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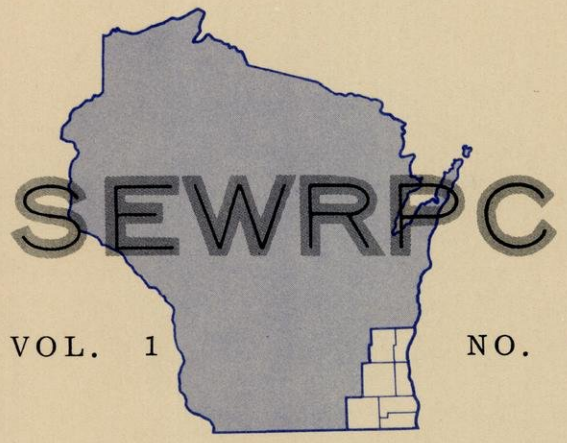
TECHNICAL RECORD



VOL. 1 NO. 2

DECEMBER - JANUARY

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* ANALYSIS ZONES AND ARTERIAL NETWORK * CONDUCTING THE HOME INTERVIEW SURVEY * CONDUCTING THE HOUSEHOLD POSTAL QUESTIONNAIRE SURVEY * AERIAL PHOTOS IN LAND USE INVENTORY

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

916 North East Avenue - Waukesha, Wisconsin

STAFF

Kurt W. Bauer . . . . . Executive Director

Land Use-Transportation Study Office

J. Robert Doughty . . . . . Study Director

Richard Sheridan . . . . . Chief Transportation Planner

Harlan E. Clinkenbeard . . . . . Chief Land Use Planner

Kenneth J. Schlager . . . . . Chief Systems Engineer

Sheldon W. Sullivan . . . . . Administrative Officer

Wade G. Fox . . . . . Cartography and Design Supervisor

Central Office

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Dallas R. Behnke . . . . . Chief Draftsman

William J. Kockelman . . . . . Community Assistance Planner

THE TECHNICAL RECORD

Volume one Number two

December 1963 - January 1964

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The preparation of this publication was financed in part through a joint planning grant from the State Highway Commission of Wisconsin, the U. S. Department of Commerce, Bureau of Public Roads and the Housing and Home Finance Agency, under the provisions of the Federal Aid Highway Legislation, and Section 701 of the Housing Act of 1954, as amended.

A BACKWARD GLANCE

by Richard E. Rehberg, Editor

THE U.S. PUBLIC LAND SURVEY IN SOUTHEASTERN WISCONSIN

Between 1830 and 1836, in an area bounded on the east by Lake Michigan, on the south by the Illinois border, on the west by the Mississippi and Wisconsin Rivers and on the north by the Fox River, Lake Winnebago and Green Bay, a group of United States deputy surveyors general carried out the United States Public Land Survey. It stands today as the basis for all division of land and for all real property boundary description within Wisconsin and, more particularly, within the seven-county Southeastern Wisconsin Region.

THE SURVEY

The U.S. Public Land Survey, established by an Act of Congress in 1785, was based, in part, on the far sighted concepts of Thomas Jefferson. Jefferson envisioned the U.S. Public Land Survey system as more than a method for carrying out land surveys over large wilderness areas. He envisioned it as a basic framework upon which the socio-economic development of the great wilderness, which was then America, could take place. He considered such a survey an absolute prerequisite to the swift, orderly development of these lands by private enterprise - an important element in the creation of our nation. It was thought too that the descriptions of the physical attributes of the wilderness lands required as a part of the survey would act as a stimulant to create interest and foster the settlement of hitherto unsettled lands. The story of the U.S. Public Land Survey in Wisconsin and subsequent development proves the validity and success of these theories.

The U.S. Public Land Survey in the Wisconsin territory actually began on July 11, 1830 in the southwest, the area first ceded by the Indians as well as the most fully settled, when Deputy Surveyor Lucius Lyon of Detroit began the survey of the boundary of the Indian lands. These lands extended from the northern boundary of Illinois north to the Wisconsin River, and from the Mississippi River east to the Rock River. Fighting in the Black Hawk Indian war, arising from a dispute concerning the ceding of the lands, was still in progress as Lyon began this work. By February of 1832, he had resurveyed the northern boundary of Illinois, establishing it as the base line for the surveys to the north. Beginning at an initial point established on the base line two miles southwest of the present community of Hazel Green, he extended the Fourth Principal Meridian due north to the Wisconsin River near what is now Muscoda. This became the eastern boundary of present-day Grant County. (See Map 1, page 10.)

Continued on page 10

ARTERIAL NETWORK AND TRAFFIC ANALYSIS ZONES

by Richard B. Sheridan, Chief Transportation Planner

Transportation planning is accomplished through a sequence of steps which seek to quantify the future demand for transportation and the supply of transportation facilities currently available. Travel surveys are made to determine the origin and destination of all person trips, along with the purpose, time of day, and mode of travel used. These trips are assigned to the existing transportation facilities, and the traffic volumes thus obtained are compared with measured volumes in order to properly calibrate the constants used in the assignment procedure. Relationships are derived between trip ends and land use. Given some condition of future land use, these are then used to predict future trip ends. Then, for any land use proposal, a future transportation proposal can be formulated which may include both improved existing transportation facilities and new facilities which are considered likely to improve transportation service or to induce the desired development of land. Assignment of future trips to such a proposed network is made, and the relationship of assigned volumes to capacity of facilities is analyzed.

This article describes two devices used in traffic analysis and transportation planning as applied by the staff of the SEWRPC, namely:

1. The street and highway network to which traffic may be assigned.

2. The system of zones by which the locations of trip origins and destinations are analyzed.

ARTERIAL STREET AND HIGHWAY NETWORK

An arterial street and highway network consists of those streets and highways which serve, or are intended to serve, the through movement of fast or heavy traffic, and which provide transportation service between two or more zones. Freeways, expressways and parkways as well as standard arterial streets are types of facilities included in the network. The primary function of the facilities included in this network is to facilitate the expeditious movement of vehicular traffic. Access to abutting property may be a

secondary function of some of these streets and highways. While such facilities comprise only about one-fifth of all street mileage, they carry about four-fifths of the traffic volume, measured in vehicle-miles.

Collector streets have the function of carrying traffic from minor streets to the major system of arterial streets and highways and serve to collect and distribute traffic from and to minor street networks. In addition, they usually provide a secondary function of access to abutting property.

Minor streets have the primary function of land access and are used, or are intended to be used, primarily for access to abutting properties. The traffic capacity of minor streets is generally not a matter of concern in the design of these functional types. Access streets are usually built to standard cross sections which consider the demands of drainage, utility location, snow removal, emergency access and maintainance rather than the demands of traffic; and they are generally established with sufficient width to permit two-way traffic. As long as these roadways serve in their designated function, the traffic volume they must carry is not a critical factor in their location and design.

The arterial street and highway network obtained by application of these functional considerations is the network to be evaluated. This will determine if component roadways have sufficient traffic carrying capacity to meet existing and probable future traffic demand. Planned or proposed changes to the real roadway network may then be simulated by the schematic assignment network as an engineering approximation to the real world, and it has been found to be particularly useful in traffic analysis. Such approximations are, of course, commonly used in all branches of engineering as a device permitting quantitative test and evaluation of only the significant essentials of a problem.

THE SEWRPC HIGHWAY NETWORK

This study is fortunate in being able to utilize the results of the 1958 statewide highway needs determination study carried out under the sponsorship of the State Legislature. This study includes a functional classification of all streets and highways by use only, without regard to signed route designations, methods of financing, or responsibility for maintenance. The classification is initiated at the municipal level (city, village or town) and consolidated and edited at both the county and state levels. The resulting designation of road classes represents a concensus of experience and judgment of the functions of the existing road network. The state's two higher use classes, "major primary roads" and "primary roads", have been selected as the classification that best describes a network of arterial roads as functionally defined above; that is, those whose chief function is to move traffic rather than to provide collector services or land access. This network includes all the U. S. and state trunk highways and most county trunk highways.

> The definitions of the state classifications which have been adapted to the regional arterial and highway network are as follows: major primary are... "roads of countywide interest and serve intercounty and intracounty traffic.... These roads serve major desire lines of travel, have greater than average traffic volume and serve the entire area and population of the county."
>
> Primary roads are..."those which serve minor desire lines of traffic attraction,

connect principal land use areas of the county including recreational areas and roads which generally connect the rural non-farm areas not served by a state trunk highway or major primary highway. These...roads usually carry substantial volumes of through traffic including commercial traffic. These... together with major primary highways...form a grid of primary roads serving all areas of the county..."[1]

Updating the Arterial Street and Highway Network to 1963

Early in 1963, the roadways designated as major primary and primary by the Wisconsin State Legislative Council, plus the major thoroughfares and arterial streets as designated by the larger cities within the Region were color coded on map prints. They were then inked in on a base map of the Region. Prints were sent to members of the SEWRPC urban and rural highway planning subcommittees (subcommittees of the SEWRPC technical coordinating and advisory committee). It was requested that each member submit any changes that he thought necessary in his area, or elsewhere, to update the map from 1958, the date of the legislative council's study, to May of 1963. This was accomplished at a subcommittee meeting on May 27th. With the inclusion of these changes, a basic arterial roadway network had been agreed upon which met the approval of all levels of government in the Region. The map thus revised was titled the "Network of Principal Streets and Highways", and it was dated May 27, 1963.

Traffic Assignment

These roadways were then traced as overlays to base maps of the Region, and at the intersection of traced lines a heavy dot was drawn. These intersections were defined as "nodes" and given identifying numbers. The numbering system used is described in the last section of this article. The line representing a section of roadway between two nodes was defined as a "link". It is identified by the two node numbers at its ends. It is these links for which IBM punched cards must be prepared to describe the system for test and evaluation.

TRAFFIC ANALYSIS ZONES

Closely related to the street and highway assignment network are the geographic areas within which trip ends are grouped for analysis. These areas are called traffic analysis zones. Trip origins and trip destinations determined in the travel surveys are grouped by these zones. When trips are assigned to the street and highway network, the computational procedure requires that all trips in or out of any particular zone be assigned, in or out, through one point in that zone. Similarly, estimates of potential or future trip origins and destinations are calculated for the same zones, and are assigned to the network through the loading point. In laying out analysis zones and the transportation network, a relationship is desired such that the loading points selected are a reasonable approximation of the true locii of trip origins or destinations in each zone.

There are a number of constraints and criteria applicable to this task which are described later in this article. Once these are met, or a good compromise is achieved,

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1 Highway Advisory Committee of the Wisconsin Legislative Council, Wisconsin Highway Needs 1960 - 1970, January 1961.

the remaining decision as to where to place a boundary is a matter largely determined by the judgment and experience of those designing the zone system and street and highway network and their knowledge of the local area.

SEWRPC TRAFFIC ANALYSIS ZONES

There were a number of considerations and constraints which affected the laying out of a zone system for the Region. Some of these considerations and constraints were conflicting, and in delineating zones it was, therefore, often necessary to make judgments in an attempt to best accommodate all the applicable constraints and considerations. For example:

1. Zone boundaries must follow U.S. Public Land Survey quarter section lines in the areas covered by the home interview survey and follow section lines in the remainder of the Region. This constraint was necessary because survey data was collected by these units.

2. Each zone must contain a suitable loading point on the network.

3. Size and shape of the zone should be such that the loading point is a suitable approximation to the point of origin or destination of all trips in that zone.

4. Access in and out of the zone in various directions on the simplified network should be generally comparable to directional access in the real world. (This occasionally required adding roadway links to the network which are of lesser importance that those designated on the map of the "Network of Principal Streets and Highways".)

5. Homogeneous or similar land use areas are grouped together where feasible for convenience in forecasting trip generation. (For example, the Milwaukee County Institutions are delineated as one zone.)

6. Natural barriers (major rivers or lakes) are desirable zone boundaries.

7. Where otherwise feasible, it is convenient to have zone boundaries lie on or near civil division boundaries.

8. Zones are generally smaller in areas of higher trip generation per unit area and larger in areas of low trip generation. Therefore, cities and villages are divided into smaller zones than the surrounding rural areas.

9. Using comparable travel time from the periphery of a zone to the load point, as a general criteria, results in small zones in the more densely built up parts of the cities and large zones in outlying areas. (Thus, if we wish to think of the average time for all trips originating in a zone to get to the load node as being one minute, it would be permissible to have zone boundaries several miles from the load point in rural areas, but only a few blocks away in the cities.)

10. The maximum number of loading points and, therefore, number of zones, cannot exceed 700 (a limitation imposed by the computer program which will be used for trip distribution and assignment).

11. The number of possible zone-to-zone movements increases as the square of the number of zones. Therefore, a small number of zones reduces the number of computations and thus reduces computer operating time.

12. Offsetting the considerations of item 11 above, is the fact that an assignment of traffic from many load points representing small areas, should, in general, yield more realistic results than assignment between a few points representing gross areas. Of course, zones should not be so small that meaningful forecasts of future trip ends per zone cannot be made.

13. The screen lines used to check origin-destination survey data must lie along zone boundaries.

Resulting Zone System

The zones, as finally delineated in the urban and urbanizing areas of the Region, are generally not greater than a square mile in area. In rural areas they are larger, and increase to township size (36 square miles) for some of the sparsely settled townships. In the very dense urban centers, where survey data was collected by units two blocks in area, zone boundaries followed the lines of these small survey units. In other areas the quarter section was the smallest zone size used. It should be pointed out that one of these small zones of quarter section size or less, when located in the middle of a city, is expected to produce more trips than whole townships in some of the sparsely settled parts of the Region. Other zones were marked off in intermediate sizes, ranging from two sections up to about half a township, as seemed appropriate in keeping with the criteria listed above. (See Figure 1.) Enlarged map scales were used to more easily show the zones and network in the urban areas where both zone boundaries and roadways are closer together.

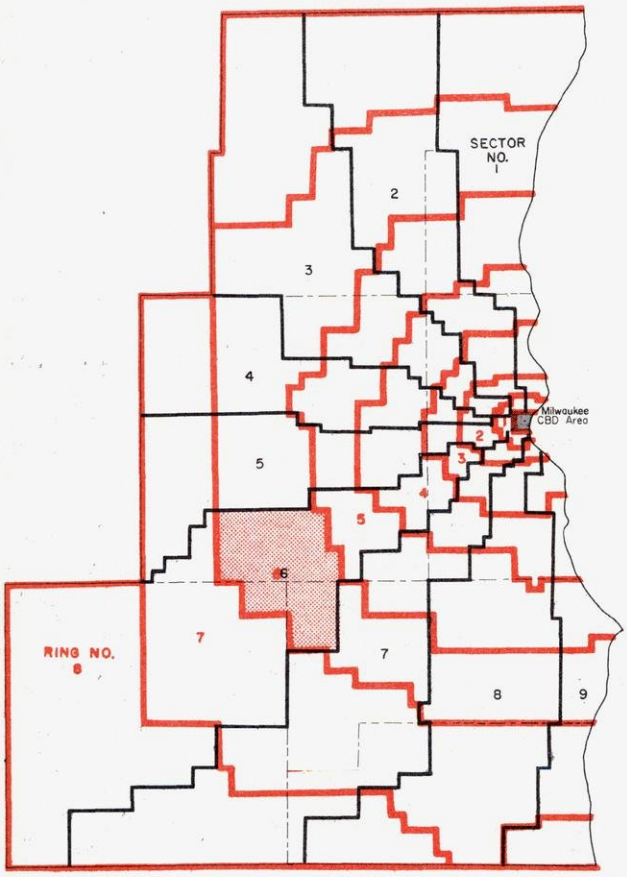
Typical Adjustment of Zone Boundaries

The desirability of having load points on the network to properly approximate the location of zone trip ends, led to a decision which illustrates the adjustments required. In outlying areas of Milwaukee County, where square mile zones are located, zone boundaries were initially drawn coincident with section lines. It was immediately noted that arterial roads in these areas also run along section lines. To use sections as zones would require either that all trips for a zone (section) would be loaded in and out of the road intersection at a section corner, or many local streets and even artificial links would have to be added to the network to get trips in and out of the middle of some zones. This seemed undesirable. Therefore, the zone lines were offset half a mile, so that roads intersected in the middle of each zone. Thus a loading point on this intersection of two arterial streets provided for the assignment of all trips in or out of the four adjacent quarter sections. In these areas four quarter sections from four different sections comprise one zone. However, this is believed to better represent trip movement in and out of the area around the junction of these major roads.

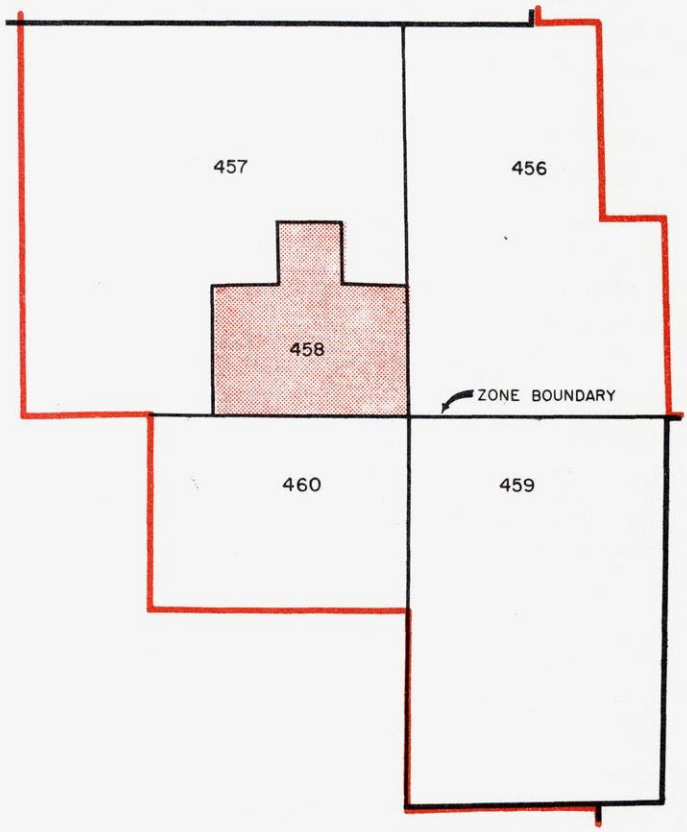
Figure 1

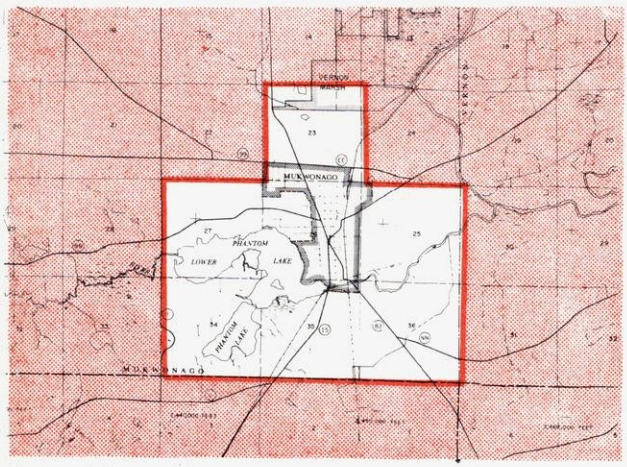
IDENTIFICATION OF AREAS FOR TRAFFIC ANALYSIS

A. ANALYSIS RINGS AND SECTORS



B. ANALYSIS DISTRICT 66





C. ANALYSIS ZONE 485

The Zone Overlay

The zone overlay was developed in the transportation planning division. The zone delineation in the City of Milwaukee area was closely reviewed by the planning engineer assigned to the study staff from the City of Milwaukee, and the whole overlay was reviewed by an engineer from the State Highway Commission of Wisconsin. It was further reviewed by the land use planning division, which suggested several revisions, mostly to improve homogenity of land use within zones. They also pointed out several areas judged to be on the threshhold of more intense development where smaller zones than originally designated seemed more desirable for forecasting and assigning future trips.

RINGS AND SECTORS

Having achieved concurrence on the zone system, the next step was to locate rings and sectors for analysis by units of area larger than zones. It should be noted that these larger areas will not be used in the same way as zones (to define trip origins or destinations at a load point). The sectors, which are approximately wedge-shaped areas between generally radial lines, will be used for analysis of corridors converging on the Milwaukee Central Business District (CBD). They were delineated so as to generally have an important radial highway lying near the middle of each. An exception was made in the case of sectors 4 and 5, where the line between them is the Milwaukee screen line. It lies generally along the east-west leg of I 94. Zone boundary lines which best approximate radial lines were traced to delineate analysis sectors.

Rings were also located using the Milwaukee CBD as the center. Ring numbers, like section numbers, do not exceed one digit. Since ring 9 is designated to describe everything outside the Region, the Region must be divided into rings 0 through 8. With use of an overlay placed on the Region base map, arcs were drawn; and after a few trials, a series of concentric arcs was located which was judged suitable. The zone boundary lines lying closest to these arcs were then traced to delineate the analysis ring.

The area between ring lines and between adjacent sector boundaries is defined as a "district". Districts are identified by a two digit number, the first being the ring number and the second being the sector number. Thus district 72 is in ring seven and in sector two (West Bend area). As stated above, ring and sector lines, while generally approximating arcs and radial lines, respectively, were fitted to zone boundaries. Therefore, zones are grouped into districts. (See Figure 1.)

THE NUMBERING SYSTEM

Zones and Districts

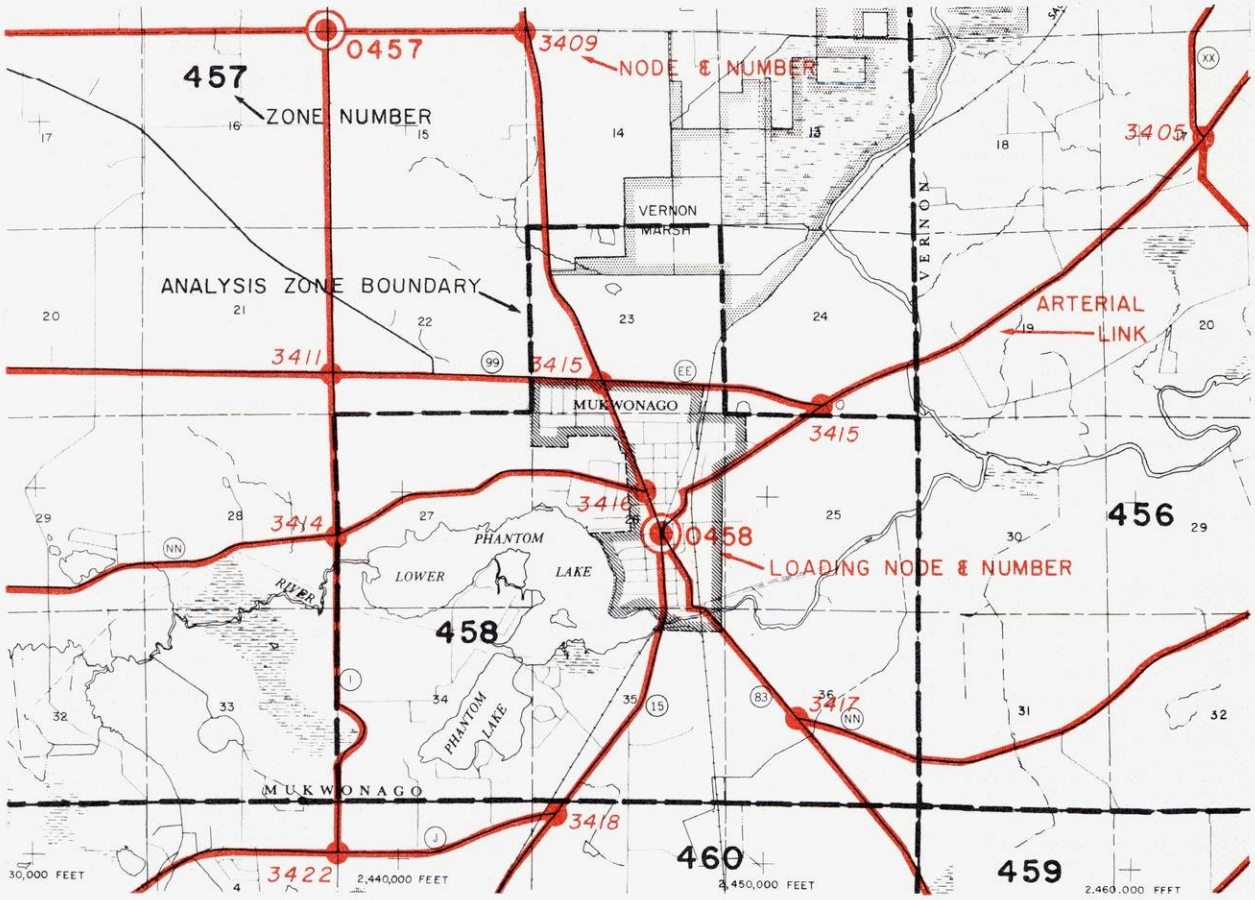
Zones were numbered consecutively within each district starting at the smallest district number. Therefore, zone numbers, like district numbers, increase from the Milwaukee CBD outward. Thus zones 1, 2, 3, and 4 are in the CBD, district 00; zones 5 through 9 are in district 01; zones 10 through 13 in district 02; and so on, continuing to the highest numbered zones which are 615 through 619 in district 89 (highest district number.) The computer programs require that zones, but not districts, be numbered in unbroken sequence starting with one. There were 619 zones established within the Region in seventy-four districts.

Nodes and Links

We have established that each intersection of roads in the network is defined as a node and is given an identifying number, and that the section of road between two nodes is defined as a link and is identified by the node numbers at its two ends. In the SEWRPC network, the loading nodes, previously described as loading points, were given the same number as their zones. Four digit node numbers were adopted as a convention, so lead zeroes were added where necessary. Thus node 0005 is the loading node in zone 5; node 0514 is the loading node for zone 514. Numbers 0700 through 1499 were allocated for expressway nodes throughout the Region. (See Figure 2 below.)

Figure 2

PORTION OF ARTERIAL NETWORK DIAGRAM



In order to facilitate finding other nodes on the map, it was found convenient to assign a block of node numbers to a geographic area. One can, thereby, reduce map search to a fairly small area when looking for a link whose node numbers are its only identification. The remaining node numbers were allocated by zone, following zone sequence. For example, numbers 1500 - 1508 were allocated to zone 1 and numbers 1509 to 1513 were allocated to zone 2. Unused numbers were left in each district for future use. It will be necessary to enter a table of node numbers to find the zone to which any number

over 1500 is assigned, but it will not be necessary to search more than one zone. Within each zone, nodes were generally numbered outwardly from the Milwaukee CBD. Nodes on a zone boundary were numbered with those in the lower numbered zone.

COMPUTER APPLICATION

The network of links and nodes thus obtained can be described to a digital computer by preparing a punched data card for each link, identified by its two node numbers (eight digits) and containing link length, travel time and traffic capacity. The computer reads this information, and from it formulates a numerical "network description" in its memory. It can then calculate a minimum time path from any one node to any other node in the system. It also can assign or load traffic volume between zones on these minimum time paths, accumulate the total assigned volume per link for all zone-to-zone movements, and adjust link travel time on the basis of a comparison between volume assigned and given capacity. Finally, the computer prints out total volume assigned per link, summarizes network totals of vehicle hours, vehicle miles, and performs benefit-cost analysis.

CONCLUSION

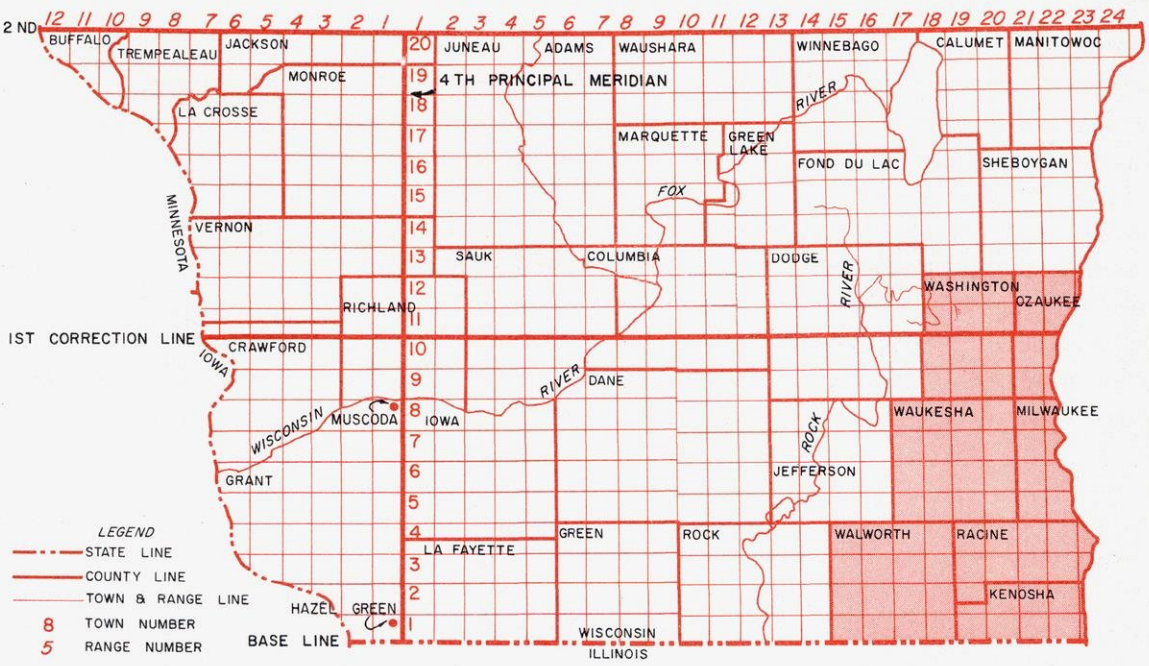
This article describes how the SEWRPC roadway network and traffic analysis zones have been determined. As the study proceeds, these devices will be used in analysis. Traffic assignments determined by the origin and destination surveys will be the first assigned to the network. Later assignments will be made to the network after new highway facilities, under construction or in design, have been incorporated. Future trips per zone will be calculated and assigned to future roadway networks through the use of a mathematical model.

In later issues of the Technical Record the delineation of the transit network and the physical inventory of the assignment networks will be described, and traffic assignment procedure and results will be discussed in greater detail.

* * * * *

Map 1

U. S. PUBLIC LAND SURVEY IN SOUTHERN WISCONSIN



Source: Commissioners of the Public Lands, State of Wisconsin.

From the base line (see Map 1 above) at intervals of six miles, east and west of the 4th Principal Meridian, range lines were run due north. Then from the 4th Principal Meridian, at intervals of six miles north of the base line, township lines were run due east and west. These then formed the boundaries of the civil townships, each approximately 36 square miles in area.

Since due north lines converge with an increase in latitude, the townships were progressively less than six miles wide in an east-west direction. To overcome this deficiency, a correction line was run at the end of each tenth township north of the base line due east and west of the 4th Principal Meridian, and range lines north of the correction line were started at six mile intervals along the correction line. The first correction line bisects Washington and Ozaukee Counties. Evidence of the correction is seen in the easterly jog of the east and west boundaries of Washington County.

Monuments were placed along all town and range lines at intervals of one-half mile (40 chains) to mark the corners of sections and quarter sections. The townships were then divided into sections. Starting at the section corner monument one mile west of the southeast corner of the township, the government surveyors ran a line northerly and parallel to the east line of the township, correcting at each mile by measuring east to the section corner monument previously set. As in the township surveys, monuments were placed at half-mile intervals. Any discrepancy in the total six mile measurement as well as the falling, east or west of the section corner monument of the north boundary of the township, was noted. Where north-south roads along section lines cross township lines, this falling is clearly evident by a jog in the road alignment. Proceeding westerly at mile intervals, the boundaries of each section were surveyed and monumented in the same manner, and finally north lines of the west tier of sections were run west to the section corner monuments on the west range line of the township, any discrepancies in measurement again being noted in the last half mile.

Continued on page 26

CONDUCTING THE HOME INTERVIEW SURVEY

by Sheldon W. Sullivan, Administrative Officer

Knowledge of the present behavior of travel is a prerequisite to an understanding of future travel behavior. Results of origin-destination studies have demonstrated repeatedly that travel is remarkably regular in nature. It is this particular quality, in fact, that permits a confident prediction of future tripmaking. To measure the amount of tripmaking now taking place in the Region and to provide other related information necessary to land use-transportation planning, four separate travel surveys were required. These were the home interview, truck-taxi interview, postal questionnaire and the external (or "roadside") interview surveys. The home interview and truck-taxi interview surveys were surveys in which individuals were personally interviewed and the person and vehicle trips by residents within the highly urbanized areas of the Region recorded; the postal questionnaire survey accounted for the person and vehicle trips by all other residents of the Region; and the external survey reported the travel of residents and nonresidents entering and leaving the Region.

The most comprehensive and the most important of these four travel surveys was the home interview survey. It was the most comprehensive because the data obtained included not only the travel information common to all the other surveys, but also included information on household characteristics; a history concerning the changes in location of the home and work addresses of the present head of household of each sample dwelling place over a thirteen-year period; and data concerning the travel and housing preferences of adults in a subsample of the households scheduled for interview. It was the most important survey because the information obtained was representative of approximately 85 percent of the Region's total population, or about 430,000 of the estimated 500,000 dwelling places in the Region. The purpose of this report is to describe in general terms the organization and operation of the survey, pointing out some of the innovations introduced, some of the problems encountered and some of the preliminary statistical results of the survey.

SURVEY PLANNING

One of the first considerations in preparing for the survey was the determination of the best method for obtaining data necessary to

serve planning needs. Ideally, personal interviews with residents of every dwelling place within the Region would be the most desirable arrangement. However, with approximately a half million dwelling places located in the 2688 square mile study area, such a procedure was considered totally infeasible from the standpoint of the excessive time and cost involved.

The method considered best from all standpoints, and finally adopted, called for personal interviews to be made at an adequate sample of those dwelling places in the highly developed areas of the Region, with the balance of dwelling places in the Region reached through postal questionnaires.

Areas Selected for Coverage

Three major urban areas were selected for personal interview. (See Map 1.) For reference convenience, these areas will be called the Milwaukee, Racine and Kenosha areas throughout this report. The Milwaukee area included all of Milwaukee County, the eastern one-third (approximately) of Waukesha County and the southern portions of Washington and Ozaukee Counties. The Racine and Kenosha areas included in both cases the principal city and a fringe of the less highly developed environs.

Arranging the Schedule

Because of the vast amount of preparation necessary in a home interview survey of this magnitude, it was determined early in January, 1963, that the earliest starting date would be around the first of May. In the meantime forms had to be designed and printed, manuals written, interview personnel recruited and trained, samples drawn and the interview assignments prepared. It was also determined that the survey should not extend into July, since many residents would be vacationing during that month, and this could introduce bias in the data. In mid-February, therefore, the decision was made to schedule the survey for the nine-week period between April 29 and June 29.

Sample Size by Area

Taking into consideration the standards set by the U.S. Bureau of Public Roads for metropolitan areas and experiences of previous large-scale transportation studies, the sample rate for the Milwaukee area was fixed at 1 in 30 dwelling places[1] and for both Racine and Kenosha areas at 1 in 10. The overall sample rate for the combined areas was slightly in excess of 4 percent.

The sampling process was completed in two phases. A previous Technical Record article[2] has described the systematic random sampling used to draw sample addresses from utility account records. Not included in these samples were places such as trailer camps, institutions, convents, dormitories and other "special" dwelling places.

To provide for these, a list of all structures containing such units was compiled from city directories and telephone yellow page directories. Interviewers, on loan for a

1 A clerical error during the sampling process resulted in a 1 in 31 sample instead of 1 in 30, as planned. The error was discovered when sampling was nearly completed. Because the error was considered of minor significance, the smaller sample was accepted.

2 "Home Interview Sample Selection", Technical Record, Vol. 1, No. 1, SEWRPC, 1963.

week from the truck-taxi survey, visited these structures and listed the number and location of each dwelling place found. A systematic random sample selection was then accomplished using sample rates identical to the original rates for each area.

Each sample address was geographically located and numerically coded to the proper U. S. Public Land Survey quarter section; the quarter section, containing approximately one quarter square mile in area, being the basic areal unit for which data was collected in the land use-transportation study.

The total number of sample addresses selected and the number of dwelling places represented by the samples in each area are shown in Table 1.

Table 1

SAMPLES SELECTED FROM EACH PERSONAL INTERVIEW AREA

Area	Utility Records	Specials	Totals	Dwelling Places Represented
Milwaukee	11,654	368	12,022	372,682
Racine	3,242	80	3,322	33,220
Kenosha	2,325	76	2,401	24,010
Total	17,221	524	17,745	429,912

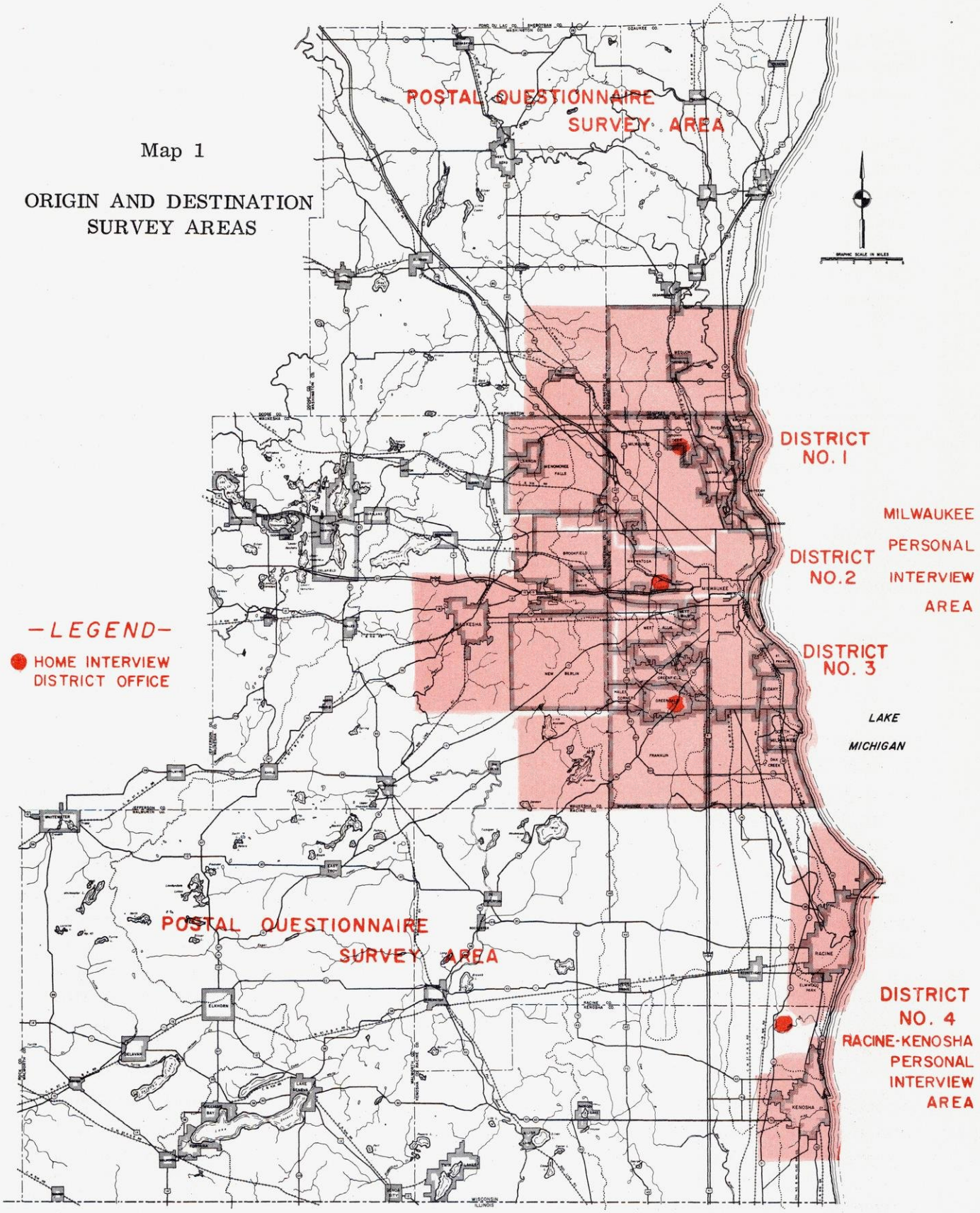
Locating and Establishing District Field Offices

In mid-March, the interview areas were subdivided into districts and field offices were established in each district. The Milwaukee area could not be managed efficiently from a single office, and there was some doubt whether the combined Racine and Kenosha areas could be managed efficiently from a single office. Since the total number of sample addresses within each area was unknown at this point, estimates were necessary. The total number of households in each area was calculated by examining the number of households in each area, as reported by the 1960 U. S. Census, and by arbitrarily adding a flat 4 1/2 percent of that figure to account for the interim increase in the number of households. By applying the sample rates to this total estimate, it was determined that approximately 12,500 sample addresses would fall in the Milwaukee area, while about 5,500 sample addresses would be located in the combined Racine-Kenosha areas.

It was decided, finally, that the Milwaukee area should be divided into three districts, and that the Racine-Kenosha area could be considered as a single district. The three districts of the Milwaukee area were designed to minimize interviewers' travel time and costs and, at the same time, to contain approximately equal numbers of sample addresses. (See Map 1.)

Map 1

ORIGIN AND DESTINATION SURVEY AREAS



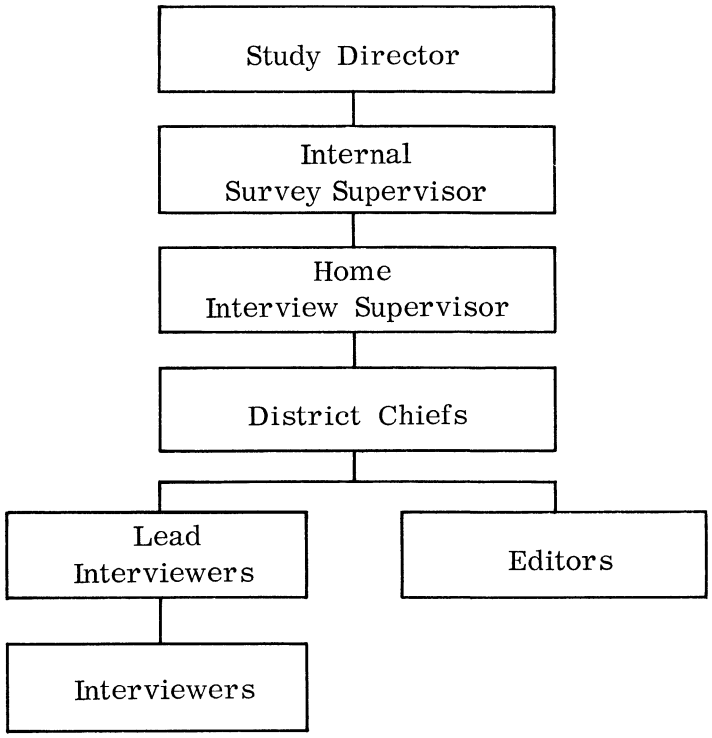
By the end of March, field offices had been established for all districts. All offices were provided by municipal or county agencies at either nominal or no cost to the Commission; and in all cases, some furniture was furnished as well. An attempt was made to locate each field office near the center of its district, and this was generally accomplished. (Map 1 also shows the location of these field offices.)

Recruiting and Training Interview Personnel

The recruitment of interview personnel began in the first week of April. Prior to that time, only the internal survey supervisor (who was in charge of conducting the home interview survey and a similar survey for trucks and taxis), the home interview supervisor, and three of the four district chiefs had been hired. (See Figure 1.)

Figure 1

ORGANIZATIONAL CHART



Through the cooperation of the Wisconsin State Employment Offices in Milwaukee, Racine and Kenosha and through contacts with the U. S. Census Bureau, the fourth district chief and a complete roster of lead interviewers, editors and interviewers were assembled by the time training periods were ready to begin. Many of these people had valuable prior experience, either with the census or with market research projects.

Training sessions for district chiefs and lead interviewers were held in the Commission offices in Waukesha during the week of April 15. Unfortunately, because of a delay in final approval of the interview forms to be used in the surveys, neither the forms nor the procedural manuals were ready for this training period. Preliminary forms

were substituted and oral instructions for completing the forms were necessary. As a part of their training, chiefs and lead interviewers were required to perform a trial run by interviewing preselected sample dwelling places.

The training period for interviewers took place in their respective field offices during the week of April 22. By this time, all interview forms and procedural manuals were ready. The five-day training period consisted of intensive instructions on proper methods for completing interview and report forms and included a trial run in the field. The district chiefs and lead interviewers were in charge of the training sessions. The internal survey supervisor and the home interview supervisor visited the field offices during these sessions on several occasions to help with the training.

The personnel required in each district office is shown in Table 2.

Table 2

DISTRICT OFFICE PERSONNEL REQUIREMENTS

Area - District		District Chief	Interviewers	Lead Interviewers	Editors	Total
Milwaukee (North)	#1	1	12	2	2	17
Milwaukee (Central)	#2	1	15	2	3	21
Milwaukee (South)	#3	1	12	2	2	17
Racine-Kenosha	#4	1	15	3	3	23

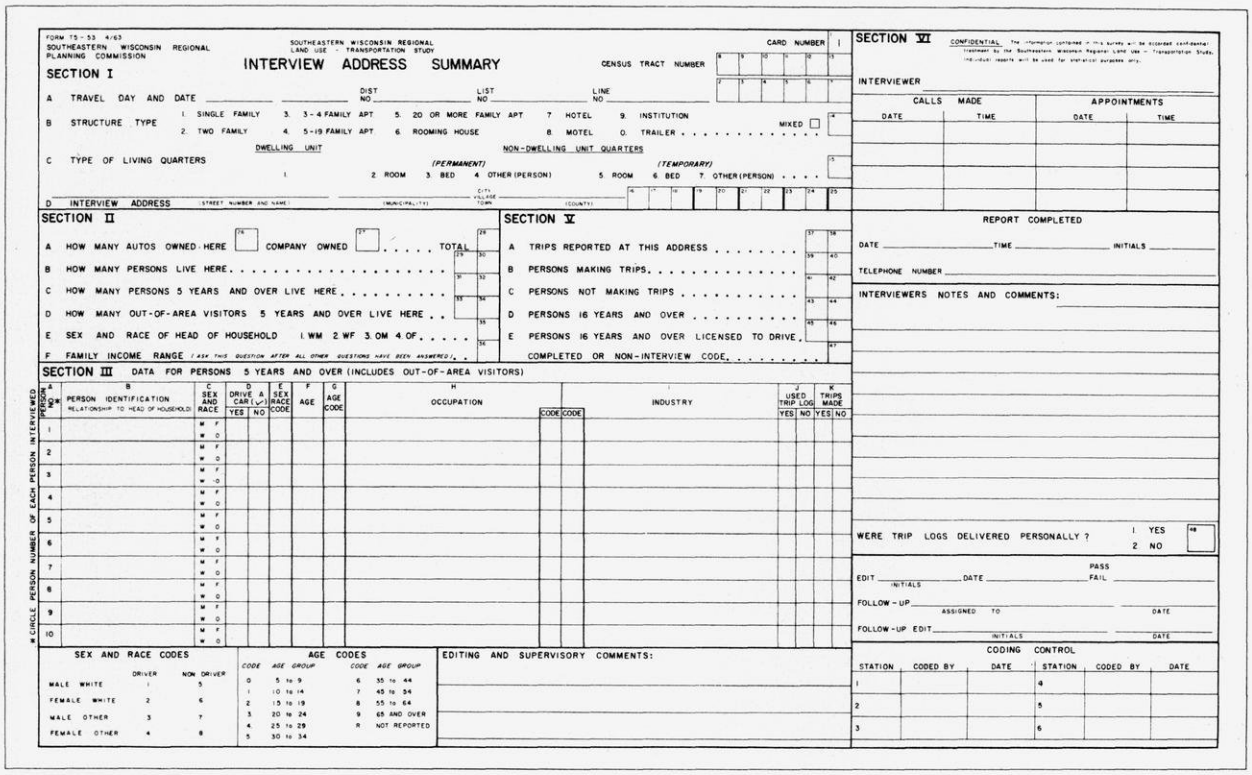
Interview Forms

To record the vast amount of data that was obtained in the home interview survey, four interview forms were employed. These were the "Interview Address Summary", the "Internal Trip Report", the "Household History" and the "Personal Opinion (Attitudinal) Questionnaire". (See Figures 2 and 3.)

Information reported on the interview address summary form included such household characteristics as type of dwelling quarters, the number of residents and visitors, the sex, age, race and occupation of each household member, the number of autos owned and the number of licensed drivers.

Figure 2

INTERVIEW ADDRESS SUMMARY AND INTERNAL TRIP REPORT FORMS



FORM TS-53 4/63
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

SOUTHEASTERN WISCONSIN REGIONAL LAND USE - TRANSPORTATION STUDY

INTERVIEW ADDRESS SUMMARY

CARD NUMBER 1

CENSUS TRACT NUMBER

SECTION I

A TRAVEL DAY AND DATE — DIST NO — LIST NO — LINE NO

B STRUCTURE TYPE — 1. SINGLE FAMILY 2. TWO FAMILY 3. 3-4 FAMILY APT 4. 5-19 FAMILY APT 5. 20 OR MORE FAMILY APT 6. ROOMING HOUSE 7. HOTEL 8. MOTEL 9. INSTITUTION 0. TRAILER — MIXED

C TYPE OF LIVING QUARTERS — DWELLING UNIT: 1. (PERMANENT) 2 ROOM 3. BED 4. OTHER (PERSON); (TEMPORARY) 5 ROOM 6. BED 7. OTHER (PERSON) — NON-DWELLING UNIT QUARTERS

D INTERVIEW ADDRESS (STREET NUMBER AND NAME) (MUNICIPALITY) CITY, VILLAGE, TOWN (COUNTY)

SECTION II

A HOW MANY AUTOS OWNED HERE — COMPANY OWNED — TOTAL

B HOW MANY PERSONS LIVE HERE

C HOW MANY PERSONS 5 YEARS AND OVER LIVE HERE

D HOW MANY OUT-OF-AREA VISITORS 5 YEARS AND OVER LIVE HERE

E SEX AND RACE OF HEAD OF HOUSEHOLD 1. WM 2. WF 3. OM 4. OF

F FAMILY INCOME RANGE (ASK THIS QUESTION AFTER ALL OTHER QUESTIONS HAVE BEEN ANSWERED)

SECTION V

A TRIPS REPORTED AT THIS ADDRESS

B PERSONS MAKING TRIPS

C PERSONS NOT MAKING TRIPS

D PERSONS 16 YEARS AND OVER

E PERSONS 16 YEARS AND OVER LICENSED TO DRIVE

COMPLETED OR NON-INTERVIEW CODE

SECTION VI

CONFIDENTIAL The information contained in this survey will be accorded confidential treatment by the Southeastern Wisconsin Regional Land Use - Transportation Study. Individual reports will be used for statistical purposes only.

INTERVIEWER

CALLS MADE — DATE, TIME

APPOINTMENTS — DATE, TIME

REPORT COMPLETED

DATE — TIME — INITIALS

TELEPHONE NUMBER

INTERVIEWERS NOTES AND COMMENTS:

SECTION III DATA FOR PERSONS 5 YEARS AND OVER (INCLUDES OUT-OF-AREA VISITORS)

PERSON	A PERSON IDENTIFICATION (RELATIONSHIP TO HEAD OF HOUSEHOLD)	C SEX AND RACE	D DRIVE A CAR (✓) YES	D NO	E SEX RACE CODE	F AGE	G AGE CODE	H OCCUPATION CODE	H CODE	I INDUSTRY	J USED TRIP LOG YES	J NO	K TRIPS MADE YES	K NO
1		M F / W O												
2		M F / W O												
3		M F / W O												
4		M F / W O												
5		M F / W O												
6		M F / W O												
7		M F / W O												
8		M F / W O												
9		M F / W O												
10		M F / W O												

* CIRCLE PERSON NUMBER OF EACH PERSON INTERVIEWED

SEX AND RACE CODES

	DRIVER	NON DRIVER
MALE WHITE	1	5
FEMALE WHITE	2	6
MALE OTHER	3	7
FEMALE OTHER	4	8

AGE CODES

CODE	AGE GROUP	CODE	AGE GROUP
0	5 to 9	6	35 to 44
1	10 to 14	7	45 to 54
2	15 to 19	8	55 to 64
3	20 to 24	9	65 AND OVER
4	25 to 29	R	NOT REPORTED
5	30 to 34		

EDITING AND SUPERVISORY COMMENTS:

WERE TRIP LOGS DELIVERED PERSONALLY? 1. YES 2. NO

PASS / FAIL

EDIT — INITIALS — DATE

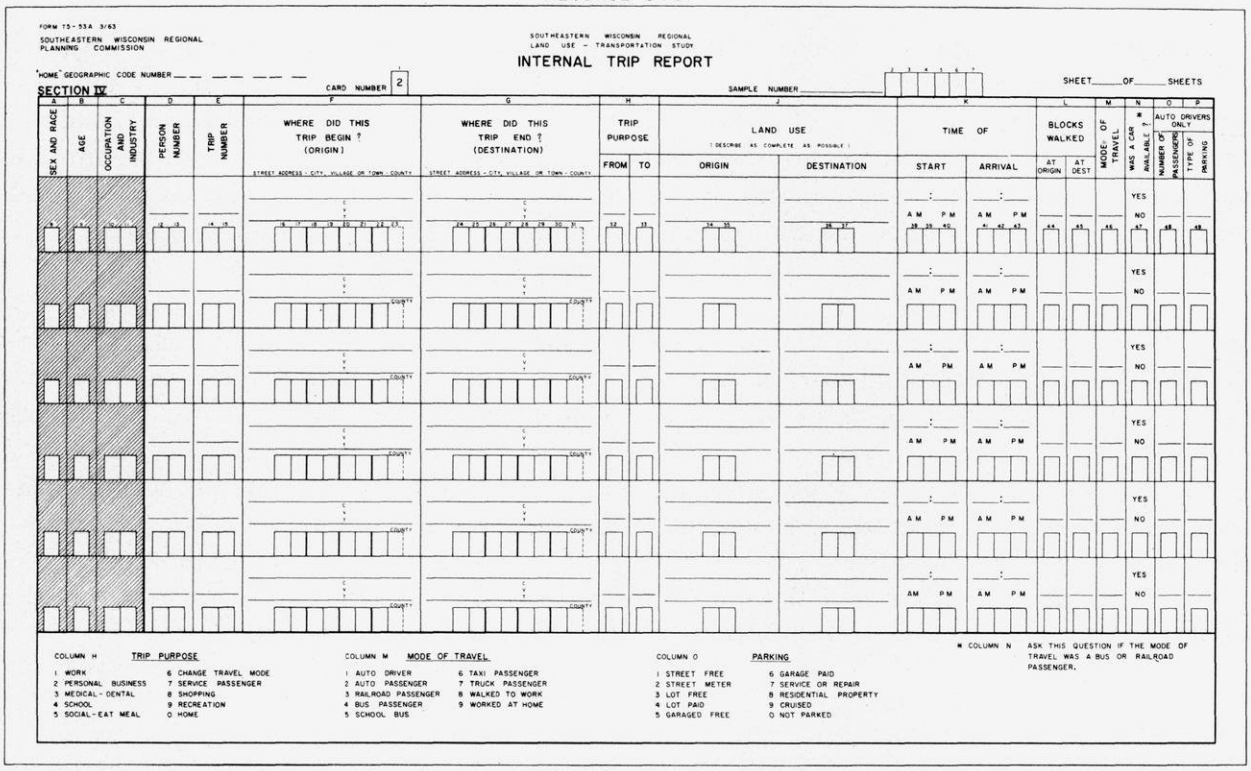
FOLLOW-UP — ASSIGNED TO — DATE

FOLLOW-UP EDIT — INITIALS — DATE

CODING CONTROL

STATION	CODED BY	DATE	STATION	CODED BY	DATE
1			4		
2			5		
3			6		

REVERSE SIDE



FORM TS-53A 3/63
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

SOUTHEASTERN WISCONSIN REGIONAL LAND USE - TRANSPORTATION STUDY

INTERNAL TRIP REPORT

*HOME GEOGRAPHIC CODE NUMBER

CARD NUMBER 2

SAMPLE NUMBER

SHEET ___ OF ___ SHEETS

SECTION IV

A SEX AND RACE	B AGE	C OCCUPATION AND INDUSTRY	D PERSON NUMBER	E TRIP NUMBER	F WHERE DID THIS TRIP BEGIN? (ORIGIN) STREET ADDRESS - CITY, VILLAGE OR TOWN - COUNTY	G WHERE DID THIS TRIP END? (DESTINATION) STREET ADDRESS - CITY, VILLAGE OR TOWN - COUNTY	H TRIP PURPOSE FROM	H TO	J LAND USE (DESCRIBE AS COMPLETE AS POSSIBLE) ORIGIN	J DESTINATION	K TIME OF START	K ARRIVAL	L BLOCKS WALKED AT ORIGIN	L AT DEST	M MODE OF TRAVEL	N * WAS A CAR AVAILABLE?	O AUTO DRIVERS ONLY NUMBER OF PASSENGERS	P TYPE OF PARKING
											AM PM	AM PM					YES NO		
											AM PM	AM PM					YES NO		
											AM PM	AM PM					YES NO		
											AM PM	AM PM					YES NO		
											AM PM	AM PM					YES NO		
											AM PM	AM PM					YES NO		

COLUMN H TRIP PURPOSE

1. WORK
2. PERSONAL BUSINESS
3. MEDICAL - DENTAL
4. SCHOOL
5. SOCIAL - EAT MEAL
6. CHANGE TRAVEL MODE
7. SERVICE PASSENGER
8. SHOPPING
9. RECREATION
0. HOME

COLUMN M MODE OF TRAVEL

1. AUTO DRIVER
2. AUTO PASSENGER
3. RAILROAD PASSENGER
4. BUS PASSENGER
5. SCHOOL BUS
6. TAXI PASSENGER
7. TRUCK PASSENGER
8. WALKED TO WORK
9. WORKED AT HOME

COLUMN O PARKING

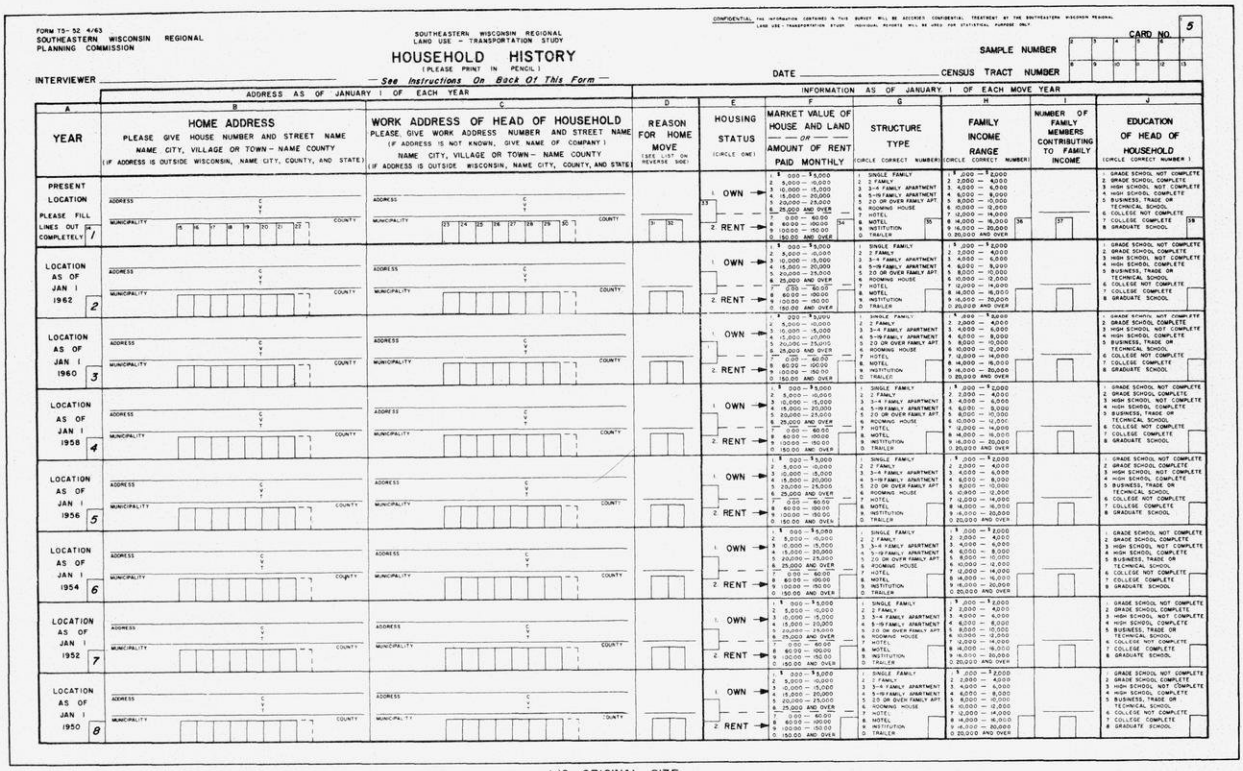
1. STREET FREE
2. STREET METER
3. LOT FREE
4. LOT PAID
5. GARAGED FREE
6. GARAGE PAID
7. SERVICE OR REPAIR
8. RESIDENTIAL PROPERTY
9. CRUISED
0. NOT PARKED

* COLUMN N ASK THIS QUESTION IF THE MODE OF TRAVEL WAS A BUS OR RAILROAD PASSENGER.

1/2 ORIGINAL SIZE

Figure 3

HOUSEHOLD HISTORY FORM



1/2 ORIGINAL SIZE

The internal trip report recorded the trips of residents and visitors for a preselected travel date. Information obtained for each trip recorded included the origin and destination, trip purpose, mode of travel, land uses at origin and destination, and the times of start and arrival. In the case of auto drivers only, the type of parking and the number of passengers carried was recorded. For trips made by public carriers, the respondent was asked if he had the option of driving at the time the trip was made.

One of the innovations in the home interview survey was the household history. This history traced the home and work address of the present household head at each sample address from the date of interview back to January 1, 1950 (or until his eighteenth birthday, if more recent). For every change in home address, the respondent was asked the reason for the move, the type of structure in which he lived at the time, whether the home was owned or rented, its market value or monthly rental, the family income and the number of members contributing to it, and the degree of formal education achieved. This information will be used to analyze how often families move within the Region and their preferences for different locations and housing types.

The personal opinion questionnaire, if not entirely new, was certainly uncommon, in transportation surveys. This form was left at 1 in 8 of the sample addresses along with a postage paid envelope for mail back. Each adult household member was asked to record his preferences with respect to modes of travel and suggestions for improving transportation. Additionally, respondents were asked their housing preferences, the reasons for selecting their present home and the major considerations that would be involved in choosing a new home.

THE SURVEY

Interviewer Assignments

As previously mentioned, after the sample addresses had been geographically located and coded, the information was key punched on data processing cards arranged and controlled by quarter section. By combining contiguous quarter sections, work areas were provided for each interviewer. For example, the total area (all quarter sections) in interview district 1 was divided into 12 parts with approximately equal sample addresses in each part to provide for the 12 interviewers in that district.

The samples were drawn systematically from within one of these work areas so that one day's assignment for each interviewer was in the same general locale as the preceding assignment.

Each interviewer was assigned a list of eight sample addresses for each work day. The travel dates were scheduled on a Monday through Friday base. This meant the interviewer's work schedule was Tuesdays through Saturdays, since interviewing was scheduled for the day after the travel date.

Preinterview Procedures

About one week before the travel date, each householder scheduled for interview received a "Dear Householder Letter" which briefly described the objectives of the study and explained that an interviewer would call on the day before the travel date.

The purpose of this preinterview contact at the sample address was to explain the type of information needed and to leave a household history form as well as trip logs. Respondents were asked to record all trips made on the travel day by each household member 5 years of age or older. The interviewer explained to the householders that another call would be made the day after the travel date to collect the forms and to obtain the balance of the information necessary to complete the interview. If the interviewer could not find the householder at home after two attempts to reach them on the preinterview contacts, the forms were left in the respondent's mailbox or with a neighbor, who was asked to deliver them.

The Interview Procedures

On the day following the travel date, the interviewer called on the respondents and if the preinterview forms had been completed, checked them for completeness and asked the additional questions necessary to complete the interview. If the preinterview forms had not been filled out, the interviewer obtained the necessary information by asking the questions on the form and recording the answers.

If respondents refused to cooperate, the interviewer was instructed to try to persuade them by pointing out the objectives of the study and by emphasizing the confidential nature of the information. If the respondent still refused, the interviewer reported the refusal to the district office and another attempt was made to obtain the information by one of the supervisors.

Interviewers were allowed three working days following the travel date to complete an interview. It was felt that respondents would not accurately recall the details of their tripmaking over a longer period.

Each interviewer reported to the district office each morning to turn in completed schedules, to obtain the daily assignment and, if necessary, to confer with editors or supervisors about any problems that may have arisen concerning the interviews. An interviewer, therefore, was required to make a minimum of 16 calls per day; eight calls to deliver the preinterview forms for the following day's travel date and eight calls to complete the interview for the previous day's travel date. In reality, many more calls were often necessary, since respondents were not always at home on the first call (either on preinterview contact attempt or when the interviewer returned to complete the interviews on the day following the travel date). Consequently, on some days one interviewer would complete only four or five interviews and on other days complete perhaps ten or eleven.

Problems Encountered

A serious situation developed in the first week of interviewing that required immediate remedial action. In that short time, nearly all interviewers were encountering an intolerably high number of refusals. The attempts to convert the refusals into completed interviews added more work to the interviewer's already heavy schedules and consequently, work backlogs quickly formed. In a chain reaction, the problem spread to the district offices. Because district chiefs, lead interviewers, and in some cases, editors were dispatched to try to convert the refusals into completed interviews, their normal work routines were interrupted and delayed.

The main problem appeared to be a resistance by respondents to some of the questions contained on the household history form. Interviewers reported that during the preinterview contacts, some respondents reviewed the forms and flatly refused to cooperate. In other cases, they accepted the forms but, when the interviewers returned after the travel date to complete the interviews, many more refusals were encountered.

It undoubtedly would be unfair to place the blame for all refusals on the household history form. A certain number of refusals are to be expected in any survey; and, in this

case, some of the respondents appeared to be annoyed by the large amount of information required. The interviewers and their supervisors, however, generally agreed that questions in the household history were, likely, the main cause of the high refusal rate.

After consulting with interviewers and supervisors, it was decided that the preinterview technique was not operating to the best interests of the study and should be discontinued as of May 8, the earliest practicable date.

As a result of the discontinuance of the preinterview contacts, certain changes in procedures were necessary. The "Dear Householder Letter" was changed to read that an interviewer would call to obtain the required information on the day following the travel date. Since trip logs and the household history form were no longer left on a preinterview contact, it was necessary, now, for the interviewer to obtain all information orally. The new interview procedure called for obtaining the household characteristic information first, then the trip information and finally the household history data. It was felt that by asking the more sensitive questions last, the probability of obtaining the household characteristic and travel information would be greater; and it was hoped that less resistance would be shown for the household history data.

Results appear to indicate that the new procedure was successful. After the change in technique, the interview program progressed much more smoothly; the refusal rate dropped sharply, work backlogs were reduced to normal status and householders responded more freely to questions in the household history form. During the preinterview period, the preliminary rate of those who refused to give any information was approximately 15 percent. Through the determined efforts of the entire personnel, interviewing teams, interviewers, lead interviewers, editors and even district chiefs, this rate was reduced to 4.5 percent by calling back on those who originally refused and by further explaining the objectives of the study.

In the first week following the change in procedure, the refusal rate dropped to 2.9 percent and to 1.3 percent in the succeeding week. For the full nine-week period of the survey, the refusal rate stood at 1.6 percent, which is probably among the lowest ever recorded for a survey of this magnitude.

Another problem encountered was that the method employed to check for possible omissions in sample coverage proved to be invalid. In the sampling process, dwelling places were arranged by utility meter routes, and these were believed to be locationally sequential. When the sample addresses were listed for interviewing, the succeeding address on the route was also listed.

The interviewer was instructed to determine whether the succeeding address listed corresponded with the actual succeeding address found in the field. If it did not, all dwelling places that were found between the sample address and the succeeding address would be reported to the central office where a check of the source material would be made. If these addresses did not appear in the source material, they were considered as being omissions and were then added to the list for interview.

It was discovered, however, that addresses from the meter routes were not always listed in the order necessary for this check to be effective. A special check for possible omissions in the source material, therefore, was undertaken as reported earlier.[3]

Newsletter

One other innovation in the survey was "The Tattler", a weekly newsletter which was distributed to all members of the interviewing teams. "The Tattler" carried news items sent in from the district offices, and also contained tables showing statistical results of the previous week of interviewing for each district. The tables included the percentages of completed interviews, the refusal rate and the average number of trips per completed interviews for each district and listed the name of the interviewer in each district who obtained the highest trip totals for a single day's assignment during the previous week.

The purpose of the newsletter was to inform the interview teams of the progress of the survey and by showing comparison of results by district, to instill competitive spirit.

"The Tattler", mimeographed on both sides of a single 8 1/2 x 14 sheet was first issued after the fourth week of interviewing. It was well received by interview personnel, and appeared to create the desired competition.

SURVEY RESULTS

Once safely past the disruptive influence of the problems connected with the preinterview technique, the home interview survey was completed on schedule without further complications of major importance.

Most of the persons originally employed for the interviewing teams worked throughout the survey. A few replacements were necessary during the first week of the survey, when refusals and backlogs discouraged certain interviewers. After that time, relatively few changes in personnel were made.

It should be pointed out that nearly all interviewers stated that their work schedule averaged more, sometimes many more, than the eight hours for which they were paid, and especially during the period when the preinterview contact was a part of the interview procedure.

Preliminary tabulations reveal that approximately 90 percent of the total schedules resulted in completed interviews. The remaining 10 percent, the non-interviews, were categorized as follows: vacant dwelling places, 4.0 percent; refusals, 1.6 percent; residents out of area, 1.4 percent; no one at home, 1.2 percent and other, 1.8 percent.

The average number of person trips per completed interview in this survey was 7.5. This is one of the highest averages recorded in a large scale transportation study and is an encouraging indication of the completeness of the information obtained. When expanded to represent all of the dwelling places in the personal interview area, this will mean that over 3,000,000 person trips are made in the area on an average weekday.

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3 Ibid., p. 12, footnote 2.

Household history information was obtained in approximately 98 percent of the total completed interviews. The information obtained on this phase of the survey was not always as complete as that gathered on the other phases. Two particular items that were troublesome were questions concerning family income and market value of the homes. In some cases respondents refused to give the figures; and, in other cases, they could not remember the figures for some of the past years. Personal opinion questionnaires were left at approximately 2,000 dwelling places. Of these, 705 households (35 percent) mailed in 1,562 questionnaires.

As a part of the quality control program, lead interviewers telephoned approximately 15 percent of the respondents a few days following the interviews as a check on the validity of the information. One of the questions asked during that check was whether or not the respondent had heard of the survey before receiving the "Dear Householder Letter". It is interesting to note that only 27 percent said that they had. Of these, 72 percent said that they had read about the survey in the newspapers, 18 percent gave television as the source, and the remaining 10 percent said that they had heard of it through a friend or on the radio. Some of them, no doubt, had known about the survey from more than one of these sources.

SURVEY COSTS

The preliminary estimate of the cost of the home interview survey is approximately $116,500, not including costs of data processing still in progress. Although this estimate is preliminary, it is not expected that final accounting will differ significantly.

Shown below is the estimated cost by item:

Salaries of Interviewing Personnel	$75,700.00
Travel Expenses	6,700.00
Printing, postage, telephone, equipment, materials and supplies	3,800.00
Coding of Interview Forms (Salaries)	25,800.00
Preparation of coding guides[4]	4,500.00
Total estimated survey costs	116,500.00
Estimated cost per completed schedule	6.57

SUMMARY

Nearly 18,000 dwelling places were scheduled for personal interview in the highly urbanized areas of the Region during the late spring of 1963.

Sample addresses were drawn from utility account records and from lists of special dwelling places such as convents, trailer camps, and dormitories.

Four district offices were established to facilitate collection of the data. Three of these were located in the Milwaukee area and one for the combined Racine and Kenosha areas.

4 The total cost of preparing the coding guides was approximately $10,000.00. It was estimated that the proportionate share chargeable to the home interview survey was about 45 percent.

Through the help of the U. S. Census Bureau and the Wisconsin State Employment Service, experienced interview personnel were obtained. The previous census experience of many interviewers was of considerable advantage to the survey.

Information obtained in the survey included household characteristics of the sample address; the travel habits of the occupants of these dwelling places; a history tracing the home and work address of the head of each household sample over a 13 year period; and personal opinions of adult members from 1 in 8 of the total households sampled concerning travel and housing preferences.

Respondent reaction to forms left at the households during preinterview contacts forced a change in interview technique after about one week of interviewing. The shift in technique meant that all information concerning tripmaking and the history of households would be obtained by oral interview.

Preliminary results show that approximately 90 percent of the schedules listed for interview resulted in completed interviews. The final refusal rate of 1.6 percent is unusually low, and it shows a dedication to the work by the interviewing teams. The preliminary estimated cost of the home interview survey through coding, but not including data processing machine work, is $116, 500. This amounts to a cost of $6.57 per completed interview schedule.

CONCLUSIONS:

While satisfaction with the operation and results of the survey has been generally expressed, this is not to say that, in retrospect, certain improvements could not be made.

One disturbing factor was that insufficient time was allowed, between final approval of forms and the start of interviewer training sessions, to properly prepare procedural manuals. At least three weeks should be allowed for this purpose. Training sessions, in this instance, were impaired because the manuals were not ready.

Another flaw in survey operations was the inclusion of the household history form with its sensitive questions in the preinterview technique. This procedure caused considerable friction, as previously described, and forced the cancellation of the preinterview technique.

This was unfortunate because this technique was regarded as a valuable tool in the collection of data. The benefits derived from this personal contact included the opportunity to explain to respondents the types of information required and to give instructions for completing trip logs; the ability of interviewers to make appointments for return calls to complete the interviews; the advantage of respondents recording their own trips; the assistance to editors in checking information on the forms; and other advantages that personal contact itself usually affords.

It was felt that if trip logs only had been left at the households during preinterview contact, no serious problems would have occurred. There was some consideration given,

upon discontinuance of the preinterview technique, to include trip logs with the "Dear Householder Letter". This was not done because the wording of the instructions on the trip log forms was such that respondents could have been confused. In future surveys, however, the trip log forms could be designed specifically for mailing with the "Dear Householder Letter".

A preinterview technique that might have succeeded would have been to leave trip logs, and a household history form which required that respondents record only the changes in home and work addresses for the desired period. The more sensitive questions on the household history would be asked when the interviewer returned to complete the interview on a following day.

On the brighter side, the intentional attempt to hire interview personnel with either census or market research experience proved to be very fortunate. It is very doubtful that inexperienced interviewers could have managed to obtain the very large amount of data required and still finish the survey on schedule. Another apparently wise decision was that of conducting the survey within the organization. There is little question that a considerable amount of money was saved because of this decision; and the greater flexibility provided made it possible to make desirable changes as the work progressed.

* * * * *

(Backward Glance continued from page 10)

SURVEYING THE REGION

Surveying was nearly completed as far east as the Rock River when, in September 1833, the remaining Indian tribes in southeastern Wisconsin (Chippewa, Ottawa, and Potawatomi) ceded their lands along Lake Michigan to the United States. In 1835, the public land surveys were extended through southeastern Wisconsin, and by December of 1836, 119 townships and fractional portions of townships had been surveyed and monumented with field notes recorded.

Thus the government survey provided a permanent record of definitely located and numbered townships, sections and subdivisions of sections through which any parcel of land in the wilderness area could be simply and uniquely described, monumented, and conveyed into private ownership. More than that, however, it supplied the first documented description of the land which was detailed enough to be of special benefit to entrymen and prospective purchasers who, by this time, were learning of the fertile, resource abundant lands of southeastern Wisconsin.

DETAILED DESCRIPTION OF THE LAND

The government surveyor laid out townships and sections by blazing his way through the forest or sighting over open prairie along meridians and parallels one mile apart. His surveying instruments were the compass and chain. Since his lines crossed at approximately right angles, he necessarily looked into each square mile of land from all four sides, and - except in the densest forest - was bound to see a considerable part of it in addition to what he actually crossed in running the survey lines. All that the surveyor saw, he recorded in his field book, a copy of which was filed at the land office of the district in which the lands were located.

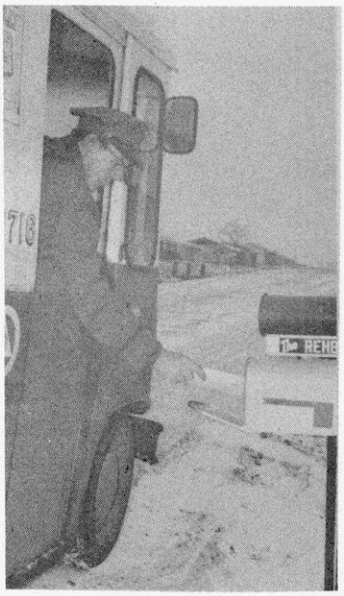
The government surveyor noted in this field book the several kinds of timber and undergrowth, the quality of the soil, the presence of minerals and ores, the presence and kind of stone in quarries and rock ledges, and the major topographic features such as hills, valleys, swamps and dry level tracts. He also noted the points where his survey lines crossed streams, watercourses and lakes, trails or roads, and described the locations of such features as cabins, settlements, Indian mounds, old battle fields and the like. In short, the government surveyors worked under instructions to "furnish a complete topographical description of the country surveyed, as it regards everything which may afford useful information, or gratify public curiosity." It was valuable information to prospective purchasers and developers. Land seekers could, at slight expense, obtain this information and the surveyors' plats from the land office.

Some of the most important data recorded, as far as the state was concerned, were the descriptions for the beginning and ending of swamp areas. The Swamp

Continued on page 38

CONDUCTING THE HOUSEHOLD POSTAL QUESTIONNAIRE SURVEY

by Wade G. Fox, Cartography and Design Supervisor



During the late spring of 1963, the land use-transportation study of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) initiated two postal questionnaire surveys to obtain information in the less populated areas of the seven county Region. At this same time, but over a longer period, in the urbanizing areas of Milwaukee, Racine and Kenosha and at roadside stations on an external cordon line, conventional personal interviews were conducted. By combining these two types of surveys, a complete picture of household characteristics and trip behavior within the Region can be obtained.

The postal surveys were composed of two separate questionnaire mail-outs (household and truck). The household postal questionnaire survey's counterpart in the personal interview area was the home interview survey. The truck postal questionnaire counterpart was the truck and taxi personal interview survey. It was imperative that the information gathered in all (both personal and postal) surveys be compatible so that all trip movement could be analyzed at a regional scale.

POSTAL QUESTIONNAIRE SURVEY AREA

Within the seven county Region, the postal questionnaire survey area includes: all of Walworth County; Ozaukee County, north of the city of Mequon; Washington County, north and west of the town of Germantown; Racine and Kenosha Counties west and a few miles east of I 94; and Waukesha County, west of the city of Waukesha. This area is still largely rural in nature, spotted with smaller cities and villages. The postal questionnaire survey area accounts for about 75 percent of the Region's total land area. Approximately 250,000 persons reside in this area (about 15 percent of the Region's population). An unusual characteristic of the postal questionnaire survey area is the presence of summer resorts and private cottages around the numerous lakes which dot the area. Many of the private cottages have been and are being converted to year around residences. The only county not touched by the postal questionnaire survey was Milwaukee County, which is located entirely within the personal interview area. (See Map 1, page 14, for the relationship between the personal interview survey area and the postal questionnaire survey area.)

NEED FOR THE POSTAL QUESTIONNAIRE SURVEY

In order to provide the data essential to the preparation of a regional plan, it was necessary that trip information be obtained for the entire Region. The postal survey area, because it is largely rural, required that a high sample rate of households and trucks be used to adequately represent the trips generated from this area. In reviewing the types of surveys that could be applied, it was determined that personal interview surveys would have been financially impossible. The cost of a personal interview survey in this dominately rural area may be best analyzed by the following example:

> Assuming that a personal household survey would have been conducted in the postal survey area at a sample rate of 1 in 10, the salaries of the interviewers alone would have been over $14,000. This figure does not include the cost of any overhead, fringe benefits, travel expenses, supervisory costs, personnel processing, training, or any related costs. In addition, at an estimated production rate of seven interviews per day per interviewer, one less than the quota actually achieved in the home interview survey, it would have taken 40 interviewers over a month to contact the 7,500 respondents. The resulting $14,000 basic salary cost would have been more than the estimated total of all cost ($13,500) of conducting both the household and truck postal questionnaire surveys. In addition, the household and truck postal surveys conducted by SEWRPC actually netted about a 17 percent and a 19 percent return rate of questionnaires respectively. This is approximately a 1 in 6 sample for households and a 1 in 5 sample for trucks.

It was therefore determined that the postal questionnaire surveys were the best approach to obtain desired information in the Region outside the highly developed urban areas. This article will discuss the methods and procedures used by SEWRPC personnel to conduct the household postal questionnaire survey. (The truck postal questionnaire survey will be described in the next issue of the "Technical Record".)

HOUSEHOLD POSTAL SURVEY

The household postal questionnaire survey was conducted for five consecutive weekdays starting on Wednesday, May 22 through Tuesday, May 28. This scheduling facilitated the collection of trip information while the home interview and the external surveys and the screen line counts were still in progress and was timed prior to the beginning of the summer vacation season.

To obtain the highest possible final sample rate in the postal questionnaire survey, it was decided that it would be necessary that every household receive a questionnaire. It was estimated that a mail-out of this type would yield approximately a 20 percent return. Of these returns, it was anticipated that about 70 percent would be useable or approximately 14 percent of the original mail-out. Although the original estimated rate-of-return was not realized, the final useable rate of the questionnaires was higher than the original estimate. A total of 72,087 questionnaires were mailed out during the household postal questionnaire survey and there were 11,957 useable questionnaires returned - a 16.5 percent response.

Although a high return rate was necessary, it is even more important that the house-

holds returning the questionnaires be relatively evenly distributed throughout the postal questionnaire survey area. To evaluate the geographic distribution of the returned questionnaires, it was necessary that two factors be known: first, the number of questionnaires sent to any particular area; and second, the number of questionnaires returned from the same area. In the postal questionnaire survey area, the only existing means of geographic control that could be used for these purposes were the post office delivery areas. All questionnaires mailed out and returned were grouped and counted by the post office delivery area of each respondent's address. Post office delivery area boundaries do not follow civil division boundaries, but they are fixed and relatively stable. With the area thus defined, it was possible to obtain accurate counts of questionnaires mailed and returned.

QUESTIONNAIRE DESIGN

Since there is no personal contact with a respondent during a postal questionnaire survey, the over-all design of the questionnaire can have a significant influence upon the rate-of-return. It also can have a direct bearing on the usefulness of the data obtained. The questionnaire used in the survey had to be designed so that the information received would be compatible with that received through the use of the personal interview forms, yet uncomplicated, so as not to discourage the respondent from completing it.

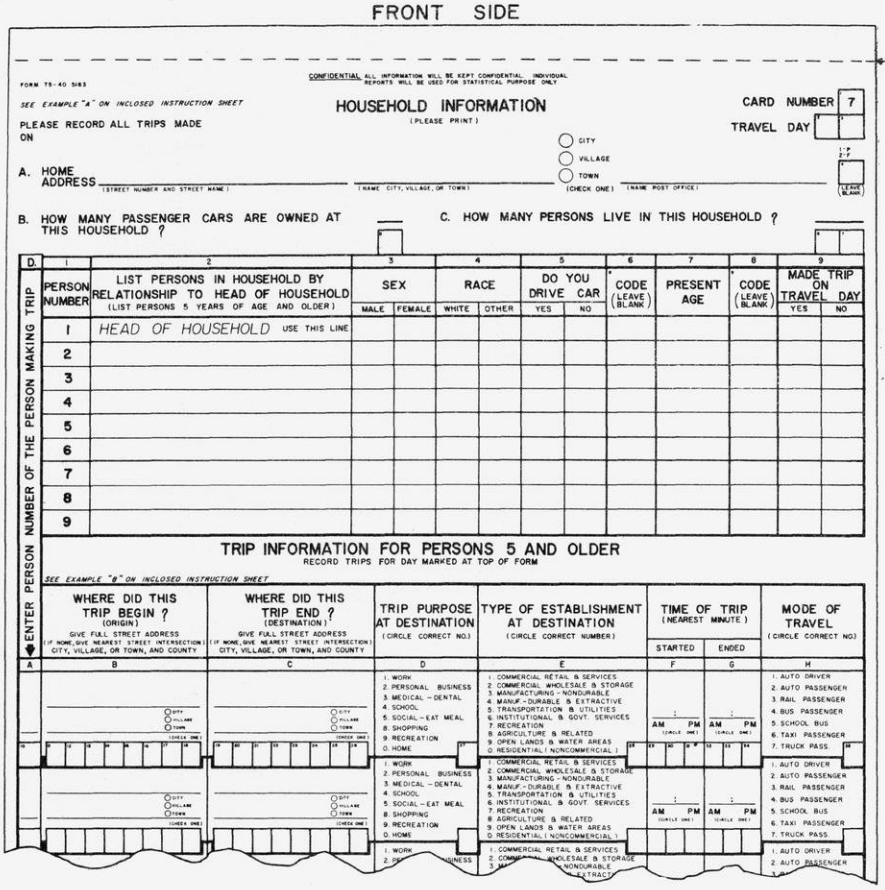
Basically, then, there were two incompatible objectives to be achieved in the design of the questionnaire - completeness and simplicity. The design apparently has achieved the first objective, completeness, very well. The second objective was not achieved as well, and the form has drawn some criticism from respondents as being too complex. Nevertheless, it should be noted that the very high useable rate of the returned questionnaire (approximately 97 percent) indicated that the respondents were, in fact, able to understand it without too much difficulty.

The household questionnaire used by SEWRPC for the postal questionnaire survey was a single returnable form. This questionnaire was developed on two sides of an 8 1/4" X 11 1/4" sheet. On one side, space was provided for questions pertaining to the household, including auto ownership, family size, and sex, race, and age of all members of the family over 5 years of age. Space was also provided on the front of the form for recording six trips made by household members. The reverse side contained recording space for seven additional trips, the Commission's return address, and a printed first class business reply stamp. The form was designed so that the personal information about each person could be related to that person's trip. The form was pre-folded in three sections with a perforated 3/8" gummed flap. The gummed flap was used by the respondent to seal the questionnaire for return mailing. The perforation along the flap was incorporated into the design to ease the opening of the returned questionnaire by study personnel. The form was designed so that the flap would seal in an unprinted area; and, after breaking of the perforation, the flap would remain on the form. This questionnaire, together with a letter of introduction to the study, with instructions and examples on the reverse side, was mailed to each household in the postal questionnaire survey area. (See Figure 1.)

Figure 1

HOUSEHOLD POSTAL QUESTIONNAIRE

FRONT SIDE



FORM TS-40 5163

CONFIDENTIAL ALL INFORMATION WILL BE KEPT CONFIDENTIAL. INDIVIDUAL REPORTS WILL BE USED FOR STATISTICAL PURPOSE ONLY

SEE EXAMPLE "A" ON INCLOSED INSTRUCTION SHEET

HOUSEHOLD INFORMATION (PLEASE PRINT)

CARD NUMBER 7

PLEASE RECORD ALL TRIPS MADE ON

TRAVEL DAY

A. HOME ADDRESS (STREET NUMBER AND STREET NAME) (NAME CITY, VILLAGE, OR TOWN) ○ CITY ○ VILLAGE ○ TOWN (CHECK ONE) (NAME POST OFFICE) (LEAVE BLANK)

B. HOW MANY PASSENGER CARS ARE OWNED AT THIS HOUSEHOLD ?

C. HOW MANY PERSONS LIVE IN THIS HOUSEHOLD ?

D. ENTER PERSON NUMBER OF THE PERSON MAKING TRIP	1 PERSON NUMBER	2 LIST PERSONS IN HOUSEHOLD BY RELATIONSHIP TO HEAD OF HOUSEHOLD (LIST PERSONS 5 YEARS OF AGE AND OLDER)	3 SEX MALE	3 SEX FEMALE	4 RACE WHITE	4 RACE OTHER	5 DO YOU DRIVE CAR YES	5 DO YOU DRIVE CAR NO	6 CODE (LEAVE BLANK)	7 PRESENT AGE	8 CODE (LEAVE BLANK)	9 MADE TRIP ON TRAVEL DAY YES	9 MADE TRIP ON TRAVEL DAY NO
	1	HEAD OF HOUSEHOLD USE THIS LINE											
	2												
	3												
	4												
	5												
	6												
	7												
	8												
	9												

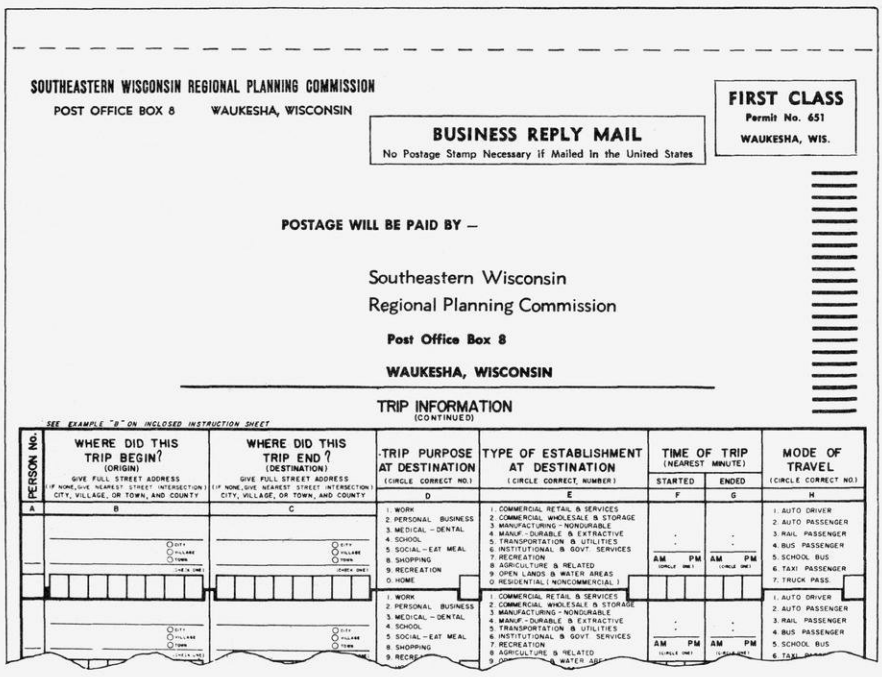
TRIP INFORMATION FOR PERSONS 5 AND OLDER

RECORD TRIPS FOR DAY MARKED AT TOP OF FORM

SEE EXAMPLE "B" ON INCLOSED INSTRUCTION SHEET

A	WHERE DID THIS TRIP BEGIN ? (ORIGIN) GIVE FULL STREET ADDRESS (IF NONE, GIVE NEAREST STREET INTERSECTION) CITY, VILLAGE, OR TOWN, AND COUNTY — B	WHERE DID THIS TRIP END ? (DESTINATION) GIVE FULL STREET ADDRESS (IF NONE, GIVE NEAREST STREET INTERSECTION) CITY, VILLAGE, OR TOWN, AND COUNTY — C	TRIP PURPOSE AT DESTINATION (CIRCLE CORRECT NO.) — D	TYPE OF ESTABLISHMENT AT DESTINATION (CIRCLE CORRECT NUMBER) — E	TIME OF TRIP (NEAREST MINUTE) STARTED — F	TIME OF TRIP (NEAREST MINUTE) ENDED — G	MODE OF TRAVEL (CIRCLE CORRECT NO.) — H
	○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	1. WORK 2. PERSONAL BUSINESS 3. MEDICAL – DENTAL 4. SCHOOL 5. SOCIAL – EAT MEAL 8. SHOPPING 9. RECREATION 0. HOME	1. COMMERCIAL RETAIL & SERVICES 2. COMMERCIAL WHOLESALE & STORAGE 3. MANUFACTURING – NONDURABLE 4. MANUF. – DURABLE & EXTRACTIVE 5. TRANSPORTATION & UTILITIES 6. INSTITUTIONAL & GOVT. SERVICES 7. RECREATION 8. AGRICULTURE & RELATED 9. OPEN LANDS & WATER AREAS 0. RESIDENTIAL (NONCOMMERCIAL)	AM PM (CIRCLE ONE) :	AM PM (CIRCLE ONE) :	1. AUTO DRIVER 2. AUTO PASSENGER 3. RAIL PASSENGER 4. BUS PASSENGER 5. SCHOOL BUS 6. TAXI PASSENGER 7. TRUCK PASS.
	○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	1. WORK 2. PERSONAL BUSINESS 3. MEDICAL – DENTAL 4. SCHOOL 5. SOCIAL – EAT MEAL 8. SHOPPING 9. RECREATION 0. HOME	1. COMMERCIAL RETAIL & SERVICES 2. COMMERCIAL WHOLESALE & STORAGE 3. MANUFACTURING – NONDURABLE 4. MANUF. – DURABLE & EXTRACTIVE 5. TRANSPORTATION & UTILITIES 6. INSTITUTIONAL & GOVT. SERVICES 7. RECREATION 8. AGRICULTURE & RELATED 9. OPEN LANDS & WATER AREAS 0. RESIDENTIAL (NONCOMMERCIAL)	AM PM (CIRCLE ONE) :	AM PM (CIRCLE ONE) :	1. AUTO DRIVER 2. AUTO PASSENGER 3. RAIL PASSENGER 4. BUS PASSENGER 5. SCHOOL BUS 6. TAXI PASSENGER 7. TRUCK PASS.
			1. WORK 2. PERSONAL BUSINESS	1. COMMERCIAL RETAIL & SERVICES 2. COMMERCIAL WHOLESALE & STORAGE			1. AUTO DRIVER 2. AUTO PASSENGER

REVERSE SIDE



SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

POST OFFICE BOX 8 WAUKESHA, WISCONSIN

BUSINESS REPLY MAIL

No Postage Stamp Necessary if Mailed in the United States

FIRST CLASS

Permit No. 651

WAUKESHA, WIS.

POSTAGE WILL BE PAID BY –

Southeastern Wisconsin
Regional Planning Commission

Post Office Box 8

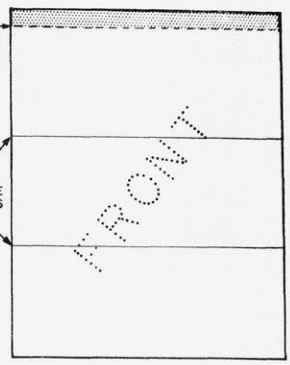
WAUKESHA, WISCONSIN

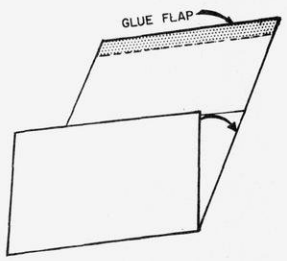
TRIP INFORMATION (CONTINUED)

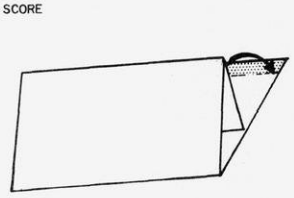
SEE EXAMPLE "B" ON INCLOSED INSTRUCTION SHEET

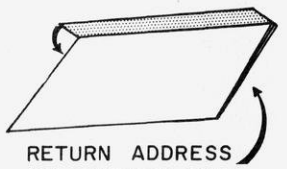
PERSON NO.	A	WHERE DID THIS TRIP BEGIN? (ORIGIN) GIVE FULL STREET ADDRESS (IF NONE, GIVE NEAREST STREET INTERSECTION) CITY, VILLAGE, OR TOWN, AND COUNTY — B	WHERE DID THIS TRIP END? (DESTINATION) GIVE FULL STREET ADDRESS (IF NONE, GIVE NEAREST STREET INTERSECTION) CITY, VILLAGE, OR TOWN, AND COUNTY — C	TRIP PURPOSE AT DESTINATION (CIRCLE CORRECT NO.) — D	TYPE OF ESTABLISHMENT AT DESTINATION (CIRCLE CORRECT NUMBER) — E	TIME OF TRIP (NEAREST MINUTE) STARTED — F	TIME OF TRIP (NEAREST MINUTE) ENDED — G	MODE OF TRAVEL (CIRCLE CORRECT NO.) — H
		○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	1. WORK 2. PERSONAL BUSINESS 3. MEDICAL – DENTAL 4. SCHOOL 5. SOCIAL – EAT MEAL 8. SHOPPING 9. RECREATION 0. HOME	1. COMMERCIAL RETAIL & SERVICES 2. COMMERCIAL WHOLESALE & STORAGE 3. MANUFACTURING – NONDURABLE 4. MANUF. – DURABLE & EXTRACTIVE 5. TRANSPORTATION & UTILITIES 6. INSTITUTIONAL & GOVT. SERVICES 7. RECREATION 8. AGRICULTURE & RELATED 9. OPEN LANDS & WATER AREAS 0. RESIDENTIAL (NONCOMMERCIAL)	AM PM (CIRCLE ONE) :	AM PM (CIRCLE ONE) :	1. AUTO DRIVER 2. AUTO PASSENGER 3. RAIL PASSENGER 4. BUS PASSENGER 5. SCHOOL BUS 6. TAXI PASSENGER 7. TRUCK PASS.
		○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	○ CITY ○ VILLAGE ○ TOWN (CHECK ONE)	1. WORK 2. PERSONAL BUSINESS 3. MEDICAL – DENTAL 4. SCHOOL 5. SOCIAL – EAT MEAL 8. SHOPPING 9. RECREATION	1. COMMERCIAL RETAIL & SERVICES 2. COMMERCIAL WHOLESALE & STORAGE 3. MANUFACTURING – NONDURABLE 4. MANUF. – DURABLE & EXTRACTIVE 5. TRANSPORTATION & UTILITIES 6. INSTITUTIONAL & GOVT. SERVICES 7. RECREATION 8. AGRICULTURE & RELATED 9. OPEN LANDS & WATER AREAS	AM PM (CIRCLE ONE) :	AM PM (CIRCLE ONE) :	1. AUTO DRIVER 2. AUTO PASSENGER 3. RAIL PASSENGER 4. BUS PASSENGER 5. SCHOOL BUS 6. TAXI PASS

2/3 ORIGINAL SIZE









CONTENT OF THE QUESTIONNAIRE

For compatibility, all questions pertaining to trip ends on the home interview forms were incorporated into the design of the postal questionnaires. Due to space limitations on the postal questionnaires, however, the amount of detail was reduced to some extent. Questions pertaining to the household were limited to the number of autos owned, the total trips, and the number of persons in the household. The information requested about each person in the household over five years of age was similar to that requested in the home interview, except for the person's occupation and industry.

An attempt was made to make the form as self-contained as possible so that the respondent could fill out the form without relying on any instructions. Where there was a choice of answers (such as trip purpose, land use, and mode of travel) every possibility was listed, and the respondent had only to circle a number or mark the correct answers. This decreased the coding required and assured proper classification of the answers. The most difficult part of the questionnaire to convey to the respondent was the method of transcribing the person number from the list of persons to the trips reported for each person. It was attempted to point out the relationship between the trip and the person number on the questionnaire by overprinting the boxed space provided for both in grey (black screen). Coding boxes were incorporated into the design of the form so that all information reported could be coded in the office without an additional form. Since many households make more trips than the 13 for which recording space was provided, an area was allotted for recording the number of additional trips made by household members. The travel day to be used by the respondent was printed on each form. To emphasize the travel day date, a shaded area boxed in both the day and date on the questionnaire form.

MAILING PROCEDURES

The household questionnaires were mailed out in first class metered envelopes. The first class permit was considered imperative in order to avoid the comparatively low return experienced by other surveys in which the bulk rate was used for mailing. Printed in large bold type on the envelope, along with the Commission's return address, were the words, "Important Open At Once". This was done to create immediate interest, so that the people who might possibly discard the envelope as "junk" mail would at least open the envelope out of curiosity.

The major source for the addresses used to mail the household questionnaire was the electric power companies' billing address files. Seven different electric power companies were contacted, and 85,000 addresses were obtained. About 13,000 of these addresses were summer cottages and, therefore, not occupied during the survey. The mailing addresses were received from these sources in three different forms. About 74 percent were IBM punched cards with street address printed on them by Address-O-Graph process, 25 percent were on gummed labels, and one percent were in list form only. Since about 63,000 "raw" addresses (before cottages were deleted) were already printed on IBM cards, it was decided that retyping the addresses was unnecessary. Window envelopes were used so that the IBM cards containing the addresses could be utilized. The 21,000 "raw" addresses printed on gummed labels required no additional handling other than their application to the envelopes. The one percent list had to be typed directly on the envelopes, using telephone directories as a guide.

Before any envelopes could be prepared for mailing, it was necessary to sort out the seasonal housing units. Since all of the addresses obtained were in printed form, sorting had to be done by hand. This was a time consuming, yet necessary, job. Each of the 85,000 addresses was examined, and those of summer cottages[1] were pulled out. Because it was necessary to have the addresses segregated by post office before mailing, the search for seasonal residences was done while the addresses were grouped by post office.

Next, a count of the addresses to be mailed out was made by post office. A record of the address count was kept on an accountability form assigned to each post office. This count made up the post office control totals of the outgoing questionnaires. The total address count within each post office was divided by five, systematically sorted, and assigned a travel date (Wednesday, Thursday, Friday, Monday, and Tuesday). As the addressed envelopes were being boxed, awaiting stuffing of the questionnaires, they were again counted and the five day totals checked against the control total for each post office.

Starting with the Wednesday travel date, 14,200 questionnaires for each travel day were stuffed into envelopes for mailing. Enclosed in each window envelope was the questionnaire, the letter with instructions, and the addresses IBM card. The plain envelopes containing the gummed labels or typed addresses required only that the questionnaire and the letter with instructions be inserted.

The mail-out was timed so that the questionnaire would arrive at the respondent's household the day before the assigned travel day. Since a first class mail permit was used on all out-going questionnaires, they arrived at the household within 24 hours of the time they were taken to the post office. The local post offices were very cooperative in the handling of the questionnaires and processed them with dispatch.

HOUSEHOLD ACCOUNTABILITY

Using utility company billing addresses introduced the slight possibility of underestimating the total number of households in the postal questionnaire survey area.[2] For this reason, it was necessary, as a preliminary accuracy check, to obtain a count of households in this area from other sources. Two such preliminary checks were made. One check was made by expanding the 1960 census count of households for the seven county Region and subtracting out the households within the personal interview area. The second check was completed during the survey by requesting that the postmaster from each post office within the postal questionnaire survey area record the number of

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1 Summer cottages were identifiable on the addresses obtained from the electric power companies by the way in which the addresses were printed. An address representing a summer cottage had the owner's full year-around address and only a general description of the cottage. The electric power companies' addresses were in order geographically according to their meter reading routes. For example, a cottage located at Pewaukee Lake would be grouped with other cottages and year-around houses from that area. If the owner of that cottage lives in Hales Corners it was quite easy to note the Hales Corners address, when the majority of the other addresses in the group were located in the Pewaukee area.

2 Since electric power company billing addresses were used as the source for the household postal questionnaire survey, a number of reasons for underestimating the households (families) in the area were introduced. Households that may not be accounted for are: households where more than one household obtains electric service through one meter; households served by a commercial rated meter; and households not having electric service.

year-round households served by his post office. It should be stressed that the checks described here were only preliminary checks and more refined checks will be conducted during the later phases of the study.

Census Check

The preliminary census check was made by expanding the 1960 total households for the Region to an estimated 1963 figure. This was accomplished by multiplying the average 1950-1960 yearly increase of households for each county by three and adding the product to the 1960 number of households. Using this method, the 1963 total households for the Region was estimated to be 533,187. Since only year-round, active households were contacted during the household postal questionnaire survey, the expanded census estimate had to be adjusted. A 1963 figure for seasonal and vacant households was calculated and subtracted from the total estimate. The resulting estimated number of active households in the Region was 496,275. Next, the number of active households in the personal survey area was deducted from the number of active households in the Region. The resulting estimated number of active households in the postal questionnaire survey area was 78,673. The compilation may be summarized as follows:

1.	Census Information:	Households
	a. 1960 Census - Region total	500,761
	b. Three year increase (1960 - 1963)	+ 32,426
	Total	533,187
	c. Vacant and seasonal households	- 36,913
	Difference	496,275
2.	Home interview survey (personal survey area)	Households
	a. Racine - Kenosha expanded households	57,230
	b. Milwaukee expanded households	+ 372,682
	Total	429,912
	c. Allowance for under-reporting (2.2% preliminary)	+ 9,458
	Total	439,370
	d. Vacant and other nonactive households	- 21,768
	Difference	417,602
3.	Postal questionnaire survey area household estimate:	
	a. Total active households for Region (estimate from census)	496,275
	b. Total active households, personal interview area (estimate)	- 417,602
	c. Postal survey area estimate	78,673

The 78,673 households estimated by expanding the census data was about 9 percent higher than the 72,087 household questionnaires actually mailed out during the postal questionnaire survey.

Post Office Check

The second check of households in the postal survey area was completed at the same time the household postal questionnaire survey was conducted. A letter was mailed to each of the 78 post offices in the postal survey area requesting that the postmaster complete a short form and mail it back to the Commission. The information requested on the form was: the number of year-round and seasonal families the post office served. Sixty-five of the postmasters responded, the remaining 13 were contacted by telephone to obtain the information. Five of the area's post offices served both the postal questionnaire and personal survey areas and therefore, required special handling. The number of active households in the postal questionnaire survey area, as reported by the postmasters, was 75,388. This count was 4.6 percent higher than the number of questionnaires mailed out in the postal questionnaire survey area.

PROCESSING RETURNED QUESTIONNAIRES

Receipt of the returned questionnaires began within two days after the first travel day. About 85 percent of the total number of questionnaires returned were back in the Commission's office within seven days of the last assigned travel day. As the forms were received, they were opened and separated by the travel day printed on the form. No further processing was done at that time. After about a three week period, the number of incoming questionnaires had dwindled down to only a few per day. At this time, approximately 11,800 forms had been received and filed.

The first step in further processing of the questionnaires was to separate the returned questionnaires by post office and travel day. A count was made of the number of forms received from each post office area for each travel day. This count was recorded on the control form which indicated the total number of questionnaires mailed out each travel day by post office. Next, every questionnaire was classified as either "passed" or "failed". If the form was not adequately completed, it was given a "failed" code and was sorted out to be filed separately. A total of 11,957 forms, or 97 percent, were rated "passed". This very high rate of useable questionnaires was much better than anticipated and balanced out, to some extent, the somewhat lower than estimated rate-of-return. For a questionnaire to qualify as "passed" it need not have any trips reported, but, it did have to have a proper street address and adequate household information which could be used for population and auto ownership analysis. A high percent of the "passed" questionnaires did have trips reported, however.

Grouping the Questionnaires

As already noted there were 83 different post office service areas involved in the household postal questionnaire survey. For ease of handling and processing, the returned questionnaires were grouped into four post office categories. The categories to which a post office was assigned depended upon the number of families served by that post office (See Table 1.)

Table 1

DISTRIBUTION OF RETURNED QUESTIONNAIRES BY POST OFFICE GROUPS

Group No.	Number Of Families Served By Post Office	Total Mailed Out	Total Returned Useable	Rate Of Return (percent)	Post Office Count	Difference SEWRPC Count / Post Office Count
1	1,000 or less	19,728	3,169	16.1	20,668	95.45
2	1,001 to 2,000	13,852	2,565	18.5	15,252	90.82
3	2,001 to 3,000	23,260	3,452	14.8	24,437	95.18
4	3,001 & over	15,247	2,771	18.2	15,031	101.44
Total	....	72,087	11,957	....	75,388	.....
Average	....	.....	.....	16.9	.....	95.62

HOUSEHOLD POSTAL SURVEY COST

The costs involved in the household portion of the postal questionnaire survey can be separated into nine categories. At the time of writing, the final cost of only five of these categories can be given. No cost figures are available as yet for the last four categories since they have not been completed. Following are the nine categories and the available cost figures.

Cost Final

1.	Obtaining Addresses	$ 130.00
2.	Printing and Related Cost	
	a. Design and Drafting	205.00
	b. Printing of Questionnaires	1,935.00
	c. Printing of Instruction Letters	578.00
	d. Envelopes with Printing	803.00
	Sub Total	3,521.00
3.	Processing, outgoing questionnaires	2,303.60
4.	Mailing cost (first class permit)	
	a. Outgoing Mail	3,619.90
	b. Returned Mail	756.87
	Sub Total	4,376.77

5. Processing returned questionnaire 700.00

Total Cost To Date $10,901.37

Cost Not Yet Final

6. Coding (estimate cost)
   a. General . . . . . (no estimate)
   b. Geographic . . . . . (no estimate)

7. Key Punch and Verifying . . . . . (no estimate)

8. EAM Processing . . . . . (no estimate)

9. Analysis . . . . . (no estimate)

Relating the cost given above to the number of household questionnaires handled during the survey the following preliminary unit costs were derived.

1. Cost per questionnaire mailed out (72,087) 0.13
   (includes all cost up to and including item 4a)

2. Cost per returned questionnaire (11,957) 0.84
   (includes all cost up to and including item 4b)

3. Cost per processed completed questionnaire (11,957) 0.92
   (includes all cost up to and including item 5)

PUBLICITY

The publicity given the household postal questionnaire survey by the SEWRPC was minimal. Only one short news release was prepared and sent to regional news media preceding the household postal questionnaire mailout. A higher rate of return might have been experienced if a full public information program had been undertaken to enlighten the public concerning the postal questionnaire survey. Such a program would, however, have increased the cost of the survey and in light of the entirely satisfactory rate-of-return achieved, would represent a questionable expenditure. Moreover, in the seven county area comprising the planning jurisdiction of the Commission there are over 70 newspapers, radio stations, and television stations. With so many news outlets, there is always the chance that one of these outlets might not agree, editorially, with the Commission's work program. If this should occur, but it did not, and an unfavorable article or news report resulted, it could adversely affect the number of questionnaires returned from the survey area. As a result, a bias would be injected into the return.

SUMMARY AND CONCLUSION

During the late spring of 1963 the land use-transportation study conducted a household postal questionnaire survey. This survey was directed to persons living outside the intensively developed areas of Milwaukee, Racine and Kenosha standard metropolitan

statistical areas. About 72,000 questionnaires were mailed out to residents in this area. Slightly over 12,000 questionnaires were completed and returned to the Commission office. The 17 percent rate-of-return was slightly less than anticipated. About 97 percent of the questionnaires returned were, however, found to be completed satisfactorily, and this high quality of returns offset the somewhat lower rate-of-return.

An attempt to reach every household in the postal survey area was made. Preliminary independent estimates of the total households in the postal area revealed that about 5 to 9 percent of the households may not have received questionnaires. This possibility was foreseen and adjustments will be made during the sample expansion process.

The post office service area of the respondents was used as a control for mailing out the questionnaires and for grouping the returned questionnaires. This relationship of outgoing and returned questionnaires was necessary to compute an accurate rate-of-return from a known geographic area.

The total cost for conducting the household postal questionnaire survey was about $11,000. This includes all cost up to and including preliminary, manual processing of the returned questionnaires. At the time this article is written, the questionnaires are being coded to prepare the data for machine processing. (These costs will be presented in a later issue of the "Technical Record".)

It is believed that the postal questionnaire survey presented the only practical way to obtain trip information in the rural areas of the Region. Personal interviewing at a sample rate comparable to the rate achieved by the postal survey, would have been impractical within the budgetary and time limitations of the study.

Preliminary review of the returned questionnaires indicates that a very favorable result should be obtained from a postal questionnaire survey as conducted by the Commission. A preliminary count of trips per completed questionnaire returned, reveals that a rate of about six trips per household should be realized. This is somewhat lower than the rate found in the home interview survey but, nevertheless, a very satisfactory rate. It is believed that the postal questionnaire type survey tends to understate trip production for various reasons. Most important of these reasons probably is the respondent's lack of understanding of what constitutes a trip. Respondents often believe that a short trip, such as to a neighborhood store, is trivial and need not be reported. Other respondents believe that only auto driver trips need be reported. Such under reporting of trips is, however, to be expected without the probing questions of an experienced interviewer to assist in searching out all trips made by the household residents on the travel day.

Since all phases of the postal questionnaire survey are not complete, a final conclusion regarding the survey as a whole cannot as yet be made. Considering the facts available at this time, however, it appears that the data collection phase was most satisfactory. Moreover, the returns show what appears to be an even geographic distribution of returned questionnaires and a comparatively high number of trips reported from each of the households. Once the information contained on the questionnaires has been

punched onto IBM cards, processed, and a detailed analysis is made, the completeness and accuracy of the SEWRPC postal questionnaire survey can be further evaluated. (The conclusions drawn by the study staff will be recorded in future articles of the "Technical Record".)

* * * * *

(Backward Glance continued from page 26)

Act of 1850 gave the state title to all land in tracts of forty acres or more, if over fifty percent of that land was swamp. Over 3,250,000 acres became state land under this act.

THE SURVEYORS

The pioneer surveyors were usually men with good scientific training. Some of them, like Lucius Lyon, later a United States Senator from Michigan, attained distinction in political life. Other deputy surveyors who were responsible for the subdivision of lands in the four southern lake-shore counties (Kenosha, Racine, Milwaukee, Ozaukee) were: Sylvester Sibley, Garret Vliet, Joshua Hathaway, William Burt, and Increase Lapham. Hathaway was a leading citizen of Milwaukee until his death in 1863. Vliet, who was an engineer on the Ohio Canal, has a street in Milwaukee named in his honor. William Austin Burt became renowned for his invention of the solar compass, which has proved to be vastly superior to the magnetic compass since it is not affected by local magnetic fields; and it is still in use today. Increase Lapham later became a prominent engineer and scientist. He surveyed the route of the proposed Milwaukee to Rock River canal, and in honor of his archeological work, the highest point in Waukesha County is named Lapham Peak.

A RESULT OF THE SURVEY

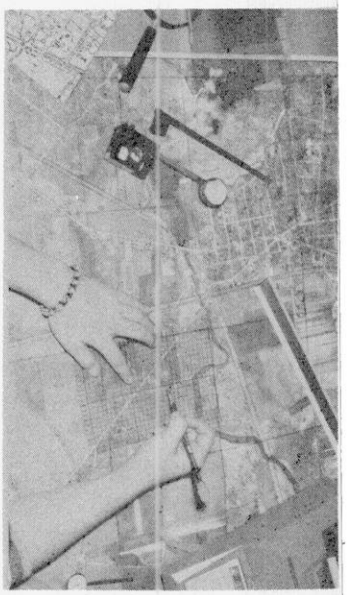
By 1840, the land that had once been described officially as "but a waste of swamp, and entirely uninhabitable" (Green Bay Intelligence, June 2, 1835.) had gained a reputation as one of the most fertile and potentially productive areas in the Midwest. By 1850, 113,389 people resided in 41 bustling settlements in what is now the seven-county Region. The transition from frontier wilderness was complete; and the corners of the survey that made it so remain today, remarkably accurate considering the conditions under which they were established.

The U.S. Public Land Survey system provides a classic example of a sound engineering solution to a very complex problem. It is a remarkably simple yet effective and flexible device. To this day the public land survey system provides not only a basis for all property surveys, descriptions and conveyances in the Region but, when combined with the state plane coordinate system, it provides an effective system for the geographical identification of planning data by machine methods.

(Sources: Wisconsin Domesday Book, Vol. II, Four Wisconsin Counties, Wisconsin State Historical Society, Madison, 1927; and United States Land Survey of Wisconsin, Lee W. Crandall, 1935.)

AERIAL PHOTOGRAPHS AND THEIR USE IN THE REGIONAL LAND USE INVENTORY

by Harlan E. Clinkenbeard, Land Use Planning Chief



Land is one of our three most important natural resources, the others being water and air. The way in which land is used is, therefore, one of the most important problems facing man today. The proper development, management, and conservation of land resources requires the preparation of long-range land use plans. The task of preparing such plans for the seven-county area known as the Southeastern Wisconsin Region has been assigned to the Southeastern Wisconsin Regional Planning Commission (SEWRPC).

Since practical development plans cannot be prepared without definitive knowledge about the existing situation, the first phase of any long-range planning program must encompass the collection and analysis of data descriptive of existing conditions. Land use is probably the best available base for studying urban development. It is closely related to travel and provides the basis for establishing trip generation rates. Land use data also provides factual information necessary to forecast future development.

The necessary inventory of existing land use is, therefore, one of the singularly most important and basic tasks to be performed in the collection of information for comprehensive planning purposes. It is also one of the largest and most time consuming tasks.

Land use may be defined as "any activity taking place upon land," and its inventory involves collecting information on three aspects:

1. The kind of activity; that is, its function in the urban or rural environment.
2. The geographic location with respect to all other land uses.
3. The intensity of use.

Land use data cannot be used in planning unless it is summarized into useable form. For such summarization, it is necessary that the uses be differentiated according to the characteristics and classified into categories which serve a purpose within the planning process. A land use inventory, therefore, consists of an accurate classification of the kinds of activities taking place on land, the geographic delineation of these activities and their measurement.

The seven-county Southeastern Wisconsin Region, encompassing 2,689 square miles, represents a vast area in which to collect comprehensive information regarding land use. The size of the task is apparent when one considers that 1.6 million persons reside in the Region, that it contains four of the five most populated cities in the state, and that it contains 142 municipalities in addition to these four cities and the seven counties. The large area, the relatively large population, and the many governmental units make any collection of information relating to people and their activities a major undertaking.

BACKGROUND

Several methods of collecting the necessary land use information were explored during the detailed study design. These included:

1. The assembly of land use information from secondary data sources including local and state planning reports, fire insurance maps and plat books.
2. Field listing.
3. Aerial photographic interpretation.

It soon became evident that there had never been an accurate inventory of existing land use made for the entire Region, and that only a few of the 146 municipalities within the Region and only three of the seven counties had ever conducted land use inventories. None of this information was current, except that which the local planning staffs of the Cities of Milwaukee, Racine, and Kenosha (which encompass approximately 117 square miles of the most densely populated parts of the Region) had completed or were in the process of completing. This latter information would be placed at the disposal of the Commission, regardless of the method selected for inventorying the rest of the Region. The collection of existing land use data for the remaining 96 percent of the Region could not, therefore, be accomplished by the first method. Further study indicated that performance of the task by field listing methods would exceed budgetary and time limitations. It was, therefore, decided to inventory the land uses in the remainder of the Region by aerial photographic interpretation.

In the preparation of the Regional Land Use-Transportation Study Prospectus, the interagency technical advisory committee had anticipated the need for complete aerial photographic coverage of the Region to be utilized for two distinct purposes:

1. To update the Commission's base maps.
2. To provide inventory base sheets for the collection of planning data including data on land use.

USE OF AERIAL PHOTOGRAPHS

Three tasks had to be performed before the inventory of existing land uses by aerial photographic interpretation could begin. These were:

1. The preparation of a contract and specifications for aerial photography, the negotiation of a contract with a photogrammetric engineering firm for the specified photography, the completion of the actual photography and photo processing itself, and final delivery of useable photographs to the Commission offices.

2. The preparation of a detailed inventory design and the preparation of a land use inventory procedural manual for staff use, including the adoption of a land use classification system.
3. The employment of staff and assembly of equipment necessary to perform the required land use inventory.

The first task was begun in January, 1963, with the preparation of a contract and detailed specifications for technical services. The contract specifications called for photographic flights to be made at two altitudes. High altitude photography of the entire 2689 square mile Region was to be taken at a flight altitude of 21,000 feet and was to produce negatives at an average scale of one inch equals 6,000 feet. From these negatives, ratioed rectified enlargements at a scale of one inch equals 2,000 feet would be prepared. Each of these enlargements covered an entire U.S. Public Land Survey township, and they were used to update the Commission's base maps.

Low Altitude Photography

Low altitude photography of the entire 2689 square mile Region was also required to provide a basic data source for various planning inventories, including the land use inventory. The contract specifications required an average negative scale of one inch equals 2,000 feet. The photographs were to be taken with a Zeiss RMK distortionless precision aerial mapping camera having a six-inch focal length and producing negatives nine inches by nine inches in size. The photographs were to be clear and sharp in detail and have an average uniform density. They were also to be free from clouds and cloud shadows, light streaks, static marks or other blemishes which might interfere with their intended use. The photographs were to be taken when the area was free of snow, but before foliation, between the hours 10:00 a.m. and 2:00 p.m., and with a minimum solar angle of 30 degrees. Excessive variation in tone or density was also a cause for rejection.

Ratioed photographic enlargements of the one inch equals 2,000 feet negatives were provided at a scale of one inch equals 400 feet. These enlargements were printed on reproducible Chronaflex photographic film using a 300-line per inch halftone screen. Horizontal control was provided by 7 1/2 minute U.S.G.S. quadrangle maps. Each ratioed enlargement was prepared from the center portion of the low altitude negatives and covered four U.S. Public Land Survey sections, being centered over the common section corner. Ratioed enlargements having a departure in any area of the photograph from the scale of one inch equals 400 feet by more than 2 percent could be rejected. Delivery of the photographs was to begin within 15 days after the aerial flights.

The enlargement scale of one inch equals 400 feet was selected for two reasons: the interpretation of aerial prints at a smaller scale would become difficult; and the use of a larger scale would reduce the area coverage of each print and multiply costs involved. By specifying the use of a 300-line per inch halftone screen and printing the enlargements on reproducible Chronaflex, it was possible for the staff to accomplish the actual photographic interpretation, delineation and measurement of existing land uses directly on inexpensive paper prints prepared in the SEWRPC offices using an Ozalid printer.

The finished photography was carefully checked to maintain quality control, and particularly to determine the amount of error in the scale of the enlargements. A sampling procedure was used to determine the scale error as follows:

1. A sample of approximately 10 percent of the aerial photographs was drawn from the delivered Chronaflex enlargements. This sample included 67 of a total of 686 photos. The sample was drawn using a random number table. Sample size was arbitrary by necessity, since the standard deviation of the population was not known. It was believed, however, that a 10 percent sample would be large enough for statistical validity and adaptable to the time and cost limitations.
2. Two measurements between well-defined physical features were taken at right angles to each other on each sample photograph. These measurements were made between the same well-defined physical features on standard U. S. G. S. 7 1/2 minute quadrangle maps.
3. The largest deviation between the photo and map measurements for each photo in the sample was recorded and expressed as that percentage by which the photo measurement differed from the map measurement (plus or minus).
4. The mean deviation and standard deviation of the sample were calculated to be 0.265 and 1.233 respectively, the standard error of the mean to be 0.15, and the standard error of standard deviation to be 0.11. Since the standard error of the mean and the standard error of the standard deviation were both found to be small, it was assumed that the mean and standard deviation of the sample closely approximated that of the true population parameters. By further assuming that the population distribution was reasonably normal, it was determined that the scale errors of the photographic enlargements would range between a minus 2.00 percent and a plus 2.00 percent, 88 percent of the time. It was, therefore, concluded that the error between photo measurements and map measurements was on the average very small and within acceptable limits, and that measurements for the land use inventory could be made with acceptable accuracy directly on the aerial photographic enlargements.

LAND USE CLASSIFICATION SYSTEM

The task of developing and adopting a land use classification system was begun in February of 1963. This classification system had to be reviewed and approved by the rural and urban land use planning subcommittees of the technical advisory and coordinating committee on regional land use transportation planning. These subcommittees initially determined that the regional land use classification system must be suitable for both regional land use and transportation planning, be compatible with existing land use classification systems already in use within the Region by local planning agencies, and be suitable for local planning at least at the county level. It was further determined that the land use classification system should be based primarily upon the functional characteristics of the land uses, as these are the most important attributes of the existing land use system. Functional information is absolutely essential for analytical purposes and for the comparison of land use data assembled by various agencies operating within the Region. In addition, it was determined that the land use classification system should indicate other characteristics, such as intensity of use, as secondary considerations to the extent necessary to provide the system with practical utility and

depth. It became apparent in working with the rural and urban land use planning subcommittee that a compromise would have to be achieved in any classification system that was adopted in order to resolve differing requirements for urban and rural planning. The two digit land use classification system shown on the coding sheet reproduced as Figure 1, was finally recommended for adoption by both the rural and urban land use subcommittees and subsequently adopted by the staff as the basis for the regional land use inventory.

INVENTORY PROCEDURES

The land use inventory was divided into four working phases:

1. Preinterpretation phase.
2. Interpretation and delineation phase.
3. Measurement and coding phase.
4. Quality control phase.

The aerial photography was put to best advantage in each of these phases, a brief description of which follows.

Preinterpretation Phase

The preinterpretation phase of the land use inventory involved the field listing of all those areas of the Region which were too densely urbanized to be properly inventoried by aerial photographic interpretation alone and for which no current land use inventories existed. This task was performed by inspecting the photographic enlargements, selecting those which covered the densely urbanized areas of the Region, and preparing blue line paper prints from these enlargements. These blue line paper prints were then taken into the field and, using the adopted land use classification system, interpreted and delineated on the spot by outlining in colored pencil the area occupied by each use and by designating each area so delineated with the appropriate land use code.

Interpretation and Delineation Phase

The first step in this phase of the work consisted of obtaining black line Ozalid prints on plastic coated paper of each of the screened photographic enlargements. The boundaries of each U. S. Public Land Survey section and quarter section were then delineated on each black line print in orange ink, resulting in 16 outlined quarter sections on each print. Interpreters then "read" each print, quarter section by quarter section, interpreting and delineating the existing land uses by proper color and code designations directly on the aerial photographic print. (See Figure 2.) Where necessary, the preinterpreted and delineated prints were used as well as any available secondary source data to complete the interpretation and delineation.

Measurement and Coding

The area of each land use delineated was measured directly on the plastic coated paper prints using engineering scales, polar planimeters and transparent overlays having parabolic curves and grid patterns printed thereon. The total area as measured in square feet for each land use in each quarter section was then recorded on a quarter section coding sheet along with the corresponding land use classification code number (See Figure 1).

Figure 1

LAND USE CLASSIFICATION SYSTEM

(Sample Quarter Section Coding Sheet - Quarter Section 0619 - 10 - 2)

FORM T4-2 5/63

SOUTHEASTERN WISCONSIN REGIONAL TRANSPORTATION STUDY

SOUTHEASTERN WISCONSIN REGIONAL LAND USE-TRANSPORTATION STUDY

LAND USE INVENTORY QUARTER SECTION CODING SHEET

LAND USE DIVISION

CARD NUMBER 2 0

CIVIL DIVISION 7 37

TOWN AND RANGE 06 19

SECTION 10

QUARTER SECTION 2

NAME		DATE	OFFICE	FIELD
PRE-INTERPRETATION FIELD LISTER	PG	6-28		✓
LAND USE INTERPRETER	JAF	7/30	✓	
LAND USE CHECKER	WEJ	8/9		✓
LAND USE CODER	PGB	8/28	✓	
CODE CHECKER	M.R.S.	9/19/63	✓	

1 DIGIT	LAND USE CLASSIFICATION	2 DIGIT		SPEC	AREA SQUARE FEET (THOUSAND)				CHECK LIST	✓
0 YELLOW RESIDENTIAL	SINGLE-FAMILY RESIDENTIAL	0	0		0	8	4	1	PRE-INTERPRETATION LAND USE SHEETS	
	TWO-FAMILY RESIDENTIAL	0	1		0	1	1	2		
	MULTI-FAMILY HIGH RISE 4 OR MORE STORY	0	2							
	MULTI-FAMILY LOW RISE 1 TO 4 STORY	0	3		0	1	9	5	EXISTING COMMUNITY LAND USE MAPS	
	MOBILE HOMES	0	4							
	VACANT RESIDENCE (UNDER DEVELOPMENT)	0	5							
1 PINK RETAIL & SERVICES	LOCAL RETAIL AND SERVICES	1	0		0	0	6	2		
	REGIONAL RETAIL AND SERVICES	1	1							
									CODED MAPS	
2 RED WHOLESALE	WHOLESALE (OPEN)	2	0							
	WHOLESALE (ENCLOSED)	2	1							
3 PURPLE MANUFACTURING NON-DURABLE	FOOD AND KINDRED PRODUCTS	3	0							
	TEXTILE MILL PRODUCTS	3	1						U.S.G.S. QUADRANGLE MAPS	
	APPAREL AND OTHER KINDRED PRODUCTS	3	2						WAUKESHA	
	PAPER AND ALLIED PRODUCTS	3	3						MUSKEGO	
	PRINTING, PUBLISHING, AND OTHER ALLIED INDUSTRIES	3	4		0	0	5	9		
	CHEMICALS AND ALLIED PRODUCTS	3	5						PLAT MAPS	
	LEATHER AND LEATHER PRODUCTS	3	6						WAUKESHA	
	MISCELLANEOUS NON-DURABLE GOODS	3	7							
4 PURPLE MANUFACTURING DURABLE	LUMBER AND WOOD PRODUCTS	4	0						HIGHWAY RIGHT OF WAY TAB SHEETS	
	STONE, CLAY AND GLASS PRODUCTS	4	1						WAUKESHA	
	PRIMARY METAL INDUSTRIES	4	2							
	FABRICATED METAL PRODUCTS	4	3							
	MACHINERY (EXCEPT ELECTRICAL)	4	4							
	ELECTRICAL MACHINERY EQUIPMENT AND SUPPLIES	4	5						OTHER MAPS	
	TRANSPORTATION EQUIPMENT	4	6							
	PROFESSIONAL, SCIENTIFIC AND CONTROLLING INSTRUMENTS	4	7							
	MISCELLANEOUS DURABLE GOODS	4	8							
	EXTRACTIVE (QUARRIES AND MINING OPERATIONS)	4	9						OTHER PUBLICATIONS	
5 BROWN TRANSPORTATION COMMUNICATIONS & UTILITIES	RAIL, BUS, AND SHIP TERMINALS	5	0							
	RAILROAD RIGHT OF WAY	5	1							
	RAILROAD YARDS	5	2							
	AIRPORTS (TERMINAL AND FIELD)	5	3						GENERAL REMARKS	
	LOCAL AND COLLECTOR STREET RIGHT OF WAY	5	4		0	3	2	6		
	ARTERIAL STREET AND HIGHWAY RIGHT OF WAY	5	5		0	3	1	1		
	FREEWAY AND EXPRESSWAY RIGHT OF WAY (LIMITED ACCESS)	5	6							
	TRUCK TERMINALS	5	7							
	OFF-STREET PARKING	5	8		0	1	7	4		
	COMMUNICATION AND UTILITY FACILITIES (NO OFFICES)	5	9		0	0	4	8		
6 GRAY INSTITUTION & GOVERNMENT SERVICES	LOCAL INSTITUTION	6	0		0	1	4	0		
	REGIONAL INSTITUTION	6	1		1	1	2	3		
	LOCAL GOVERNMENT	6	2							
	REGIONAL GOVERNMENT	6	3		0	4	6	4		
7 BLUE RECREATION	LOCAL PUBLIC RECREATION AREA (ENCLOSED)	7	0							
	LOCAL PUBLIC RECREATION AREA (OPEN)	7	1		0	9	1	4		
	REGIONAL PUBLIC RECREATION AREA (ENCLOSED)	7	2							
	REGIONAL PUBLIC RECREATION AREA (OPEN)	7	3							
	PRIVATE AND OTHER RECREATION (NATURAL AREAS INTENSIVE USE)	7	4							
	PRIVATE AND OTHER RECREATION (ARTIFICIAL AREAS INTENSIVE USE)	7	5							
	OTHER RECREATION	7	6							
8 LT GREEN AGRICULTURE & RELATED	CROP LANDS AND ROTATION PASTURE ✓	8	0		1	5	8	4		
	PERMANENT PASTURE	8	1							
	ORCHARDS AND NURSERIES	8	2		0	2	2	4		
	FOWL AND FUR FARMS	8	3							
	OTHER AGRICULTURE USES	8	4							
9 DARK GREEN OTHER OPEN LANDS SWAMPS & WATER AREAS	LAKES, RIVERS, STREAMS AND CANALS	9	0							
	SWAMPS, MARSHES AND WETLANDS	9	1							
	UNUSED LANDS	9	2		0	3	6	9		
	LAND FILL AND DUMPS	9	3							
	GENERAL WOODLANDS	9	4							
	MISCELLANEOUS OPEN LANDS	9	5							
		TOTAL AREA			6	9	4	6		

Figure 2

EXAMPLE OF LAND USE DELINEATION ON AERIAL PHOTO
(Quarter Section 0619 - 10 - 2)

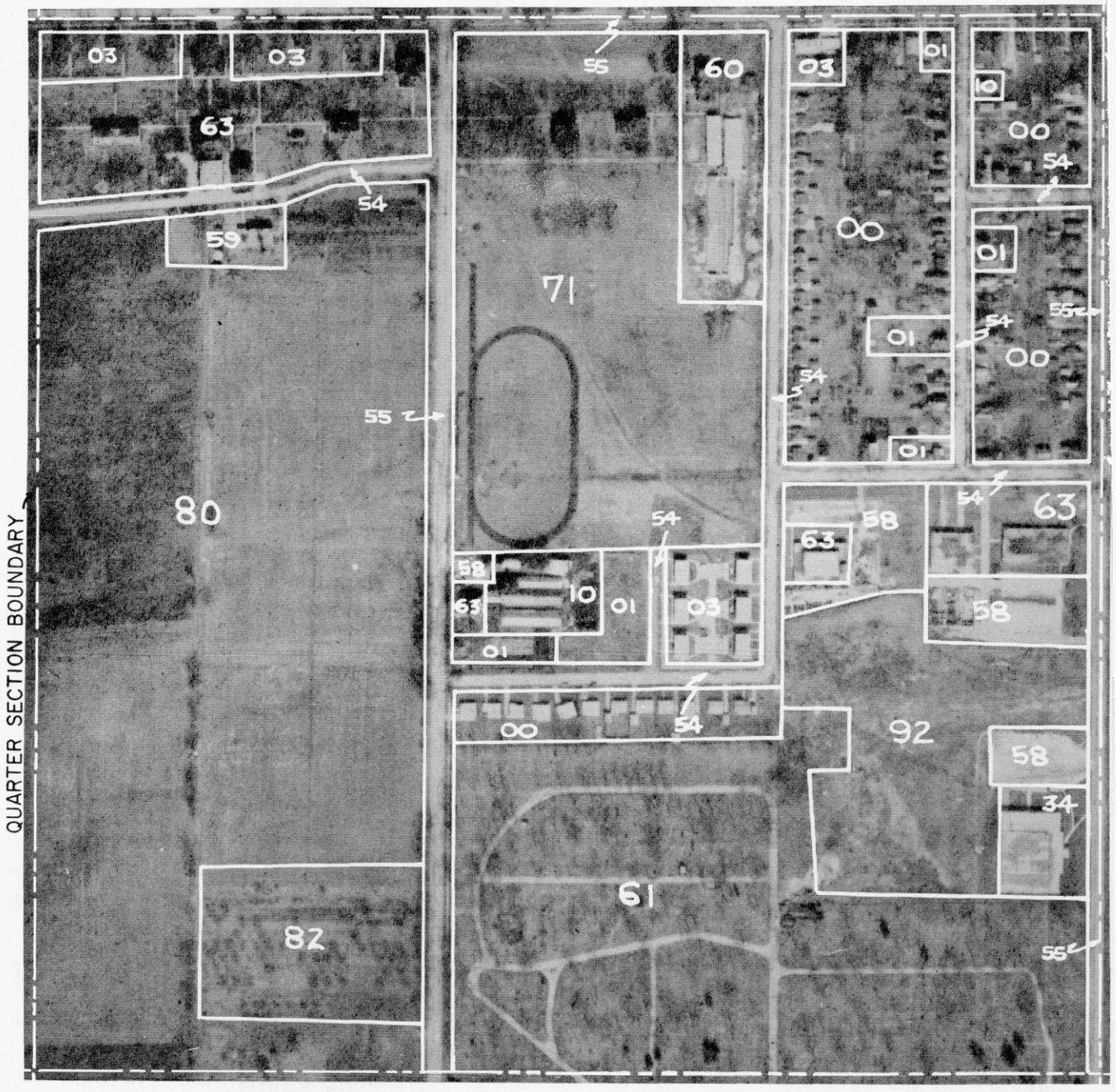


Figure 2 (above) depicts an enlarged aerial photo print (1" = 400') of a quarter section in Waukesha County. Drawn on the print are the boundaries of various land uses as interpreted and delineated by the Commission staff. The numbers represent the codes for the particular land uses. (See Figure 1). It should be noted that in the actual inventory, specific colors were used to denote the various major land use classifications.

Quality Control

Quality control of the land inventory itself involved two separate operations, the first operation consisted of field checks on a 10 percent sample of the interpreted and delineated photographs. Field checks were accomplished by a supervisory planner and consisted of checking the interpreted and delineated uses on the photographs against actual land uses observed in the field. The second operation of the quality control work involved the establishment of control measurements for geographic areas. Accurate areas were determined for each U. S. Public Land Survey quarter section within the Region by computing the area of the quarter section from actual field measurements provided to the Commission by local city engineers and private land surveyors. This was done for all quarter sections for which such field measurements were available. For the remaining quarter sections in the area, each quarter section was measured on the Commission's base maps, which are drawn to national map accuracy standards, using engineer's scales and polar planimeters.

These independently determined control measurements were then compared to the quarter section area totals obtained from the aerial photographs. Discrepancies between the area totals, as determined on the aerial photographs versus those obtained by independent computation or measurement, were adjusted to the control measurement totals. In this way firm, accurate and consistent area totals were obtained for quarter sections, sections, minor civil divisions, counties and the Region as a whole.

CONCLUSIONS

In retrospect, the use of aerial photographic interpretation to complete the existing land use inventory, as outlined herein, proved to be a wise decision. This method of inventory afforded the Commission staff an accurate and complete picture of the existing land uses in the Region at a minimum cost.

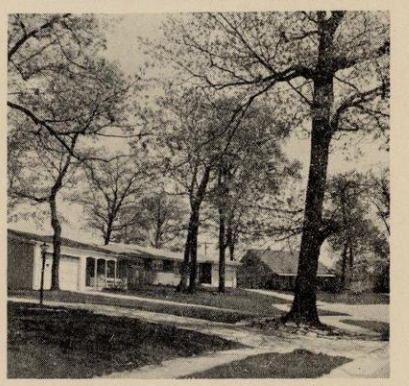
Plastic coated paper prints prepared from the Chronaflex originals were inexpensive and easy to work with. Field checks revealed few errors on the part of the interpretation and delineation teams. The photographs also made the necessary supplementary field listing tasks much easier, particularly for those areas of the Region wherein good community maps at appropriate scales were nonexistent.

The storage of delineated aerial prints is relatively simple, due to the fact that the map files used during the work phase can be retained for storage purposes. It is believed that the land use data can be readily updated and maintained by periodic reflights of the Region. Such reflights would also permit statistical and analytical comparisons to be made between the existing land uses as determined in 1963 and any land uses shown on the new photography. The interpretation, delineation and measurement for the land use inventory was accomplished by relatively inexperienced temporary personnel, working under the close supervision of professional planners. About half of the persons employed in the inventory had educational backgrounds in geography or cartography. Those who did not, required very little time after initial training to become skilled at interpreting the photographs for land use inventory purposes. The work was accomplished by a staff of 15 employees working from June 3, 1963 to October 17, 1963.

THIS IS SOUTHEASTERN WISCONSIN

Important vital statistics on the Region and percent of totals for the State of Wisconsin.

Land and Water Area (sq. mi.)	2,688	5%
Population (1960)	1,573,620	40%
Resident Employment (1960)	612,723	42%
Resident Unemployment (1960)	24,174	41%
Resident Labor Force (1960)	636,897	42%
Resident Man'f. Employment (1960)	253,292	52%
Resident Non-Man'f. Employment (1960)	359,431	37%
Disposable Personal Income (1960)	$3,572,000,000	46%
Retail Establishments (1958)	15,780	33%
Retail Sales (1960)	$2,045,000,000	42%
Property Value (1960)	$8,726,000,000	46%
Total Shared Tax (1960)	$62,777,000	54%
Total State Aids (1960)	$35,474,000	26%
Total Property Tax Levy	$239,380,000	50%
Total Long Term Public Debt	$378,592,000	55%
Total Highway (miles) (1960)	8,740.45	8.9%
Value of Mineral & Non-Metal Production (1961)	$15,494,487	20.08%
Total Vehicle Registration (1962-1963)	633,540	36.8%
Auto Vehicle Registration (1962-1963)	551,188	40%
Truck Registration (1962-1963)	55,950	23%
State Parks & Forest Areas (acres) (1963)	12,546	3.02%




KENOSHA · MILWAUKEE · OZAUKEE ·
WAUKESHA · WASHINGTON · WALWORTH · RACINE ·
SOUTHEASTERN
WISCONSIN
REGIONAL
PLANNING
COMMISSION