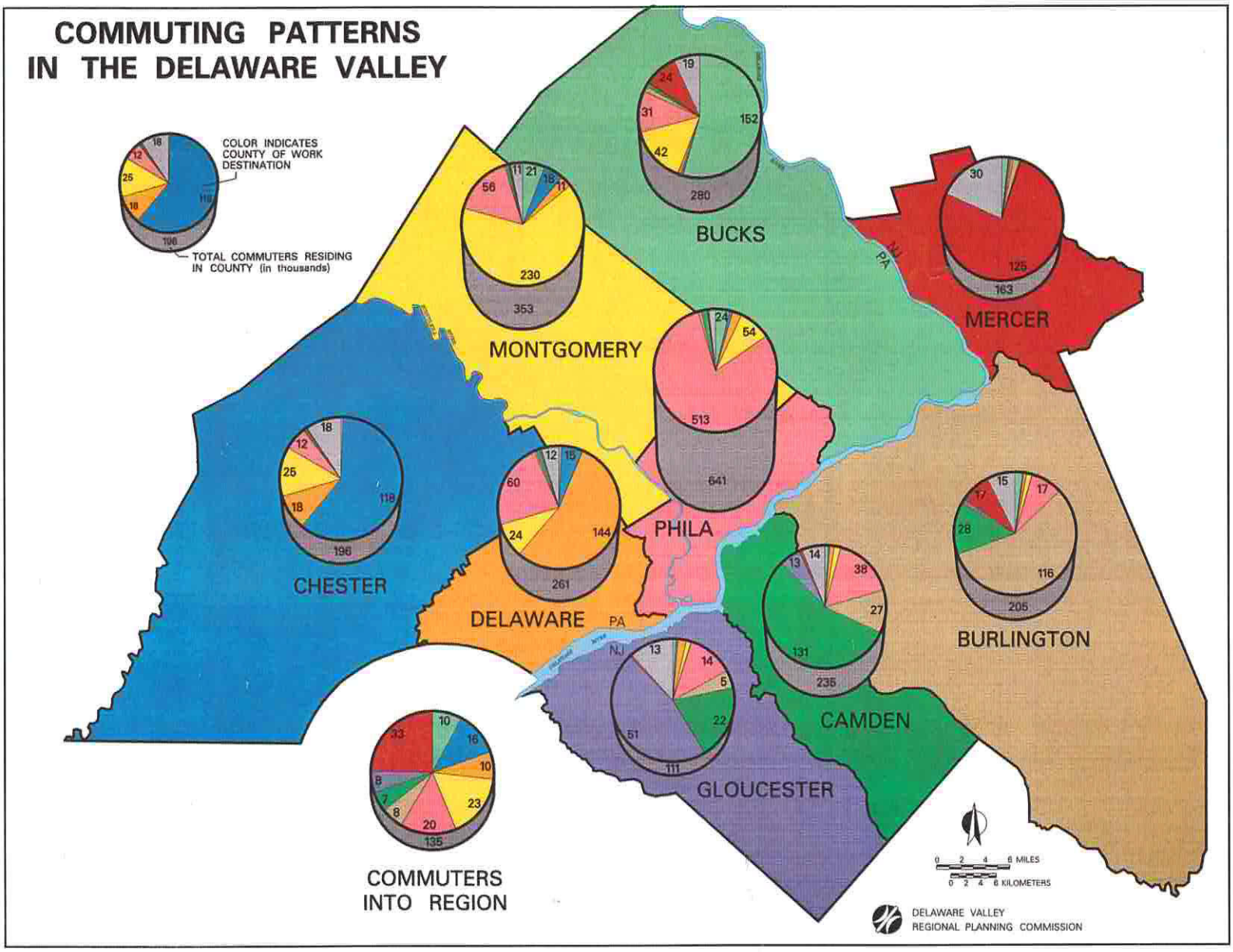
Additional Resources (continued)

To request CTPP on CD-ROM:

Bureau of Transportation Statistics
400 7th Street SW
K-1
Washington, DC 20590
202-366-3282

For other CTPP questions:

Journey to Work and Migration Branch
Bureau of the Census
Washington, DC 20233
301-457-2454



This map shows both the number and geographic distribution of home-to-work trips that occurred in the 9 county area encompassing Philadelphia, Pennsylvania. The three dimensional, color coded, pie charts indicate both the proportion and magnitude of where workers of a particular county are employed.

Each county is represented by a different color on the map and pie charts. Each pie chart also depicts the number of residents employed outside of the DVRPC region (the gray pie underneath). Finally, an additional pie chart, in the lower left corner, indicates the employment of workers residing outside of the DVRPC.

Software: Intergraph

Hardware: Unix Workstation
Versatec Electrostatic Plotter

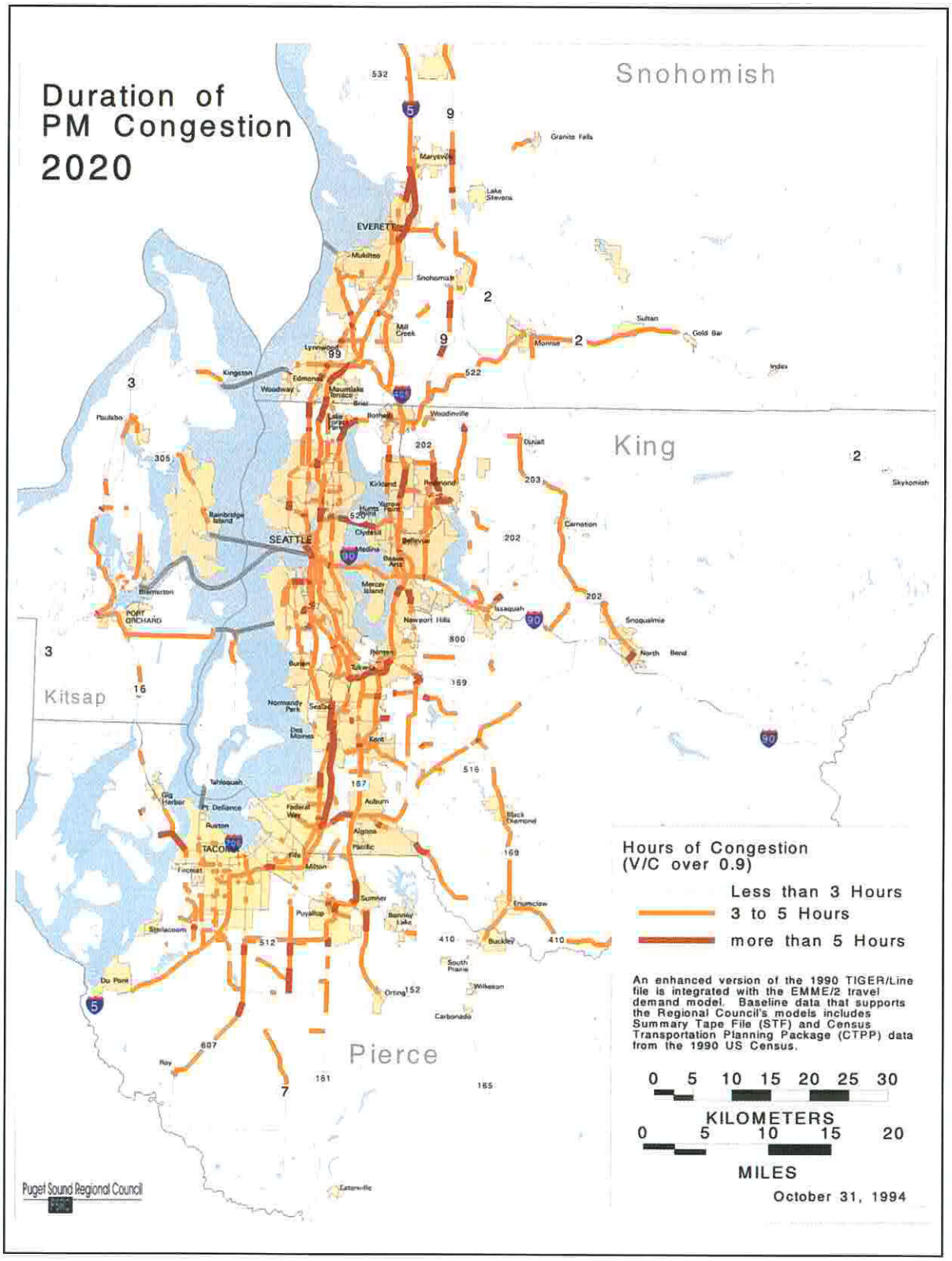
Data Source: U.S. Census Bureau
CTPP, Part 3 (Urban)

2

Software: ARC/INFO

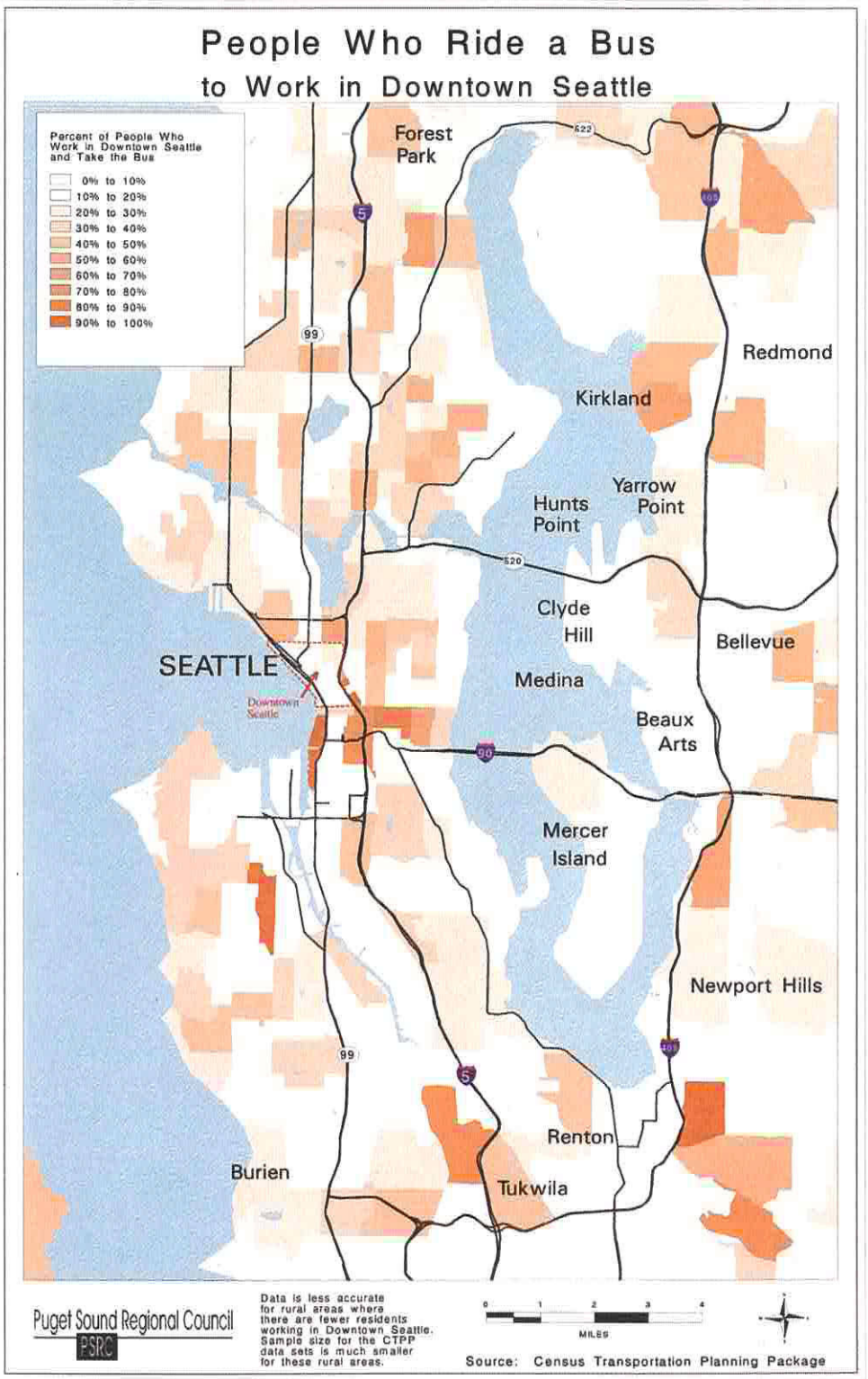
Hardware: Sun Sparcstation 10 Workstation
Hewlett Packard 650C Plotter

Data Source: U.S. Census Bureau
TIGER, CTPP, STF



This map demonstrates the amount of extra travel time, due to traffic congestion, predicted for Seattle area highways by the year 2020. This is based on the assumption of no highway construction after 1996, and a 90% plus use of capacity of the road network.

A three class interval model was created from EMME2 travel demand model.



Software: ARC/INFO

Hardware: Sun Sparcstation 10 Workstation
Hewlett Packard 650C Plotter

Data Source: U. S. Census Bureau
CTPP, TIGER

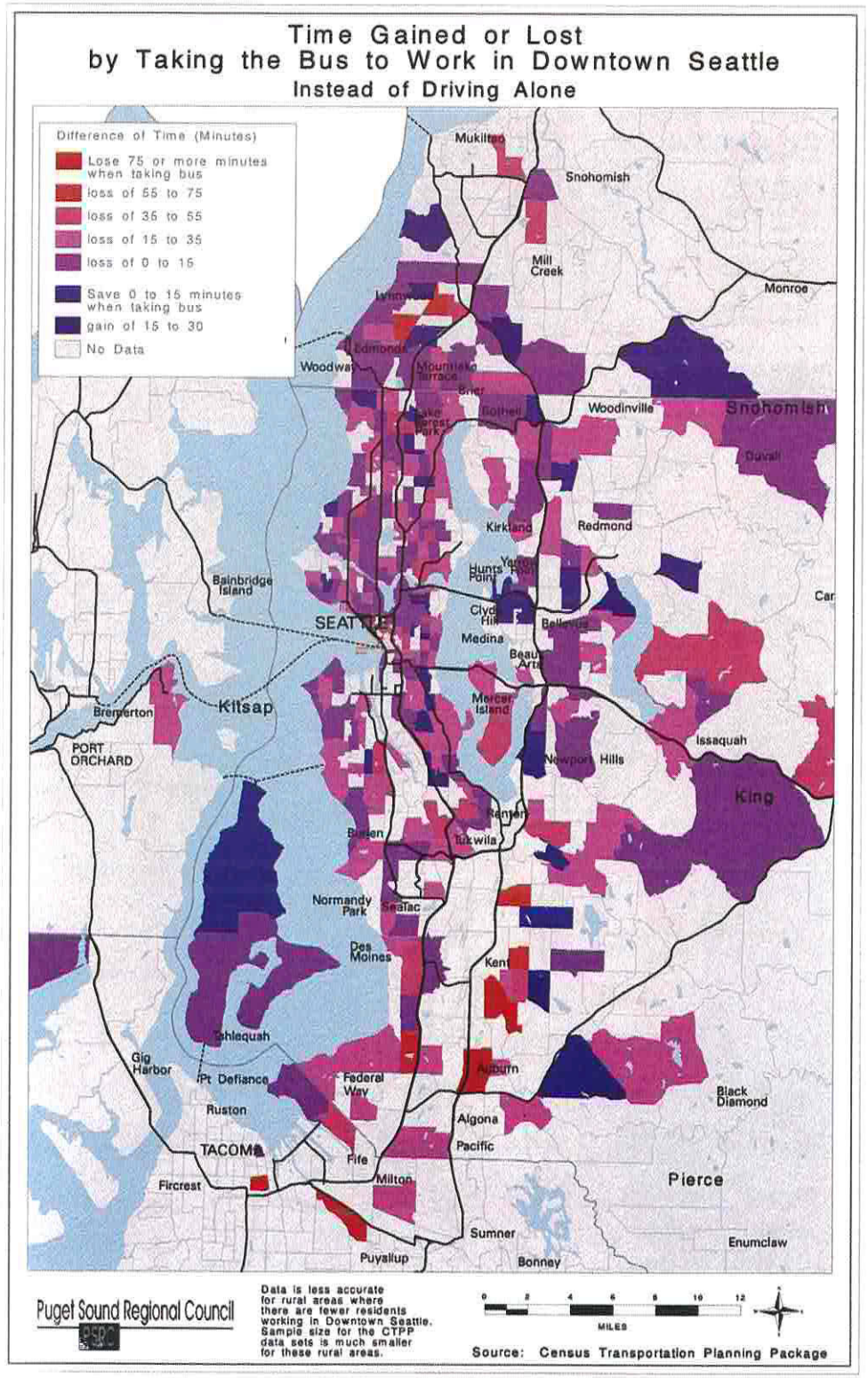
This map shows the percentage of workers in the Seattle area who use a bus as their primary means of travel to work to downtown Seattle. The data is displayed by TAZ using a 1 color gradation scheme, across 10 "class intervals", with percentages ranging from 0 to 100 percent.

The highway network is an enhanced version of the 1990 TIGER/Line files.

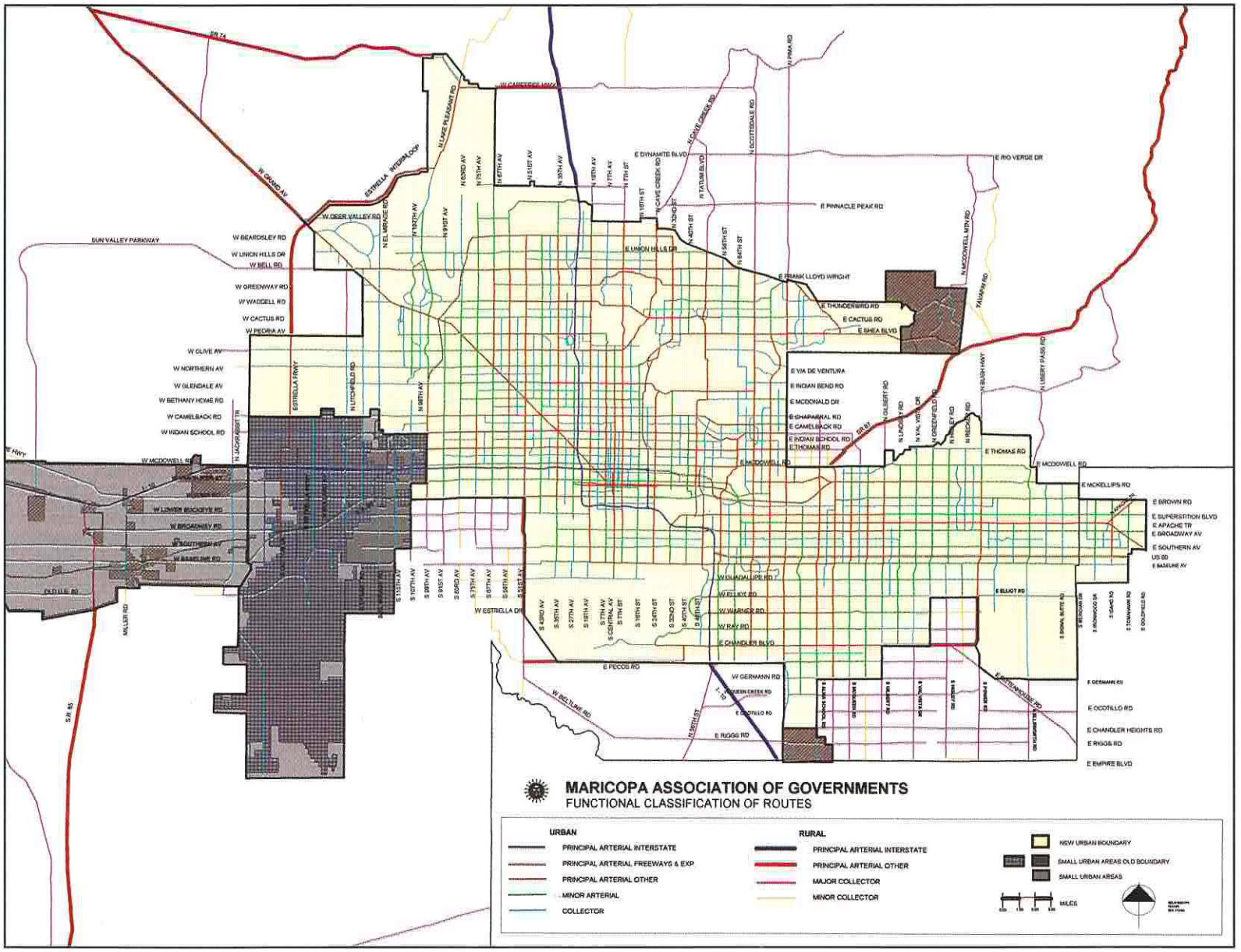
Software: ARC/INFO

Hardware: Sun Sparcstation 10 Workstation
Hewlett Packard 650C Plotter

Data Source: U.S. Census Bureau
TIGER, CTPP



This map shows the difference in time from riding the bus instead of driving alone. Data is summarized by TAZ.



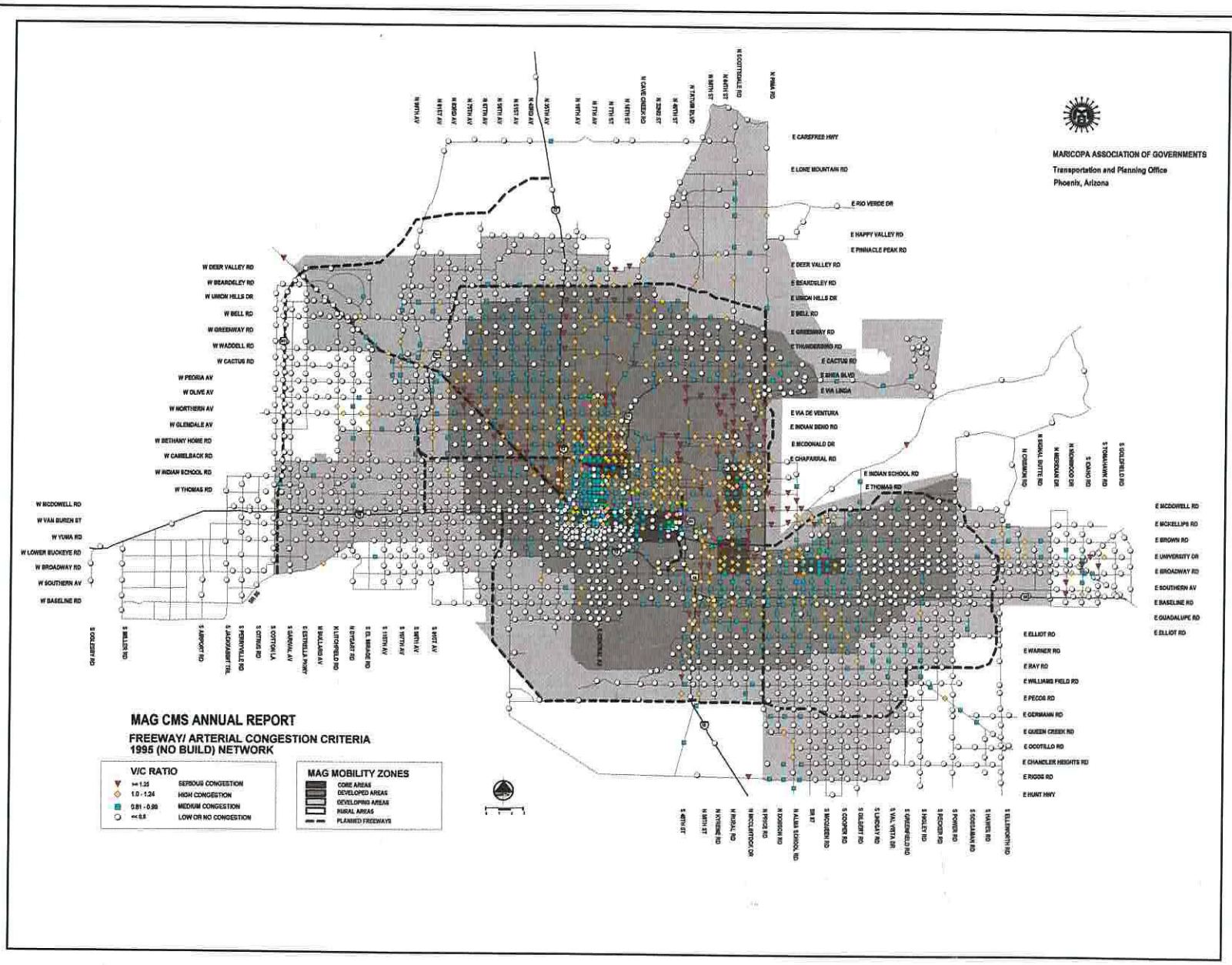
This map illustrates the various urban and rural roads classifications in use in the Maricopa Area. Census Bureau 1990 UA (Urbanized Area) Boundaries were used to code appropriate sections of highway as either "Urban" or "Rural." This was done to make highway network data conform to the Federal Highway Administration's HPMS (Highway Performance Management System) standards.

With FHWA approval, UA boundaries were "smoothed" where required to make display both more accurate and easier to read.

Software: MapInfo

Hardware: IBM compatible 486/50 PC Workstation
Hewlett Packard 650C Inkjet Plotter

Data Source: U.S. Census Bureau Population Data



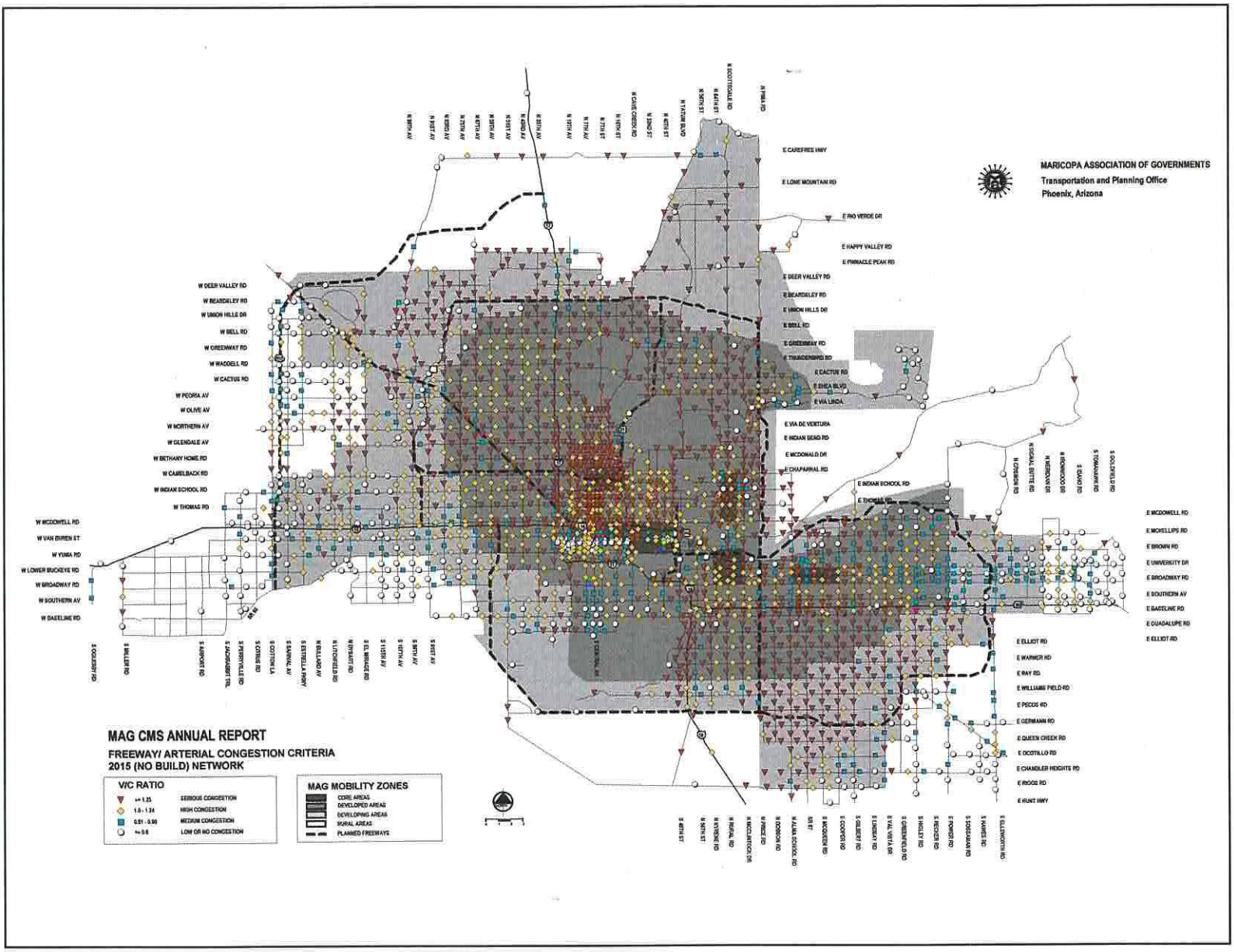
Software: MapInfo

Hardware: IBM compatible 486/50
PC Workstation
Hewlett Packard 650C
Inkjet Plotter

Data Source: U.S. Census Bureau
Population Data

This map illustrates what road congestion levels will be in 1994. "Volume-to-capacity" ratios were calculated for existing roads and overlaid with traffic levels in the year 1994. These values are placed in 4 classes, and color coded. Values over 1.00 mean that volume exceeds capacity.

Projected traffic levels are based on a base year 1990. Data is derived from CTPP data, and aggregated at the TAZ level. Projections to year 1994 were made using the standard "4 step transportation modeling process," as found in UTPS and EMME2 software.



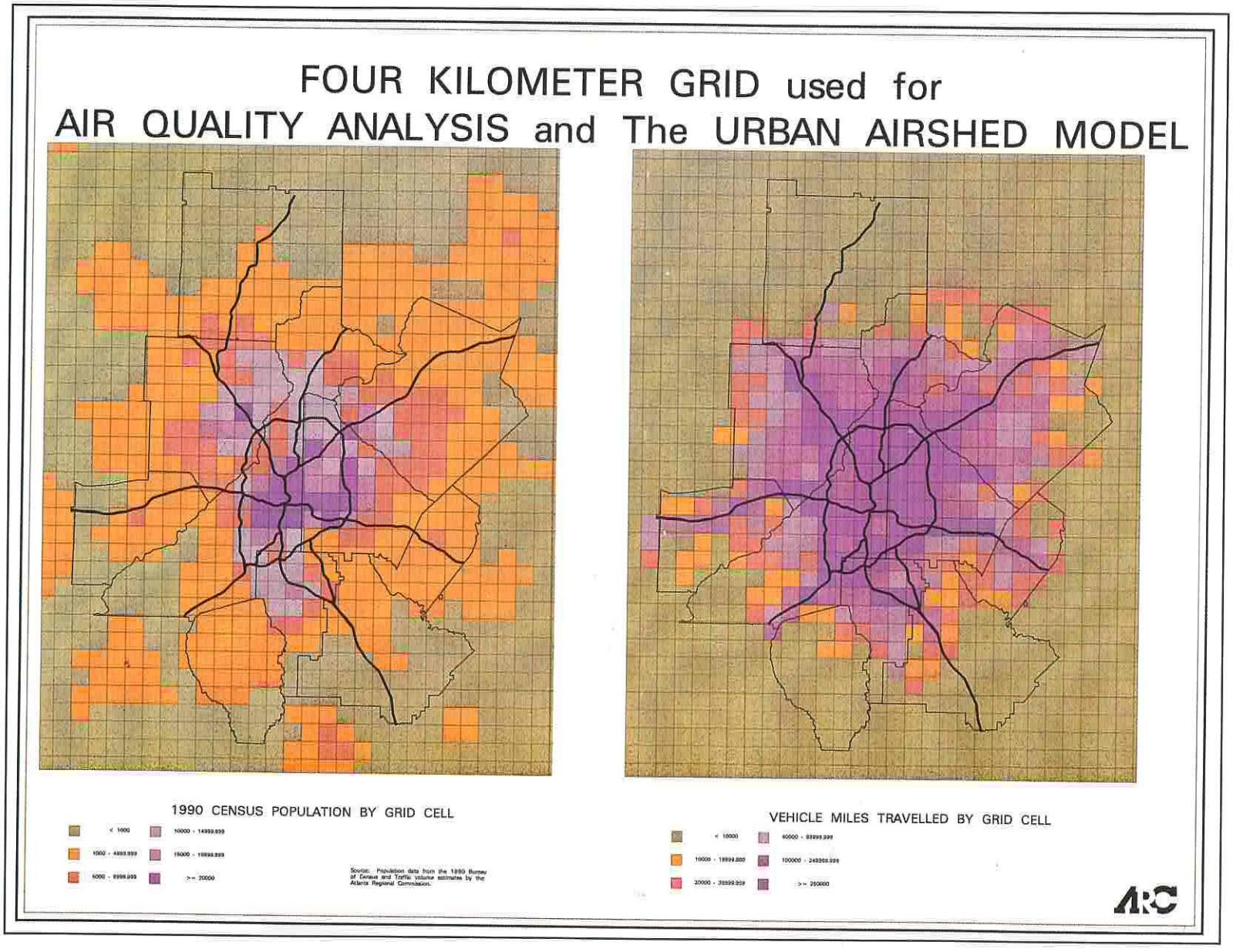
This map illustrates what road congestion levels will be by 2015, if no freeways are built after 1994. "Volume-to-capacity" ratios were calculated for existing roads, and overlaid with projected traffic levels in the year 2015. These values were placed in four classes, and color coded. Values over 1.00 mean that volume exceeds capacity.

Projected traffic levels are based on a base year 1990. Data is derived from CTPP data, aggregated at the TAZ level. Projections to year 2015 were made using the standard "4 step transportation modeling process," as found in UTPS and EMME2 software.

Software: MapInfo

Hardware: IBM compatible 486/50 PC Workstation
Hewlett Packard 650C Inkjet Plotter

Data Source: U.S. Census Bureau CTPP Data



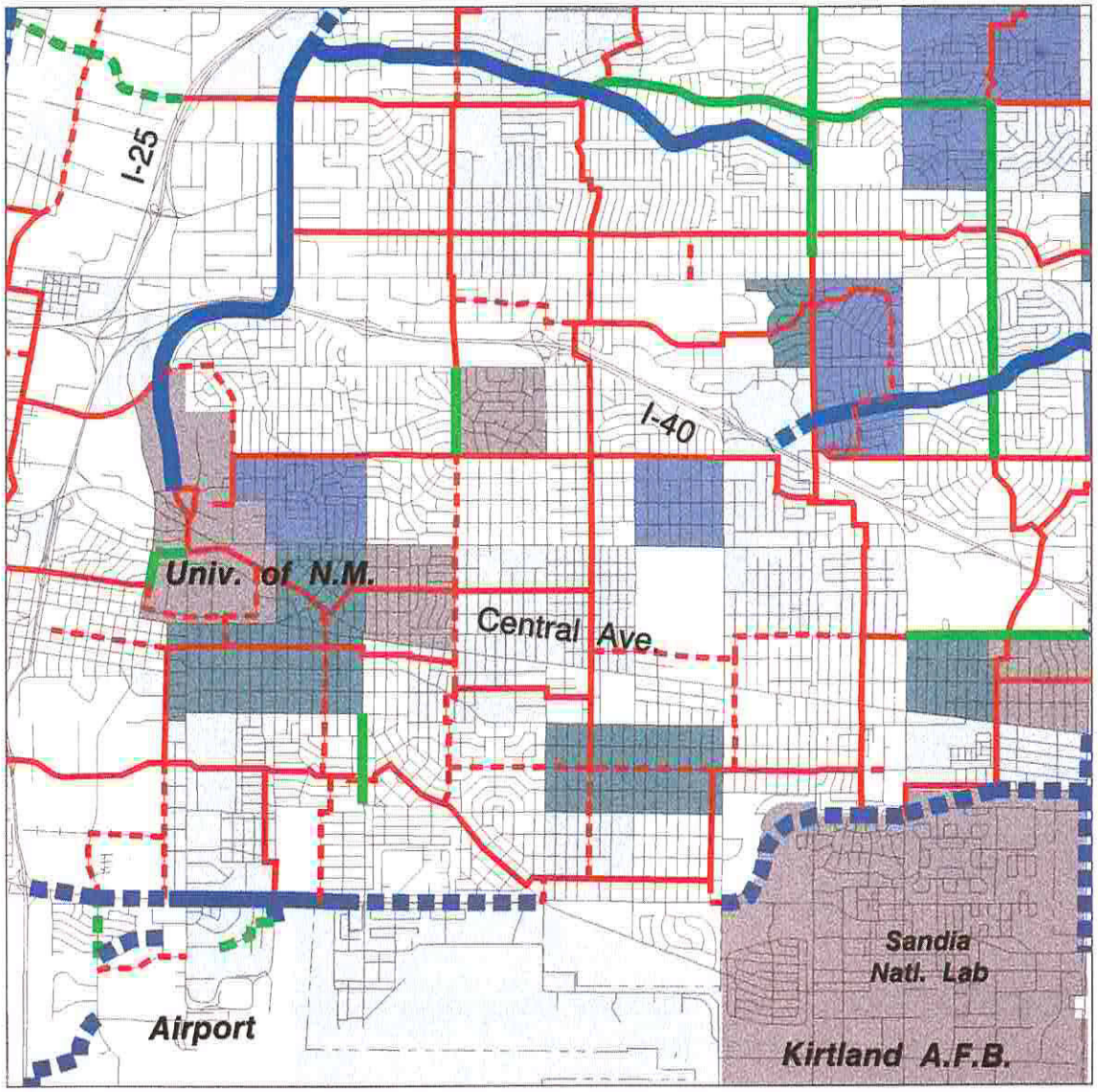
Software: ARC/INFO

Hardware: Digital Alpha 4610 Unix Workstation
Hewlett Packard Color Electrostatic Plotter

Data Source: U.S. Census Bureau STF 1A

This map shows the relationship between the population levels and the automobile emission levels in the Atlanta regional area. 1990 population data was displayed at the census tract level, and overlaid by a 4-by-4 kilometer grid.

The first map shows population density by grid cell. The second map shows the intensity of vehicle miles travelled by cellgrid.



BICYCLE FACILITIES ON BIKEWAYS MASTER PLAN
- EXISTING TRAIL
- PROPOSED TRAIL
- EXISTING LANE
- PROPOSED LANE
- EXISTING ROUTE
- PROPOSED ROUTE

PERCENT OF EMPLOYED PERSONS COMMUTING BY BICYCLE BY DATA ANALYSIS SUBZONE
- <1%
- 1.0% - 1.9%
- 2.0% - 2.9%
- 3.0% - 3.9%
- >4%

Bicycle Commuters and Bikeways Master Plan

Map showing a portion of the Albuquerque Metropolitan Planning Area

Prepared by the Middle Rio Grande Council of Governments of New Mexico

Middle Rio Grande Council of Governments
317 Commercial N.E., Suite 300
Albuquerque, N.M. 87102 (505) 247-1750

Source: U.S. Bureau of the Census, 1990 Census, Census Transportation Planning Package, Part 2.

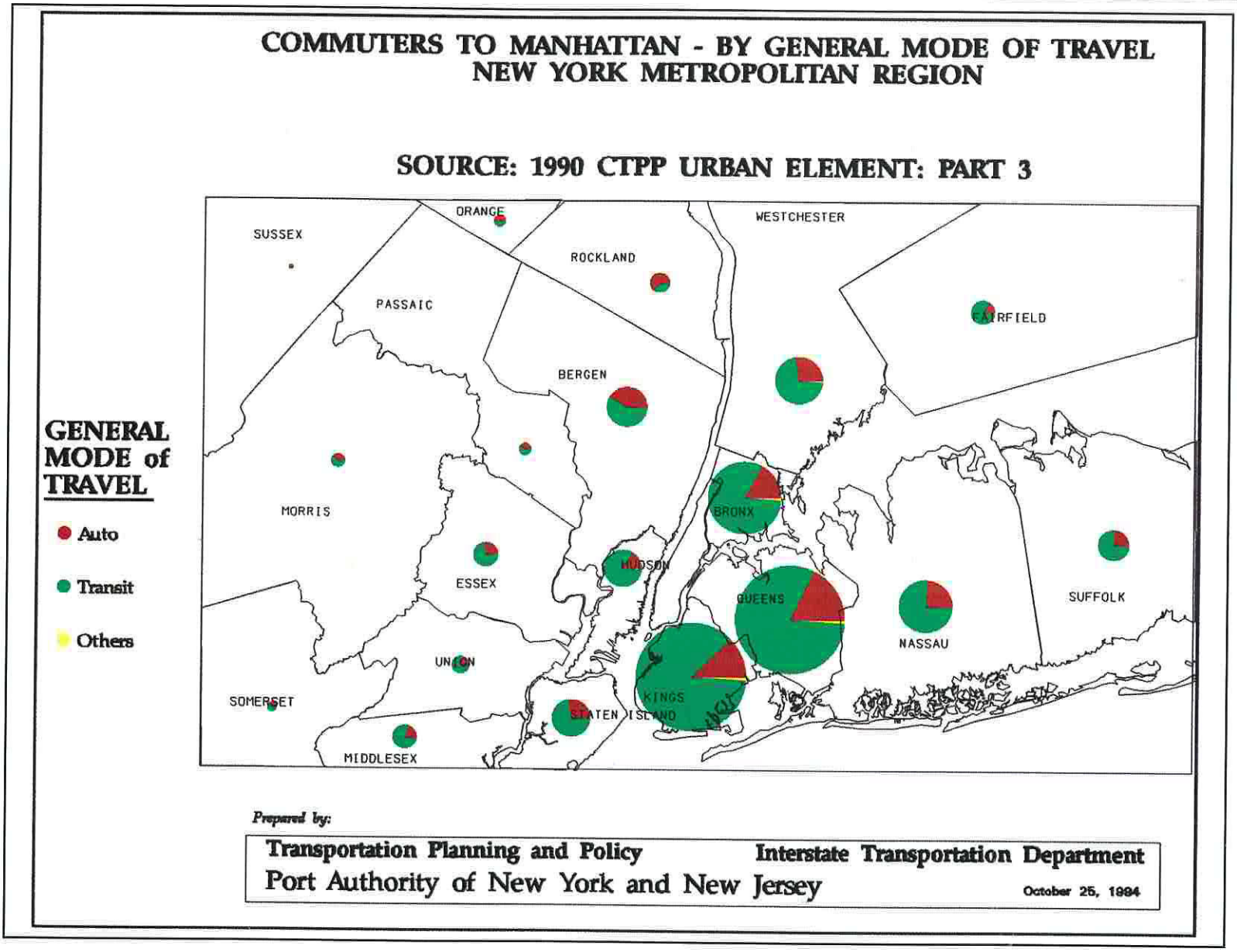
Software: ARC/INFO

Hardware: Sun File Server
Tektronix 4207 terminal
Hewlett Packard 650C
Inkjet Plotter

Data Source: U.S. Census Bureau
CTPP, Part 2
City of Albequerque
street coverage

This map shows the relationship between areas of employment where workers commuted by bicycle, and the existing and proposed bikeways. The map used data from the CTPP.

The map shows which subzones had higher percentages of employees arriving to work by bicycle. New trails and bikeways are proposed annually based on changes in these areas.



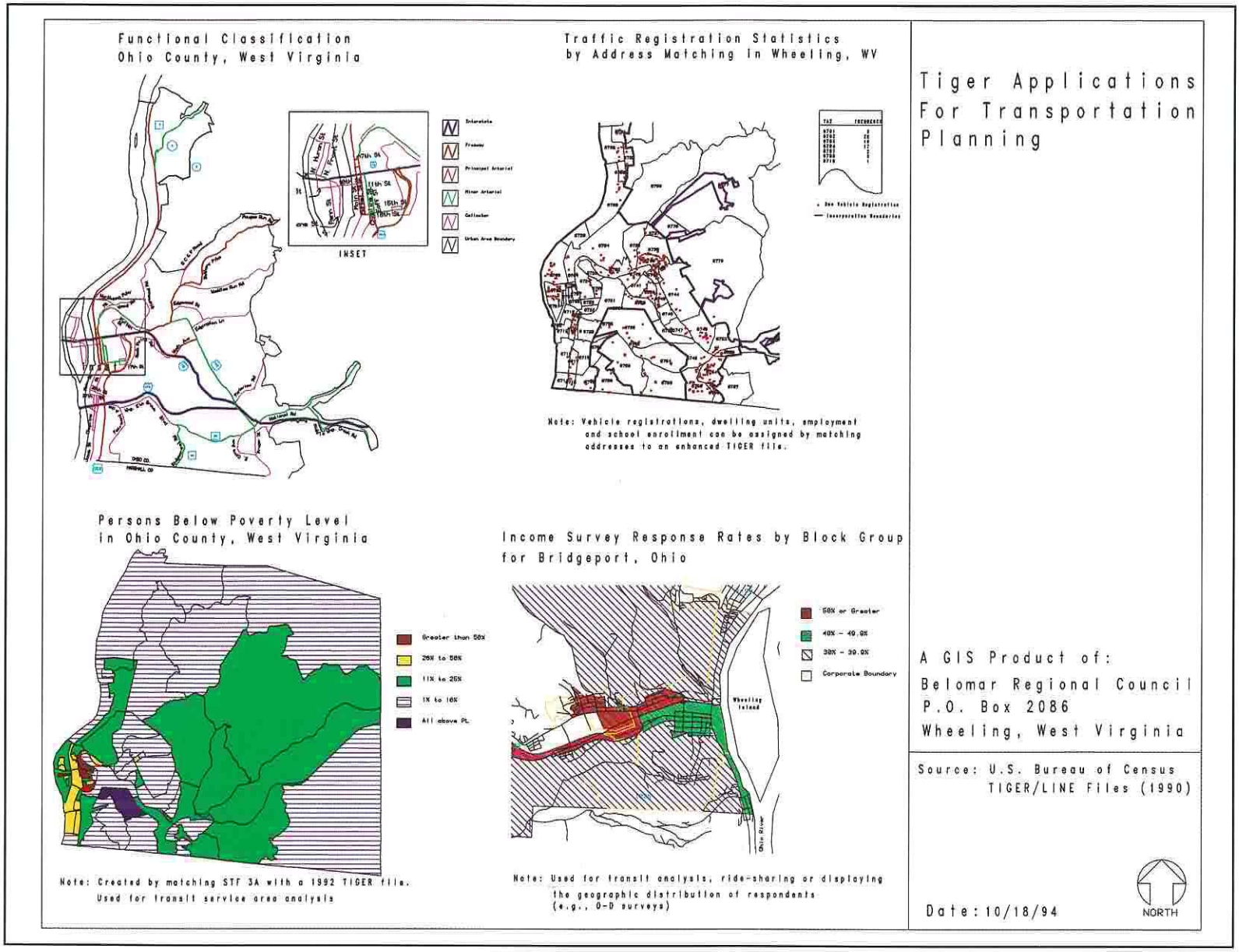
Software: ARC/INFO

Hardware: Sun Workstation
Calcomp 5912
Thermal Plotter

Data Source: U.S. Census Bureau
TIGER, CTPP

This map shows home-to-work patterns into Manhattan from the greater New York area. The size of each pie chart indicates the magnitude of the commuting into Manhattan from that borough or county.

Individual "slices" show the percentage of that mode of travel from each locality. This map illustrates the extent of transit's dominance (75% share) for work travel from all places in the region into Manhattan.



These 4 maps demonstrate some planning applications developed by a small MPO.

The maps at the top of the page use TIGER/Line files. One shows major road classes. The other shows data on vehicle registrations, dwelling units, and other statistics. This data is assigned to street addresses found in the enhanced TIGER/Line files.

The maps at in the lower half of the page display data from STF3A. The maps display income survey data, and poverty levels, at the Census "Block Group" level. Data is overlayed onto the highway network, and used in ridesharing analysis.

Software: pcARC/INFO ver 3.4D+

Hardware: Compaq 486/33 Desktop
Hewlett Packard 650C
Inkjet Plotter

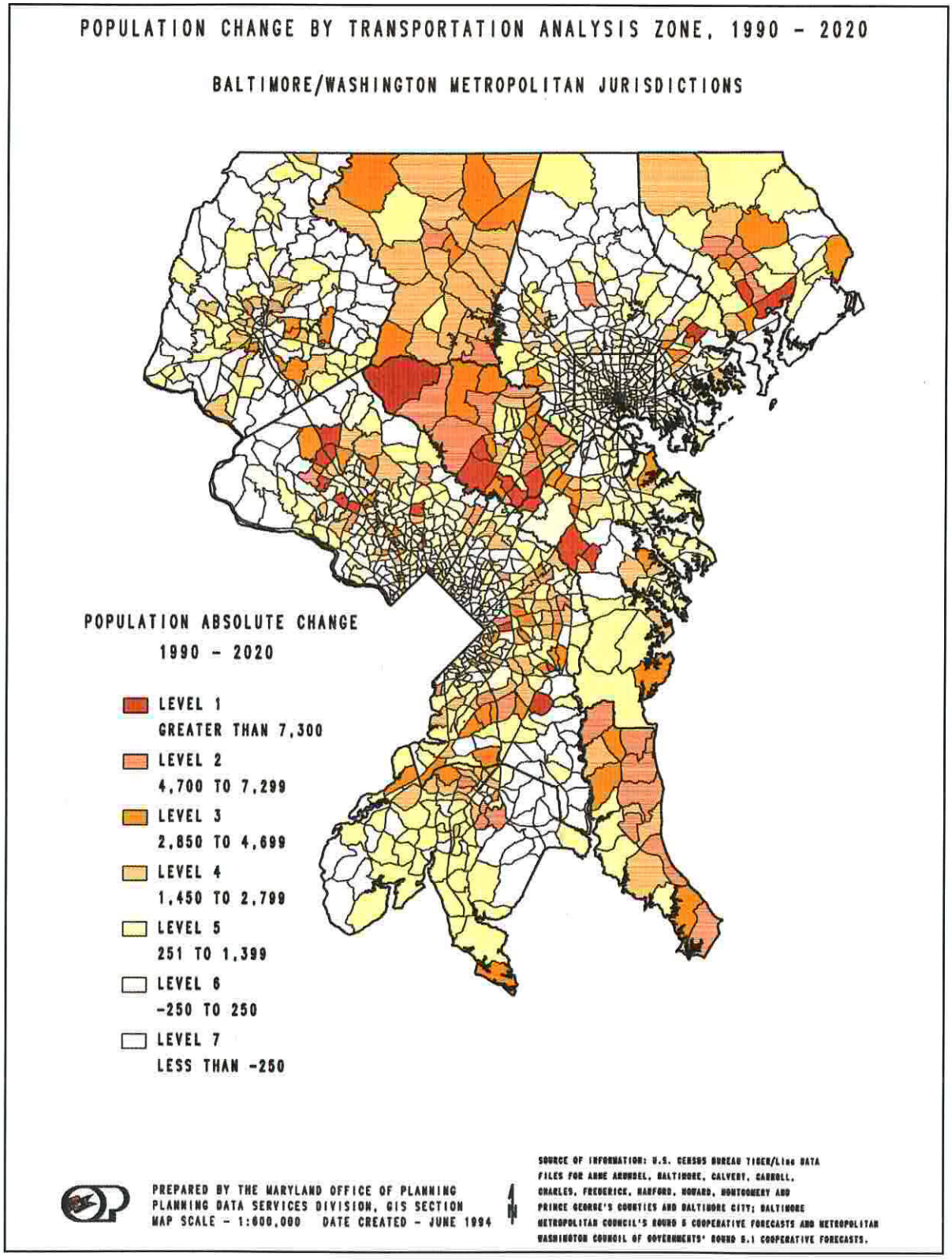
Data Source: U.S. Census Bureau :
Enhanced TIGER
STF 3
Address files for Income survey

12

Software: pcARC/INFO ver 3.4D+

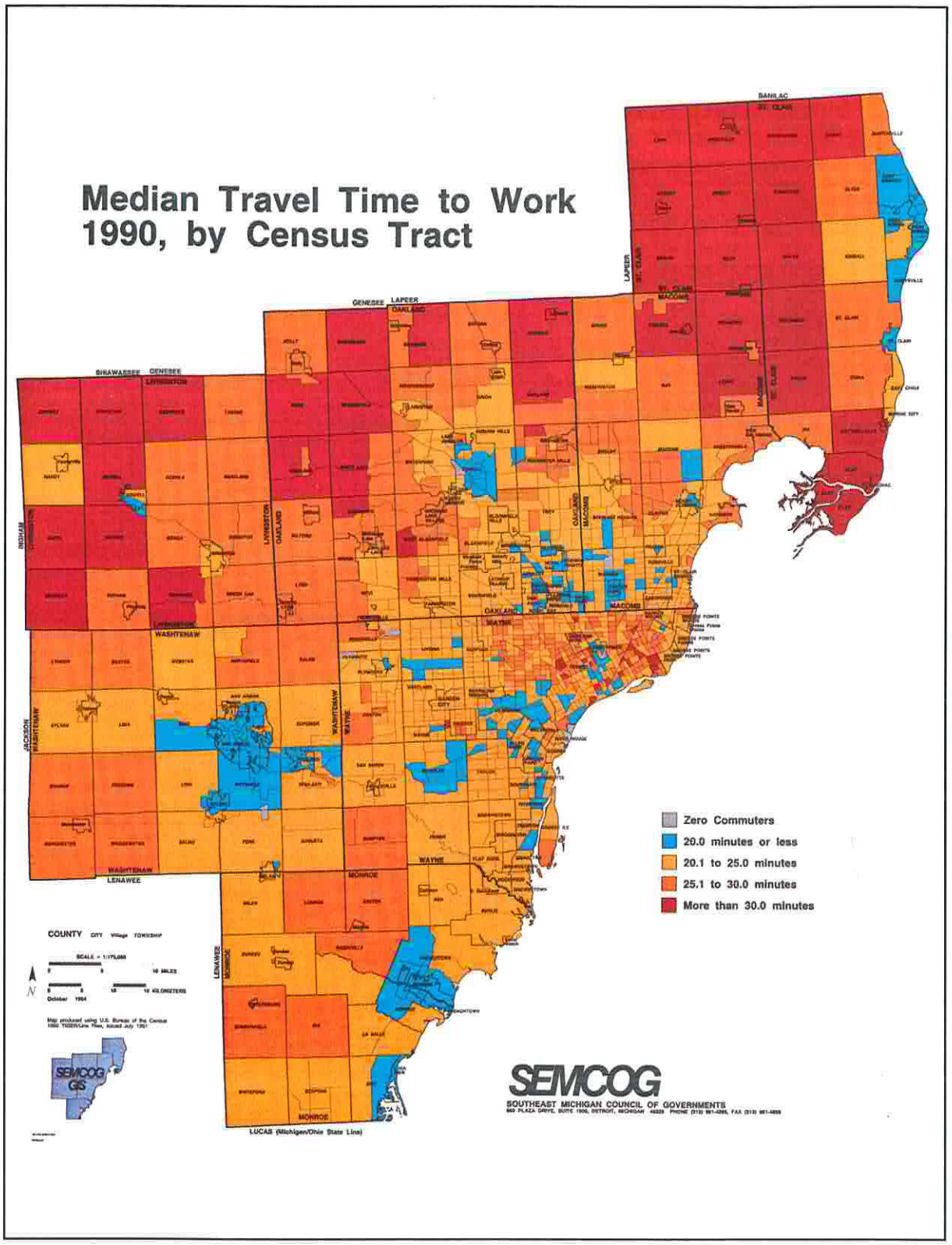
Hardware: Hewlett Packard 486 Workstation
Xerox 4700 Color Printer

Data Source: U.S. Census Bureau TIGER
Baltimore Metropolitan Council's Round 5 Cooperative Forecasts; Metropolitan Washington Council of Governments' Round 5.1 Cooperative Forecasts.



Transportation analysis zones (TAZs) are small areas within counties that have been determined by factors such as traffic flow patterns, street networks, number of commuting trips and places of work and residence.

This map indicates the population change by TAZ for the Baltimore-Washington Metro Area. Population changes, by TAZ, show where expected growth will impact the transportation system.



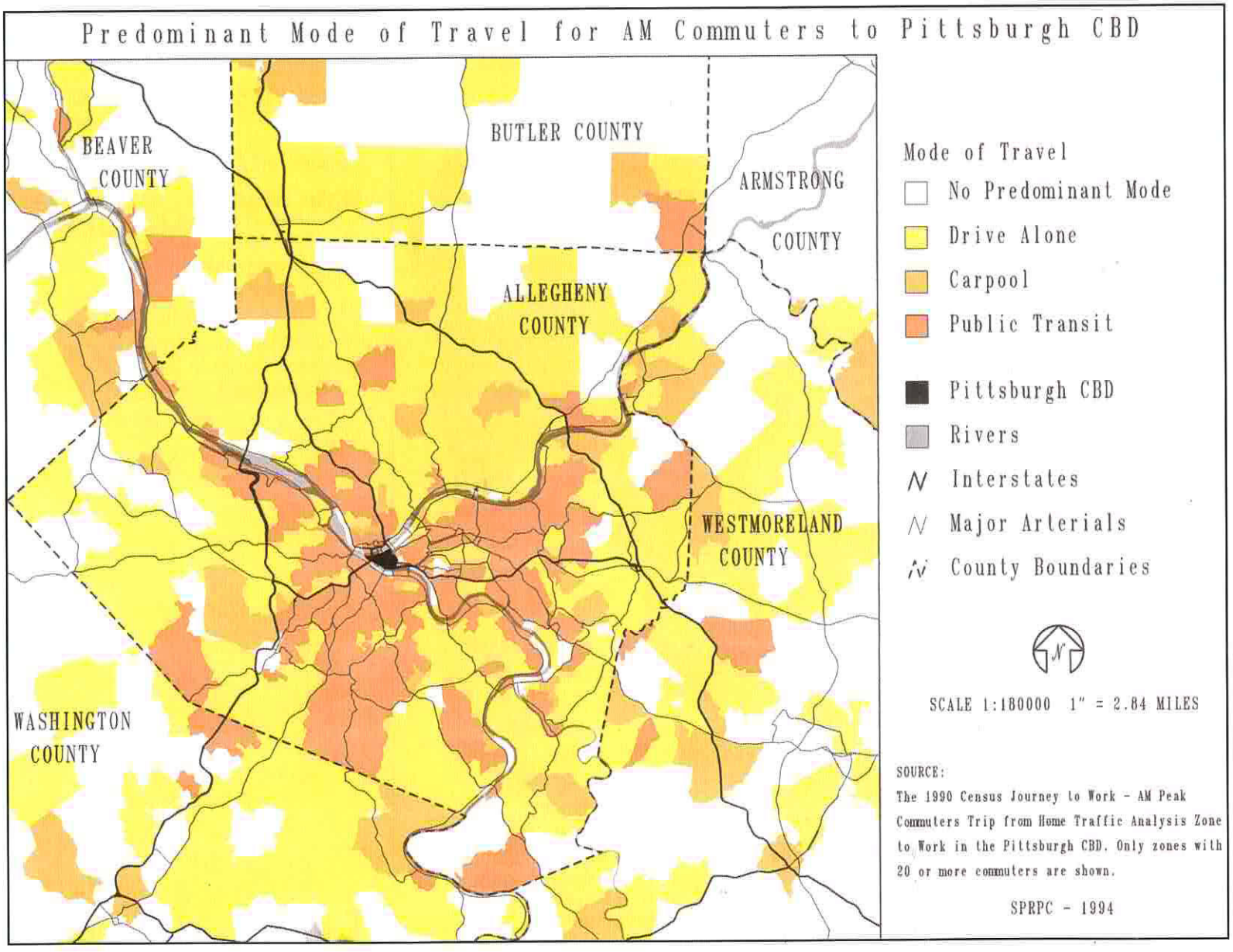
Software: ARC/INFO

Hardware: IBM 6000 Unix Workstation
Hewlett Packard Plotter

Data Source: U.S. Census Bureau
TIGER, STF 3A

This map shows the median travel time to work from place of residence for southeast Michigan .

Data was classed into 4 categories and is displayed by census tract. This data shows that almost without exception, the inner ring suburbs have the shortest travel times to work. Interestingly, most urban areas in the inner urban area of Detroit have long travel times. This is due to high transit usage.



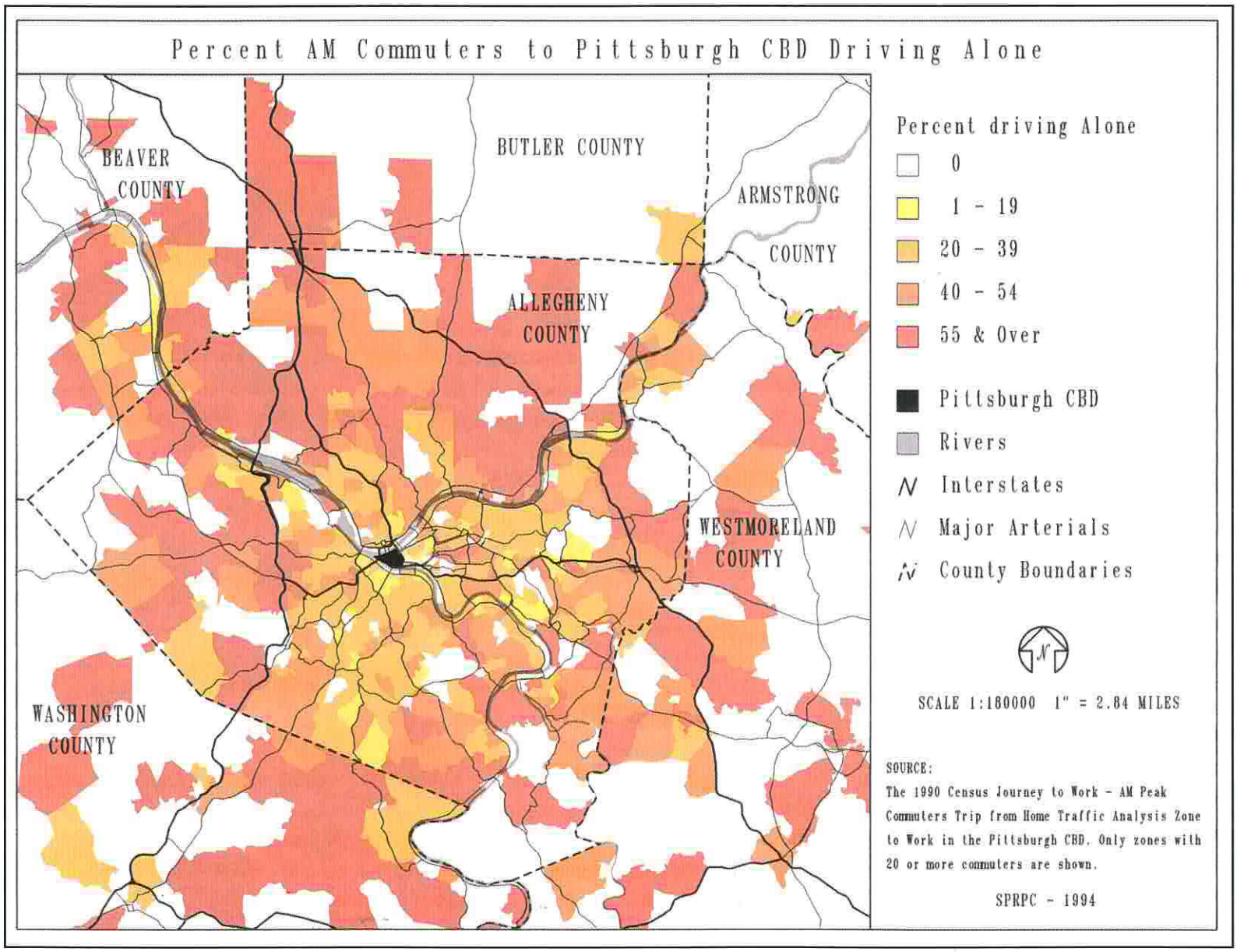
Software: pcARC/INFO ver 3.4

Hardware: 486 Desktop Computer
Encad Nova Jet Color Plotter

Data Source: U.S. Census Bureau
CTPP, Part 3 (Urban)
TIGER

This map shows the predominant mode of transportation used daily by commuters going into the CBD of Pittsburgh, Pennsylvania. Inner area commuters tend to use public transit, while outer suburban region commuters drive alone.

Four major categories were selected, and each assigned a color. The data is displayed by TAZ.



This map shows the percentage of people who drive alone to work in the CBD of Pittsburgh, Pennsylvania. This map complements the data found in the adjoining map on predominant modes of travel.

The percentages are placed into a "5 class interval" distribution and each is assigned a color. The data is displayed by TAZ.

Software: pcARC/INFO ver 3.4

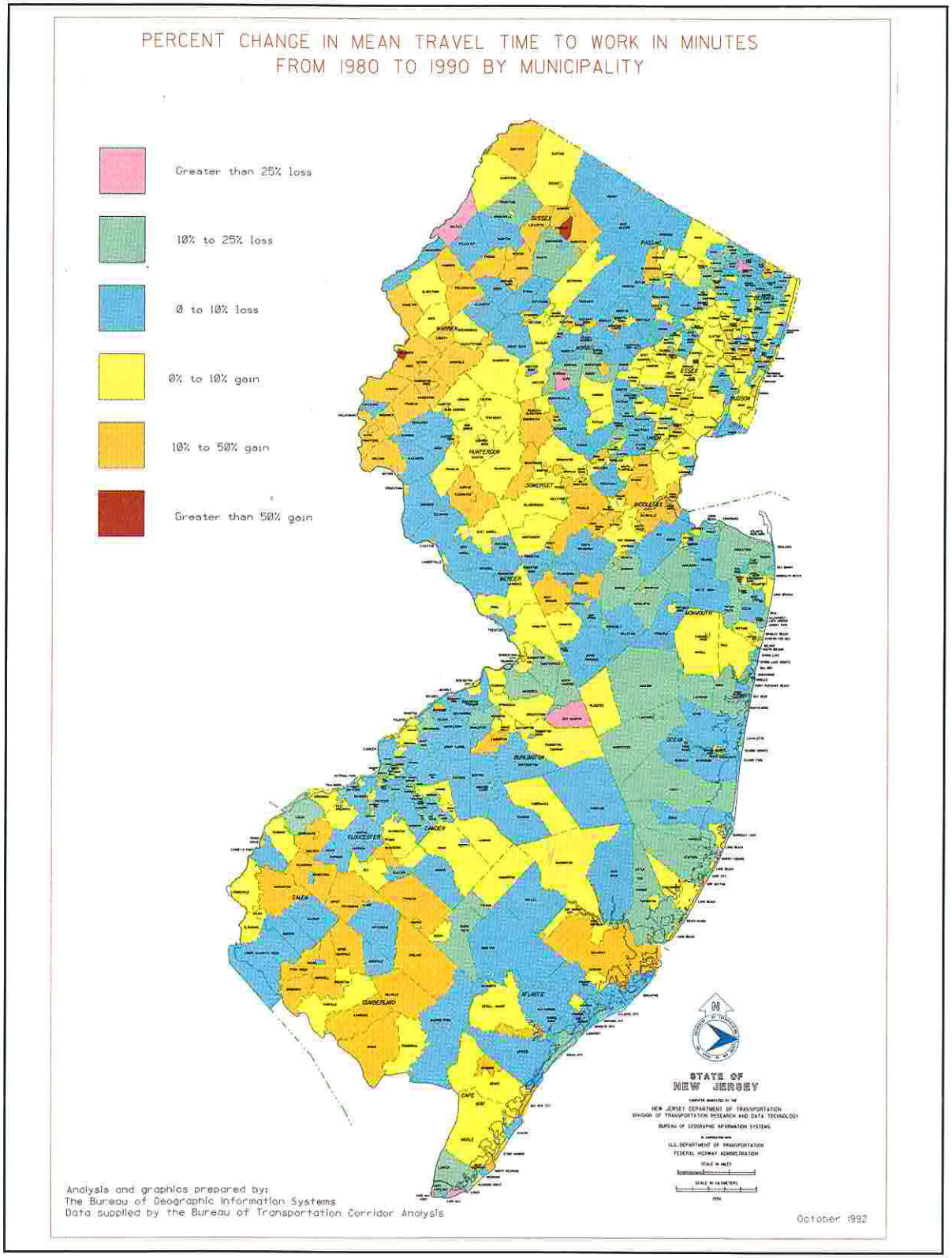
Hardware: 486 Desktop Computer
Encad Nova Jet Color Plotter

Data Source: U.S. Census Bureau
CTPP, Part 3 (Urban)
TIGER

Software: Intergraph MGE

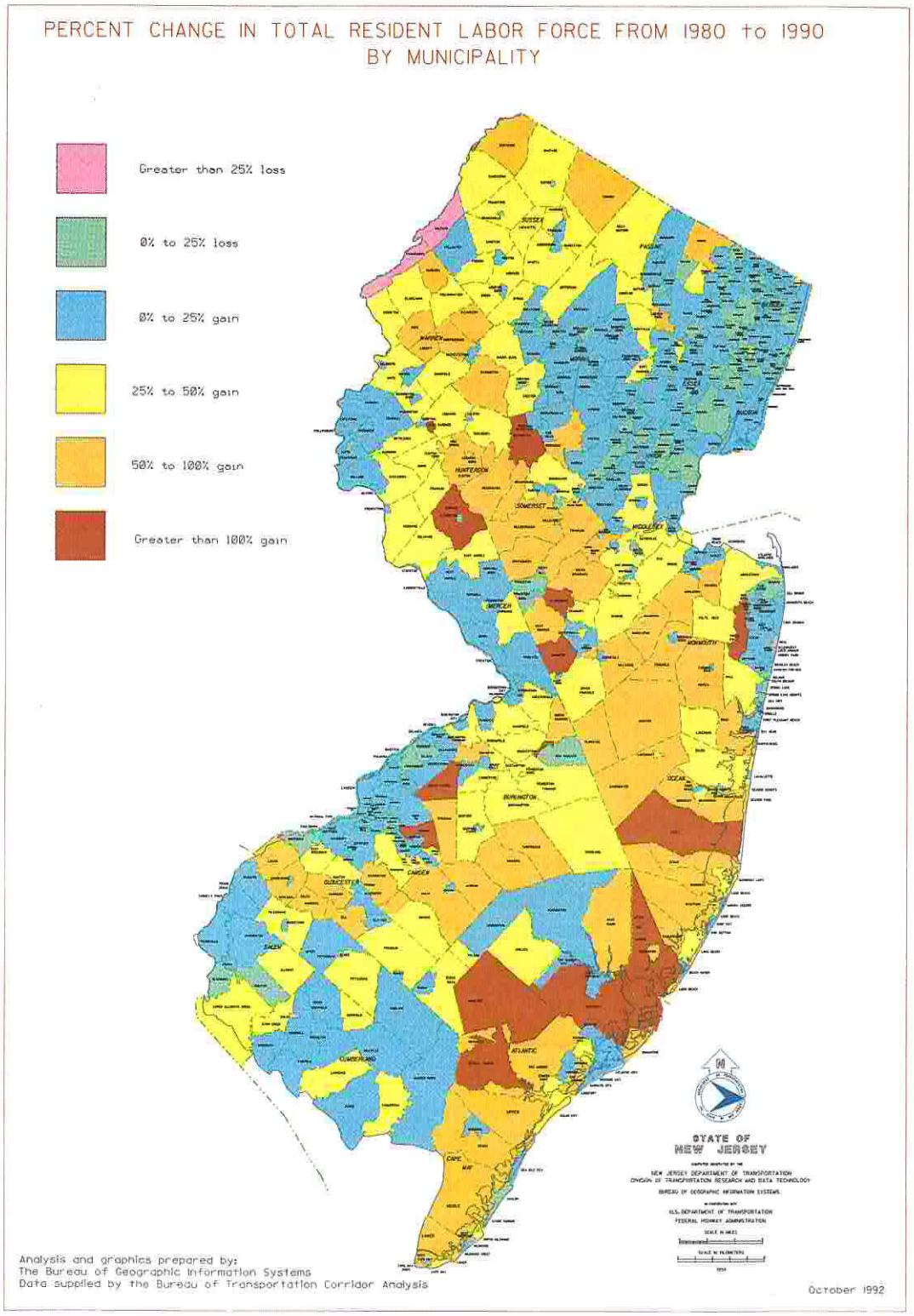
Hardware: Intergraph CLIX Workstation
Hewlett Packard Inkjet Plotter

Data Source: U.S. Census Bureau
Population data 1980
STF 3



This map displays travel time to work per municipality. Shorter trips (losses) to longer trips (gains) are displayed in a 6 class interval scheme.

The map was used in a study to examine where infrastructure enhancements would be required.



Software: Intergraph MGE

Hardware: Intergraph CLIX Workstation
Hewlett Packard Inkjet Plotter

Data Source: U.S. Census Bureau
Population Data, 1980
STF 3

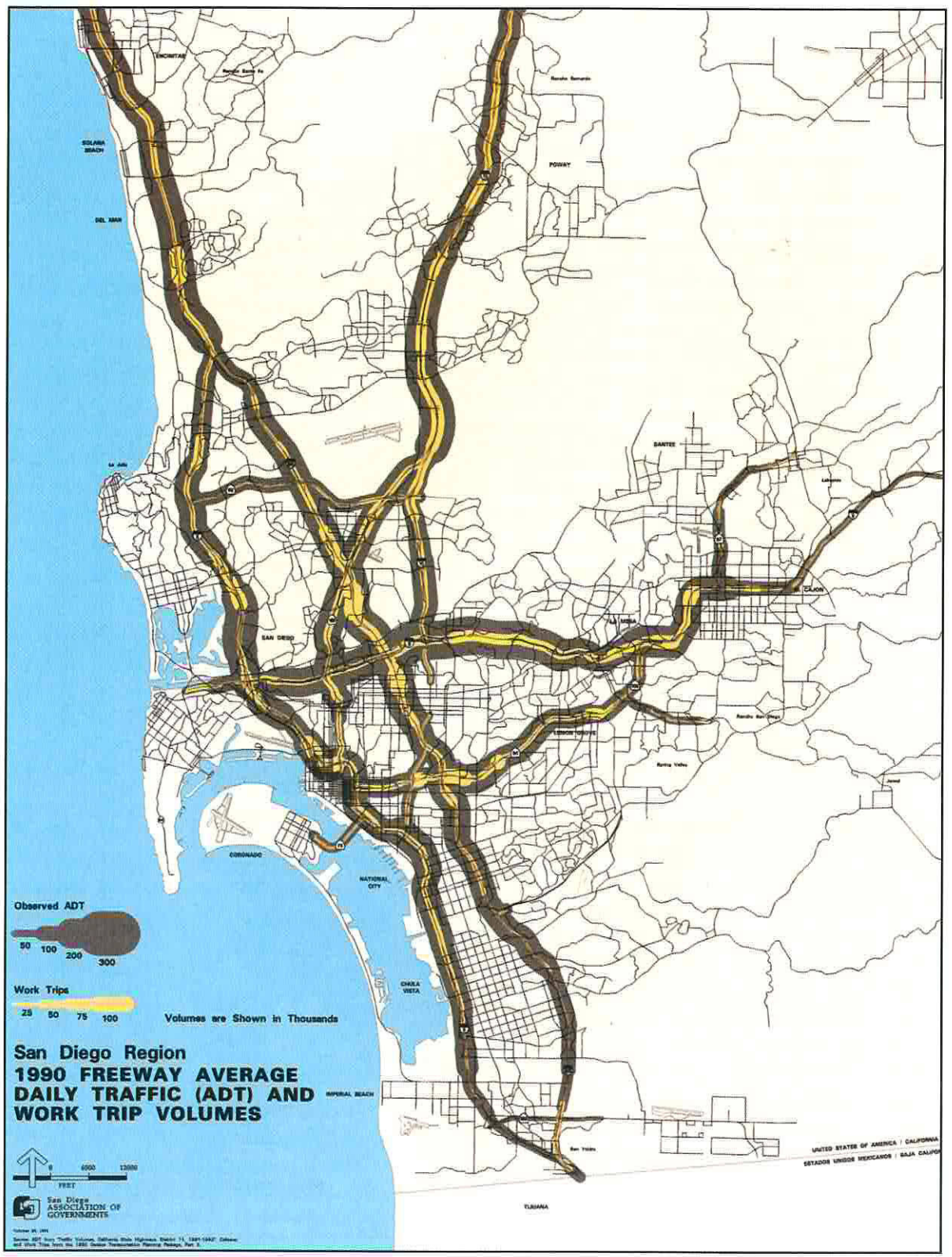
This map displays changes in worker population by residence, by municipality. Absolute decreases (losses) and absolute increases (gains) are displayed in a 6 class interval scheme.

The planning study was completed to examine where infrastructure enhancements would be required.

Software: ARC/INFO

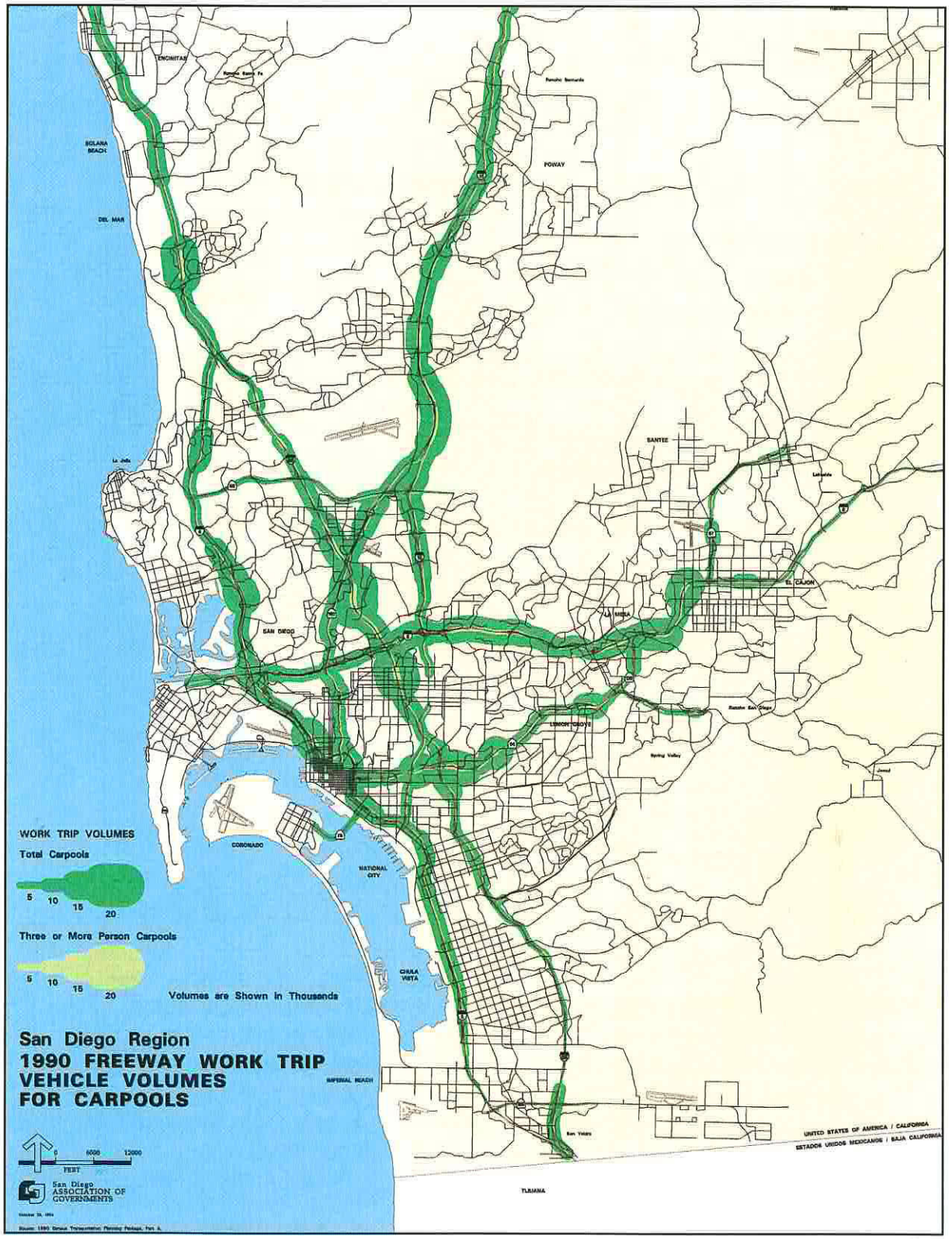
Hardware: Sun Workstation
Hewlett Packard 650C
Inkjet Plotter

Data Source: U.S. Census Bureau
CTPP, Part 3 (Urban)



This map represents the average daily traffic and "work trips" for the freeways in the San Diego Metropolitan Area. Two categories were created: the average daily traffic, and the traffic that is using the freeway to get to and from work.

The two types of volume information are displayed as bandwidths along the major freeways.

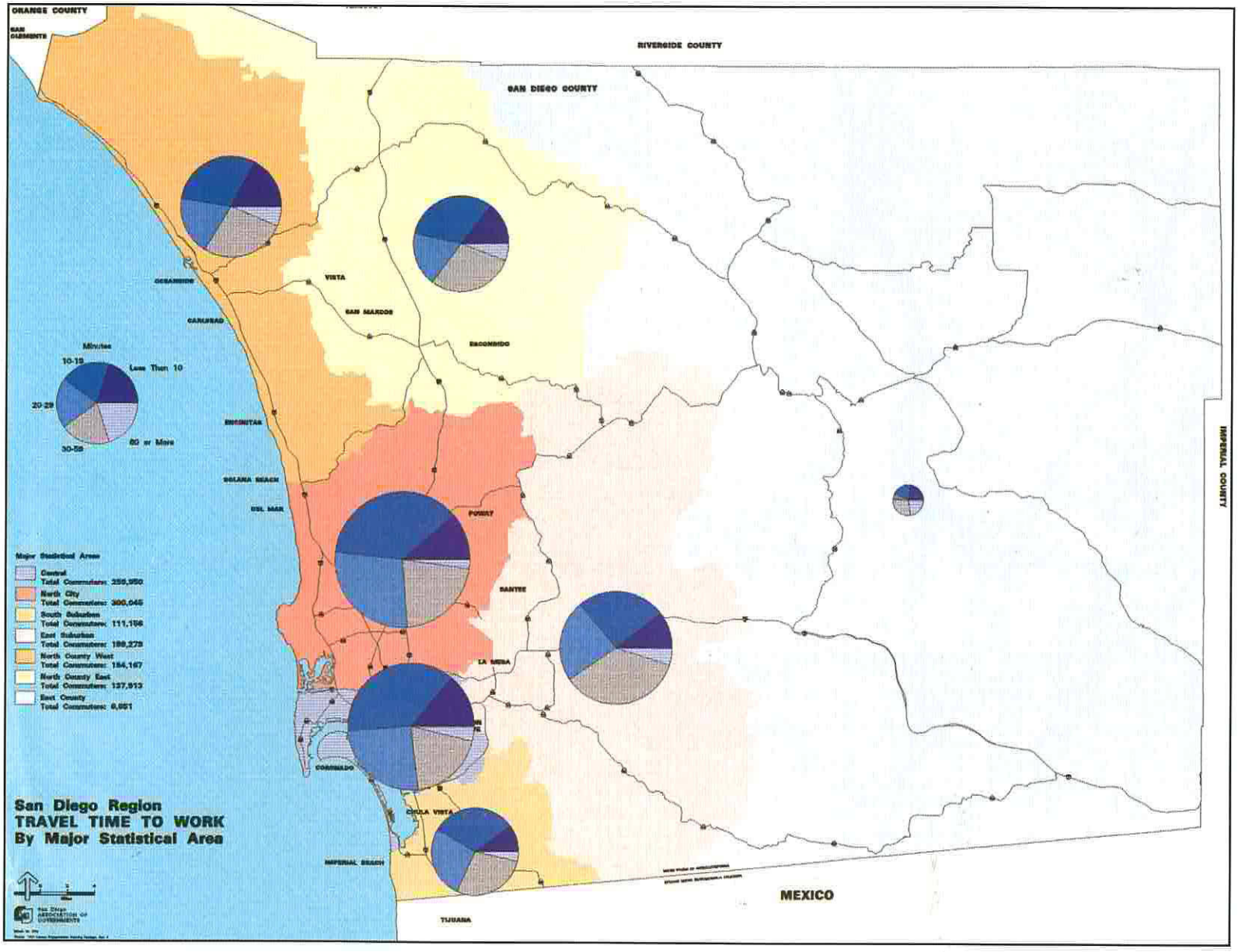


Software: ARC/INFO

Hardware: Sun Workstation
Hewlett Packard 650C
Inkjet Plotter

Data Source: U.S. Census Bureau
CTPP, Part 3 (Urban)

This map represents the number of "work trip" carpools that are using freeways in the San Diego Metropolitan Area. Two categories were created: the total number of carpools and the carpools with 3 or more passengers. These maps are designed to be used in two ways. One way is for the evaluation of HOV strategies. The second is to help identify new HOV corridors with existing high levels of carpooling.

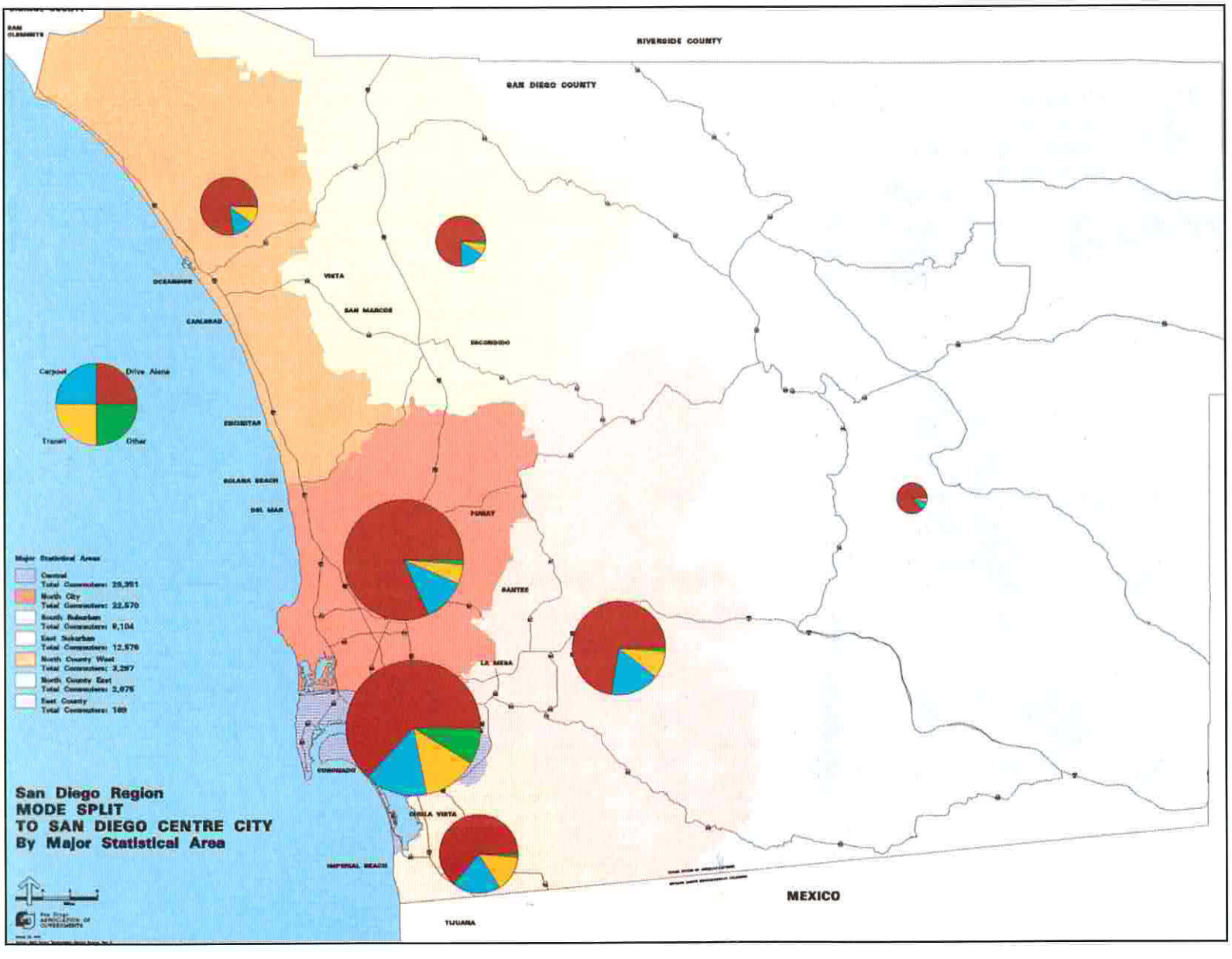


Software: ARC/INFO

Hardware: Sun Workstation
Hewlett Packard 650C
Inkjet Plotter

Data Source: U.S. Census Bureau
CTPP, Part 1 (Urban)

This map represents the travel time to work and the volume of commuters by Major Statistical Area in the San Diego Metropolitan Area. The size of the pie chart represents the volume of commuters. The segmentation within each pie chart depicts travel time categories. About 70% of the region's workers have commutes of less than 1/2 hour.



This map shows the workers who commute to the downtown area of the city of San Diego. Workers who drive alone predominate in all MSAs. Transit users are greatest in those areas closest to the downtown.

There are more than 1.1 million workers in the San Diego region. The rural east county MSA contains the fewest number of workers (6,299), while the north city MSA has the greatest (292,200).

Software: ARC/INFO

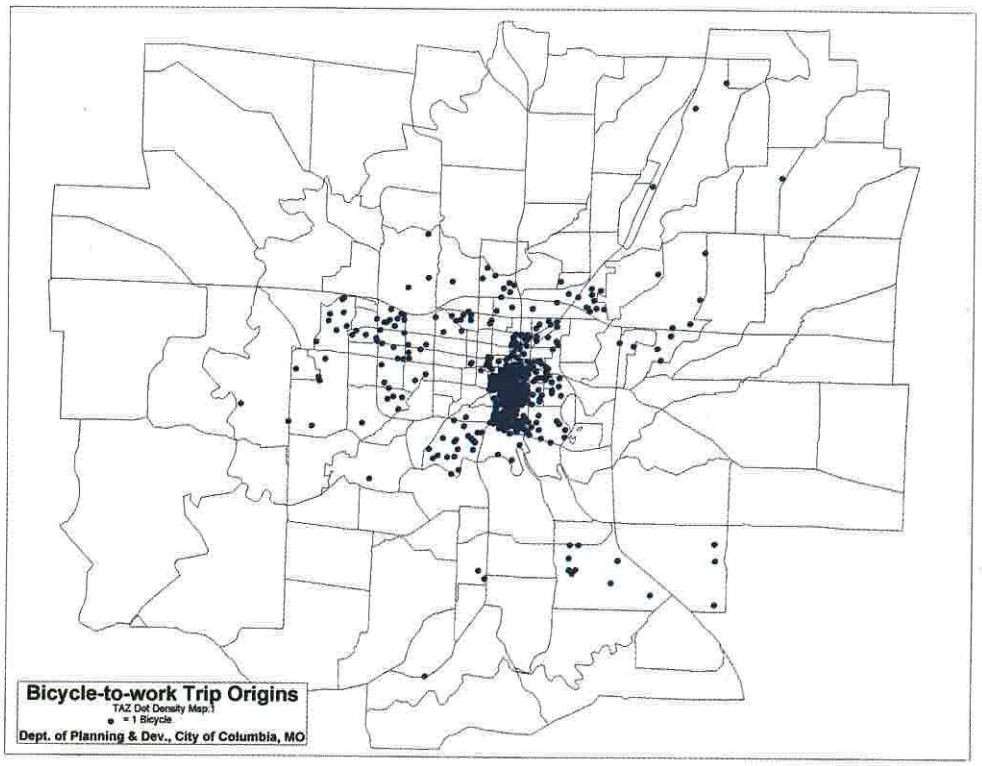
Hardware: Sun Workstation
Hewlett Packard 650C
Inkjet Plotter

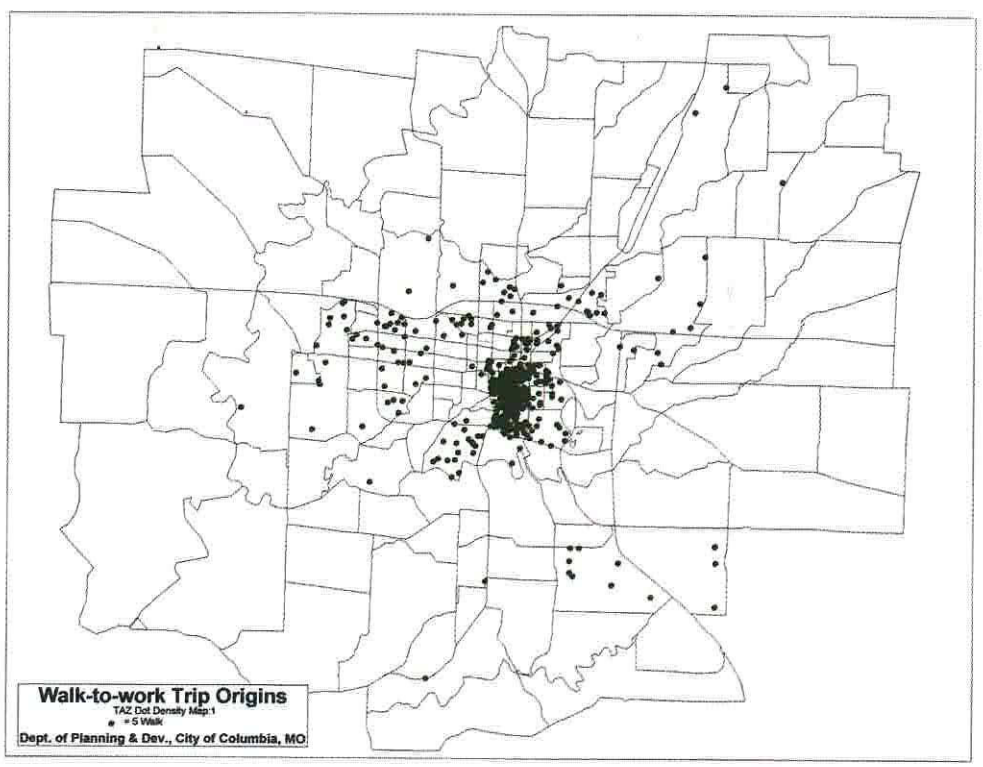
Data Source: U.S. Census Bureau
CTPP, Part 3 (Urban)

Software: TransCAD

Hardware: 486 Desktop Computer
Hewlett Packard 650C Inkjet Plotter

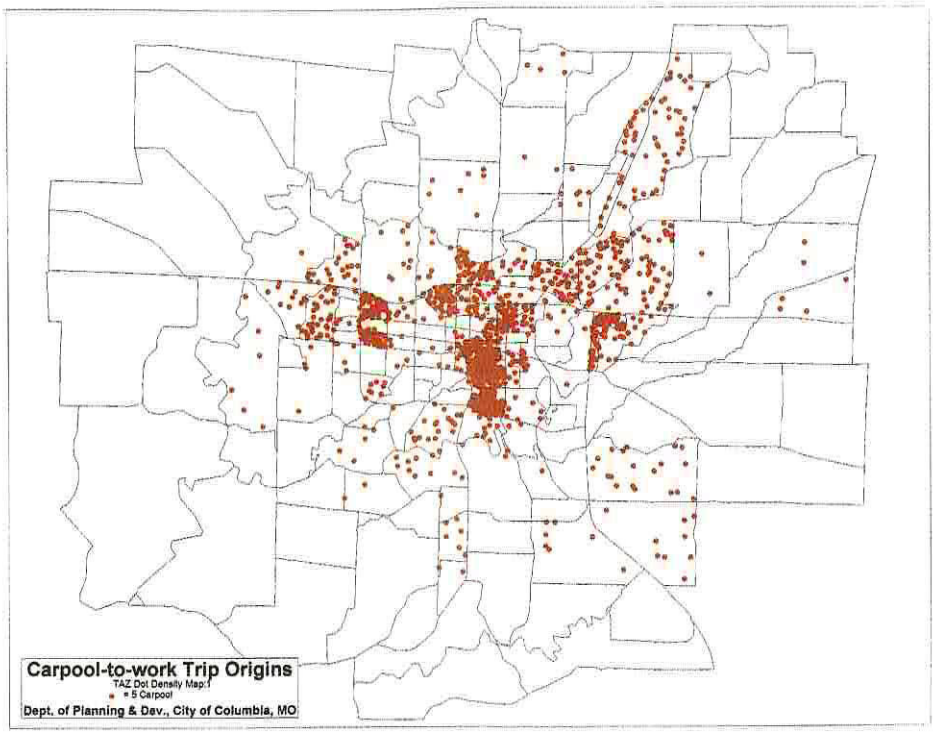
Data Source: U.S. Census Bureau
CTPP, Part 3 (Urban)

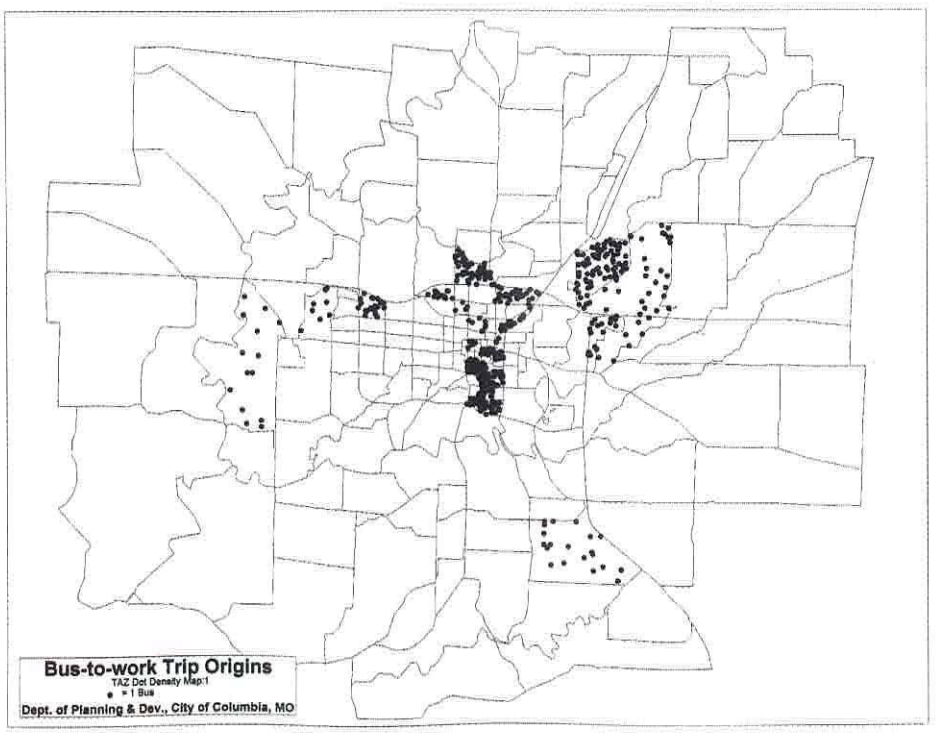




The maps shown are a series showing the various modes of transportation used in the City of Columbia, Missouri. The points represent origins of trips-to-work.

The information was collected as part of a long range transportation plan under the ISTEA act of 1991. The data is used to determine the concentrations of bicycle and pedestrian traffic to prepare plans for bicycle and pedestrian routes for the city.





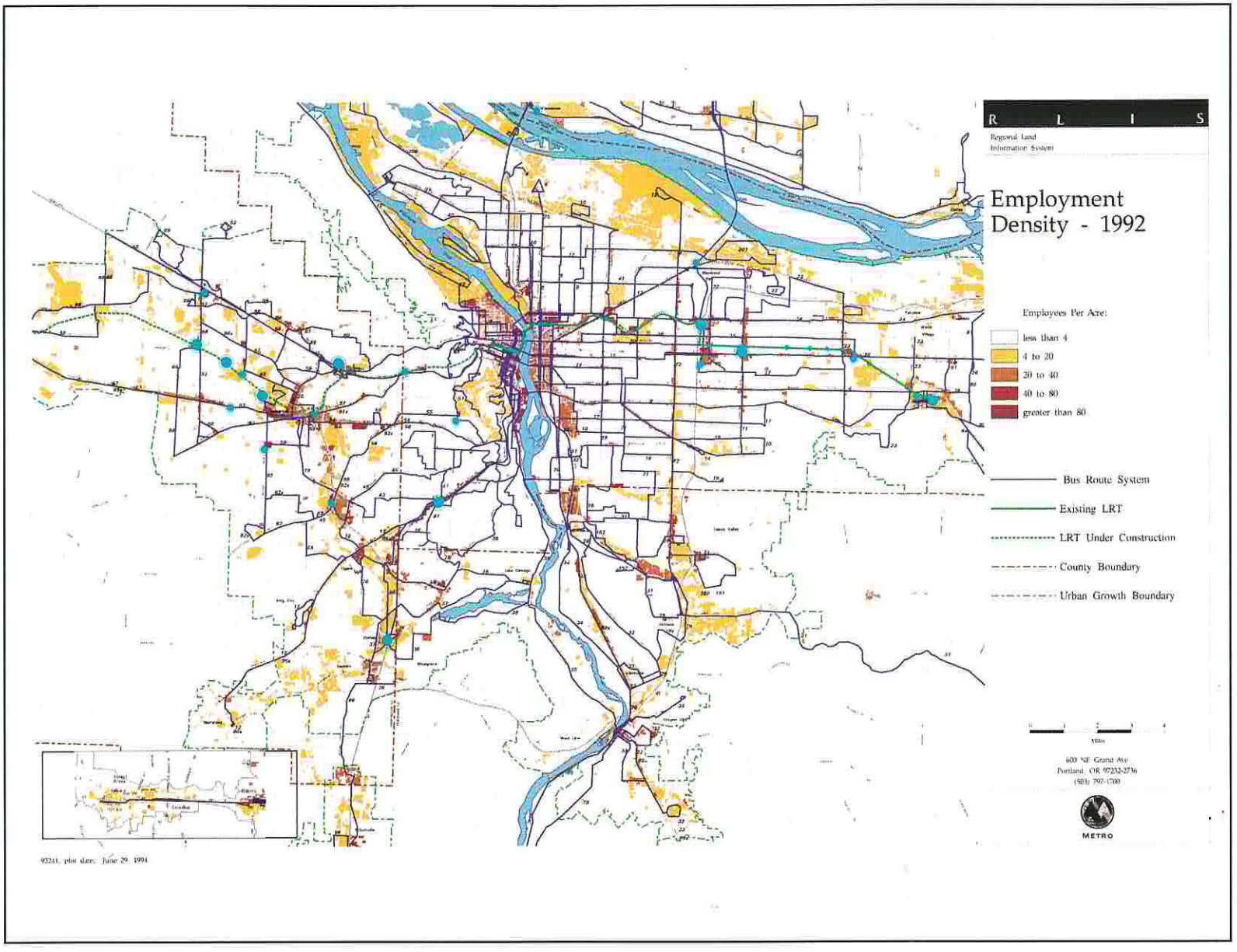
Software: TransCAD

Hardware: 486 Desktop Workstation
Hewlett Packard 650C
Inkjet Plotter

Data Source: U.S. Census Bureau
CTPP, Part3 (Urban)
TIGER

The maps shown are part of a series showing the various modes of transportation used in the City of Columbia, Missouri. The points represent origins of trips-to-work.

The data is used to determine the concentrations of workers using carpools and buses.

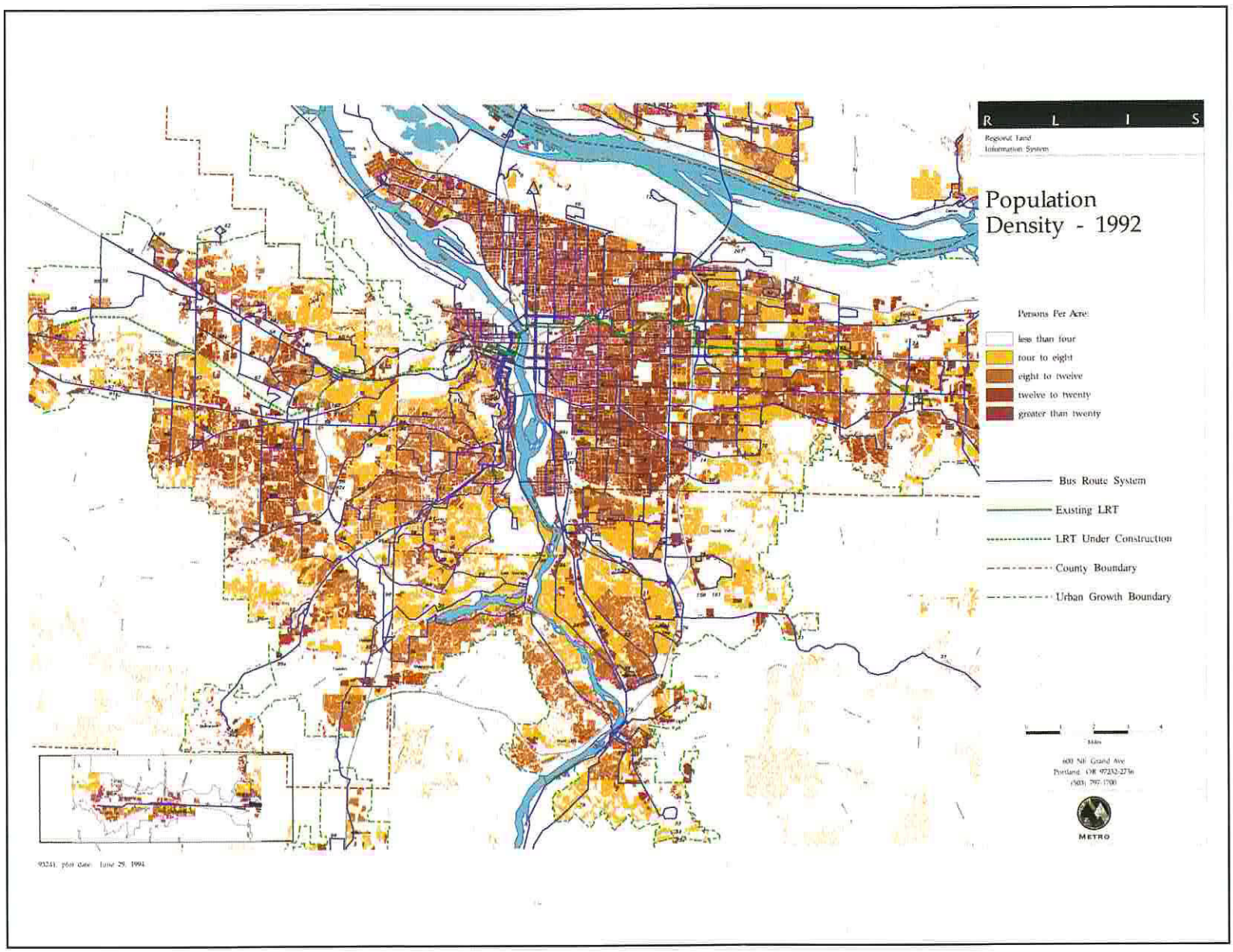


Software: ARC/INFO

Hardware: Hewlett Packard Unix Workstation
Hewlett Packard Color Electrostatic Plotter

Data Source: U.S. Census Bureau
TIGER

This map shows employment data by census block group that was allocated to 1/4 acre grid cells depending on land use. The result was then utilized to show the relationship of employment density to fixed route transit facilities.



This map shows population density which was created from 1990 population figures that were updated to 1992 by including birth/death and immigration statistics. The density based on census block was further allocated to 1/4 acre grid cells depending on the underlying land use as indicated by county tax assessor data.

The resultant population density is displayed in relationship to fixed route transit facilities.

Software: ARC/INFO

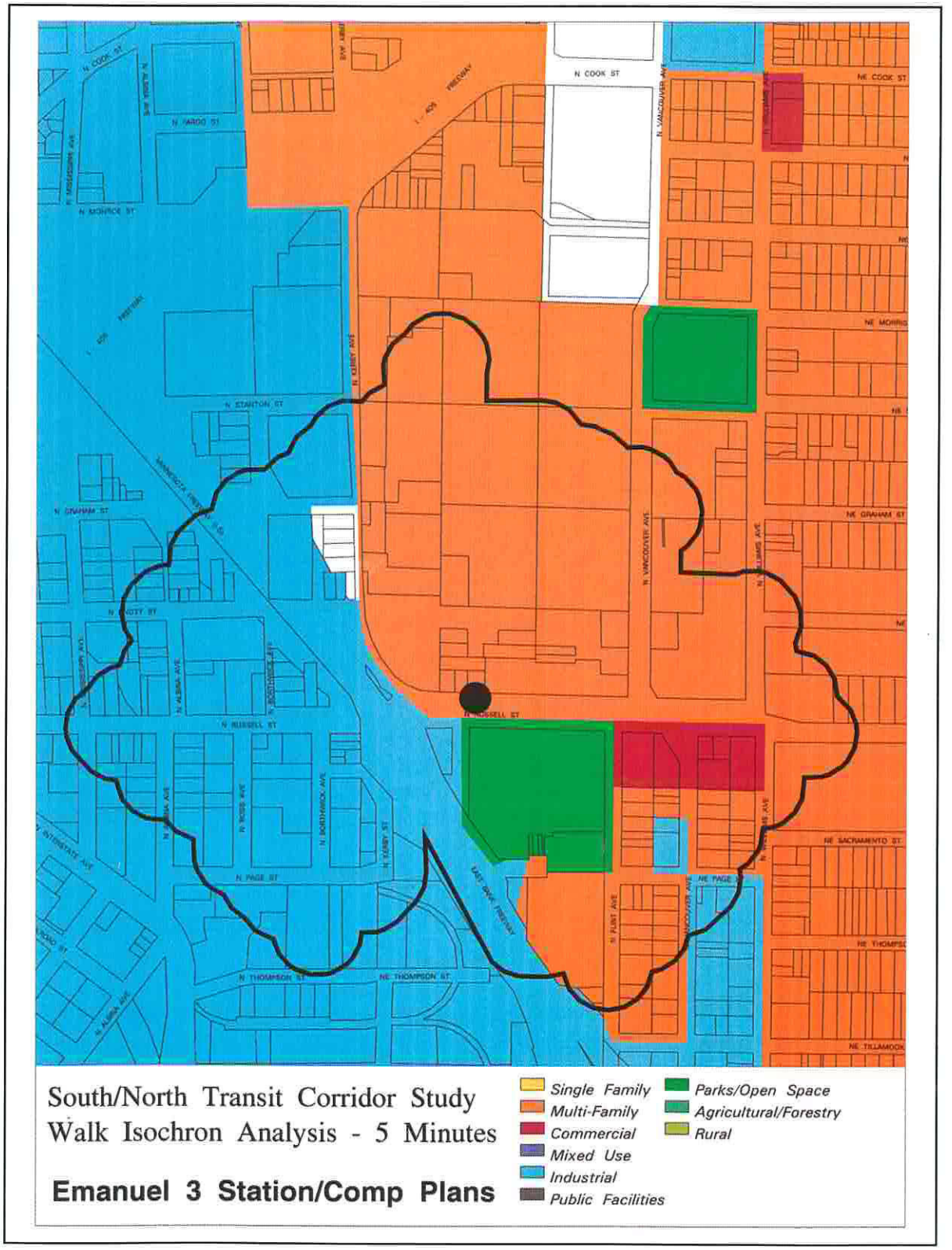
Hardware: Hewlett Packard Unix Workstation
Hewlett Packard Color Electrostatic Plotter

Data Source: U.S. Census Bureau
TIGER
PL94 modified

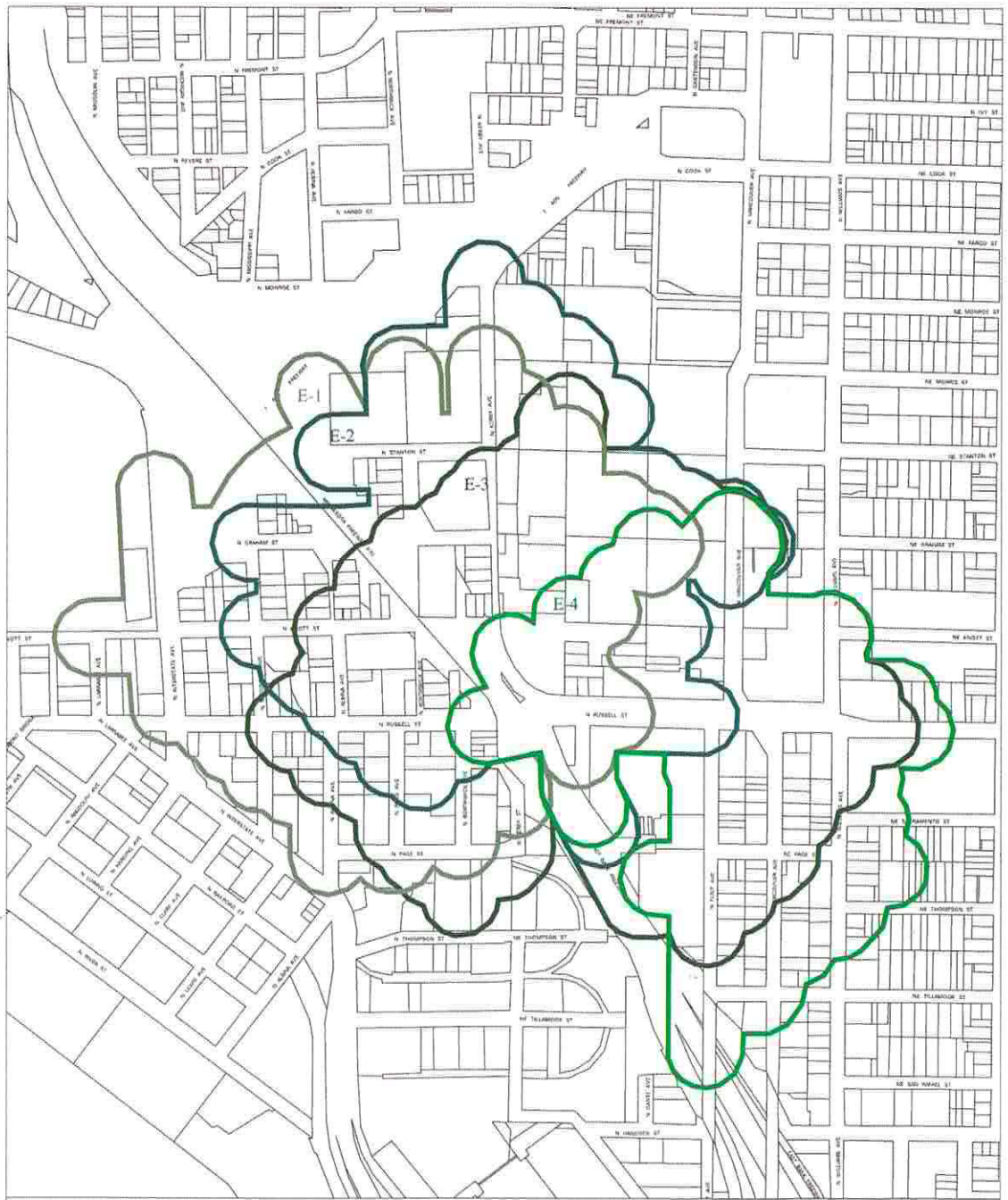
Software: ARC/INFO

Hardware: Hewlett Packard Unix Workstation
Hewlett Packard Color Electrostatic Plotter

Data Source: U.S. Census Bureau TIGER



This map shows the 5 minute walk isochrons that were created with routing operations performed on a TIGER centerline file. From these isochrons, the associated comprehensive plans were displayed for analysis.



South/North Transit Corridor Study
Walk Isochron Analysis - 5 Minutes

Emanuel Station Alternatives

Software: ARC/INFO

Hardware: Hewlett Packard Unix Workstation
Hewlett Packard Color Electrostatic Plotter

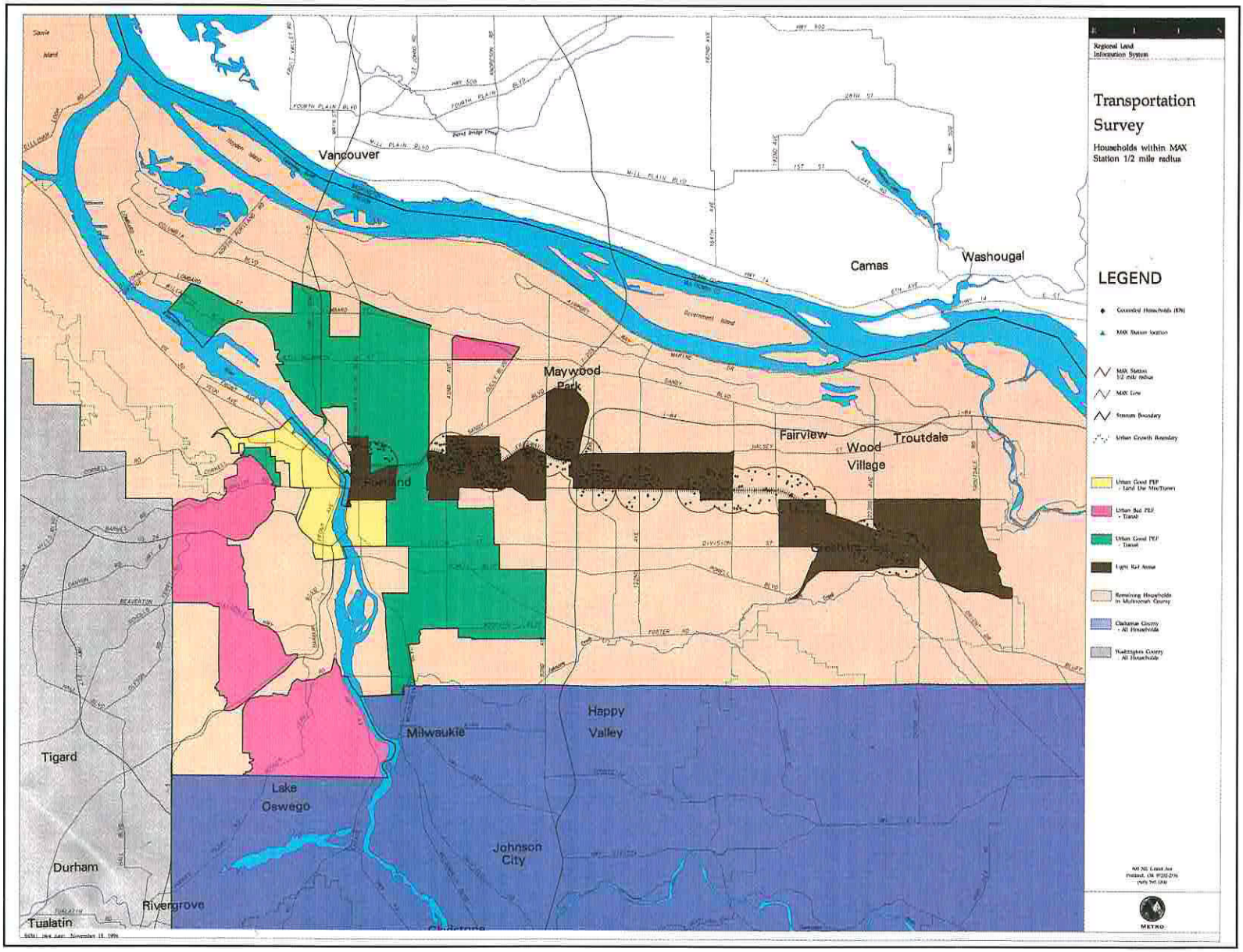
Data Source: U.S. Census Bureau TIGER

This map shows the 5 minute walk isochrons that were created with routing operations performed on a TIGER centerline file enhanced with walking speed impedance items.

Various potential locations for light rail stops were overlaid on each other for comparison.

Metro
Portland, Oregon

28



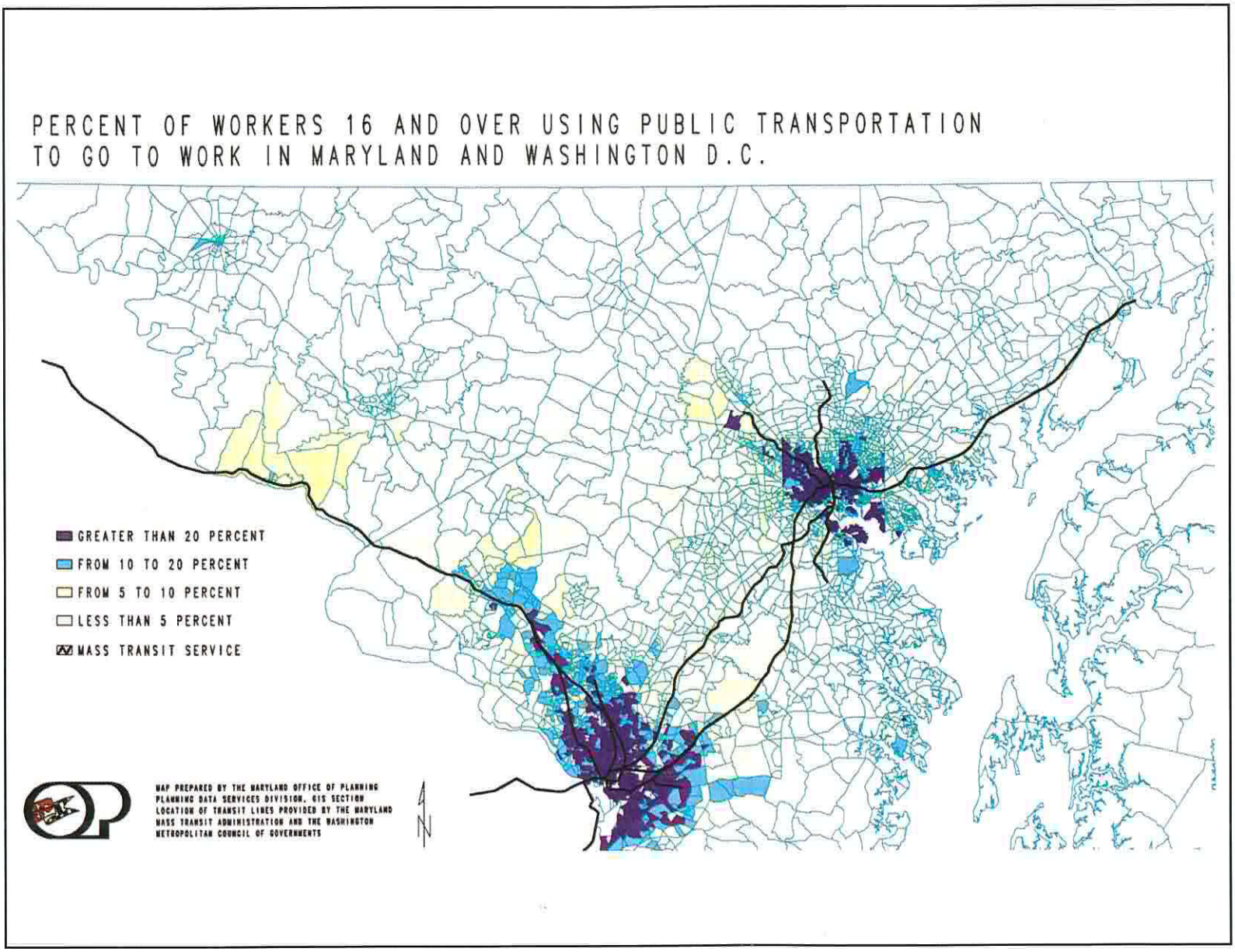
Software: ARC/INFO

Hardware: Hewlett Packard Unix Workstation
Hewlett Packard Color Electrostatic Plotter

Data Source: U.S. Census Bureau TIGER

This map displays households contacted for a Transportation Behavioral Survey. The contacted households are within 1/2 mile walking distance of a Light Rail Transit (LRT) station. The purpose was to assure a proper sample size of households served by LRT.

Automated geocoding techniques were used to complete the Transportation Behavioral Survey.



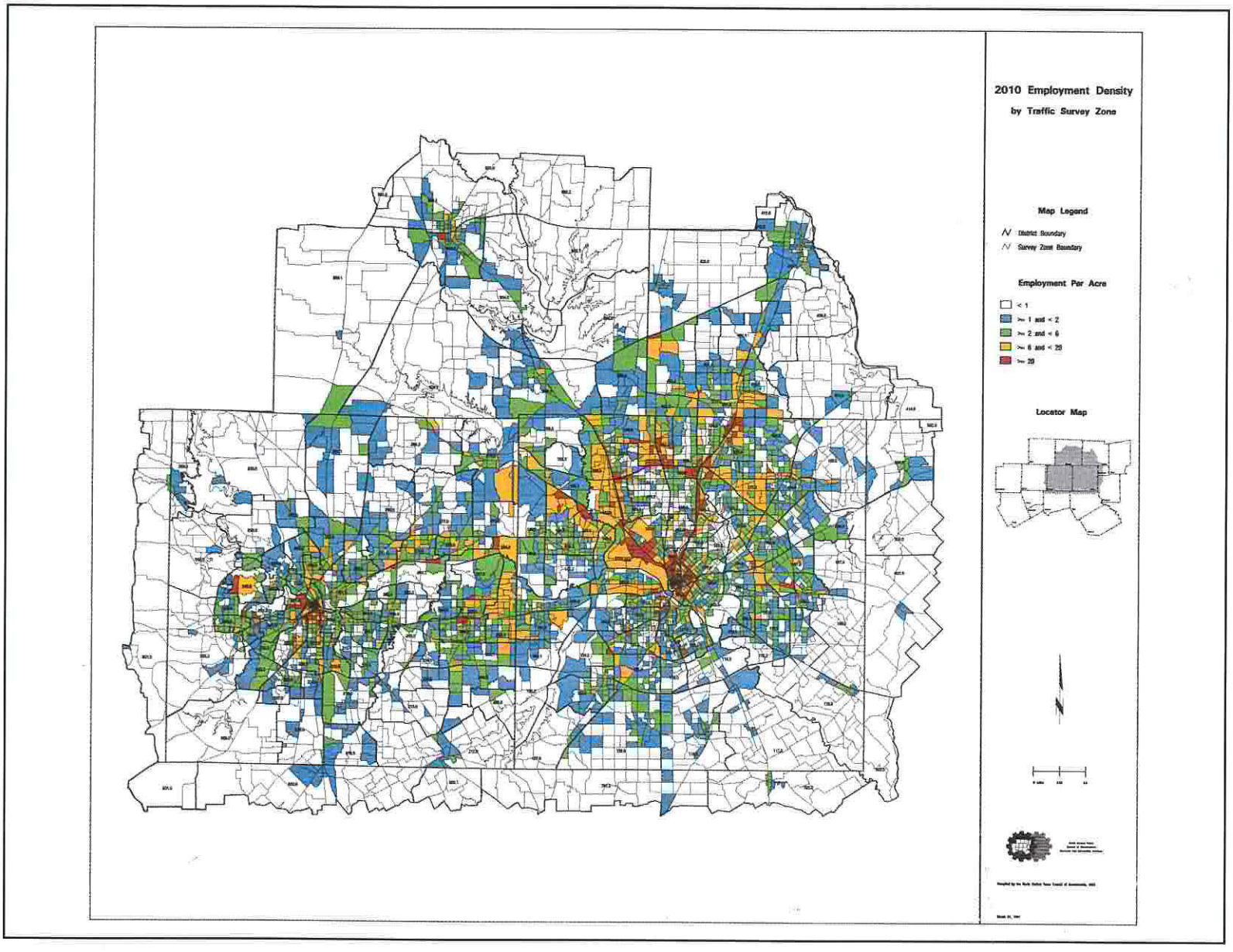
This map shows the percent of workers 16 and over using public transportation to go to work in Maryland and Washington, D.C. This is one of a series of maps that were prepared for the Maryland Department of Transportation that identified various modes of transportation that people use to travel to work.

This type of map is useful for transportation planning, economic development, resource protection and growth management.

Software: pcARC/INFO ver 3.4D+

Hardware: Hewlett Packard 486 Desktop Computer
Xerox 4700 Color Printer

Data Source: U.S. Census Bureau
TIGER
STF 1B
STF 3A

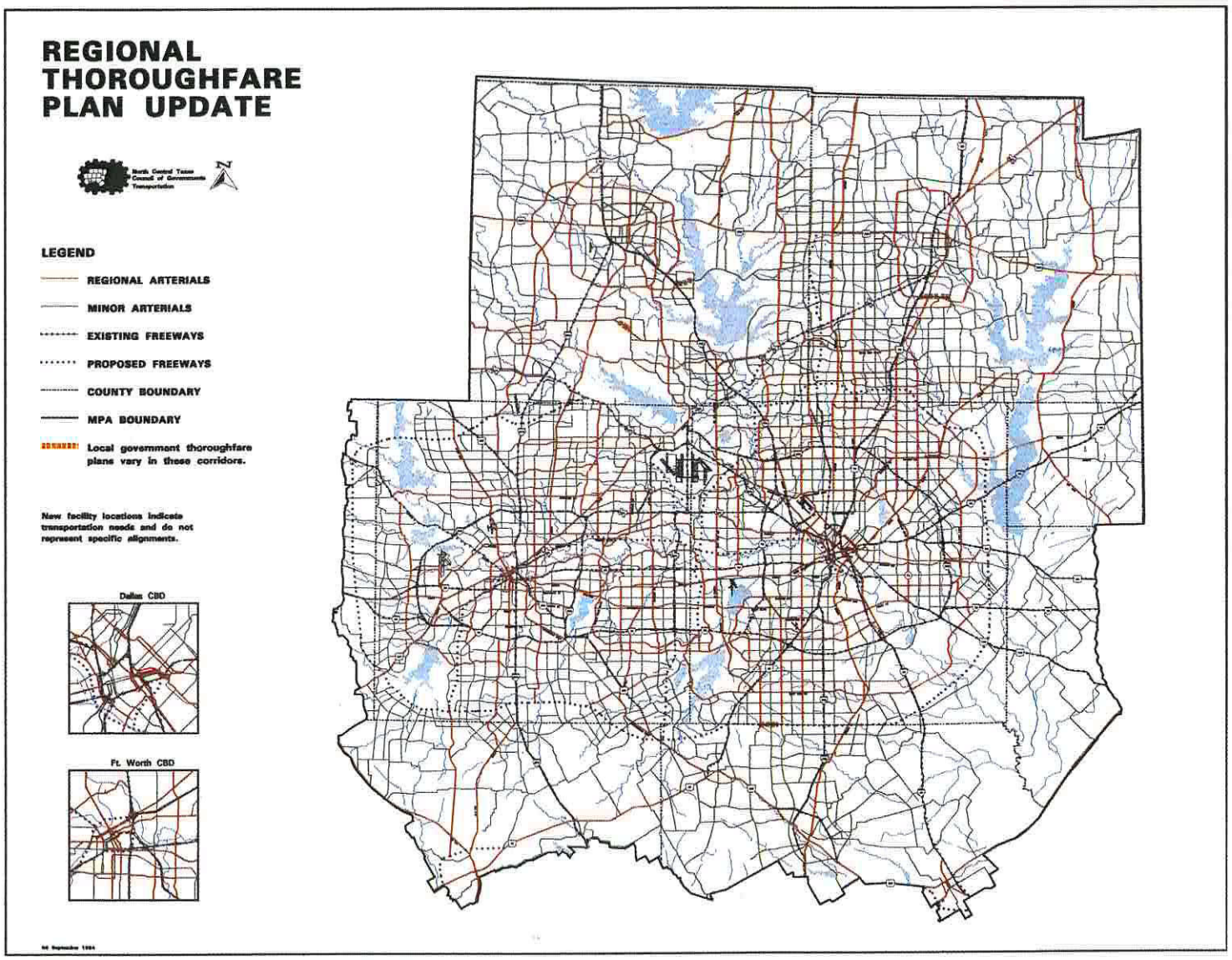


Software: ARC/INFO

Hardware: Sun Workstation
Color Electrostatic
Plotter

Data Source: U.S. Census Bureau
CTPP

This map is one of a series of maps that show the employment per acre by TAZ. This map is the employment density projected for the year 2010. Another map in the series shows the 1990 employment. A third map depicts the change between the 1990 employment and the 2010 projected employment. The map series is utilized for planning transportation infrastructure improvements.

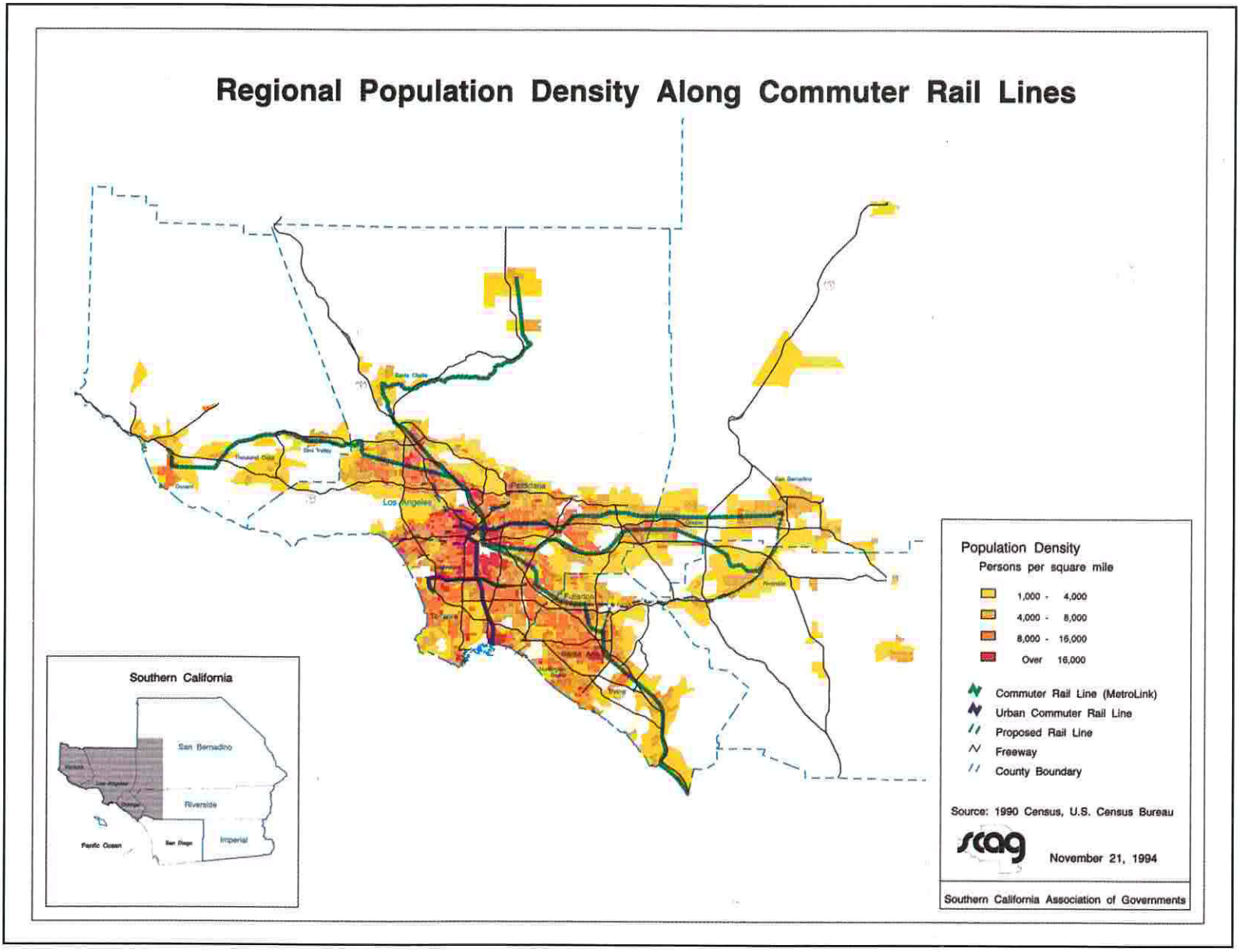


This map shows the current thoroughfares in the North Central Texas Regional Area. The map also indicates the location of proposed freeways for the area. This map is used as a basis for planning transportation improvements.

Software: ARC/INFO

Hardware: Sun Workstation
Color Electrostatic Plotter

Data Source: U.S. Census Bureau
TIGER

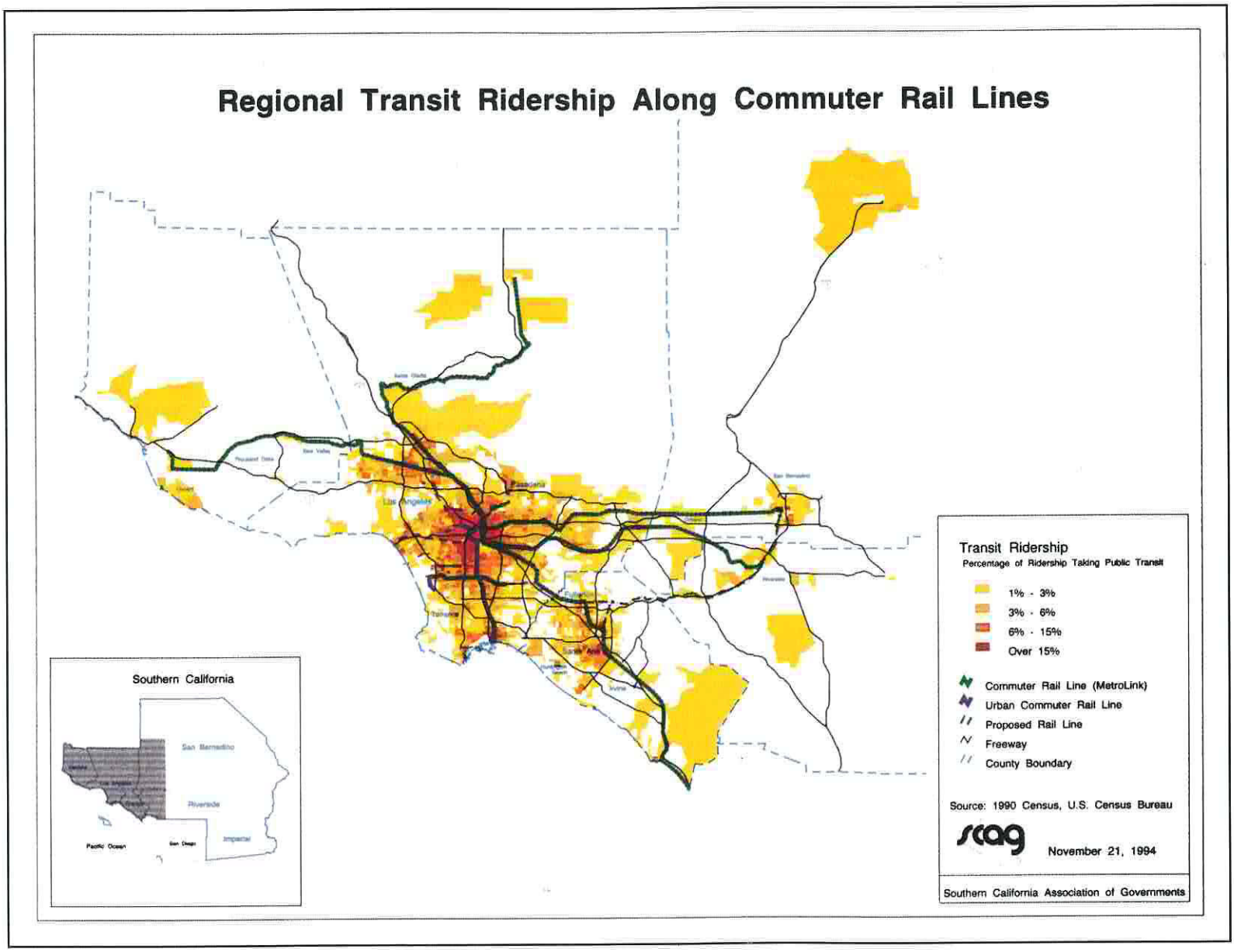


Software: ARC/INFO

Hardware: IBM Workstation
Color Electrostatic
Plotter

Data Source: U.S. Census Bureau
STF1

This map shows the regional population density along commuter rail lines. The map is used as a planning tool for the development of future commuter rail lines.

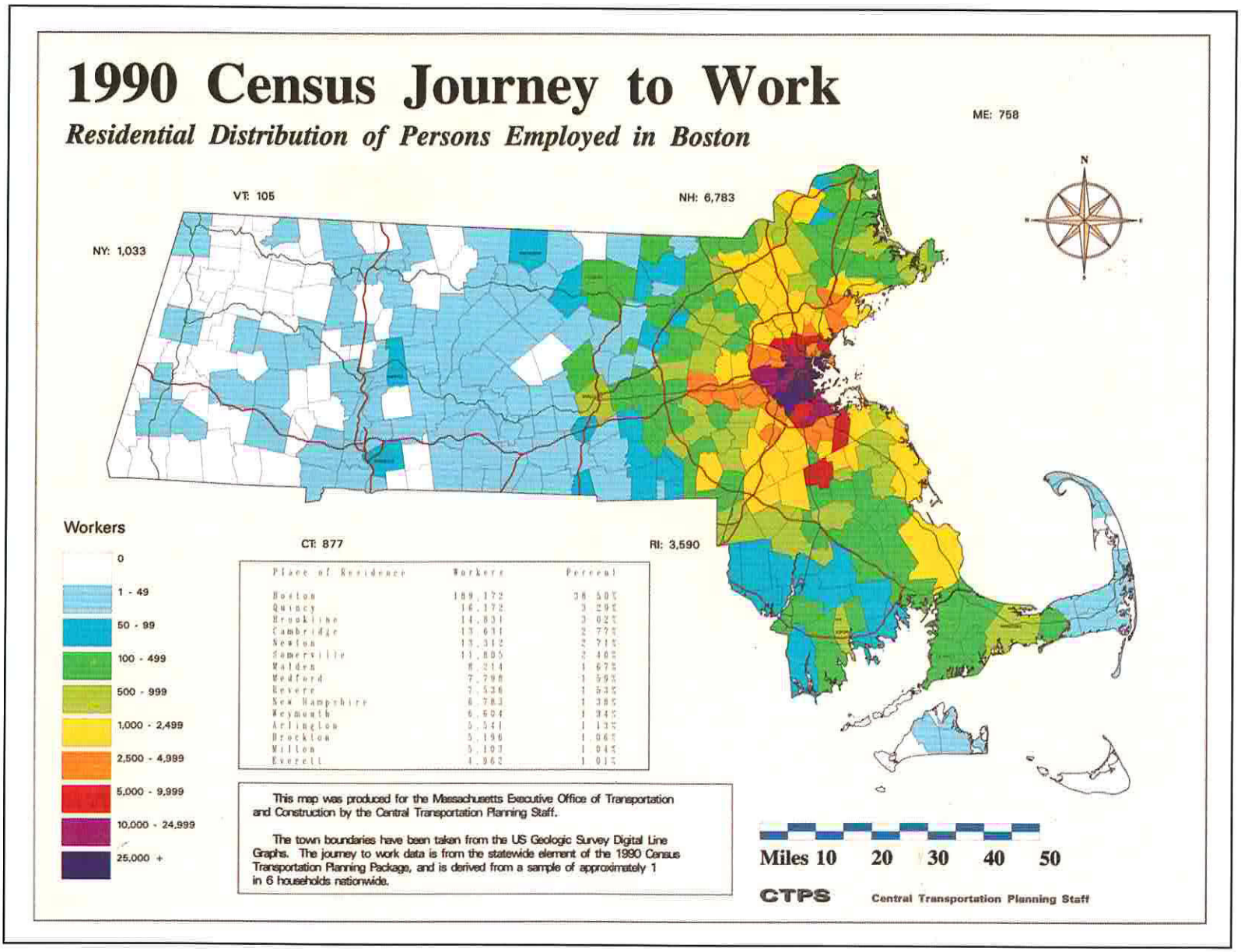


This map shows the regional transit ridership along commuter rail lines. The map shows the residential location of existing ridership and can be used to forecast future ridership.

Software: ARC/INFO

Hardware: IBM Workstation
Color Electrostatic
Plotter

Data Source: U.S. Census Bureau
CTPP

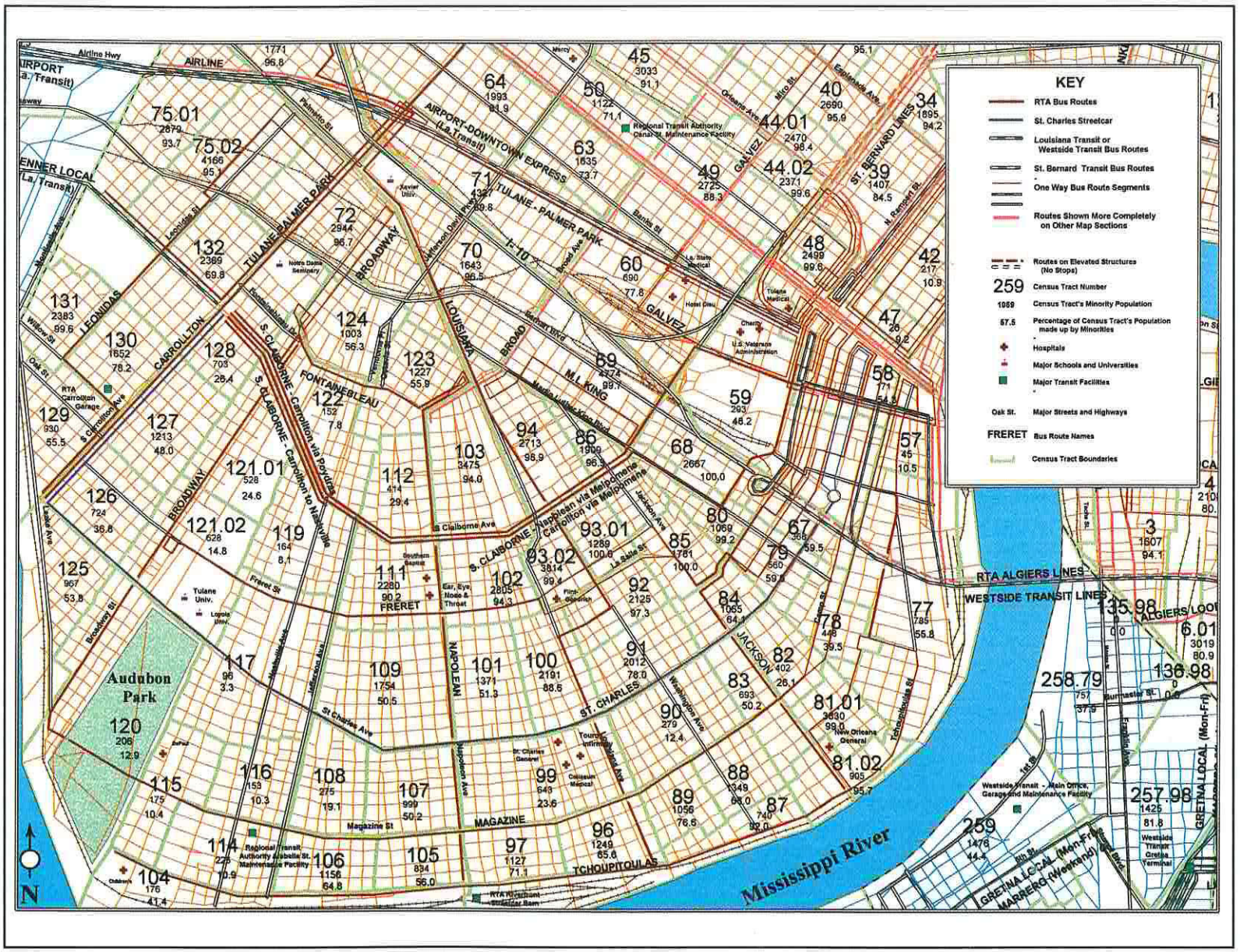


Software: ARC/INFO

Hardware: Sun Workstation
Calcomp Electrostatic Plotter

Data Source: U.S. Census Bureau
CTPP

This map shows the residential distribution of persons employed in the city of Boston. The map was produced for the Massachusetts Executive Office of Transportation and Construction as a planning tool.



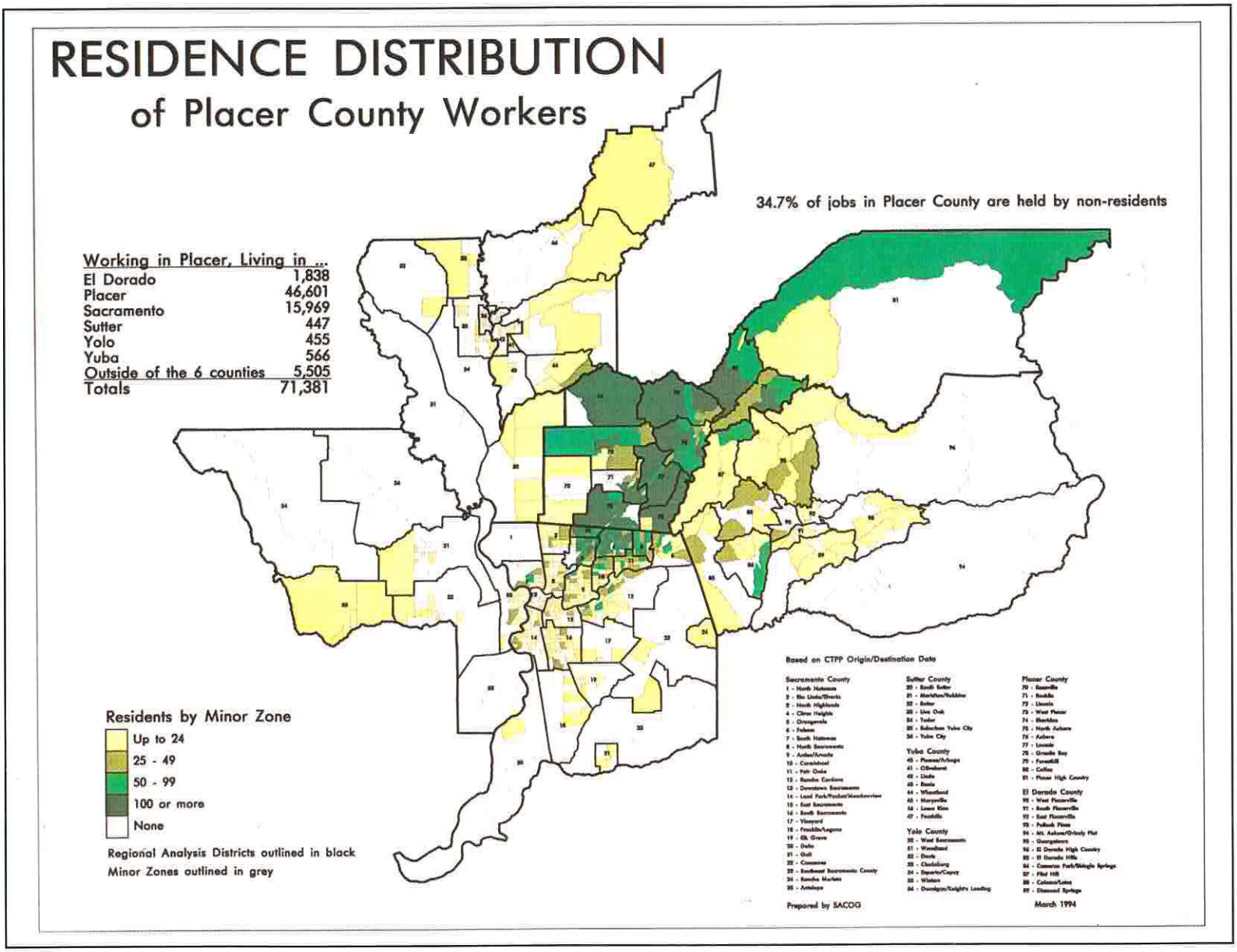
This map shows the service offered by transit operators in the New Orleans metropolitan area during the summer of 1993. The map also shows data on the total minority population, and the proportion of the population made up by minorities for each census tract in the area.

This map was used to indicate the level of compliance with the Title VI Program of the U.S. Civil Rights Act of 1964.

Software: MapInfo

Hardware: 486 Desktop Computer
Hewlett Packard 650C Inkjet Plotter

Data Source: U.S. Census Bureau
TIGER
STF3A

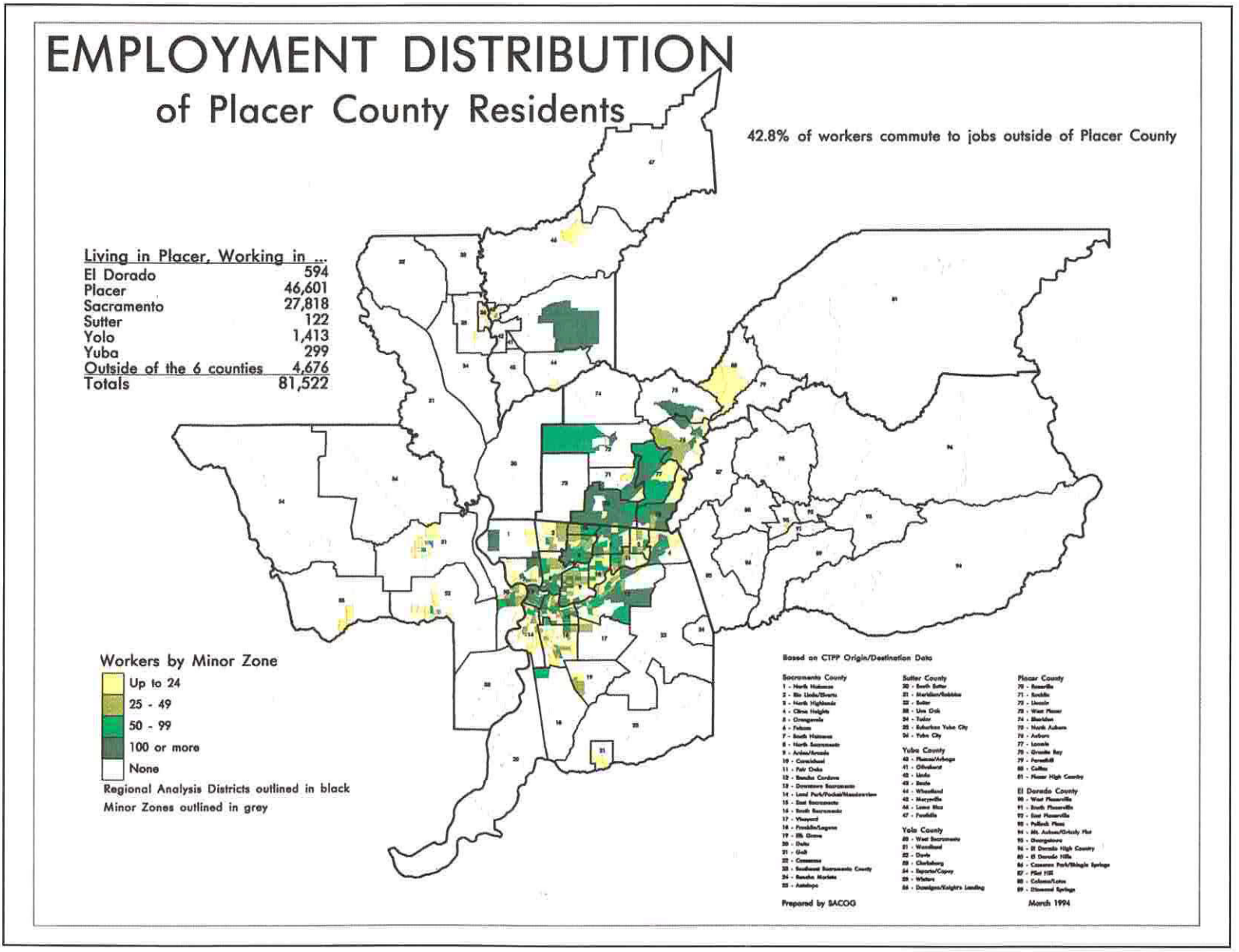


Software: Atlas GIS

Hardware: 486 Desktop Computer
RasterGraphics Color
Electrostatic Plotter

Data Source: U.S. Census Bureau
CTPP

This map shows the residence distribution of workers in Placer County. This map along with the next map demonstrate the total integration of Placer County into regional economic activities. 42.8% of all employed residents leave Placer County to commute elsewhere for their jobs. Most of them go to Sacramento County.



This map shows the employment distribution of workers in Placer County. This map along with the previous map demonstrate the total integration of Placer County into regional economic activites. 34.7% of jobs in Placer County are held by residents of other counties.

Software: Atlas GIS

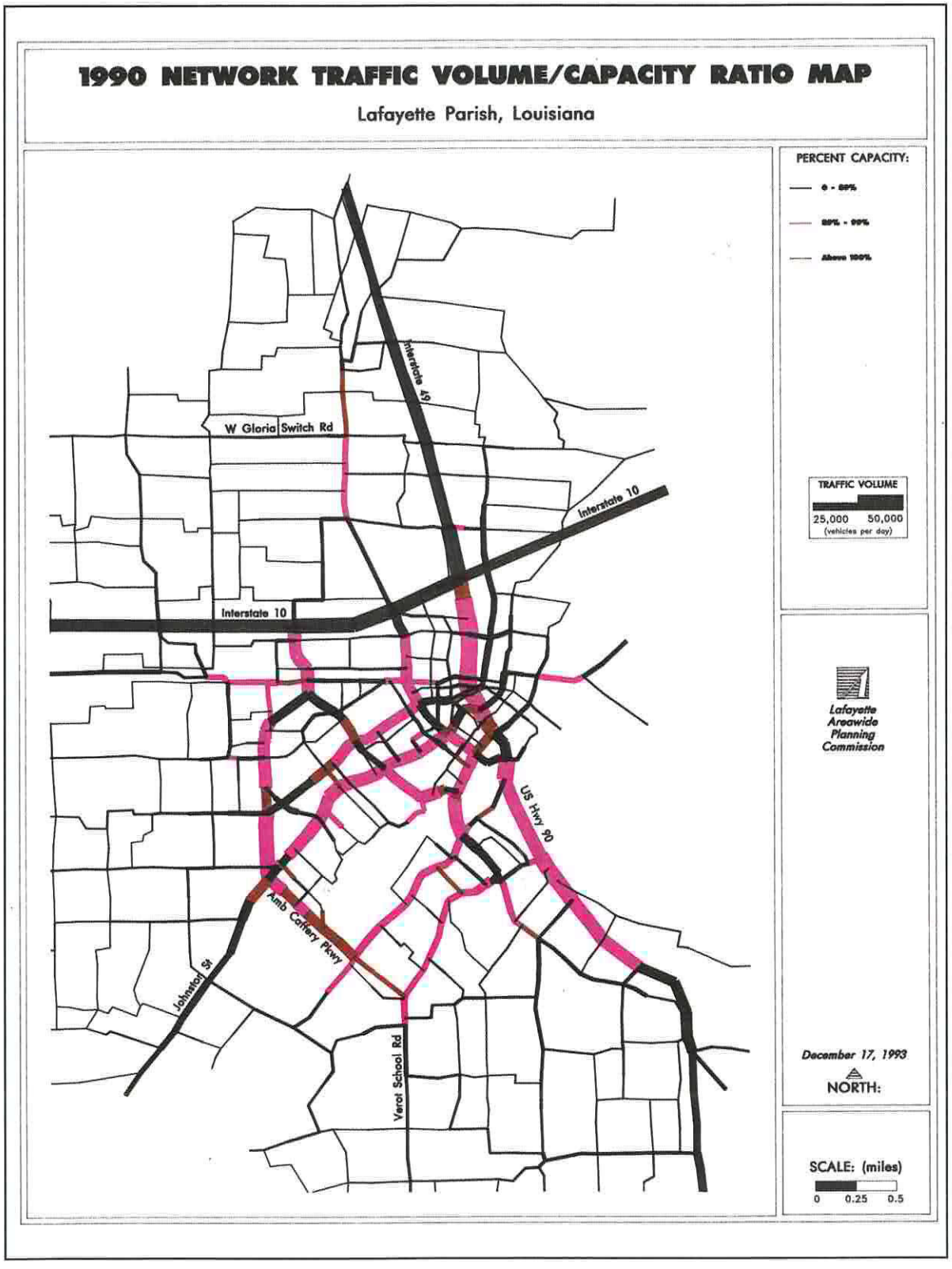
Hardware: 486 Desktop Computer
RasterGraphics Color
Electrostatic Plotter

Data Source: U.S. Census Bureau
CTPP

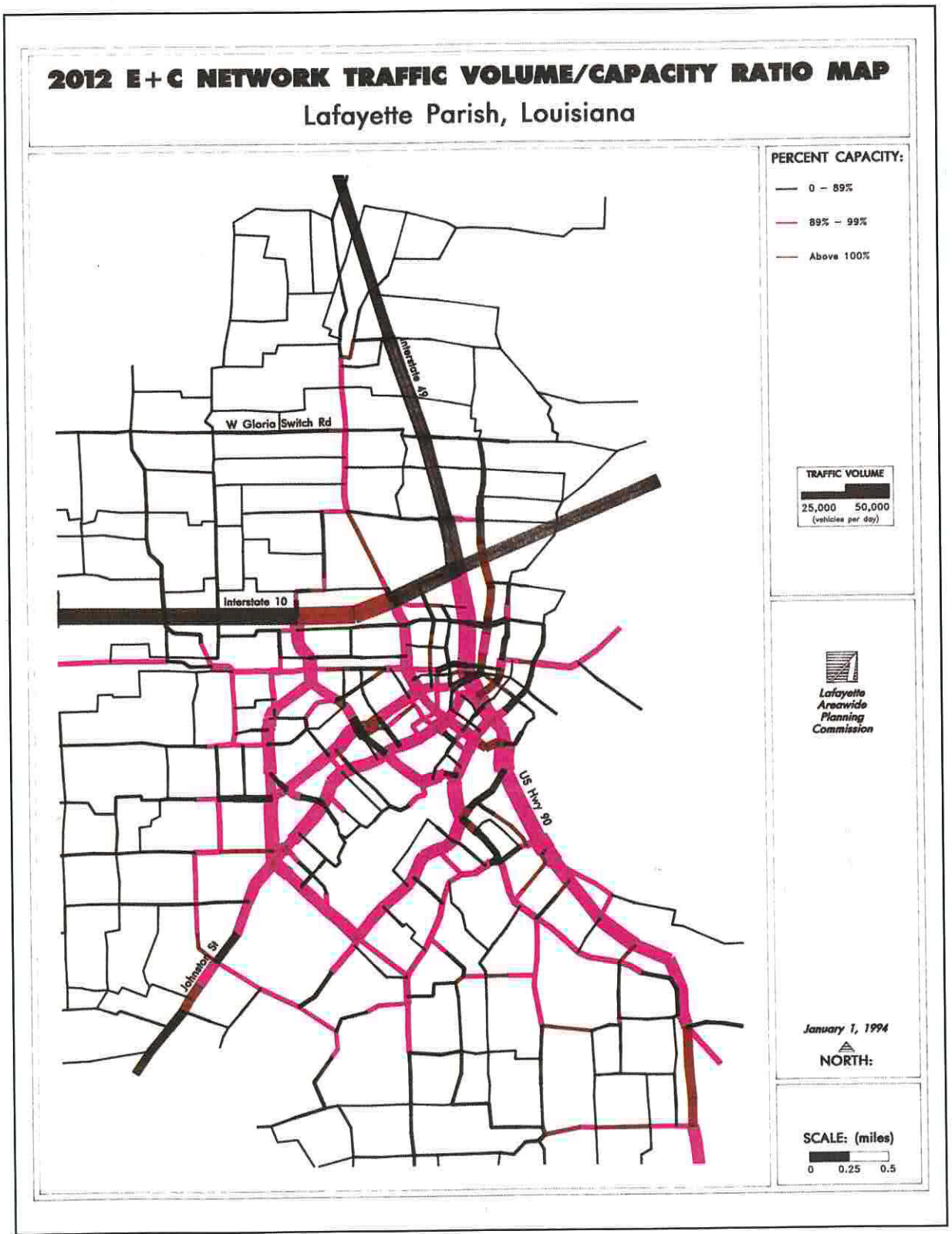
Software: Atlas GIS

Hardware: 386 Desktop Computer
IBM Pen Plotter

Data Source: U.S. Census Bureau
CTPP



This map shows the current state of the transportation network in Lafayette Parish. The map shows a no-build scenario of the Interstate 49 corridor. The results of the analysis are part of a north-south corridor study.

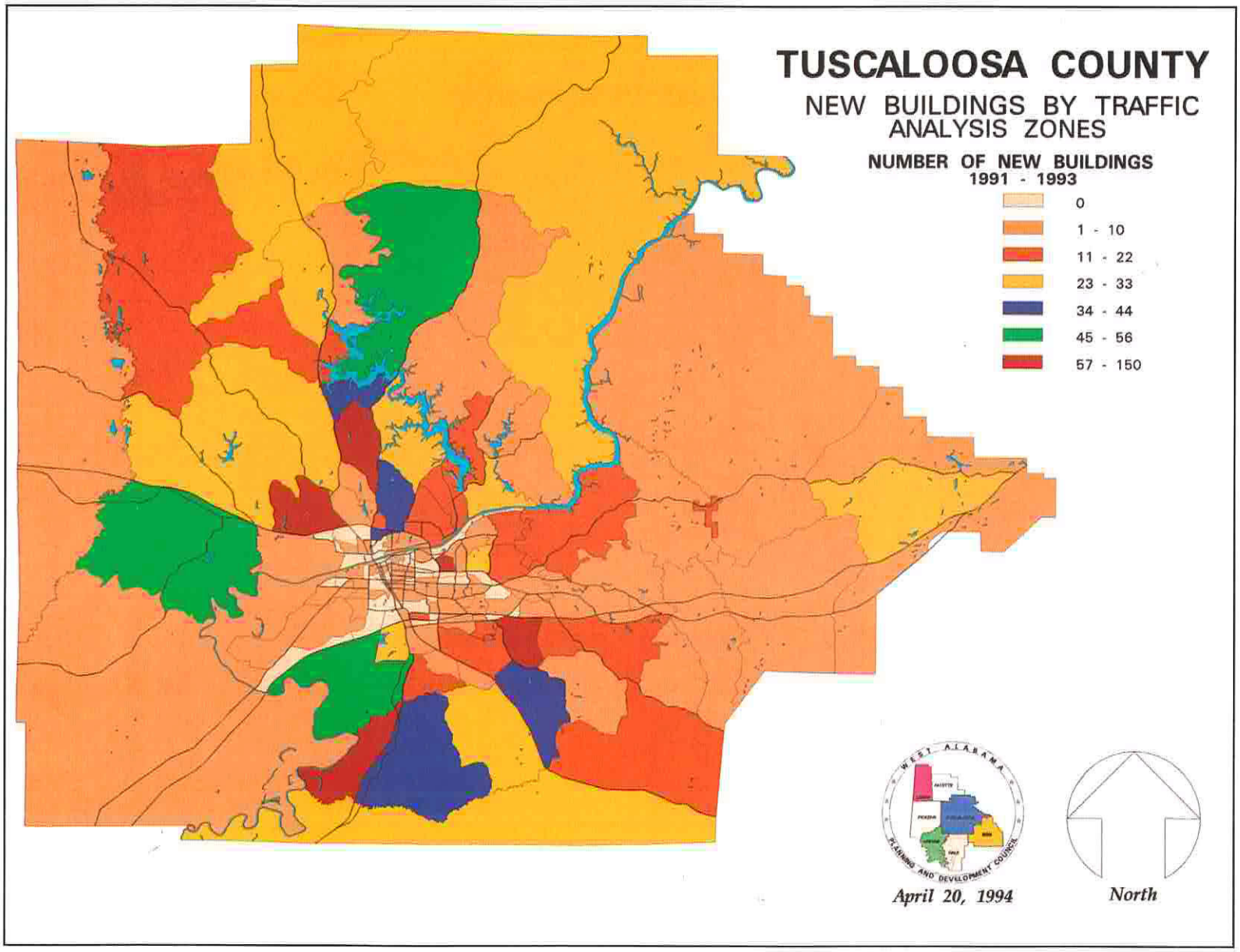


Software: Atlas GIS

Hardware: 386 Desktop Computer
IBM Pen Plotter

Data Source: U.S. Census Bureau
CTPP

The map shows the impact of improvements to the transportation network with the estimated traffic volumes in the year 2012. The network was modeled using the TRANPLAN transportation model. The results of this analysis are part of a north-south corridor study.

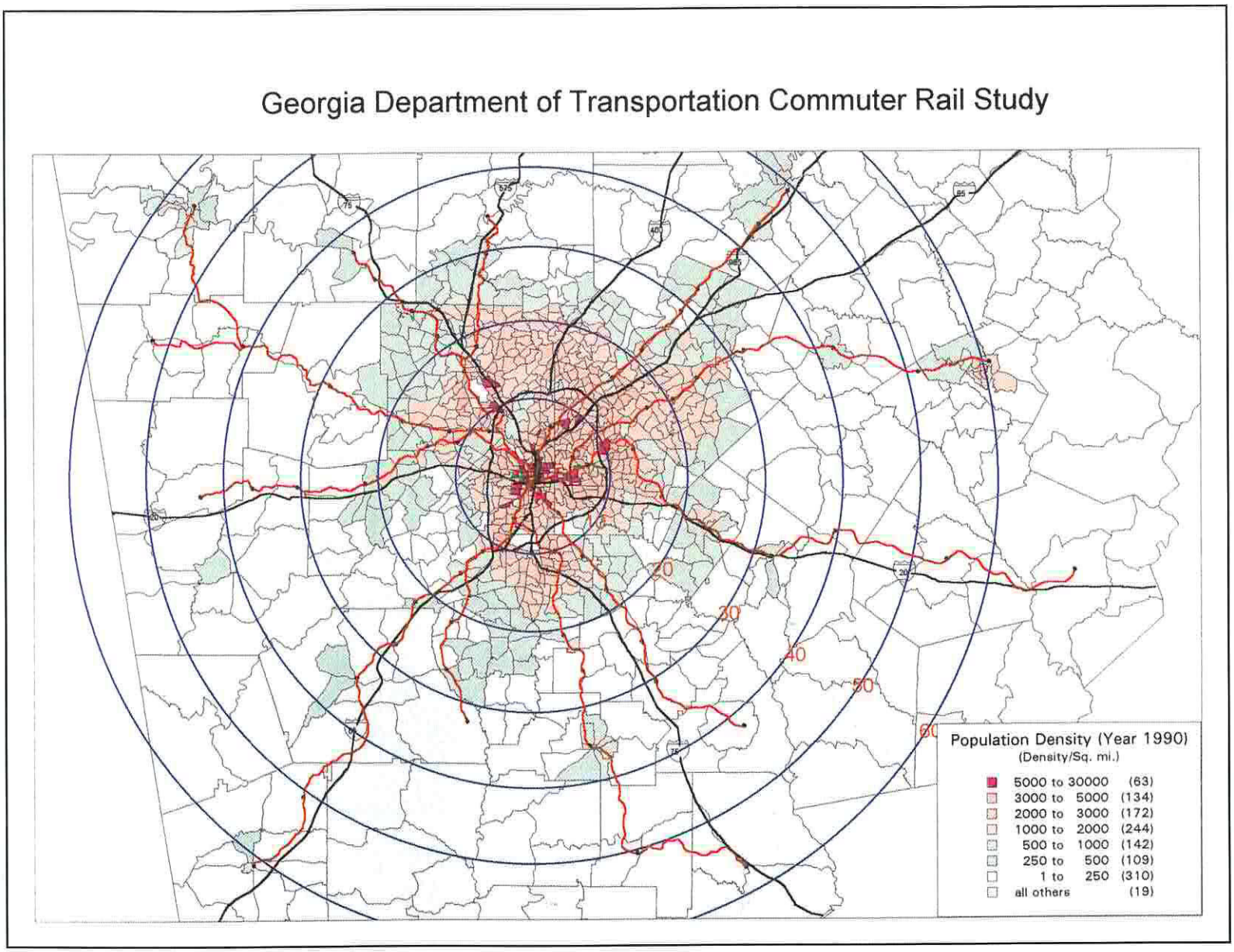


Software: ARC/INFO

Hardware: Hewlett Packard Workstation
Color Electrostatic Plotter

Data Source: U.S. Census Bureau TIGER

This map shows the new buildings by TAZ. The color code illustrates the number of buildings erected from 1991 to 1993. The data was used in the development of the Long Range Transportation Plan and the travel demand model.



This map shows the population density per square mile and its relationship to distance from downtown Atlanta. This map was produced by COMSIS Corporation in conjunction with a commuter rail corridor study performed for the Georgia Department of Transportation.

Software: ARC/INFO

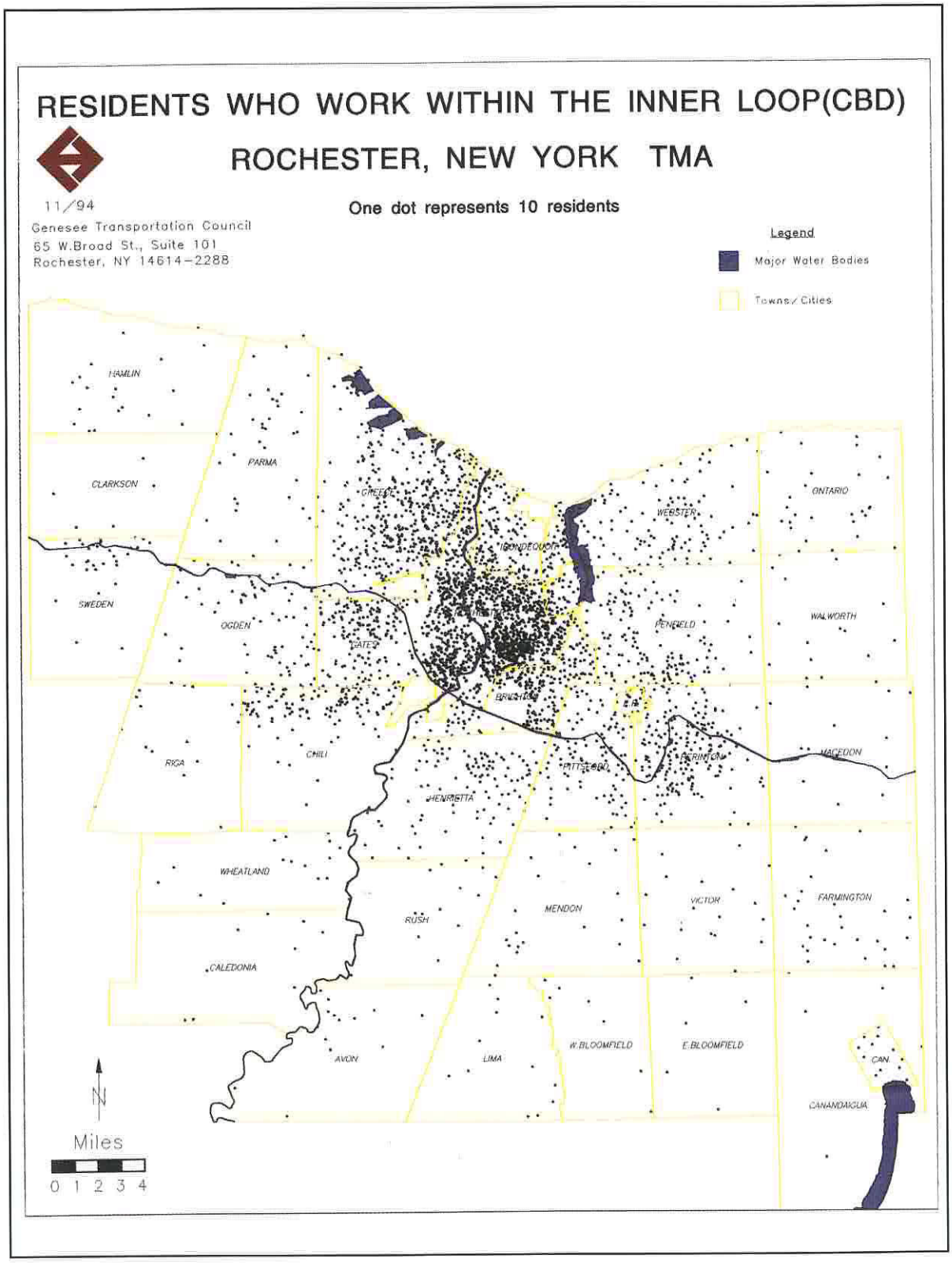
Hardware: Pentium Desktop Computer
Hewlett Packard Color Printer

Data Source: U.S. Census Bureau
TIGER
CTPP

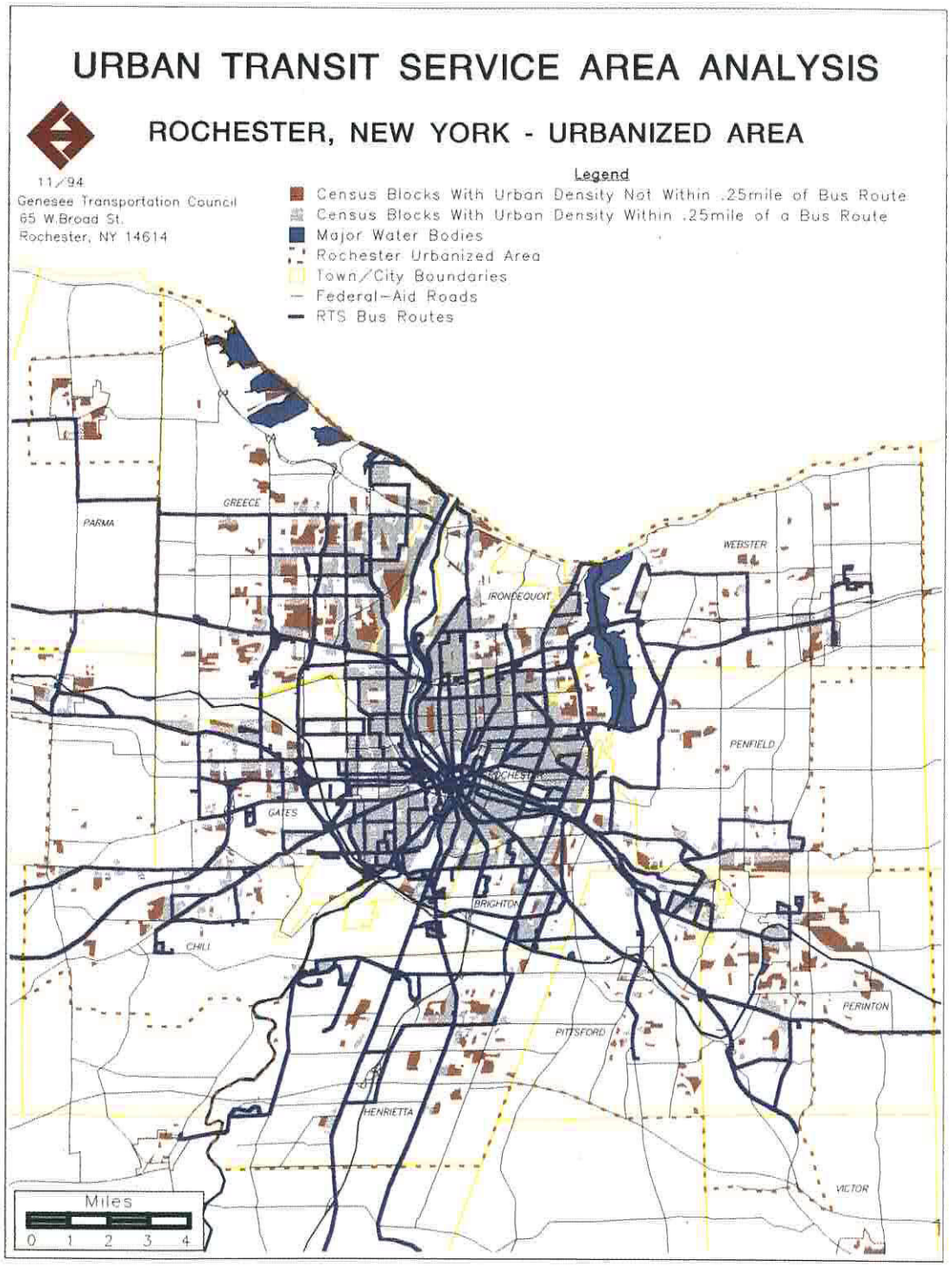
Software: Atlas GIS

Hardware: 486 Desktop Computer
Hewlett Packard Plotter

Data Source: U.S. Census Bureau
CTPP



This map shows the distribution of residents who live in the areas surrounding Rochester and work within the central business district. The map is used as a transportation infrastucture planning tool.



Software: Atlas GIS

Hardware: 486 Desktop Workstation
Hewlett Packard
Plotter

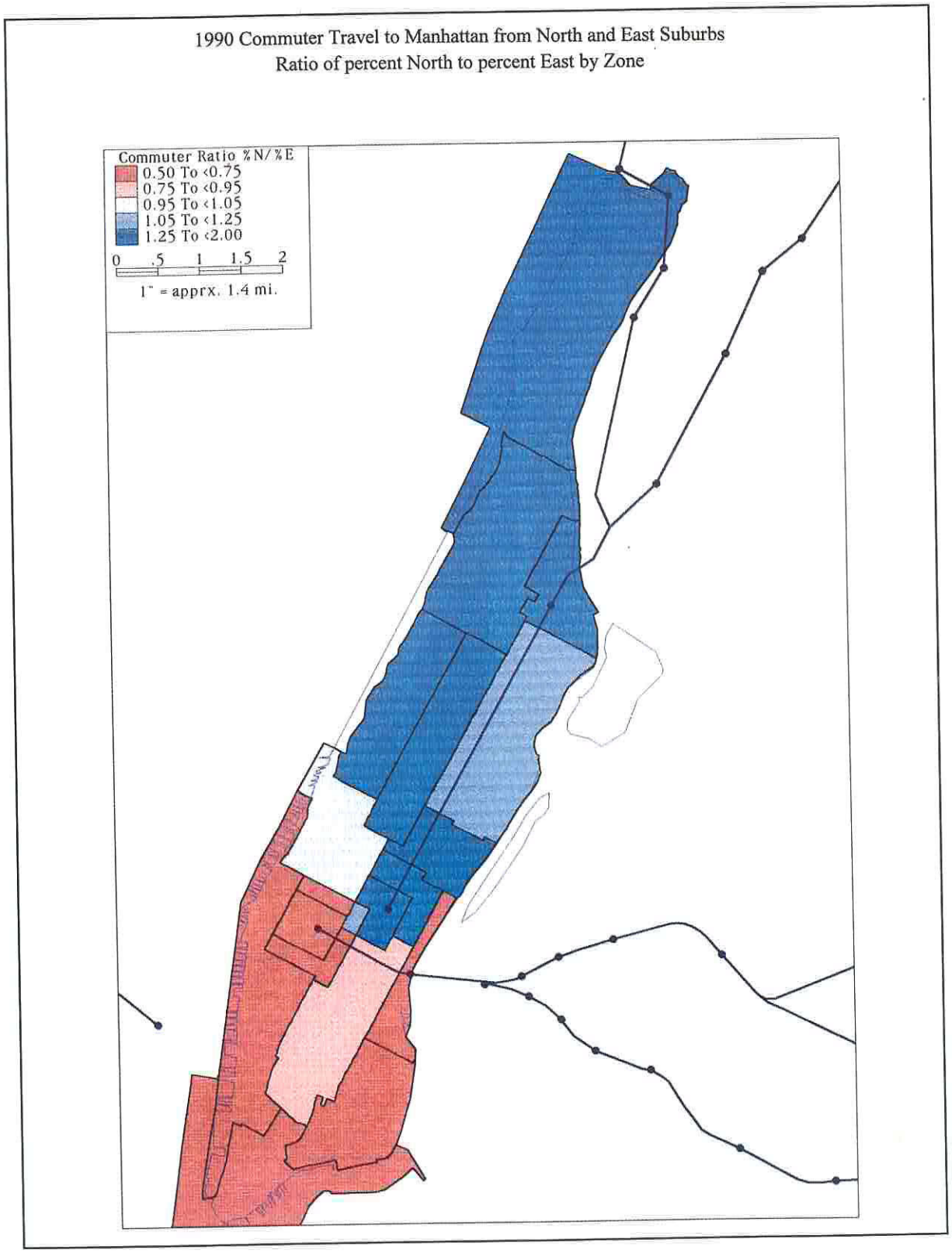
Data Source: U.S. Census Bureau
CTPP, Part3 (Urban)
TIGER

This map shows all the census blocks within a 1/4 mile of a bus route. The map was part of a report on transit which will be used to help determine the long range transportation plan.

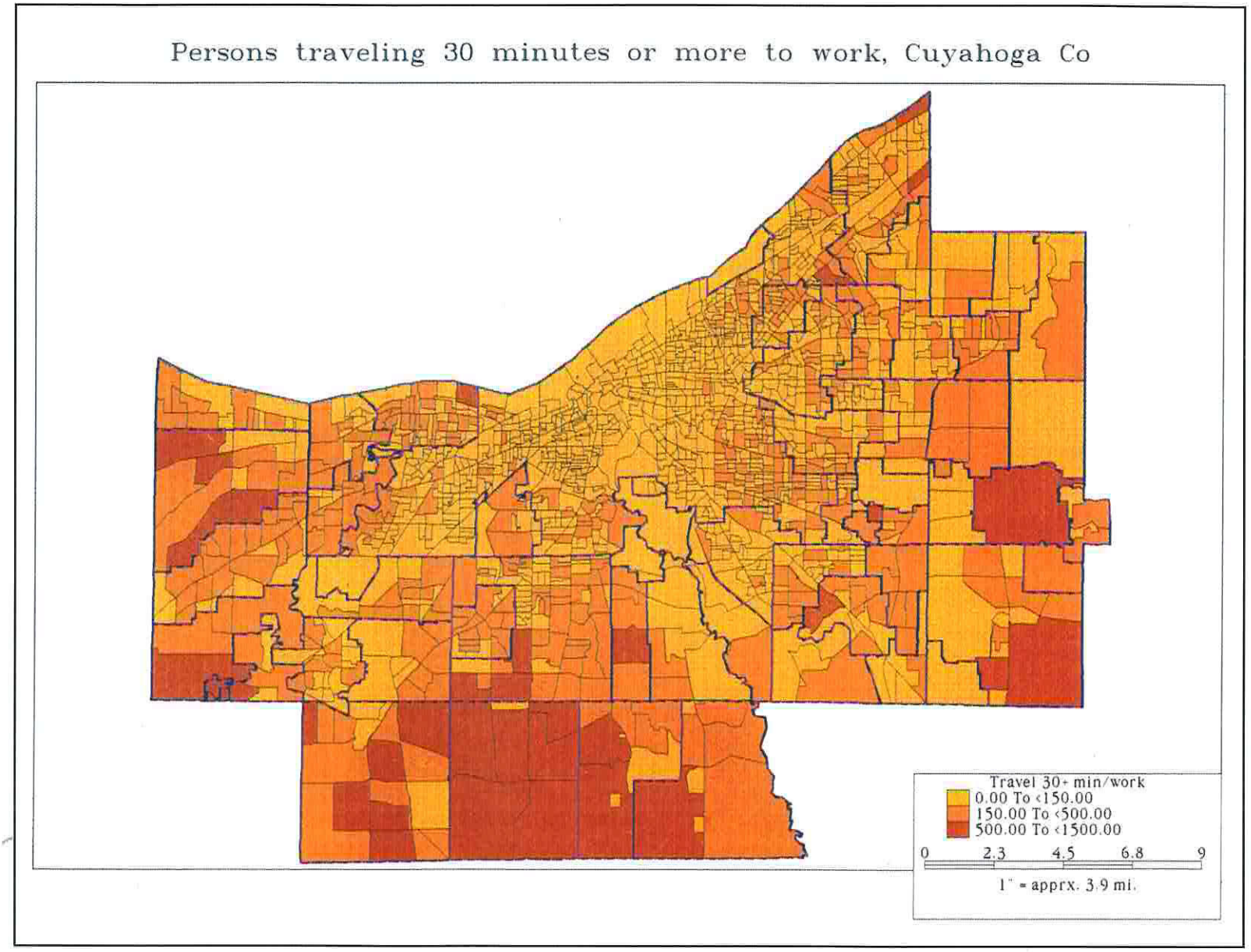
Software: TransCAD

Hardware: 486 Desktop Computer
Hewlett Packard Printer

Data Source: U.S. Census Bureau
CTPP



This map shows the ratio of commuters to Manhattan Zones from the North and East suburban corridors. The map shows how the trip patterns are influenced by rail terminal location. The map was produced by Multisystems, Inc. for an FTA sponsored study.



This map shows the persons traveling 30 minutes or more to work in Cuyahoga County. This map was produced by Multisystems, Inc. as part of a study for the transit authority.

Software: TransCAD

Hardware: 486 Desktop Computer
Hewlett Packard Printer

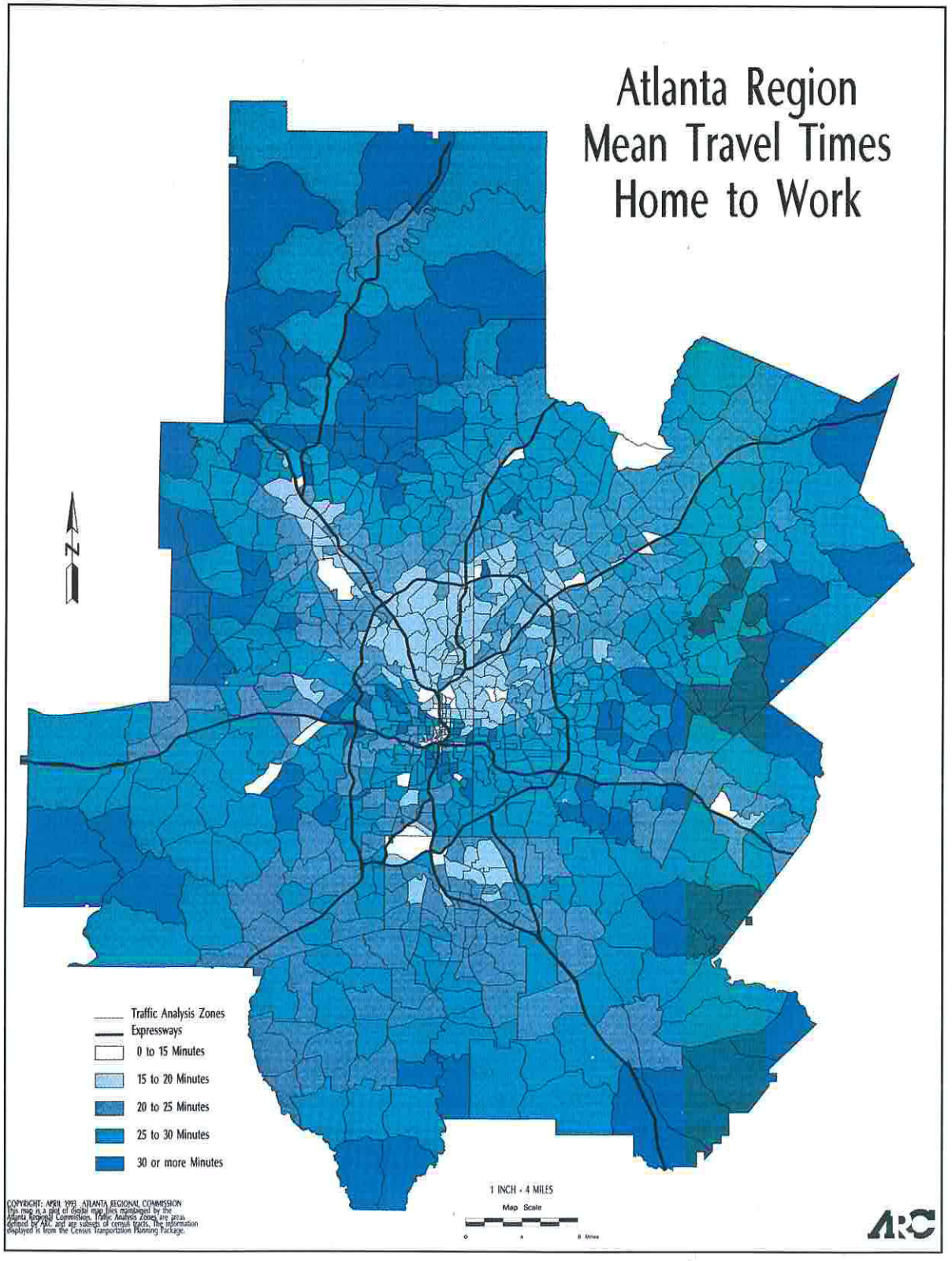
Data Source: U.S. Census Bureau
CTPP

46

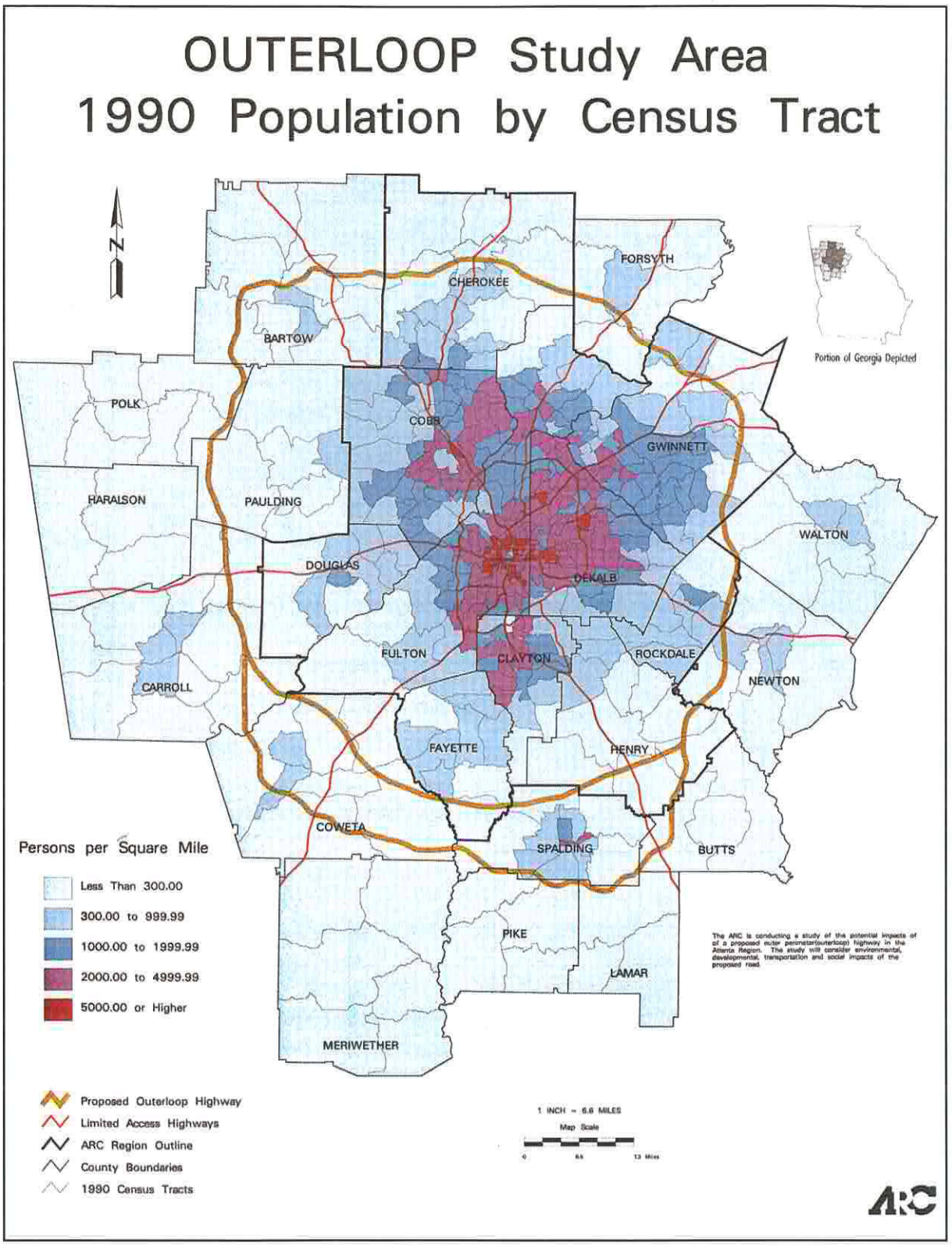
Software: ARC/INFO

Hardware: Digital Alpha 4610 Unix Workstation
Hewlett Packard Color Electrostatic Plotter

Data Source: U.S. Census Bureau
TIGER
CTPP



This map shows the mean travel times of home to work for commuters in the Atlanta area. The map is used to calibrate and validate transportation models.

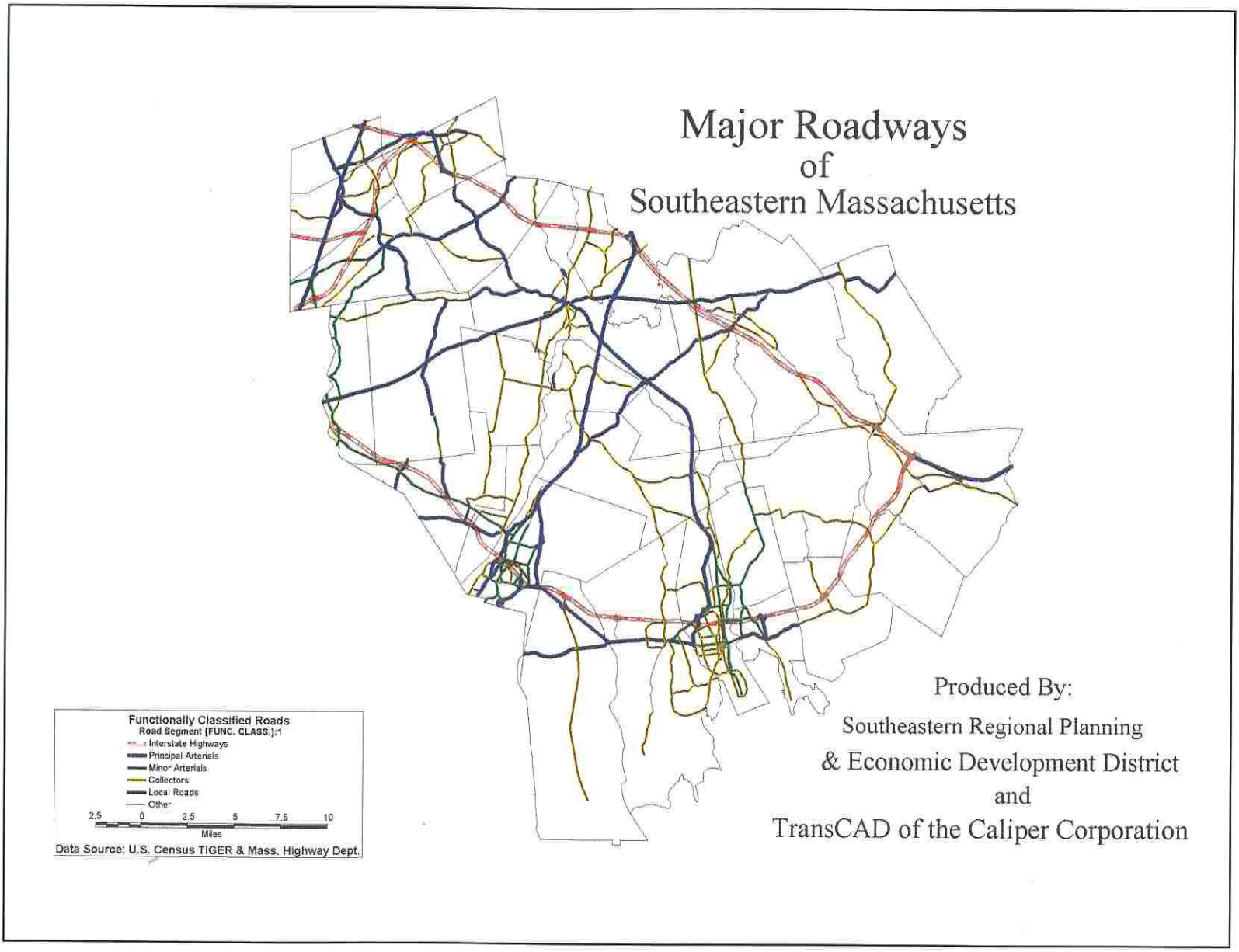


Software: ARC/INFO

Hardware: Digital Alpha 4610 Unix Workstation
Hewlett Packard Color Electrostatic Plotter

Data Source: U.S. Census Bureau
TIGER
STF3

This map shows the relationship of roads to population. The map is being utilized as part of a study of the potential impact of a proposed outer perimeter highway in the Atlanta Region.

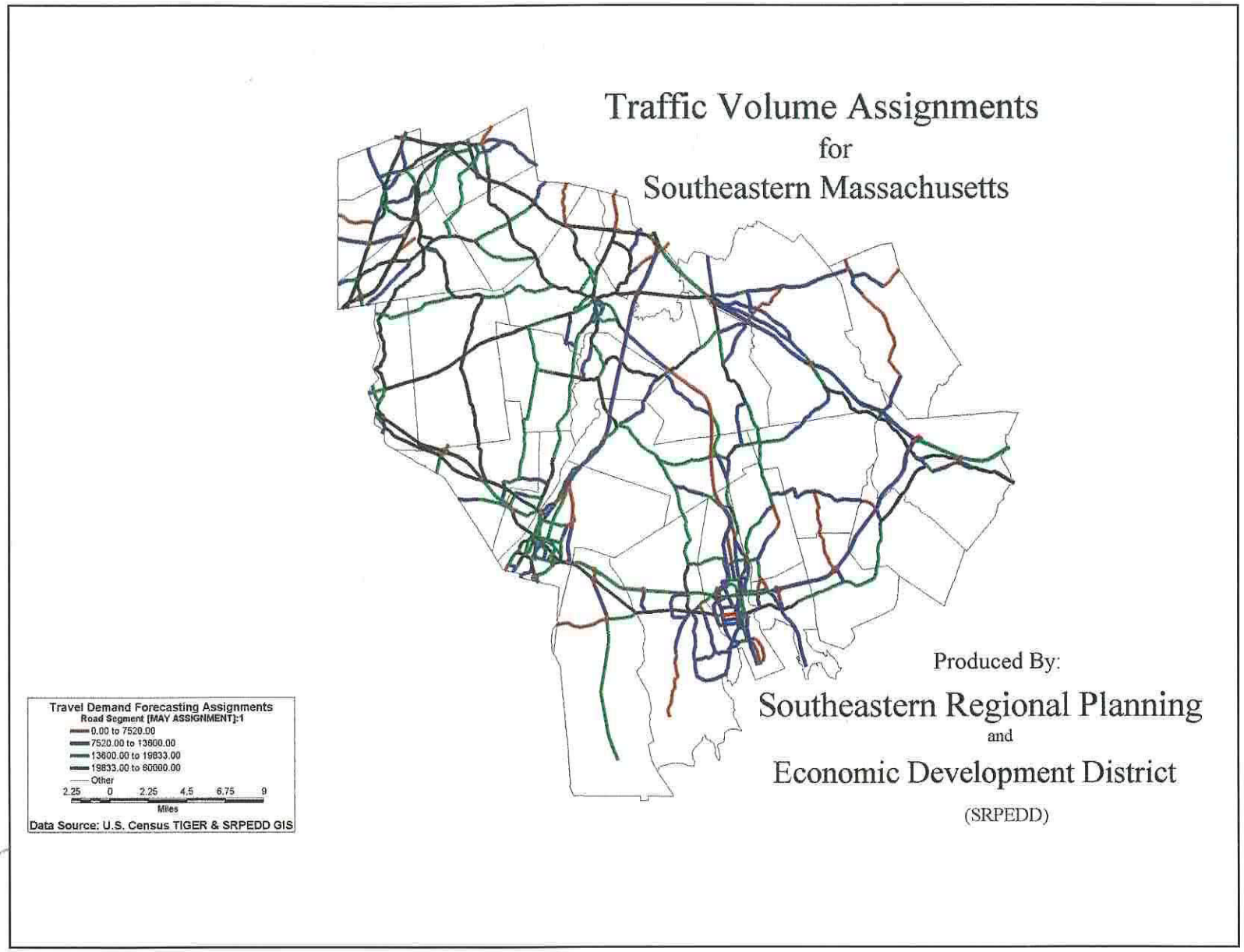


Software: TransCAD

Hardware: 486 Desktop Workstation
Hewlett Packard
Plotter

Data Source: U.S. Census Bureau
TIGER

This map shows the function classification of the major roadways in southeastern Massachusetts. The map was used as planning tool for the development of a regional model. The roadway functional classifications were provided by local authorities and the Massachusetts Highway Department.



This map shows the traffic volume assignments for southeastern Massachusetts. Census data was used to determine the amount of person trips each area would generate. These person trips were converted into vehicle trips and assigned to the road network as part of the travel demand forecasting procedures.

Software: TransCAD

Hardware: 468 Desktop Computer
Hewlett Packard Plotter

Data Source: U.S. Census Bureau
TIGER
STF1,STF3

Contributing Agencies

Atlanta Regional Commission
3715 Northside Parkway
Atlanta, Georgia 30327
Phone: (404) 364-2530

BELOMAR Regional Council
P.O. Box 2086
Wheeling, WV 26003
Phone: (304) 242-1800

Central Transportation Planning Staff
Ten Park Plaza, Suite 2150
Boston, MA 02116-3968
Phone: (617) 973-7100

City of Columbia
P.O. Box N
Columbia, MO 65205
Phone: (314) 874-7244

Delaware Valley Regional Planning Commission
111 South Independence Mall East
Philadelphia, PA 19106-2515
Phone: (215) 592-1800

Genessee Transportation Council
65 West Broad Street, Suite 101
Rochester, NY 14614-2210
Phone: (716) 232-6240

Georgia Department of Transportation
276 Memorial Drive SW
Atlanta, Georgia 30303
Phone: (404) 657-9200

Greater Cleveland Regional Transit Authority
615 Superior Avenue NW
Cleveland, OH 44113
Phone: (216) 566-5195

Lafayette Areawide Planning Commission
705 W. University Avenue
Lafayette, LA 70502
Phone: (318) 261-8000

Maricopa Association of Governments
2901 W. Durango Street
Phoenix, AZ 85009
Phone: (602) 506-4117

Maryland Office of Planning
301 West Preston Street, Room 1101
Baltimore, MD 21201-2356
Phone: (410) 225-4450

Metro
600 NE Grand Avenue
Portland, OR 97232
Phone: (503) 797-1583

Contributing Agencies

Middle Rio Grande Council of Governments
317 Commercial NE, Suite 300
Albuquerque, NM 87102
Phone: (505) 247-1750

MTA Metro-North Railroad
347 Madison Avenue
New York, NY 10017
Phone: (212) 340-2296

New Jersey Department of Transportation
1035 Parkway Avenue
Trenton, NJ 08625
Phone: (609) 530-3097

North Central Texas Council of Governments
616 Six Flags Drive
Arlington, TX 76005-5888
Phone: (817) 640-3300

Port Authority of New York and New Jersey
One World Trade Center, 64E
New York, NY 10048
Phone: (212) 435-4491

Puget Sound Regional Council
1011 Western Avenue, Suite 500
Seattle, WA 98104-1035
Phone: (206) 464-6178

Regional Planning Commission
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Sacramento Area Council of Governments
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Sacramento, CA 95816
Phone: (916) 457-2264

San Diego Association of Governments
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Southeast Michigan Council of Governments
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Phone: (313) 961-4266

Southeastern Regional Planning & Economic Develop. Dist.
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Pittsburgh, PA 15222-1573
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West Alabama Planning and Development Council
4200 Highway 69 North, Suite 1
Northport, AL 35476
Phone: (205) 333-2990

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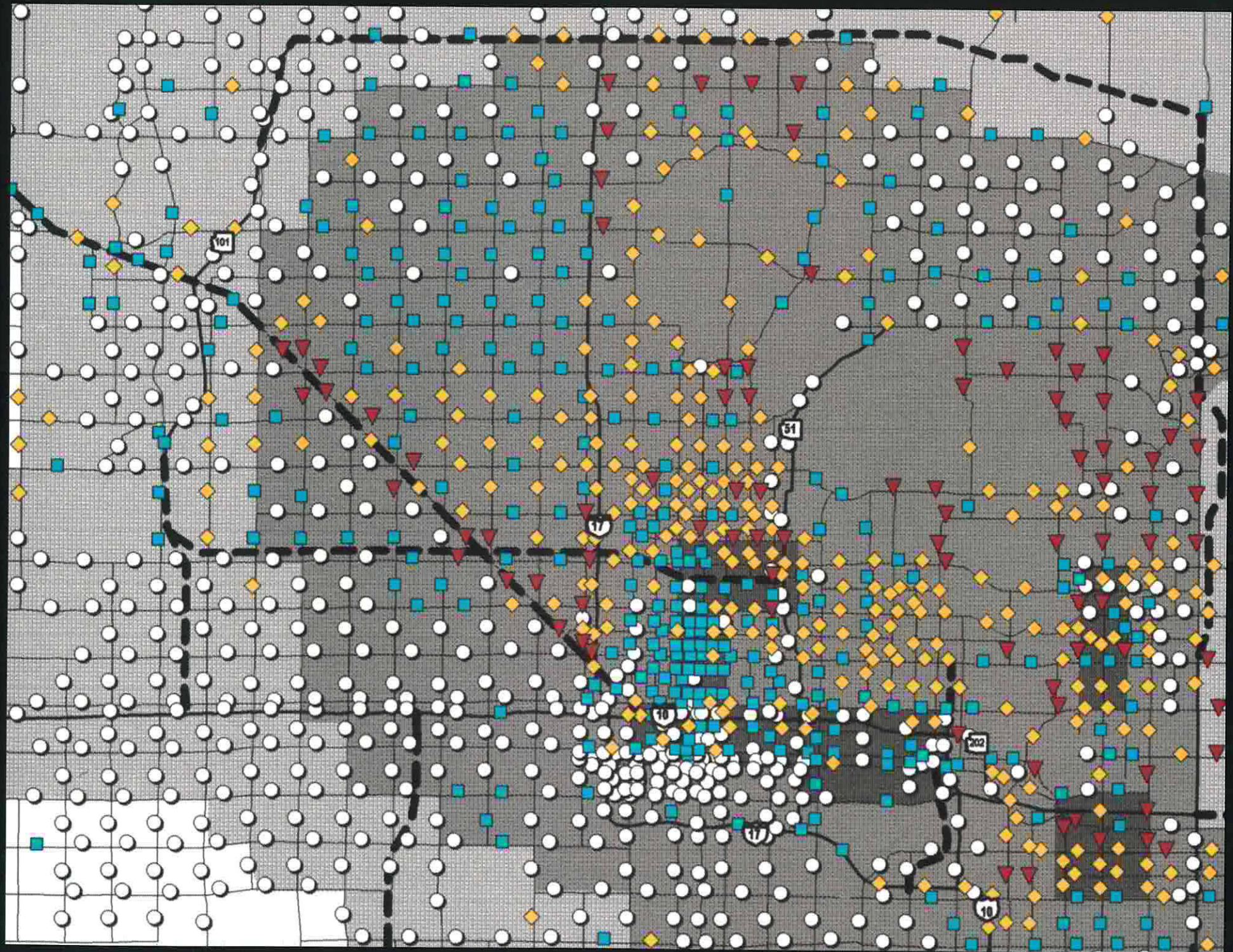

Publication No. FHWA-PL-94-035
HPM-40/12-94(10M)QE