

Transit Planning Applications: Chicago Region

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Eleven different applications are described in which 1990 census data are being used in ongoing Chicago-area transit planning. The relevance of census data for each application and whether the application could have been successfully carried out without such data are also discussed.

Use of 1990 census data for transit planning purposes in the Chicago region has been varied and wide-ranging. All four agencies involved in transit operations and planning have staff with appropriate training to access and analyze census data and have made specific applications. These agencies have also been involved in locally conducted travel surveys, which may also be matched up with census data. Together these agencies have employed census data at regional, corridor-subarea, and station-route levels of planning, with associated concerns for increasing level of detail. In general, it is the flexibility of census data for use at successively finer geographic levels of aggregation that permits this broad spectrum of planning applications, from analysis of regionwide travel flows between very large districts to grouping of census tract data around specific stations or transit routes.

Tables 1 and 2 summarize 11 different applications of 1990 census data in ongoing Chicago-area transit planning over the last few years. In general, these examples represent most of the applications revealed in a survey of the staff involved at each agency, though a few in-

complete or exploratory analyses of various kinds have been omitted. On other planning fronts, each of these agencies, as well as the Northeastern Illinois Planning Commission (NIPC), is also using census data in the exploration and development of geographic information system (GIS) applications, using several different software packages. In fact, the extensive knowledge and use of both census files and GIS systems in the NIPC regional planning program has allowed the commission to provide valuable assistance to other agencies in the region, including transit operators.

In Table 1 the objectives and planning issues addressed in each of the 11 examples are summarized. Objectives range from establishing a basic regional-level data base for understanding changes in multimodal travel demand between 1980 and 1990 to very localized analyses of work trip origin-destination patterns in the vicinity of specific commuter rail stations or bus and rail routes. In the localized examples, use of census data has also been an integral element in feasibility studies for station relocation or route-level service expansion, particularly in suburban portions of the region. Both the work trip file in the Census Transportation Planning Package (CTPP) and the demographic data in the Census Bureau Standard Tape Files have been employed in analyzing central business district (CBD) and non-CBD work travel patterns, including reverse commute patterns. The Chicago region is still focused mainly on its central area; significant radial corridor transit services are provided,

TABLE 1 Chicago Transit Planning Examples: Objectives and Planning Issues Addressed

REGIONAL			
Example	Transit Agency	Objective	Planning Issues Addressed
10-District Transit Origin-Destination Flow Analysis	Regional Transportation Authority (RTA)	Compare relative changes between 1980-90 in CTPP work trip flows between ten major districts.	Relative changes in travel demand, by mode, 1980-90: Implications for service/facility improvements.
Central Business District Modal Market Shares, By Work Trip Origin Zone	RTA	Analyze 1980-90 shifts in market share, by mode, for CBD work trips originating in outlying zones (city and suburbs).	Relative change in travel demand, by mode, for work trips specifically oriented towards the Central Business District: Implications for service/facility improvements.
Commuter Rail Station Area Market Shed Analysis	Metra (Commuter Rail Operator)	Analyze population, households, and employment in uniquely defined market sheds centered around each commuter rail station in region: 1980, 1990, 2010 forecast.	Relative change in demographic variables generating travel demand, 1980-90-2010: Implications for transit service/station change.
Suburban Bus Transit Marketing Plan	Pace	Analyze 1980, 1990, and projected 2000 work trip volumes, for Suburb-to-Suburb, City-to-City, Suburb-to-City, and City-to-Suburb markets.	Relative change in market size and Pace ridership potentials: Implications for marketing and service improvements.

CORRIDOR/SUB-AREA			
Example	Transit Agency	Objective	Planning Issues Addressed
Non-CBD Work Trip Origins: Selected Suburban Work Centers	RTA	Analyze distribution of home end of non-CBD work trips, as input to suburban transit feasibility analyses.	Ridership potential associated with proposed suburban bus routing/service improvements.
Near North Side Reverse Commuting: Distribution of Work Trip Destinations	RTA	Analyze distribution of trip destinations (non-CBD, outbound) for three major residential zones, near north side of Chicago.	Potential for improved feeder bus service to attract additional commuter rail riders in reverse commute direction.
Rapid Rail Transit Corridor Market Analyses: Orange and Blue Lines	Chicago Transit Authority (CTA)	Compare results of recent on-board passenger survey against related census travel and demographic variables, for geographically defined market sub-areas.	Defining future marketing and promotional strategies intended to increase ridership on CTA's O'Hare Line and Midway Line.
Bus Service Market Analysis: Northwest Corridor	CTA	Compare results of passenger on-board travel survey with related census travel and demographic variables, for one-mile and six-mile wide market sheds straddling key bus routes.	Define service adjustment and marketing strategies to better match ridership potentials with bus route service levels.

with morning-outbound and evening-inbound excess capacity that offers further ridership potential.

Table 2 summarizes the relevance of census data for each application and whether the application could have been successfully carried out without census data. In some cases, primary interest was focused on the CTPP data file, either for origin-destination flow patterns or for examination of the geographic distribution of work

trip origins or destinations. Market segmentation analyses tied to geographic subareas defined by agency-conducted rider surveys have been an important component of market research that utilizes census demographic data. In two instances, both associated with commuter rail service and station feasibility analyses, rider or license plate surveys were also conducted that supported the analysis to the extent that the census data applica-

TABLE 1 (continued)

ROUTE/STATION			
Example	Transit Agency	Objective	Planning Issues Addressed
Commuter Rail Station Feasibility Analysis, DuPage County	Metra	Analyze distribution of CBD-bound work trips in vicinity of proposed new commuter rail station in Wheaton, Illinois	Ridership potential associated with proposed new commuter rail station: station feasibility.
Commuter Rail Express Service Analysis: Distribution of Work Trip Origins Destined for CBD	Metra	Analyze distribution of 1990 and 2010 households along commuter rail line, in support of proposed addition of express service run.	Feasibility of proposed expanded parking capacity at selected stations along route.
Urban Core Bus Route Profiles: Atlas	CTA	Develop Atlas of key travel and census variables for census tracts within one-mile band straddling each of 125 bus routes in CTA service area.	Provide data base useful for examining feasibility of future proposed service adjustments, in relation to rider demographics and travel patterns.

tion was supplemental. In all of the other examples, however, comparable travel survey or other demographic data were not available from other sources, which reflects particularly the much larger geographic scale associated with these examples.

An important result of most of the applications was simply to establish a data base for ongoing planning efforts at the regional and corridor-subarea levels. Findings were also employed, however, in evaluating specific service change proposals, developing marketing programs, and making build or no-build decisions on rail transit stations. Figures 1 and 2 and Table 3 give examples of output from two of the regional applications.

Figures 3 and 4 and Table 4 similarly offer output illustrations for two of the corridor-subarea applications. Finally, Figures 5 and 6 represent similar examples for route and station planning applications.

REGIONAL EXAMPLES

Ten-District Analysis of Transit Origin-Destination Flow

Broad-brush shifts between 1980 and 1990 in major work trip flows between 10 "superdistricts" comprising

TABLE 2 Chicago Transit Planning Examples: Census Data Utilization, Results, and Findings

REGIONAL				
Example	Transit Agency	Relevance of Census Data	Possible Without Census Data	Results, Findings
10-District Transit Origin-Destination Flow Analysis	Regional Transportation Authority (RTA)	CTPP Work Trip Origin-Destination Flows.	No: Comparable Work Trip Origin-Destination Data not available from local travel surveys.	Data base for ongoing planning efforts.
Central Business District modal market shares, by work trip origin zone	RTA	CTPP Work Trip Origin-Destination Flows.	No: Comparable Work Trip Origin-Destination Data not available from local travel surveys.	Data base for ongoing planning efforts.
Commuter Rail Station Area Market Shed Analysis	Metra (Commuter Rail Operator)	Small-Area Demographic Data: Aggregate to market areas.	No: Comparable Small-Area Demographic Data not available from other sources.	Data base for ongoing planning efforts.
Suburban Bus Transit Marketing Plan	Pace	CTPP Work Trip Origin-Destination Flows.	No: Comparable Work Trip Origin-Destination Data not available from local travel surveys	Data base for ongoing planning efforts; 1996 Marketing Plan

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TABLE 2 (continued)

CORRIDOR/SUB-AREA				
Example	Transit Agency	Relevance of Census Data	Possible Without Census Data	Results, Findings
Non-CBD Work Trip Origins: Selected Suburban Work Centers	RTA	CTPP Work Trip-Ends: Origins.	No: Comparable Work Trip Origin-Destination Data not available from local travel surveys.	Selected suburban bus service bus options evaluated.
Near North Side Reverse Commuting: Distribution of Work Trip Destinations	RTA	CTPP Work Trip-Ends: Destinations.	No: Comparable Work Trip Origin-Destination Data not available from local travel surveys.	Shuttle bus proposal under development.
Rapid Rail Transit Corridor Market Analyses: Orange and Blue Lines	Chicago Transit Authority (CTA)	Small-Area Demographic Data: Aggregate to Market Sub-areas. Small-Area CTPP Travel Data.	No: Comparable Small-Area Demographic Data not available from other sources.	Marketing program under development.
Bus Service Market Analysis: Northwest Corridor	CTA	Small-Area Demographic Data: Aggregate to Market Sub-areas. Small-Area CTPP Travel Data.	No: Comparable Small-Area Demographic Data not available from other sources.	Data base for ongoing planning efforts.

ROUTE/STATION				
Example	Transit Agency	Relevance of Census Data	Possible Without Census Data	Results, Findings
Commuter Rail Station Feasibility Analysis, DuPage County	Metra	CTPP Work Trip-Ends: Origins & Destinations.	Yes: License Plate Survey at existing park-ride lots also conducted to establish trip origins.	Proposed station not to be built.
Commuter Rail Express Service Analysis: Distribution of Work Trip Origins Destined for CBD	Metra	CTPP Work Trip-Ends: Origins. Small-Area Demographic Data: Route Corridor.	Yes: Rider Survey along route also conducted to establish trip origins.	Express service implemented and retained.
Urban Core Bus Route Profiles: Atlas	CTA	Small-Area Demographic Data: Aggregate to Market Sub-areas. Small-Area CTPP Travel Data.	No: Comparable Small-Area Demographic Data not available from other sources.	Data base for ongoing planning efforts.

the entire Chicago region were investigated (1). The purpose was to derive implications for future service and facility improvement changes by mode. No comparable work trip origin-destination data are available from local travel surveys to permit such an analysis; the CTPP work trip tables were essential.

CBD Modal Market Shares by Work Trip Origin Zone

Because the central area of Chicago is still a major concentration of regional employment, area transportation

planners have a strong interest in changes over time in the geographic pattern of work trip flows to the Chicago CBD. Here 1980-1990 shifts in market share by mode for CBD work trips were mapped and compared to explore needs for potential transit service and facility improvement (Figure 1). Again, the CTPP work trip files provided the only available data base for such an analysis (2).

Analysis of Commuter Rail Station Marketsheds

Chicago's commuter rail operator, Metra, has divided its market area into individual commuter rail station

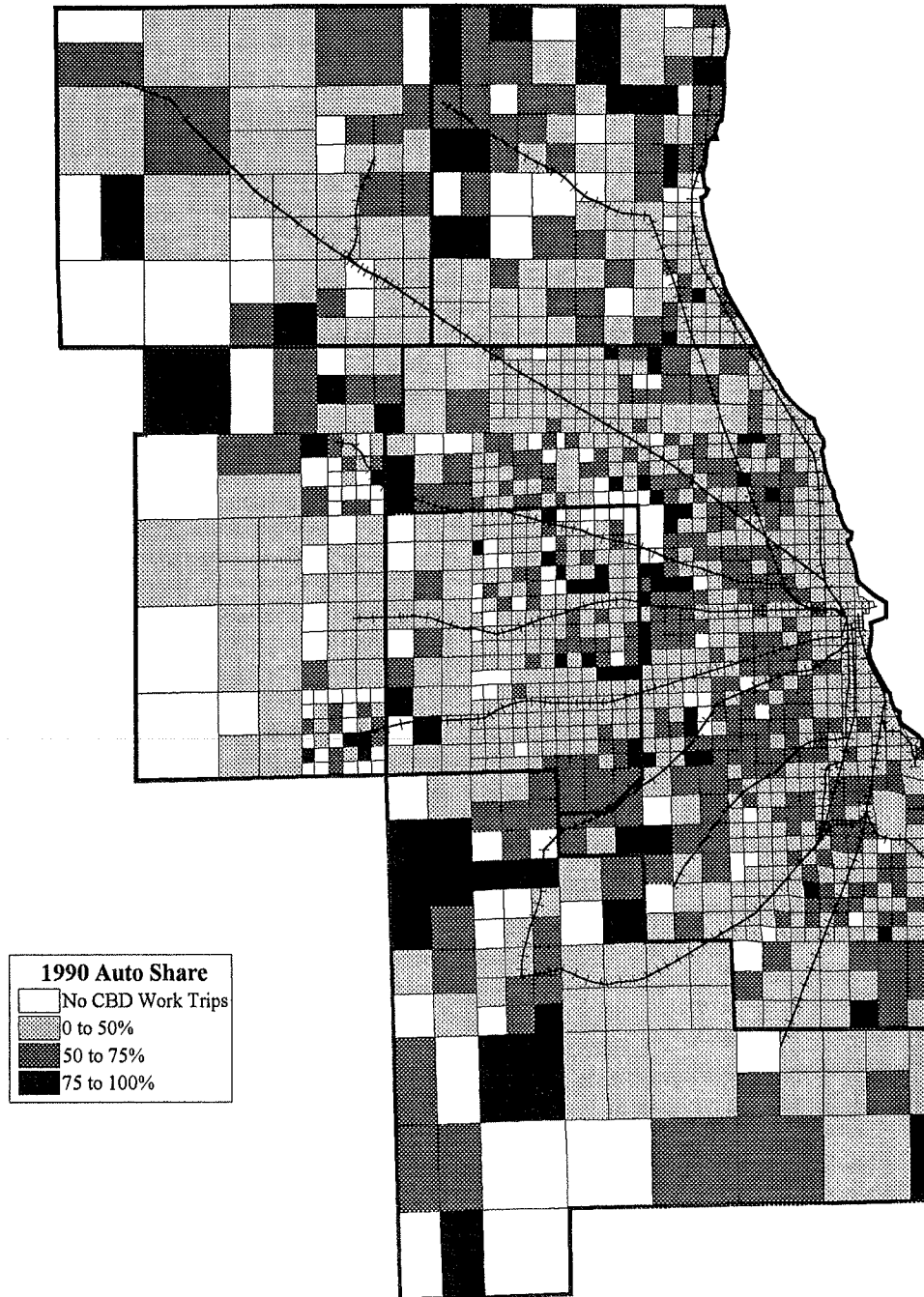


FIGURE 1 1990 CBD work trips: automobile shares by origin zones (source: 1990 census CTPP, RTA Planning Division, Oct. 1994).

marketsheds (Figure 2, Table 3). For 1980, 1990, and 2010, population, households, and employment were compared for each of these station-focused marketsheds in order to examine what types of transit service or station improvements might be most appropriate in the future. No comparable small-area demographic data sources were available to permit this analysis (3).

Suburban Bus Transit Marketing Plan

The suburban bus operator, Pace, analyzed its extensive market area along four dimensions: suburb-to-suburb, city-to-city, suburb-to-city, and city-to-suburb (4). Work trip volumes for 1980, 1990, and projected year 2000 for these interchange types were analyzed to better understand market size changes and associated service improve-

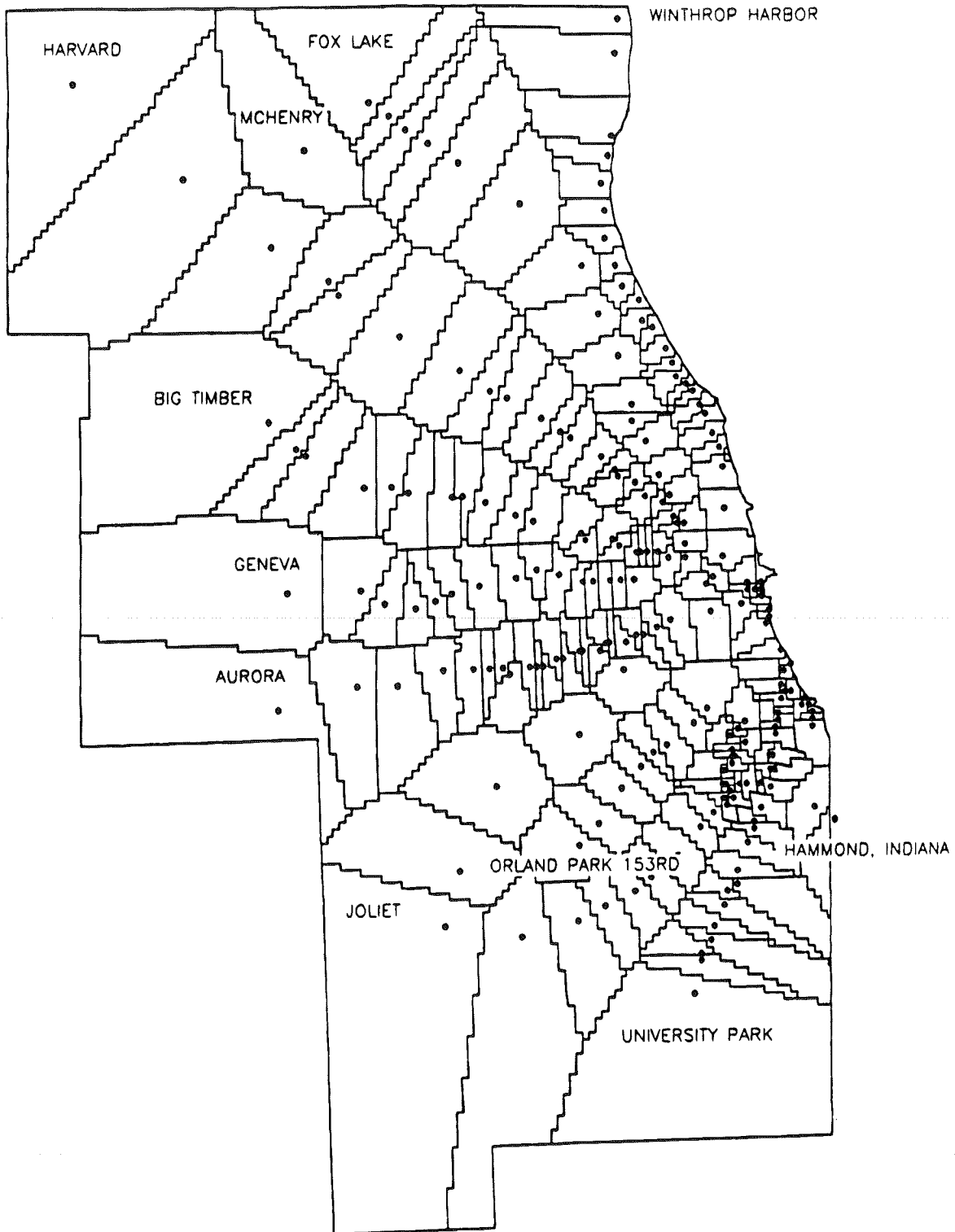


FIGURE 2 Marketshed boundaries (station locations approximate).

TABLE 3 Socioeconomic Data by Rail Station Marketshed: Households

HOUSEHOLDS BY LINE AND STATION C&NW NORTHWEST LINE	1980	1990	CHANGE 1980-1990		2010 FORECAST	CHANGE 1990-2010	
			ABSOLUTE	PERCENT		ABSOLUTE	PERCENT
CHICAGO CPT	21,199	21,615	416	2.0%	32,092	10,477	48.5%
CLYBOURN	80,596	79,120	-1,476	-1.8%	97,466	18,346	23.2%
IRVING PARK	29,093	28,007	-1,086	-3.7%	33,443	5,436	19.4%
JEFFERSON PARK	11,356	11,436	80	0.7%	10,325	-1,111	-9.7%
GLADSTONE PARK	17,065	17,282	217	1.3%	16,391	-891	-5.2%
NORWOOD PARK	8,524	8,892	368	4.3%	8,060	-832	-9.4%
EDISON PARK	13,366	13,527	161	1.2%	14,145	618	4.6%
PARK RIDGE	7,808	8,127	319	4.1%	7,995	-132	-1.6%
DEE RD	14,793	15,607	814	5.5%	15,756	149	1.0%
DES PLAINES	13,683	15,197	1,514	11.1%	15,648	451	3.0%
CUMBERLAND	10,163	10,269	106	1.0%	10,832	563	5.5%
MOUNT PROSPECT	26,897	30,290	3,393	12.6%	33,503	3,213	10.6%
ARLINGTON HEIGHTS	24,041	30,557	6,516	27.1%	33,313	2,756	9.0%
ARLINGTON PARK	19,471	23,681	4,210	21.6%	28,831	5,150	21.7%
PALATINE	26,157	37,933	11,776	45.0%	43,804	5,871	15.5%
BARRINGTON	11,031	16,488	5,457	49.5%	22,156	5,668	34.4%
FOX RIVER GROVE	10,640	13,531	2,891	27.2%	17,684	4,153	30.7%
CARY	7,951	11,243	3,292	41.4%	18,185	6,942	61.7%
CRYSTAL LAKE	11,562	15,347	3,785	32.7%	25,312	9,965	64.9%
MCHENRY (MCHENRY BRANCH)	11,259	14,020	2,761	24.5%	17,420	3,400	24.3%
WOODSTOCK	9,403	11,053	1,650	17.5%	15,029	3,976	36.0%
HARVARD	4,067	4,538	471	11.6%	4,826	288	6.3%
TOTAL	390,125	437,760	47,635	12.2%	522,216	84,456	19.3%

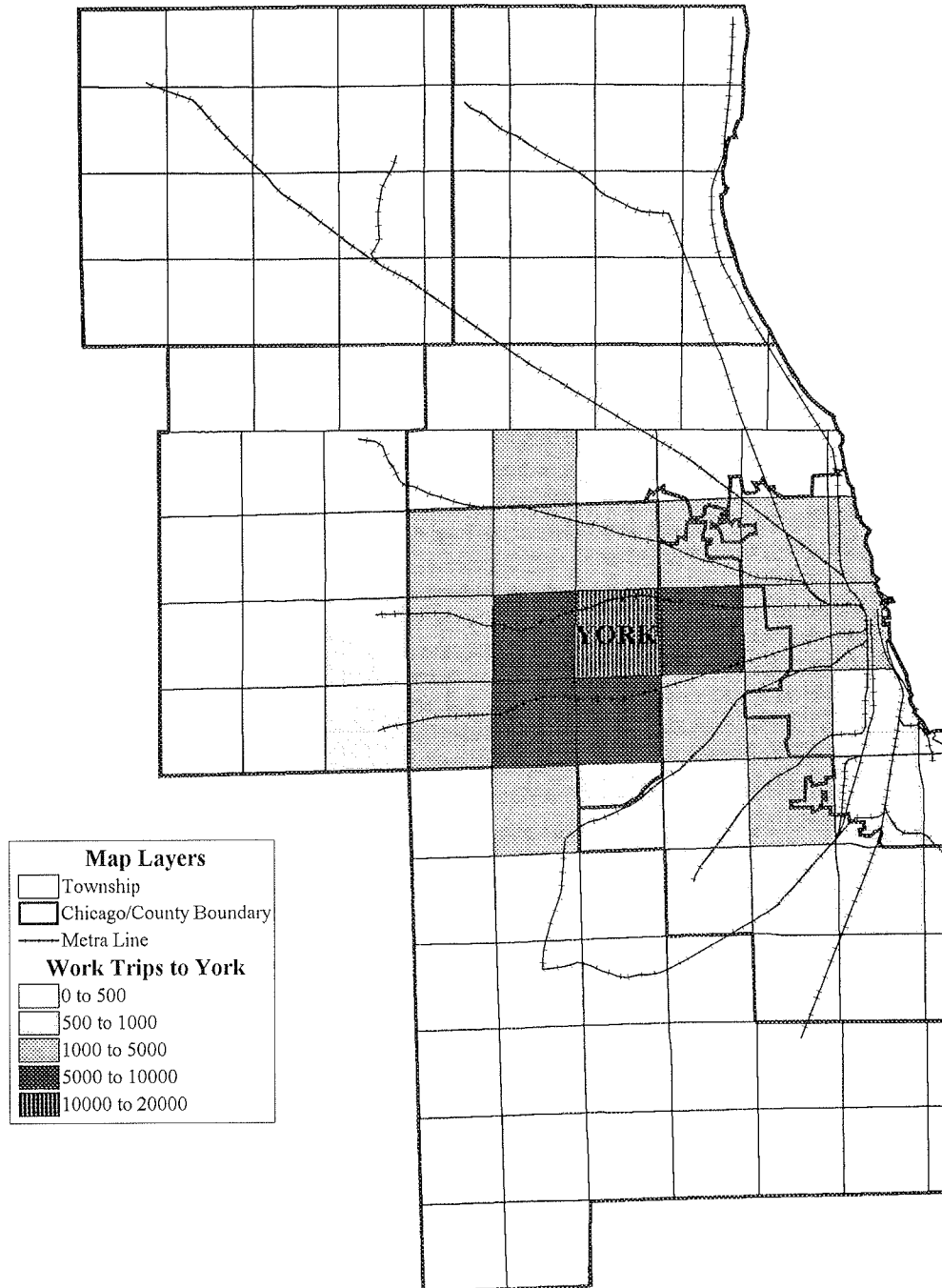


FIGURE 3 Origins of 1990 work trips to York township.

ment implications. CTPP work trip origin-destination flows were the only available data source for the analysis.

CORRIDOR-SUBAREA EXAMPLES

Non-CBD Work Trip Origins for Selected Suburban Work Centers

In order to facilitate suburban transit feasibility analyses for proposed bus route and service improvements, CTPP work-

trip-end data files for trip origins were analyzed (Figure 3) (2). The distribution of the home end of non-CBD work trips to outlying employment concentrations was mapped. Again, these data are not available from local travel surveys.

Work Trip Destinations for Near North Side Reverse Commuting

For three major residential zones of relatively high density on the near north side of Chicago, it was known that re-

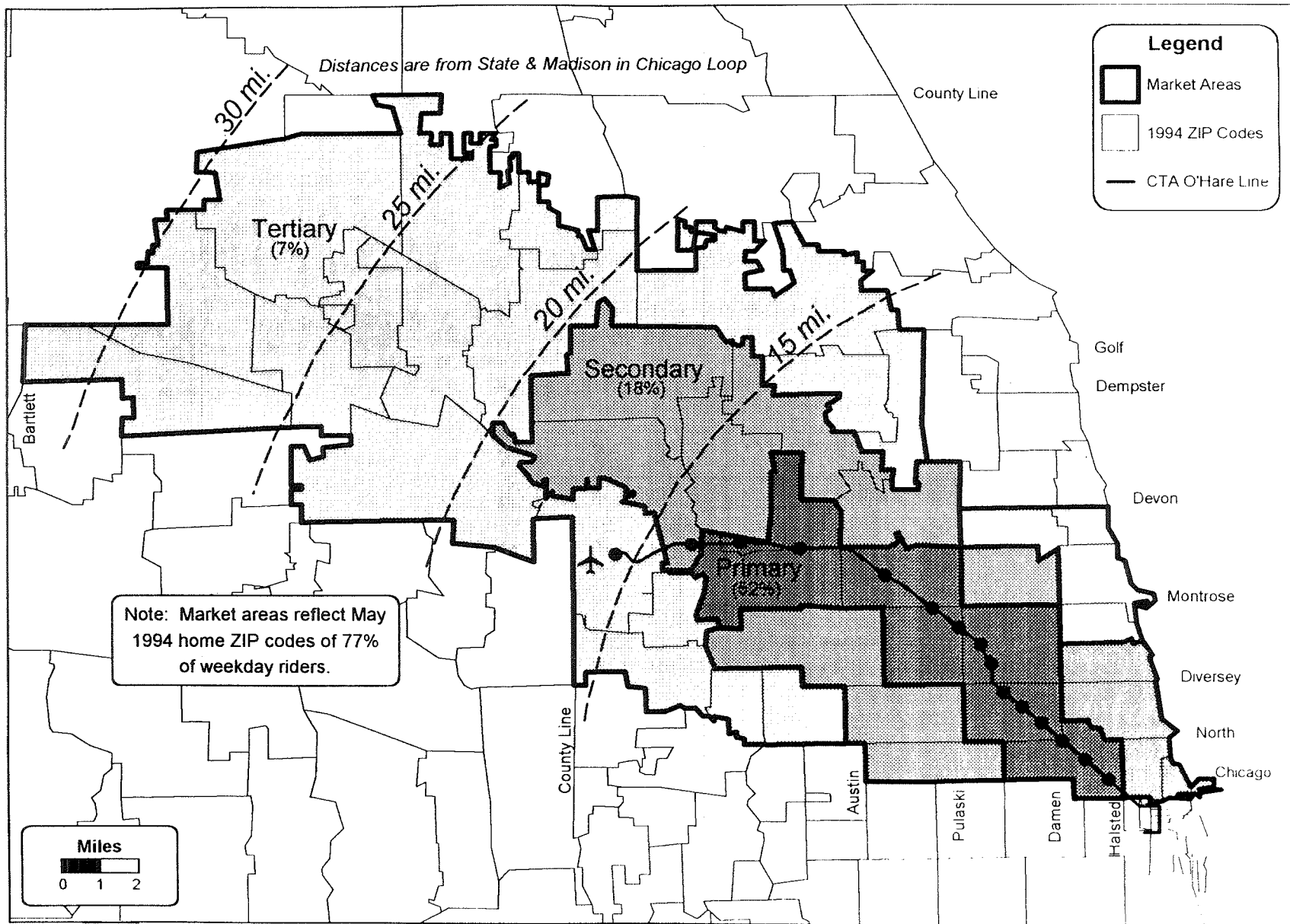


FIGURE 4 Market area geography: 1994 ridership survey.

TABLE 4 1990 Mode of Transportation to Work: O'Hare Corridor

Mode of Transportation	Core	% of Core	Secondary Sub-Area	% of Secondary	Tertiary Sub-Area	% of Tertiary	Market Area Totals	% of Market Totals
Drove Alone	103,647	51.95%	180,877	51.78%	267,824	68.80%	552,348	58.88%
Carpooled	32,370	16.23%	40,993	11.73%	40,031	10.28%	113,394	12.09%
Bus	28,028	14.05%	52,077	14.91%	24,904	6.40%	105,009	11.19%
Subway/'L'	17,636	8.84%	30,195	8.64%	18,126	4.66%	65,957	7.03%
Railroad	1,745	0.87%	4,928	1.41%	13,818	3.55%	20,491	2.18%
Taxicab	310	0.16%	5,318	1.52%	1,109	0.28%	6,737	0.72%
Walked	10,746	5.39%	24,986	7.15%	13,109	3.37%	48,841	5.21%
Work/Home	3,140	1.57%	8,038	2.30%	8,130	2.09%	19,308	2.06%
Other	1,877	0.94%	1,936	0.55%	2,206	0.57%	6,019	0.64%
TOTAL WORK TRIPS	199,499	100.00%	349,348	100.00%	389,257	100.00%	938,104	100.00%

NOTE: Percentage columns may not total exactly to 100.00% due to rounding.

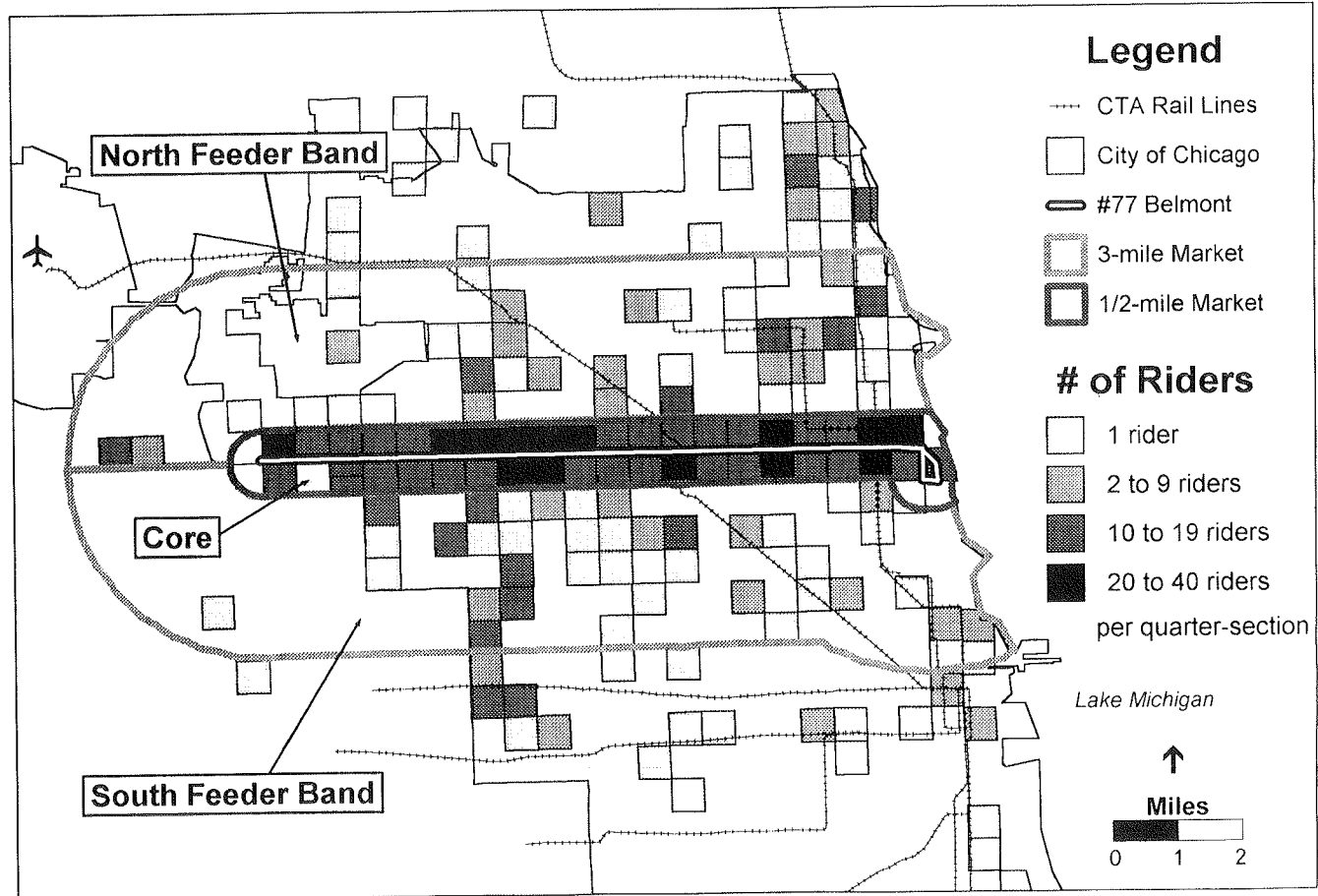


FIGURE 5 Market area for CTA Belmont bus route: rider origins.

verse commute travel linkages to the northwest sector were an important travel pattern. Analyzing CTPP work-trip-end (destination) files for these zones permitted the distribution of these reverse commute flows to be matched against potential feeder bus service improvements intended to allow these commuters to utilize commuter rail in the reverse direction. Shuttle bus proposals were under active development at the time of the analysis (5).

Rapid Rail Transit Corridor Market Analyses

Results from recent on-board passenger surveys in two major travel corridors served by the Chicago Transit Authority (CTA) Orange and Blue lines were matched against small-area demographic and CTPP travel data for geographically defined market subareas (Figure 4, Table 4). The purpose was to gain a better understanding of these subareas in the design of future marketing and promotional strategies intended to increase ridership on the two rail lines. Both CTPP and demographic census data were essential in defining the overall community-based benchmark for interpreting the passenger surveys (6).

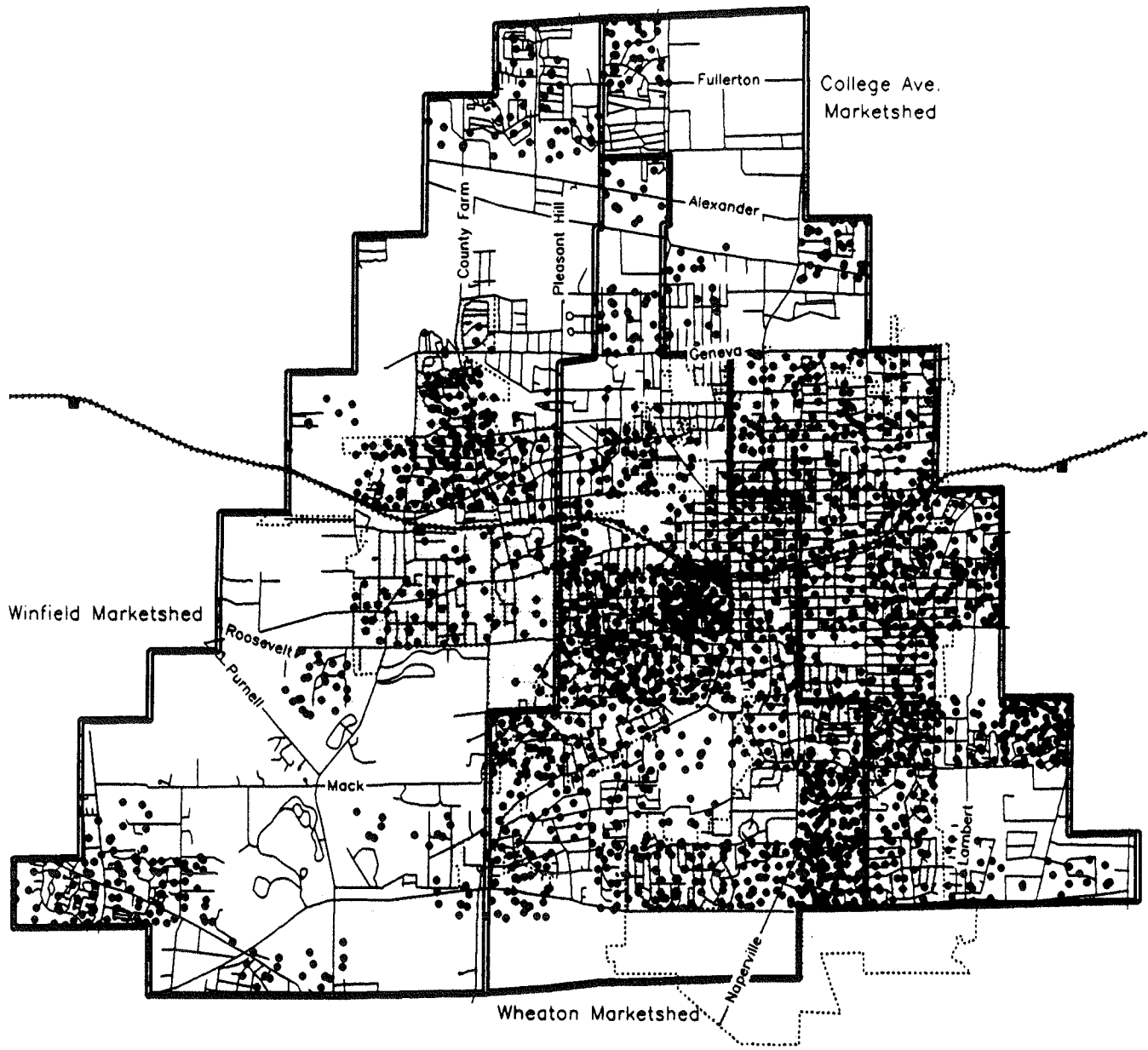
Bus Service Market Analysis in Northwest Corridor

Again the results of a major passenger on-board travel survey were matched against related census travel and demographic variables (7) in order to better understand geographically defined marketsheds straddling five key bus routes (Figure 5). Assistance in the definition of service adjustment and marketing strategies to better match ridership potentials with bus route service levels was the objective. The small-area demographic data utilized were not available from other comparable local sources.

ROUTE AND STATION EXAMPLES

Commuter Rail Station Feasibility Analysis for DuPage County

A new commuter rail station was proposed in Wheaton, Illinois, in association with a major county office center. A geographic-based analysis of ridership potentials associated with this new station was conducted through the analysis of CBD-bound work trips generated in



Legend

- Marketsheds
- Municipalities
- Metra Rail
- Lines
- Lines
- Lines
- Metra Stations

Data Displayed

- =One Worker using Metra

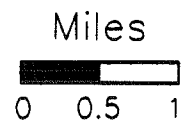


FIGURE 6 Residential quartersections of CBD workers who use Metra (source: 1990 CTPP).

the vicinity of the proposed station (Figure 6) as well as locally destined work trips (reverse commute potentials). CTPP work trip ends (origins and destinations) provided one data base, as did a license plate survey at existing park-ride lots serving the nearest commuter rail stations (on two lines); both were used to analyze the distribution of work trip ends. In part on the basis of this analysis (8), the proposed station will not be built.

Commuter Rail Express Service Analysis: Distribution of Work Trip Origins Destined for CBD

A proposed service expansion along a commuter rail route led to associated proposals for expanded parking capacity at selected stations along the route. To project potential ridership growth, CTPP work-trip-end (origins) analyses were conducted in association with analysis of the distribution of 1990 and forecast 2010 households along the route. Both the CTPP file and a license plate survey at existing park-ride lots were used to establish the geographic pattern of present trip origins (9).

Atlas of Urban Core Bus Route Profiles

Small-area demographic and CTPP data can be aggregated to route-specific market profiles for each of 125 bus routes serving the CTA market area. Using a GIS data base, an atlas of key travel and census variables has been assembled for census tracts within a one-mile band straddling each of these routes. The

atlas will be utilized in ongoing planning efforts and could not have been developed from other data sources (10).

REFERENCES

1. *Census Journey-to-Work Market Analysis*. Planning Division, Regional Transportation Authority, Chicago, Ill., May 1994.
2. *Transit System Plan Study: Status Report*. Planning Division, Regional Transportation Authority, Chicago, Ill., Feb. 1995.
3. *Tabulation of Socio-demographic Data by Rail Station Market Shed*. Office of Planning and Analysis, Metra, Chicago, Ill., Oct. 1993.
4. *1996 Marketing Plan*. Pace Marketing and Development Department, Arlington Heights, Ill., Dec. 1995.
5. *Data Request: Reverse Commute Analysis*. Regional Transportation Authority, Planning Division, Chicago, Ill., June 1994.
6. *O'Hare Line Market Area: 1990 Census Demographic Analysis*. Market Research Department, Planning Division, Chicago Transit Authority, Sept. 1995.
7. *Northwest Corridor Bus Service Market Analysis*. Market Research Department, Planning Division, Chicago Transit Authority, Feb. 1995.
8. *Station Feasibility Study: DuPage County Government Center/C&NW West Line*. Office of Planning and Analysis, Metra, Chicago, Ill., Sept. 1992, 1994 update.
9. *Burlington Northern 6:50 PM Express: On-Board Survey Study*. Marketing Department, Metra, Chicago, Ill., March 1995.
10. *1990 Census Data by Transit Route*. Market Research Department, Planning Division, Chicago Transit Authority, 1996.