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### COMMUNITY ASSISTANCE PLANNING REPORT NUMBER 194

### A LAND INFORMATION SYSTEM PLAN FOR RACINE COUNTY

Prepared by the

Southeastern Wisconsin Regional Planning Commission P. O. Box 1607 Old Courthouse 916 N. East Avenue Waukesha, Wisconsin 53187-1607

August 1991

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COMMISSION

August 25, 1991

Ms. Jean M. Jacobson, Chair, and Members of the Racine County Board of Supervisors 730 Wisconsin Avenue Racine, Wisconsin 53403 Mr. Dennis M. Kornwolf County Executive Racine County 730 Wisconsin Avenue Racine, Wisconsin 53403

Dear Chair and Members of the Board and County Executive:

On June 26, 1990, the Racine County Board of Supervisors created a Land Information Office pursuant to Section 59.88 of the Wisconsin Statutes, directing that Office to prepare a countywide plan for land records modernization. The Register of Deeds was designated as the County Land Information Officer. On July 24, 1990, the Board requested that the Regional Planning Commission provide staff support to the County Land Information Office in the preparation of the needed plan. To help guide the preparation of the plan, Racine County created a Land Information Modernization Plan Advisory Committee consisting of knowledgeable representatives of Racine County, of local units and agencies of government in the County, and of public and private utilities serving the County. This report sets forth the plan developed by that Advisory Committee with the assistance of the Regional Planning Commission.

After a careful review of pertinent information, the Advisory Committee concluded that a modernized land records system in Racine County could best be created by providing a single automated mapping base for the entire County. This single mapping base would be prepared to a set of specifications sufficient to meet the most stringent of accuracy and map feature content requirements of all users concerned. Each organization—including Racine County—intending to use the automated base would provide its own operating environment in terms of computer hardware, software, and supporting staff. Only the computerized maps and common parcel identification system would be shared. With the use of a shared automated mapping base in such a decentralized land information system, it would be possible for individual local units of government and utilities to proceed at their own pace in establishing an automated land information system, preserving, however, the capability for the ready exchange of data among the decentralized data banks that ultimately would be established.

The Advisory Committee found that the capital expended over the years by Racine County in its remonumentation of the U. S. Public Land Survey Section system and in the preparation of topographic and cadastral—real property boundary maps represents a wise investment and has contributed most significantly toward building the automated mapping base. That work has been completed largely to standard specifications promulgated many years ago by the Regional Planning Commission. What remains to be accomplished is the completion of cadastral maps of the eastern portion of Racine County and the conversion of all of the maps and data to computer-readable form.

The Advisory Committee recommended that all of the retained filing and recording fees from the Register of Deeds Office over the next six years, together with any available State grants-in-aid be directed to completion of the cadastral maps and the digital conversion of the topographic and cadastral maps, concentrating first on the eastern portion of the County. The Committee also recommended that a number of related studies and work efforts take place over the next several years. These include a pilot study to determine if it would be cost effective to acquire the single-purpose digital base map of Racine County created by the Wisconsin Natural Gas Company and convert that base map to the more comprehensive digital base map recommended in the plan, rather than create the more comprehensive map by the digital conversion of the Racine County cadastral maps; a study that would identify in detail how the current Racine County and City of Racine parcel numbering system should be adapted to meet the unique parcel identification numbering system promulgated by the Wisconsin Land Information Board; a study to address issues involving the custody, control, and maintenance of land records information, including system security and public access arrangements; a study of the internal geoprocessing needs within Racine County, including a determination of geoprocessing software and hardware requirements; and a pilot study to modernize the filing system in the Register of Deeds Office utilizing optical disk technology.

On August 2, 1991, the Advisory Committee acted unanimously to adopt the six-year plan set forth herein and to recommend adoption of the plan and its implementation to the County Board and County Executive. The Committee further unanimously recommended that the plan be submitted by the County to the Wisconsin Land Information Board for endorsement in order to qualify the County for grants from the State in support of the recommended plan implementation work.

Sincerely.

Kurt W. Bauer Executive Director (This page intentionally left blank)

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### Chapter I

### INTRODUCTION

### BACKGROUND

On July 24, 1990, the Racine County Board of Supervisors adopted a resolution asking the Southeastern Wisconsin Regional Planning Commission to help Racine County prepare a plan for land records modernization, focusing on the development of an automated mapping and parcel-based land information system. This resolution was subsequently approved by the Racine County Executive. A copy of the adopted resolution is provided in Appendix A. This initiative by the County Board was a direct result of the establishment of the Wisconsin Land Information Program under 1989 Wisconsin Act 31 as amended by 1989 Wisconsin Act 339. The resultant plan is documented in this report.

### LAND INFORMATION OFFICE

Under the Wisconsin Land Information Program, counties are encouraged to establish a Land Information Office. A Racine County Land Information Office was designated by the County Board on June 26, 1990 (see ordinance reproduced in Appendix B). As set forth in the ordinance, the policy making body for the Land Information Office is the Planning and Development Committee of the Racine County Board. The ordinance designates the County Register of Deeds as the official contact person for the County Land Information Office. The present Register of Deeds is:

Ms. Helen M. Schutten Register of Deeds Racine County Courthouse 730 Wisconsin Avenue Racine, Wisconsin 53403 (414) 636-3709

### PURPOSE OF THE REPORT

The basic purpose of this report is to document a Racine County land information system plan with emphasis on the need for the development of an automated mapping and parcel-based land information system for the County. The report is intended to provide sufficient information to permit the Racine County Board of Supervisors, the Racine County Executive, the affected Racine County departments, the concerned local units of government, and the public and private utilities operating within the County to consider the need for such a system and to determine the desirability of proceeding with the creation of such a system. To this end, the report is intended to accomplish the following purposes:

- 1. To provide county and local officials, utility managers, and concerned citizens with a basic understanding of the components of an automated mapping and land information system and the manner in which these components must be assembled to provide a conceptually and technically sound operational system.
- 2. To identify and briefly describe existing automated mapping and land information systems whose operation pertains to all or portions of Racine County.
- 3. To propose an organizational arrangement for the development of an automated mapping and land information system for Racine County.
- 4. To identify those technical issues which, in the case of a shared, multi-user, automated mapping and parcel-based land information system, would need to be resolved before a shared system could be developed.
- 5. To estimate the time and resource requirements for implementing an automated mapping and parcel-based land information system for Racine County.
- 6. To recommend a course of action.
- 7. To qualify Racine County and, through the County, the local units of government within Racine County for state grants from the Wisconsin Land Information Board in support of carrying out automated mapping and land information system projects in a manner consistent with the Racine County plan.

### ADVISORY COMMITTEE STRUCTURE

To provide a proper forum for the preparation of the report and for seeking agreement on the course of action to be recommended, an advisory committee was created. That committee included knowledgeable representatives of the County and City of Racine, concerned local units of government within Racine County, and the public and private utilities serving Racine County. A roster of the advisory committee is reproduced on the inside front cover of this report.

The purpose of the Advisory Committee was to place the knowledge and experience of the committee members at the disposal of the study and to involve actively the various interests in the study. The Committee carefully reviewed and approved the findings and recommendations of this report.

#### Chapter II

### AUTOMATED MAPPING AND LAND INFORMATION SYSTEMS: AN OVERVIEW

### INTRODUCTION

For more than a decade now, there has been growing interest in the United States in land information systems. This interest ranges from a relatively narrow concern about the need to modernize land title recordation systems to a relatively broad concern about the need to create entirely new land-related data banks for multipurpose applications. This growing interest has involved many disciplines, ranging from surveyors, abstractors, assessors, and attorneys concerned with the fiscal and legal administration of real property to planners, engineers, public utility managers, public administrators, and elected officials concerned with resource management and community development. Much of the interest was initially centered on the use of electronic computers for the storage, manipulation, and retrieval of land-related information and, more recently, for the use of computerassisted graphics collection and display hardware for the reproduction of the data in mapped as well as tabular form.

As interest in the area of land data systems has grown, the topic has become increasingly prominent as a subject of professional papers, reports, conferences, and the meeting programs of various professional organizations. Accordingly, a body of professional literature on the subject of automated mapping and land information systems has begun to coalesce and accumulate. Over this same time frame, an increasing number of local units of government and private utilities have undertaken the creation of automated mapping and land information systems-including several systems that currently cover all or parts of Racine County. This chapter presents a summary of the basic concepts involved in automated mapping and land information systems, describes the various means by which graphic data may be converted into a computer-compatible format, and identifies and briefly describes currently operating automated mapping and land information systems whose operation pertain to all or portions of Racine County.

### NATIONAL RESEARCH COUNCIL STUDIES

In 1979, the National Research Council convened a Panel on a Multipurpose Cadastre to review the status of cadastral activities at the federal, state, and local governmental levels and in the private sector and to review a number of demonstration projects that had been undertaken at various locations. This action was taken by that Council in response to the growing interest in land data systems and to the perceived increasing need for land-related information by all levels of government and by the private sector. In 1980, a report was issued, the principal finding of which was that:

There is a critical need for a better landinformation system in the United States to improve land-conveyance procedures, furnish a basis for equitable taxation, and provide much needed information for resource management and environmental planning.<sup>1</sup>

The report set forth the concept of the multipurpose cadastre as a basis for a dynamic public process that could effectively collect, maintain, and disseminate land-related information. It identified the land resource-related problems faced by public and private organizations and outlined the basic structure of a multipurpose cadastre that could help to remedy those problems. However, the report did not address how governments, especially local governments, could carry out the recommendations made in the report.

To address the questions left unanswered by its 1980 report, the National Research Council prepared a second report, which set forth a set of recommended procedures and standards for the design and implementation of a multipur-

<sup>&</sup>lt;sup>1</sup>National Research Council, Assembly of Mathematical and Physical Sciences, Committee on Geodesy, Panel on a Multipurpose Cadastre, <u>Need for a Multipurpose Cadastre</u>, National Academy Press, Washington, D. C., 1980.

pose cadastre.<sup>2</sup> It was the intent of this report to assist the local units of government wishing to pursue the development of cadastral records systems for their own jurisdictions, and also the many other regional, state, and federal agencies, as well as private businesses, whose participation will be needed for the development over time of true multipurpose land information systems.

The procedural model put forth by the Panel identified the basic components of a modern land information system as: 1) a spatial reference framework consisting of monumented geometric control points; 2) a series of accurate, large-scale topographic base maps; 3) a cadastral overlay to the base maps that delineates all cadastral-that is, real property ownershipparcels; 4) a cadastral parcel numbering scheme that provides for unique identification of each cadastral parcel; and 5) a series of compatible registers of interests in, and data about, the land parcels keyed to the parcel identifier. It is important to note, in this regard, that the creation of such land information systems requires as a foundation a means of spatial reference for the data. An adequate geometric framework for such spatial reference must, if it is to serve even the narrowest purposes of a land information system, permit identification of land areas by coordinates down to the individual ownership parcel level. A geometric framework of adequate accuracy and precision to permit system operation at the highly disaggregated parcel level is the most demanding specification possible, but, once achieved, permits ready aggregation of information from the more intensive and detailed level to the more extensive and general level as may be necessary.

It is also important to note—particularly within the context of the development of this report that both National Research Council reports determined that for much of the United States, the county presented the most logical locus for the development of multipurpose land information systems.

### WISCONSIN LAND RECORDS COMMITTEE

Within Wisconsin there has also been growing interest in land information systems and land records modernization. In 1985, then Governor Anthony Earl appointed the Wisconsin Land Records Committee, a group representing state, regional, and local governmental interests, private utilities, and other private businesses that utilize local maps and land records. Over a period of two years, this group issued 13 reports on various aspects of automated mapping and land records modernization, and a final report that summarized the more important findings of the Committee's deliberations.<sup>3</sup>

Like the National Research Council Panel, the Wisconsin Land Records Committee determined a need for continued efforts directed at land records modernization and recognized the contribution that could be made by computer technology in certain aspects of this modernization process. The Committee determined that the costs to develop modernized land records systems would not be trivial, but that these costs would be reasonable, nonetheless, in view of the sums already being expended for current outdated and inefficient land information management practices. The Committee recognized, correctly, that the ultimate costs of land records modernization would be borne by citizens in the form of tax bills and utility bills, and accordingly recommended that various levels of government, private utilities, and other private businesses involved in the use of land information make every effort to develop jointly and use automated systems to minimize their total societal costs.

The Committee recognized that its recommendation for the development of shared approaches to land information systems modernization would create new organizational and institutional strains that would be as demanding in their solutions as the technical issues involved in the creation of new, automated land information

<sup>&</sup>lt;sup>2</sup>National Research Council, Assembly of Mathematical and Physical Sciences, Committee on Geodesy, Panel on a Multipurpose Cadastre, <u>Procedures and Standards for a Multipurpose</u> <u>Cadastre</u>, National Academy Press, Washington, D. C., 1983.

<sup>&</sup>lt;sup>3</sup>Wisconsin Land Records Committee, Final Report of the Wisconsin Land Records Committee, <u>Modernizing Wisconsin's Land Records</u>, University of Wisconsin-Madison, Center for Land Information Studies, Madison, Wisconsin, 1987.

systems. The Committee accordingly recommended that the educational and coordinative aspects of land records modernization receive as much attention as the technical issues.

The deliberations of the Committee and its published reports reaffirmed the validity of the procedural model advanced by the National Research Council Panel for the development of modern, automated, land information systems and, as did the National Research Council reports, highlighted the Commission-recommended local mapping and survey control network program as a basis for the development of modern, automated, land information systems.

Also, like the National Research Council Panel, the Wisconsin Land Records Committee recognized that there is a central role to be played by counties in the land records modernization process. Although the Committee chose not to define that role precisely, preferring instead to have individual counties make that determination, at the minimum, a coordinative role was seen as necessary in view of the records maintenance functions given to the counties by the state constitution and state statutes.

### WISCONSIN LAND INFORMATION PROGRAM

Among the final recommendations of the Wisconsin Land Records Committee was a proposal for the creation of a Wisconsin Land Information Program overseen by a state-level board that would provide a focal point for land records modernization issues and efforts within Wisconsin. During 1989, the Wisconsin Legislature enacted legislation creating the Wisconsin Land Information Program. The legislation was signed into law by Governor Tommy Thompson, and, late in 1989, the Wisconsin Land Information Board began to meet following the appointment of the Board members by the Governor. Voting members of the Board are defined by statute as follows:

1. The Secretary of the Department of Administration; the Secretary of the Department of Agriculture, Trade and Consumer Protection; the Secretary of the Department of Natural Resources; and the Secretary of the Department of Transportation, or their designees.

- 2. Four representatives from county and municipal government appointed by the Governor to six-year terms, including at least one member of a county board of supervisors, at least one member of a city council or village board, and at least one person who is a county officer active in land information management.
- 3. Four representatives chosen from public utilities and private businesses appointed by the Governor to six-year terms, including at least one public utility representative and at least one representative of a professional land information organization.
- 4. The State Cartographer.

In addition, the State Historic Preservation Officer, the Secretary of the Department of Revenue, the State Geologist, or their designees; a representative of a regional planning commission who is selected by the Board; a county employee active in land information management who is selected by the Board; and representatives of state and federal agencies active in land information management who are selected by the Board shall serve as nonvoting, advisory members of the Board.

As set forth in the legislation, the duties of the board will include:

- 1. The provision of technical assistance and advice to state agencies and local units of government with land information responsibilities.
- 2. The preparation of guidelines and standards to coordinate the modernization of land records and land information systems.
- 3. The creation and administration of a grant program for local units of government to assist in the development of modernized land records systems.

In its initial meetings, the Board identified the creation of a grants program to provide a source of partial funding for land records modernization as one of its high-priority issues and took steps to encourage the passage of a bill in the Wisconsin Legislature that would provide such a funding mechanism. This bill was passed by both houses of the Legislature in March and

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April 1990. The Governor signed the legislation into law in April 1990.

Under the Wisconsin Land Information Program, it is envisioned that counties throughout the State will prepare and implement plans to modernize land records systems. Toward this end, the legislation provides for Wisconsin Land Information Board review and approval of countywide land information systems plans. On January 7, 1991, the Land Information Board adopted final guidelines pertaining to the preparation of such county plans.

To help fund the Wisconsin Land Information Program, including the preparation and implementation of county land information systems plans, the new legislation requires counties to increase register of deeds filing and recording fees from \$4.00 to \$8.00 in state fiscal year 1991— July 1, 1990, through June 30, 1991—and to \$10 in the five subsequent state fiscal years, resulting in a six-year program that under present state law would terminate on June 30, 1996. At that time, the present state law requires that the register of deeds filing and recording fee return to the \$4.00 level that preceded the new law.

For the first year of the six-year program, counties are permitted to retain \$2.00 of the \$4.00 increase in filing and recording fees. For the remaining five years of the program, counties are permitted to retain \$4.00 of the increased fee. Such monies can be retained, however, only if: a) the county has established a Land Information Office; b) the county has received approval from the Land Information Board of a county plan for land records modernization; and c) the county uses the monies to develop, implement, and maintain the countywide plan.

The law provides that counties must remit to the State the incremental register of deeds filing and recording fees not retained at the county level. Over the six-year period, this means that the State will receive \$2.00 for each filing in the State. Such monies under the new law are to be used by the State to fund the activities of the Wisconsin Land Information Board and to provide grants of up to \$100,000 to county and local governments for activities designed to implement approved county plans. Under the law, only counties are eligible to apply for such grants. Counties may act, however, on behalf of local units of government in the county to apply for grants. A minimum local match of 25 percent is required. The legislation is silent as to whether that 25 percent match can come from the retained county register of deeds recording fees.

### ALTERNATIVE TYPES OF OPERATIONAL COMPUTER SYSTEMS AVAILABLE FOR THE DEVELOPMENT OF AN AUTOMATED MAPPING AND LAND INFORMATION SYSTEM

The professional literature currently categorizes operational automated mapping and land information systems into three general types: strictly automated mapping or computer-assisted drafting (CAD) systems; automated mappingfacilities management (AM-FM) systems; and geographic and land information systems (GIS-LIS). The distinction between these types of systems is somewhat artificial and stems from marketplace segmentation strategies adopted by vendors of computer hardware and software. Nevertheless, as long as it is recognized that operational systems comprise a continuum and that many systems will resist being neatly categorized as one or another of the three general types of systems, the tripartite division is a useful one for discussion purposes.

The computer hardware components comprising these three types of systems usually provide no basis for categorization, and the different systems are virtually identical in a physical sense. Computer software available for operating the different system types generally provides a basis for distinguishing between CAD systems on the one hand and the AM-FM and GIS systems on the other; but the differences between the software utilized to operate AM-FM systems and GIS systems is often less clear. Indeed, a number of proprietary software products currently purport to support either type of operation equally well.

Functionally, the CAD systems are perhaps the easiest of the three to categorize since they tend to be almost exclusively automated mapping systems with little or no capability for the management of associated land records. Both AM-FM and GIS systems possess automated mapping and records management capabilities, although the distinction between the two as often as not is a function of the type of associated land information managed by the system rather than of any pronounced functional difference between system components. Typically, systems categorized as AM-FM systems are found where the predominant function is to manage information associated with networks: for example, water distribution systems, sanitary sewerage systems, telephone systems, and electric power and natural gas distribution systems. GIS systems are usually systems that manage information associated with areas: real property parcels, administrative districts, land use polygons, and soil mapping units. While these distinctions between predominant functions of AM-FM and GIS systems are helpful in a taxonomic sense, in practice these distinctions are often more apparent than real as virtually all currently available AM-FM software systems-while they may, in fact, be designed for optimal operation in network data analysis environments-are capable of analyzing polygon data. Likewise, virtually all currently popular GIS software is capable of performing network data analysis functions.

### CONVERSION OF GRAPHIC DATA INTO A COMPUTER COMPATIBLE FORMAT

Much of the current interest in the modernization of land data systems has been centered on the use of electronic computers for the storage, manipulation, and retrieval of the data and, more recently, the use of computer-assisted graphic collection and display hardware for the reproduction of the data in mapped as well as tabular form. Nongraphic land informationparcel identification numbers, legal descriptions, and assessment information, for example-can be entered into a computer through standard data entry procedures. Land information that has traditionally been maintained in the form of maps—such as real property boundary lines however, must be converted into a numeric, or digital, format before it can be entered into a computer. This is most often accomplished by a device, sometimes itself computer controlled. called a "digitizer," and the process by which the conversion is completed is often identified as "board digitizing."

A digitizer, therefore, is a machine system which transforms mapped information into a computer-readable form to facilitate information manipulation and display. A digitizer is usually comprised of the following hardware components:

1. A controller, which is often a small- to medium-size computer.

- 2. An online data storage device.
- 3. An operator work station, which consists of a keyboard for entering commands and nongraphic data into the system, and a graphic display screen or screens for viewing collected information.
- 4. A digitizing board or tablet which allows for determining the accurate relative location of a point identified on the surface of the board using a device—a cursor—which is able to move freely over the surface of the board.

Additional equipment may include a printer, a computer tape unit, and graphic production devices called "plotters." Each component can vary greatly in size and capability depending on the operating requirements of the particular system.

The transformation of mapped information into computer-readable information requires maps which are related to some system of geometric control and which have at least two or three points for which an x-y coordinate pair can be determined. The coordinate system utilized can vary from an arbitrary scale unique to the base map to some more universal system such as the State Plane Coordinate System. Once the base map has been placed on the digitizer board, the known coordinates of the map are entered into the digitizer and located on the base map with the cursor. When this operation is complete the map is said to be "scaled," and positions of other points on the map can be established based upon their relative positions to the known points.

Each line on the map is defined as a series of connected points. The cursor is used to identify each point, which is then assigned an x-y coordinate pair based on the position of the point relative to the known base points used to scale the maps. Each map line is then stored in the system as a series of x-y coordinates. Each line or segment can be stored separately or combined with other segments to form closed polygons with defined attributes and measurable areas.

Base map accuracy is an important consideration when digitizing. A digitizing system does not improve the accuracy of a base map but only replicates the map features, including errors and discrepancies. While the board digitizing procedure just described is the most common technique for conversion of map data into digital form, several other techniques have been developed which work well in certain specialized situations or with certain specific types of map information. These are optical scanning, direct digitizing from stereoscopic models, and coordinate geometry entry.

An optical scanning system is a machine system that is much like a board digitizing system in its physical arrangement. It merely substitutes an optical scanning device for the digitizing board or tablet. In operation, the document to be converted to digital form is mounted on a large drum that rotates at high speed under an optical device that scans the drum and "reads" the document. While these devices are capable of converting documents to digital form more rapidly than can board digitizing, they have typically required quite complex software to perform editing and categorizing of the converted data. A decision to use either board digitizing or scanning, or perhaps a combination of these techniques, in the conversion of graphic data to a computer readable format should be made on the basis of a cost effectiveness analysis.

Direct digitizing from stereoscopic models is relatively more recent in origin than either board digitizing or optical scanning, but is, however, based upon long-established photogrammetric engineering procedures. In a direct, stereoscopic digitizing system, the digitizing board or tablet that would be present in a board digitizing system is replaced by a stereoscopic map compilation machine. Stereoscopic aerial photography acquired for map compilation purposes can be used to establish a stereoscopic model in the traditional manner, but rather than utilizing the model to prepare an analog map manuscript for subsequent board digitization, the operator optically "digitizes" map features directly from the model, thereby producing the digital map files directly.

An additional means of converting map information into maps is coordinate geometry entry, sometimes referred to as "precision digitizing." In coordinate geometry entry, there is no analog device present in the machine system for the conversion of map documents to digital maps. All of the information needed to construct a map is key entered and the map is constructed utilizing plane geometry relationships and formulae contained in highly specialized computer software. Conversion of map data by coordinate geometry is exceedingly tedious and is generally used only for relatively small project areas, or for areas where the quality and precision of the data available warrant the additional effort of this procedure. Of all the currently available methods of data entry, however, coordinate geometry procedures are the only procedures that do not result in a loss of precision and are the only conversion procedures that produce digital map data that are truly scale independent.

Once the initial map data are transformed into digital form with the digitizer, a variety of manipulations become possible. Data mapped at one scale can be reproduced at different scales, provided that the accuracy limitations of the original maps are recognized in any enlargement, as opposed to reduction, in scale. Graphic base files collected from different sources can be merged and reproduced at a uniform scale. Data for special study areas can be identified, reproduced, and measured; and information on the base maps can be identified in such a manner that only selected portions of that information are reproduced at a time.

### CURRENTLY OPERATING AUTOMATED MAPPING AND LAND RECORDS SYSTEMS PERTAINING TO ALL OR PARTS OF RACINE COUNTY

It was previously noted in this chapter that there are several automated mapping and land information systems already in existence whose areas of operation cover all or portions of Racine County. Since one of the purposes of this report is to determine the feasibility of some type of shared, or joint, operation of a countywide automated mapping and land information system, these existing systems are identified and their operations briefly described below.

The different map coordinate systems utilized by the different automated mapping operations in the Racine area represent an issue of central importance in any consideration of cooperative mapping efforts, and of the transfer of existing digital map information between the existing automated mapping sites. Therefore, the map coordinate system or systems utilized and the horizontal map datum upon which the coordinate system is based are identified for each operation. The universe of all map coordinate systems is rather large, although currently only two such systems are in regular use in the Racine area: the State Plane Coordinate System and the Universal Transverse Mercator (UTM) coordinate system. Both of these systems are based upon the North American Datum of 1927 (NAD-27) which is, in turn, derived from the Clarke 1866 mapping spheroid. Since both the State Plane Coordinate System and the UTM coordinate system are based upon NAD-27, it is possible, albeit computationally tedious, to translate with mathematical precision from one of these coordinate systems to the other. It is, in an analogous fashion, further possible to move with mathematical precision between either of these two systems and any other map coordinate system derived from NAD-27, although again, the procedure is tedious.

Recently, the National Geodetic Survey of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce-the federal government agency responsible for the maintenance of the nation's geodetic control systemhas begun to move all federal mapping activity from the Clarke 1866 mapping spheroid onto the Global Reference System of 1980 (GRS 80), a newly defined mapping spheroid. As part of this transfer, an entirely new horizontal datum, NAD-83, has been developed for use with GRS 80. Any precise conversion between NAD-27 and NAD-83 requires recomputation utilizing the original control survey field measurements. The implications for the conversion from NAD-27 to NAD-83 of the type of control network and related large-scale planimetric mapping typically prepared by local units of government and utilities are therefore both technically severe and operationally costly. A similar situation exists for large-scale topographic mapping with the proposed replacement of the National Geodetic Vertical Datum of 1929 (NGVD 29) by NGVD 87 which has been developed for use with GRS 80 and NAD-83. Importantly, the replacement of NAD-27 and NGVD 29 with NAD-83 and NGVD 87 will be costly, while offering no improvement in map accuracy or precision for locally oriented largescale mapping operations.

### Southeastern Wisconsin

#### **Regional Planning Commission**

The Southeastern Wisconsin Regional Planning Commission installed CALMA hardware and software in 1976 to begin conversion to digital format of its land use and natural resource inventory data. Since then, the Commission has converted its analog land use inventories for 1963, 1970, and 1975 for its 2,689-square-mile planning area and has completed digital land use inventory updates for 1980 and 1985. During 1990 the Commission completed digitization of the detailed operational soil surveys, which includes maps completed by the U.S. Soil Conservation Service under contract to the Commission in 1966 for the entire planning area. That area includes Racine County. The primary Commission system products are land use maps, interpretive soil maps, wetland maps, wildlife habitat maps, floodplain maps, civil division boundary maps, and watershed and related analytical hydrologic unit maps, summary areal extent statistics prepared in support of long-range planning activities, and "camera ready" artwork prepared for the printing of thematic maps appearing in published reports. The Commission utilizes the State Plane Coordinate System, NAD-27, for its digital mapping activities.

The experience gained by the Commission in more than a decade of automated land use and natural resource mapping provided a valuable base upon which to evaluate the available hardware and software products when, in 1986, the Commission reached a decision to acquire new computer hardware and software for its automated mapping operation. In 1987, a completely new automated mapping system was installed comprised of DELTAMAP software running on Hewlett-Packard and Calcomp hardware. The enhanced operational capability provided by this new system allowed the Commission staff to begin taking steps in 1988 to convert its large-scale and intermediate-scale base mapping operations from analog to digital format.

### State of Wisconsin

Two agencies of state government currently possess and use automated mapping systems: the Department of Transportation and the Department of Natural Resources.

The Department of Transportation installed INTERGRAPH hardware and software in 1982. This system is used primarily for maintaining and updating the Department's official State Highway Map and the Department's statewide series of county highway maps. Some of the map data for these two programs were created by optical scanning of color separation plates that had been used for color map printing. The system is also used for project mapping in support of highway construction and improvement projects. The map data for this activity are usually acquired through direct digitization from stereoscopic models. All of the Department of Transportation's digital mapping currently utilizes the State Plane Coordinate System, NAD-27, although the Department is in the process of shifting its mapping datum to a modified NAD-83, the modification being based upon data derived from global positioning surveys.

The Department of Natural Resources began building a digital map data collection system in 1980. This system has been, in effect, custom built by Department staff who have configured purchased hardware components and written their own computer software. The system is used primarily in support of Department land acquisition, improvement, and management projects, but was used to create, and currently maintains. a statewide inventory of wetlands. The Department of Natural Resources has not chosen a standard coordinate system for its digital mapping, and, although it utilizes the UTM coordinate system, NAD-27, for some projects, it also utilizes the State Plane Coordinate System. NAD-27, for some projects and local coordinate systems on occasion. The Department possesses computer software translation capability between UTM and State Plane coordinates. The Department of Natural Resources is in the process of evaluating whether or not to shift its mapping datum to NAD-83.

Recently, both the Department of Transportation and the Department of Natural Resources began to use the proprietary software ARC/INFO to develop network and polygon map data analysis capability, while continuing to maintain their automated mapping functions on the originally acquired systems. The Department of Transportation has acquired the software and is running it on Digital Equipment Corporation (DEC) hardware which it recently installed for that purpose. The Department of Natural Resources is running the software in a "time share" mode on the University of Wisconsin's DEC system, and has recently utilized this system to develop a statewide analysis—including a state map prepared by computer-assisted methods-of groundwater contamination susceptibility.

<u>Wisconsin Electric Power Company</u> and Wisconsin Natural Gas Company

The Wisconsin Electric Power Company (WEPCo) and the Wisconsin Natural Gas Company (WNG), both subsidiaries of Wisconsin Energy Corporation, have jointly developed a digital mapping base upon which to map their respective electric and gas service networks. This effort was initiated in 1979 with the installation of INTERGRAPH hardware and software at WEPCo. All of Racine County lies within the service territory of WEPCo, and the majority of Racine County lies within the service territory of WNG. The Burlington area of Racine County receives natural gas service from Wisconsin Southern Gas Company. WEPCo and WNG completed the development of digital map coverage for the portion of Racine County lying within their service territories prior to 1985.

Throughout much of the Southeastern Wisconsin Region, WEPCo and WNG utilized data from large-scale topographic mapping and control survey projects prepared to Commissionrecommended specifications to establish their spatial reference framework. These data were acquired in State Plane Coordinate System, NAD-27, format and converted by WEPCo and WNG to the UTM coordinate system, NAD-27, which the two companies continue to utilize for their digital mapping activity.

Both WEPCo and WNG have recently begun to transfer a portion of their automated mapping capability to IBM hardware and software in order to utilize the digital maps created on the INTERGRAPH system for the mapping of nongraphic attribute data stored on the Corporations' corporate data base, which is maintained on IBM equipment.

### Wisconsin Bell

In 1990, after several years of study and after a hiatus attributable in part to the issues surrounding a federal court ordered reorganization of American Telephone and Telegraph and its subsidiaries, Wisconsin Bell reached a decision to acquire an INTERGRAPH system for conversion of its facilities information. Wisconsin Bell anticipates using the Universal Transverse Mercator coordinate system, North American Datum of 1927, for its digital mapping inasmuch as this system is already being used for its present analog mapping operations.

### Racine Water and Waste Water Utilities

The Racine Water and Waste Water Utilities is currently involved in a feasibility study for the establishment of automated mapping capability within its organization. At the present time, no decisions have been reached concerning a hardware and software system to be used. The Utilities, however, have decided to use the State Plane Coordinate System, North American Datum of 1927, for their automated mapping activities.

#### <u>City of Racine Fire Department/Racine</u> County Emergency Government Office

The City of Racine Fire Department and the **Racine County Emergency Government Office** have jointly installed an emergency management computer software package that contains a digital map of Racine County. This software package is called CAMEO (Computer Aided Management of Emergency Operations). The version of the software installed jointly by the City and County of Racine operates on MacIntosh personal computers, but an alternative version of the software is available that will operate on IBM personal computers. The software was developed by the U.S. Environmental Protection Agency and the National Oceanic and Atmospheric Administration to provide assistance in fire response and emergency planning for fires involving dangerous chemical substances. In practice, the system is used to provide advance warning of the presence of dangerous chemical substances to fire response personnel, to aid in determining fire equipment requirements, and to aid in developing evacuation plans of nearby residents.

The digital map contained in the package was obtained by optical scanning of a base map of Racine County, although no one involved with the work effort could identify the particular map concerned. The map is not separated into features in the system data base so individual map features cannot be selectively manipulated or extracted. The primary purpose served by the map is to provide a general spatial reference for personnel involved in fire response and for the modelling of toxic fume plumes to assist in the planning of emergency evacuation requirements.

### Town of Caledonia

The Engineering Department of the Town of Caledonia has recently acquired Auto-Cad software and an engineering graphics software called "DCA Engineering Software" which utilizes Auto-Cad data files and calls. This combination is being operated on an "IBMcompatible" personal computer. The Town intends to utilize the system initially in engineering drafting and design applications, but does expect to develop mapping applications in the near future. The Town plans to utilize the existing County geometric control framework for any mapping applications it develops. Thus, its mapping applications will be developed upon existing Racine County one inch equals 200 feet topographic maps utilizing the State Plane Coordinate System, North American Datum of 1927.

### **Racine Unified School District**

During 1989, the Racine Unified School District installed a software package called "Edulog," which possesses both automated mapping and data analysis capabilities. The system is currently being operated on two unlinked IBM PS2, model 80 personal computers which the District expects to link over a local area network (LAN) during 1991. The data files associated with the system are keyed to the map by street address and contain a variety of student characteristic information. The system is used by the District to schedule and map school bus routes, to analyze and map student characteristic information and enrollment trend information, and to determine and map school attendance area boundaries.

The map utilized by the system is created and stored as a "connected graph" in the same manner that is utilized by the U. S. Census Bureau to create TIGER files. A variety of locally prepared street maps and subdivision plats were board digitized by the company that licenses Edulog to create the digital base map for the School District. The original source maps used in the creation of the digital base map were of scales ranging from one inch equals 100 feet to one inch equals 1,000 feet, utilizing the State Plane Coordinate System and prepared upon the North American Datum of 1927.

### **Racine County Departments and Offices**

No Racine County departments or offices currently possess or are in the process of developing large-scale automated mapping capability. However, Racine County has developed nongraphic, automated data files keyed through parcel identifiers that would form important component parts of a parcel based land information system. The largest effort of this kind has occurred in the Register of Deeds Office beginning in 1984, when that Office began keeping its grantor index and grantee index in computer-readable format. In 1986, the Register of Deeds began keeping the County tract index in computer readable format utilizing parcel identifiers as one of the major keys into the index. The tract index was also linked to the tax roll at this same time. In more recent years, expanded interrelations of these and other records systems has been developed so that currently basic document indexing, real and personal property assessment, and property tax billing and collection systems use interrelated computer file systems that rely on the parcel identifier as one of the major linkages mechanisms between files.

In addition to the uses made by the Register of Deeds Office, local assessor's offices, and the County Treasurer's Office, other County departments and offices such as the Planning and Development Department, the Land Conservation Office, the Real Estate Description Department, the County Highway Office, the County Surveyor, and the County Park Planning Office use the parcel identifier to access and extract information in these data files through both local and remote computer terminal access points. Several of these departments and offices are also developing computer readable files that use parcel identifiers to access other nongraphic information. The Planning and Development Department has begun to use the parcel identifier as one of the keys for managing various types of "permit" and code enforcement information such as zoning variances and conditional use permits. The Land Conservation Office is presently exploring a methodology for linking information on land ownership and property tax payment history contained in County files to farm operator information and farm conservation plan information contained in the files of the federal Soil Conservation Service to assist in determining state farmland preservation program tax credits, to assist in soil erosion control planning, and to monitor operator compliance with the provisions of the the federal food security program. Interrelation of the information in these various files will depend heavily on the use of a common parcel identifier.

### Digital Map Data Exchange Issues

The ability to exchange digital map data between different automated mapping sites and systems is an important consideration in the development of a county land records modernization plan. In this regard, it should be noted that the use of different hardware and software systems and the use of different map coordinate systems by the various governmental units and private utilities that currently maintain digital mapping capability in Racine county may affect the ability to exchange digital map data between different automated mapping sites and systems.

Commercial software products are increasingly available that will provide for the "translation" of digital map data between specific sets of proprietary automated mapping systems; however, basic incompatibilities between the instruction sets, data structures, and the basic architecture of different systems may render some digital map data "untranslatable," even between systems that supposedly have translators available. Accordingly, digital map data translation cannot be taken for granted. Generally speaking, translations will be most successful between systems that have a high degree of compatibility between basic software instruction sets, data structures, and hardware architectures: or in instances where the need to translate digital map data is anticipated in advance and influences the basic decisions on the manner in which digital map data will be captured and stored.

The use of different map coordinate systems does not affect the ability to exchange digital map data provided that the different map coordinate systems have been developed on the same horizontal datum. The use of mathematically unrelated horizontal datums, however, does pose potential problems for the exchange of digital map data. Simply stated, the relative mapped position of geographic features can be expected to differ between maps prepared on mathematically unrelated datums. This situation can be expected to adversely affect—at least at higher required levels of precision—the correct integration of digital map data between sites and systems using either NAD-27 or NAD-83.

### SUMMARY

Over the past 10 years, there has been a significant and growing interest in the United States in developing land information systems. The interest is indeed broad, involving many disciplines, and centers on the use of electronic computers to store, manipulate, retrieve, and—most recently graphically display land and land-related information. This chapter presents an overview of the growing body of professional literature in this area and summarizes the automated mapping and land information systems which to date have been developed and which pertain to Racine County. The following summarizes the material included in this chapter:

- 1. National interest on land information systems was focused in 1979 by a Panel on a Multipurpose Cadastre convened by the National Research Council. The report of this Panel found that there is a critical need to modernize land information systems in the United States and to thereby improve land conveyance procedures, to furnish a basis for equitable taxation, and to provide information for resource management and environmental planning. The Panel's report emphasized the concept of a multipurpose cadastre as a basis for a dynamic public process that could effectively collect, maintain, and disseminate land-related information. In a subsequent report issued by the Panel, the basic components of a modern land information system were identified as: 1) a spatial reference framework consisting of monumented geometric control points; 2) a series of accurate, large-scale topographic base maps; 3) a cadastral overlay to the base maps that delineates all cadastral-that is, real property ownership—parcels; 4) a cadastral parcel numbering scheme that provides for unique identification of each cadastral parcel; and 5) a series of compatible registers of interests in, and data about, the land parcels keyed to the parcel identifier.
- 2. The local mapping and survey control network recommended by the Southeastern Wisconsin Regional Planning Commission since 1964 possesses two of the five basic components of a modern land information system: the spatial reference framework and the accurate large-scale planimetric and topographic base maps. In addition, the Commission-recommended program facilitates the creation of the cadastral map overlay as a third component. Finally, the Commission recommended survey control network provides a mechanism for relating real property boundary descriptions to the State Plane Coordinate System and, in

turn, to latitude and longitude, thereby facilitating the precise correlation of real property boundary lines and earth science data—a condition necessary for the creation of a modern, automated land information system.

- 3. Following issuance of a report by the Wisconsin Land Records Committee, which recommended that counties perform a central role in the land records modernization process, new state legislation was enacted to create a Wisconsin Land Information Program. That Program is overseen by the Wisconsin Land Information Board. The duties of the Board include providing technical assistance to state agencies and local governments establishing land information systems; promulgating standards to coordinate the modernization of land records and the establishment of land information systems; and the administration of a grant program to assist local governments in developing modernized land records systems. The Wisconsin Land Information Program, which is scheduled to be carried out over the six-year period beginning on July 1, 1990, and extending through June 30, 1996, is being funded by increased register of deeds filing and recording fees. A portion of the increased fees is retained by counties and a portion is remitted by the counties to the State. In order to retain monies at the county level, however, counties must establish a land information office, prepare and receive Land Information Board approval of a county plan for land records modernization, and use the retained monies to implement the county plan. Counties are also permitted to apply for grants from the Wisconsin Land Information Board to help carry out the plans. In so doing, counties may act on their own behalf or on behalf of local units of government in the county.
- 4. Three general types of automated mapping and land information system operational structures are currently recognized: strictly automated mapping or computer-assisted drafting (CAD) systems; automated mapping/facilities management (AM-FM) systems; and geographic information systems (GIS). Although the distinctions between

the types are not always clear, the CAD systems are perhaps the easiest of the three to categorize since they tend to be almost exclusively automated mapping systems with little or no capability for the management of associated land records. Both AM-FM and GIS systems possess automated mapping and records management capabilities, although the distinction between the two systems is quite often a function of the type of associated land information managed by the system rather than of any pronounced functional difference between the two system types. Typically, systems categorized as AM-FM systems are found in situations where the predominant function is to manage information associated with networks: for example, water distribution systems, sanitary sewerage systems, telephone systems, and electric power and natural gas distribution systems. GIS systems are usually systems that manage information associated with areas: real property parcels, administrative districts, land use polygons, and soil mapping units.

5. Much of the information that would be incorporated within a multipurpose cadastre or an automated mapping and land information system has traditionally been stored in the form of maps. Conversion of map information into a digital format where it can be manipulated and operated upon by a computer requires the use of a device called a digitizer. Alternatively, certain forms of specialized data conversion procedures, such as optical scanning, direct digitizing from stereoscopic models, or coordinate geometry entry, can be utilized. Once the initial map data are transformed into numeric form, a variety of manipulations become possible. Data mapped at one scale can be reproduced at different scales, provided that the accuracy limitations of the original maps are recognized in any enlargement, as opposed to reduction, in scale. Graphic base files collected from different sources can be merged and reproduced at a uniform scale. Data for special study areas can be identified, reproduced, and measured; and information on base maps can be identified in such a manner that only selected

portions of that information are reproduced at a time.

- 6. There are a number of automated mapping and land information systems already in existence whose areas of operation include all or portions of Racine County. Several of these systems-those of the Southeastern Wisconsin Regional Planning Commission, and the Wisconsin Electric Power and Wisconsin Natural Gas Companyhave been functional for a decade or more and has developed extensive digital map holdings. These existing systems currently utilize a variety of proprietary computer hardware and software products in their operation, and are using several different map coordinate systems, not all of which are mathematically relatable to each other. The use of different proprietary products may affect the ability to exchange digital map data between different automated mapping sites and systems, as commercial software products are available that can "translate" digital map data between different proprietary automated mapping systems although under certain circumstances translations may be partial rather than complete. The use of mathematically unrelated map coordinate systems, however, can be expected to adversely affectat least at higher required levels of precision—the correct integration of digital map data between sites and systems using mathematically unrelated map coordinate systems.
- 7. There is a growing interest at the local governmental level in Racine County in developing automated mapping and geographic information systems. The Racine Unified School District, the City of Racine Fire Department, and the Racine County **Emergency Government Department have** established single-purpose automated systems using digital maps. The Racine Water and Waste Water Utilities are considering a proposal to establish a geographic information system to serve that organization's planning, engineering, and utility management functions. The Town of Caledonia has acquired engineering graphics software with the capability to develop mapping applications.

### Chapter III

### COMPONENTS OF AN AUTOMATED MAPPING AND LAND INFORMATION SYSTEM

### INTRODUCTION

This chapter provides a description of the major elements of a multipurpose cadastre—or parcelbased land information system—and discusses such a cadastre within the more general context of geographic information systems. The chapter also describes remonumenting and base mapping efforts previously carried out in the Region and in Racine County which provide the essential base for the establishment of an automated mapping and land information system.

### THE CADASTRE AS PART OF A LARGER SYSTEM OF LAND INFORMATION

A cadastre may be defined as a record of interests in land, encompassing both the nature and extent of these interests. Historically, cadastres have been created and maintained for the purpose of taxing these interests, and evidence of the existence of cadastres goes back through hundreds of years of human civilization. It is possible to develop an automated version of a cadastre defined in this more narrow, historical sense; and, in fact, the development of such single-purpose cadastres has been advanced on the premise that the development of more complex multipurpose cadastres and land information systems ought to begin with the development of single-purpose cadastres relating only to the value of real property as a basis for taxation, and perhaps the registration of land ownership, being extended later in an evolutionary manner to other applications.

Thus, the development of a more narrowly defined cadastre can be considered a preliminary step in the development of a broader land-related information system. Additional information subsequently incorporated into such a system may include data on land use; certain natural characteristics of the land such as soil and geologic conditions; natural hazards such as flooding and shoreline erosion; environmentally sensitive areas such as woodlands and wetlands; permits; public and private infrastructure systems; and selected social and economic data, to name just a few. These broader land information systems are considered to contain, in addition to the information considered to be part of a singlepurpose cadastre, all types of land-related information both cultural and natural.

### ELEMENTS OF A MULTIPURPOSE CADASTRE

A multipurpose cadastre-a parcel-based land information system—can be conceptualized as a public, operationally and administratively integrated, land-related information system which provides continuous, readily available, and comprehensive information at the ownership parcel level. The Panel on a Multipurpose Cadastre of the National Research Council has proposed the procedural model shown in Figure 1 for the development of multipurpose cadastres. This model consists of the following five basic elements: 1) a geographic reference frame consisting of a geodetic survey network; 2) a series of current, accurate, large-scale base maps properly related to the geographic reference frame; 3) a cadastral map overlay delineating all cadastral parcels which is also properly related to the geographic reference frame; 4) a unique identifying number assigned to each parcel; and 5) a series of registers, or land data files, each including a parcel index for purposes of information retrieval and cross-referencing with information in other land data files.

Additional elements in the form of maps and records of land-related information can be readily added to the base over time.

### Geodetic Reference Framework

A reference frame—or survey control network consisting of a system of survey monuments having geodetically based coordinates, is necessary for defining the relative spatial location of all land-related data and, as such, comprises the first component for a multipurpose cadastre. In the United States, two different, and heretofore largely uncoordinated, systems of survey control have evolved. One of these two systems, the State Plane Coordinate System, is founded in the science of measurement and is intended to be utilized as a basis for the collection of earth science data and the preparation of earth science maps, such as topographic, geologic, soils, and hydrographic maps. The other of these two systems, the U. S. Public Land Survey System, is founded in the principles of property law, as well as in the science of measurement, and is utilized for the collection of cadastral data and the preparation of cadastral maps, such as real property boundary line maps.

<u>U. S. Public Land Survey System</u>: For most of the United States, the federal government has provided the basic survey control system for cadastral mapping in the form of the U. S. Public Land Survey System. Under regulations imposed by the Congress, the U. S. Public Land Survey System has been extended into 30 of the 50 states, including Wisconsin.

This system is founded in the best features of the English common law of boundaries, superimposing on that body of law systematic land survey procedures under which the original public domain is surveyed, monumented, and platted before patents are issued; legal descriptions are by reference to a plat; lines actually run and marked on the ground control boundaries; adjoiners are respected; and the body of law in effect at the time of the issuing of the deed is controlling, and forever a part of, the deed. Unlike scientific surveys, which are made for the collection of information and can be amended to meet improved standards or changing conditions, the original government land survey in an area cannot be legally ignored, repudiated, altered, or corrected as long as it controls rights vested in lands affected.

The U. S. Public Land Survey System is one of the finest systems ever devised for describing and marking land. It provides a basis for a clear, unambiguous title to land, together with the physical means by which that title can be related to the land it describes. The system is ingenious, being simple and easy to comprehend and administer; and without it, the nation would unquestionably have been poorer. The "rectangular" land survey system, however, has one serious flaw. Its use requires the perpetuation of monuments set by the original government surveyors, the positions of which are not precisely related to the surface of the earth through a scientifically established map projection.

<u>State Plane Coordinate System</u>: A strictly scientific control survey system designed to

#### Figure 1

### **COMPONENTS OF A MULTIPURPOSE CADASTRE**



Source: National Research Council and SEWRPC.

provide the basic control for all federal-and most private-topographic and other earth science mapping operations exists separately from the U.S. Public Land Survey System in the triangulation and traverse stations established by the National Geodetic Survey (formerly U.S. Coast and Geodetic Survey). The triangulation and traverse stations established by this agency comprise a nationwide network connecting thousands of monumented points whose geodetic positions, expressed in terms of latitude and longitude, are known. In order to make the National Geodetic Survey control network more readily available for local use, the U.S. Coast and Geodetic Survey devised the State Plane Coordinate System in 1933. This system transforms the spherical coordinates-latitudes and longitudes—of the stations established in the national geodetic survey into rectangular coordinates-eastings and northings-on a plane surface. This plane surface is mathematically related to the spheroid on which the spherical coordinates of latitude and longitude have been determined. The mutual relationship, which makes it practicable to pass with mathematical precision from a spherical to a plane coordinate system, makes it also practicable to utilize the precise scientific data of the National Geodetic Survey control network for the reference and control of local surveying and mapping operations. A limitation on such uses, however, is imposed by the relatively widespread location of the basic triangulation and traverse stations and the difficulties often encountered in the recovery and use of these stations.

#### Large-Scale Base Maps

To satisfy the growing need for an integrated, land-related information base, a system capable of handling a variety of information ranging from such earth science-related data as flood hazard boundary line locations, to such cadastral-related data as real property boundary line locations, is required. It is also mandatory that field work, data resolution, and information presentation be consistent with the most detailed level of land-related decision-making, that of the individual proprietary parcel. These requirements call for base maps at scales significantly larger than those generally available in the United States as the second component of a multipurpose cadastre. These maps should be topographic maps showing in their correct location and orientation the principal natural and cultural features of the area concerned and the elevation and configuration of the surface of the earth.

### Cadastral Overlay

The third component of a multipurpose cadastre is the cadastral overlay. Preparation of the cadastral overlay requires identifying and delineating the most fundamental unit of land a cadastral parcel. This unit of land becomes the basic building block for maintaining real property boundary line-related information, including information on rights and interests. A cadastral parcel is, therefore, an unambiguously and uniquely defined unit of land within which rights and interests are legally recognized and for which there is a unique and complete group of rights. The primary type of interest, for this definition, is land ownership associated with that set of rights and interests that may be acquired and transferred.

#### Parcel Number

The fourth component of a multipurpose cadastre is the parcel identifier, defined as a code for recognizing, selecting, identifying, and arranging information to facilitate storage and retrieval of parcel records. It may also be used for spatial referencing of information and as a means for referring to a particular parcel in lieu of a full legal description. There is general agreement that the identifier system used should provide for the assignment of a unique code to each parcel, should be easily understandable and usable to the general public—or at least to that segment of the public that may have cause to use the system, should be capable of serving a variety of different uses, and should be reasonably permanent.

#### Land Information Files

The fifth and last component of a multipurpose cadastre consists of the land information files, or land data files, which contain facts about the land parcel in question and are related to the cadastral map through the parcel identifier. The various types of information that may be compiled about the land are potentially voluminous, and may include information about both natural and cultural—that is, man-made—features of the parcel. Perhaps the most familiar land information files are those of local land-title records systems and tax assessment and collection records systems.

### EXISTING FRAMEWORK FOR THE DEVELOPMENT OF MULTIPURPOSE CADASTRES WITHIN SOUTHEASTERN WISCONSIN

It should be noted that the first three elements of the procedural model for the creation of a multipurpose cadastre as proposed by the National Research Council have long been embodied in the Regional Planning Commission's recommended large-scale base mapping program. Recognizing the importance of good large-scale maps and attendant survey control to sound community development and redevelopment, the Commission has, for almost three decades, encouraged the preparation of largescale topographic and cadastral maps within its 2,689-square-mile Planning Region. These maps are based on a unique system of survey control that combines the best features of the U.S. Public Land Survey System and State Plane Coordinate System. The large-scale maps and attendant control survey system, where they already exist, provide, in a highly cost-effective manner, the technical foundation for the creation of multipurpose cadastres within the Region. Because of their critical and central importance to the implementation of a multipurpose cadastre, these three elements-the geodetic reference frame, large-scale base maps, and the cadastral overlays—are discussed in greater detail in the following sections.

### A Composite System for the

Geodetic Reference Framework

From the preceding brief discussion of the U.S. Public Land Survey and State Plane Coordinate Systems, it is apparent that two essentially unrelated control survey systems have been established in the United States by the federal government. One of these-the U.S. Public Land Survey System—is founded in the legal principles of real property description and location and was designed primarily to provide a basis for the accurate location and conveyance of ownership rights in land. The other-the State Plane Coordinate System-is founded in the science of geodesy and was designed primarily to provide a basis for earth science mapping operations and for the conduct of high-precision scientific and engineering surveys over large areas of the earth's surface. Both systems have severe inherent limitations for use as a geographic framework for a local land data system. By combining these two separate survey systems into one integrated system, however, an ideal system for the geometric control required for land data systems is created.<sup>1</sup> This ideal system includes the relocation and monumentation of all U.S. Public Land Survey section and guartersection corners, including the centers of sections, within the geographic area for which the land data system is to be created, and the utilization of these corners as stations in second order traverse and level nets, both nets being tied to the National Geodetic Datum. The traverse net establishes the precise geographic positions of the U.S. Public Land Survey corners in the form of state plane coordinates, while the level net establishes the precise elevation above mean sea level of the monuments marking the corners.

Such a system of survey control has at least the following three advantages as a geographic framework for a multipurpose cadastre:

1. It provides an accurate system of control for the collection and coordination of cadastral data, since the boundaries of the original government land subdivision form the basis for all subsequent property divisions and boundaries. As all subsequent legal descriptions and plats must be tied to the U. S. Public Land Survey System, accurate reestablishment and monumentation of the quarter-section lines and corners permits the ready compilation of accurate property boundary line data and the ready maintenance of these data in current form over time. These data can be readily and accurately updated and extended since, in Wisconsin, all new land subdivisions must by law be tied to corners established in the U.S. Public Land Survey, and since the accuracy of the surveys for these subdivisions can be readily controlled by state and local land subdivision regulations. The recommended survey control system thus fully meets the needs of a narrowly defined cadastre for the fiscal and legal administration of real property, yet this cadastre can be developed readily and soundly into а multipurpose land data system.

- 2. It provides a common system of control for the collection and mapping of both cadastral and earth science data. By relocating the U.S. Public Land Survey corners and accurately placing them on the State Plane Coordinate System, it becomes possible to accurately correlate real property boundary line information with earth science data. This placement of property boundary and earth science data on a common datum is absolutely essential to the sound development of any multipurpose land data system. Yet such a common control datum is rarely used. The establishment of state plane coordinates for the U.S. Public Land Survey corners permits the correlation with mathematical precision of data supplied by aerial and other forms of earth science mapping with property boundary line data compiled through the usual land surveying methods. Only through such a common geometric control system can all of the information required for a multipurpose land data system be accurately collected for, and correlated in, the system.
- 3. It permits lines and areas entered into the data base—whether these lines represent the limits of land to be reserved for future public uses, the limits of land to be taken for immediate public use, the limits of districts to which public regulations are to be applied, or the location and alignment of proposed new property boundary lines or of proposed constructed works—to be

<sup>&</sup>lt;sup>1</sup>See K. W. Bauer, "Geometric Framework for Land Data Systems," <u>Journal of the Surveying</u> and <u>Mapping Division</u>, Proceedings of the <u>American Society of Civil Engineers</u>, Volume 107, Number SU1, November 1981.

Figure 2





Source: SEWRPC.

accurately and precisely reproduced upon the ground.

#### Commission Specifications for

Geometric Framework and Base Maps

As already noted, the Regional Planning Commission has, since 1961, promoted the preparation of large-scale topographic and cadastral base maps based upon a control survey system which combines the U. S. Public Land Survey and State Plane Coordinate Systems. The maps and attendant control survey system, in addition to providing essential municipal planning and engineering tools, were intended to provide the foundation for the eventual development of automated, multipurpose cadastres within the Planning Region. Since the Commission-specified topographic base maps and survey control system are already in place throughout Racine County and Commission-specified cadastral maps have been prepared for a significant portion of Racine County, a description of those specifications herein is warranted.

Specifications for Relocation, Monumentation, and Coordination of U.S. Public Land Survey Corners: The Commission specifications governing the creation of the necessary survey control network requires the relocation of all U. S. Public Land Survey corners in the areas to be mapped, and the marking of the relocated corners by reinforced concrete monuments, having engraved bronze caps imbedded in the tops (see Figures 2 and 3). The bronze caps are inscribed with the corner notation-quarter section, town, and range. The monuments placed are referenced by ties to at least four witness marks. The specifications require that the survey engineer and land surveyor provide a dossier on each control station established in order to permit its ready recovery and use. The dossier sheets provide for each station a sketch showing the monument

erected in relation to the salient features of the immediate vicinity, all witness monuments together with ties, the state plane coordinates of the corner, its U. S. Public Land Survey description, the elevation of the monument, and the location of appurtenant reference benchmarks referred to National Geodetic Vertical Datum of 1929 (see Figure 4). These dossier sheets are recorded with the County Surveyor as well as with the Commission, and are thereby readily available to all land surveyors and public works engineers operating in the area mapped.

The specifications require the control survey data to be summarized by means of a control survey summary diagram showing the exact grid and ground lengths and grid bearings of the exterior boundaries of each U.S. Public Land Survey quarter section; the area of each quarter section; all monuments erected: the number of degrees, minutes, and seconds in the interior angles of each quarter section; the state plane coordinates of all quarter-section corners together with their Public Land Survey System identification: the benchmark elevations of all monuments set; and the basic National Geodetic Survey control stations utilized to tie the Public Land Survey corners to the horizontal geodetic control datum. together with the coordinates of these stations. The angle between geodetic and grid bearing is noted, as is the combination sealevel and scale-reduction factor (see Figure 5).

All the work necessary to execute the control surveys and provide the finished topographic maps described below has been done in southeastern Wisconsin on a negotiated contract basis with an experienced photogrammetric and control survey engineer. In this regard, it was considered essential to retain a photogrammetric and control survey engineer familiar with higher order field

methods and procedures and with the attendant geodetic survey computations and adjustments, and whose crews were properly equipped with state-of-the-art survey instruments. Electronic distance-measuring equipment was employed in the work, as well as optically reading theodolites and appurtenant traverse equipment, automatic levels, and precision level rods. Indeed, the control survey system used is made economically feasible only through the application of these relatively recently developed instruments, particularly the electronic distance-measuring devices. Figure 3

#### DETAIL OF ALTERNATIVE CONTROL SURVEY MONUMENT INSTALLATION IN SURFACE TRAVELED WAY OF STREETS AND HIGHWAYS



Although the specifications governing the work make the photogrammetric engineer responsible for overall supervision and control of the mapping work, as well as for the quality of the finished maps, they require that the actual relocation of the Public Land Survey corners be done by a local land surveyor employed as a subcontractor by the photogrammetric engineer or as a contractor by the Commission directly. The specifications thereby recognize that this portion of the work requires expert knowledge of local survey custom and boundary and title law, Figure 4

#### A TYPICAL U. S. PUBLIC LAND SURVEY CONTROL STATION DOSSIER SHEET

RACINE COUNTY, WISCONSIN RECORD OF CONTROL SURVEY STATION



Source: SEWRPC.

as well as the assembly and careful analysis of all authoritative survey information—such as title documents and attendant legal descriptions, land subdivision plats and certified survey maps, survey records, and, of cardinal importance, records on existing land survey monumentation and land occupation—in order to arrive at the best possible determination of the location of the land survey corners. In the areas mapped, the land survey portion of the control survey work requires a very high degree of professional competence, as almost all of the Public Land Survey corners fall under the federal definition of either obliterated or lost corners. The importance of this phase of the work and its impact on real property boundaries throughout the community can hardly be overemphasized.

Specifications for Topographic Mapping: The specifications provide for the completion of finished topographic maps that can serve as the base maps for the preparation of a multipurpose cadastre by accurately recording the basic geography of the area mapped. In addition to showing the usual contour information, spot elevations, planimetric and hydrographic detail, and coordinate grid ticks, the maps show, in their correct position and orientation, all U. S. Public Land Survey quarter-section lines and corners established in the control surveys (see Figure 6). The specifications require that all state plane coordinate grid lines and tick marks and all horizontal survey control stations be plotted to within 1/100 inch of the true position as expressed by the coordinates for the control survey stations. The specifications further require that the planimetric features and contours shown on the maps conform to National Map Accuracy Standards. Thus, 90 percent of all welldefined planimetric features must be plotted to within 1/30 inch of their true positions, and no such features may be off by more than

1/20 inch. Ninety percent of the elevations indicated by the solid-line contours must be within one-half contour interval of the true elevation, and no such elevation may be off by more than one contour interval. A combination sea level and scale-reduction factor, and the angle between geodetic and grid bearing, are noted on each map sheet, as is the equation between any local datum and mean sea level.

<u>Specifications for Cadastral Mapping</u>: The Commission's specifications visualize the prepaFigure 5



A TYPICAL CONTROL SURVEY SUMMARY DIAGRAM

Source: SEWRPC.

ration of real property boundary line maps, complementing the topographic maps, by the local units of government concerned utilizing resident engineering and planning staffs or consultants. The property boundary line maps are compiled at a scale matching that of the topographic maps, each map sheet covering, like the topographic maps, a U. S. Public Land Survey section or quarter section.

As the topographic maps are being compiled, the Commission specifications require that the photogrammetric engineer provide cadastral base sheets. These sheets consist of reproducible duplicates of the partially completed topographic maps showing, in addition to the state plane coordinate grid, the U. S. Public Land Survey section and quarter-section lines and corners in their correct position and orientation, together with the attendant ground lengths and grid bearings, and such salient planimetric detail and hydrographic features as may be helpful in the subsequent plotting of real property boundary lines, including railway tracks, electric power transmission lines, principal structures, wetlands, and such hydrographic features as streams and lakes. Utilizing recorded subdivision plats, certified survey maps, and legal descriptions, all real property boundary lines, including street rightof-way lines and major utility easement lines, are then constructed on the base sheets working within the framework of control provided by the ground lengths and grid bearings of the U.S. Public Land Survey quarter-section lines. The property boundary lines are constructed in a manner that parallels the location of these lines on the surface of the earth following land surveying practice in the State of Wisconsin. The specifications require that all real property boundary lines be plotted within 1/30 inch of their true position based on analysis of all authoritative information available. Dimensions are shown for all platted areas as shown on the recorded subdivision plats. Wisconsin Statutes have long required that such plats be prepared to an accuracy of 1 part in 3,000, as compared to the accuracy of 1 part in 10,000 required by the specifications for the basic survey control network. Any overlaps or gaps between adjoining property boundary lines, as indicated by the constructions and plotting of those lines, are noted on the cadastral maps. Finally, a cadastral parcel identification number is added.

The property boundary line maps thus show the ground length and grid bearing of all quartersection lines; the state plane coordinates of all quarter-section corners: the monuments marking these corners; the recorded dimensions of all street lines, alley lines, and boundaries of public property; recorded street widths; platted lot dimensions; and a parcel identification number. In unplatted areas, real property boundaries are shown by scale alone. Railway tracks, electric power transmission lines, principal structures, fences, wetlands, lakes, streams, and drainage ditches are also shown (see Figure 7). As previously noted, these boundary line maps can be readily and accurately updated and extended as new land subdivision plats and certified map surveys, utilizing the survey control, are made and recorded.

Status of Survey Control, Large-Scale Topographic Base Mapping, and Cadastral Mapping in Racine County

As previously noted, the Commission has long recognized the importance of good large-scale maps to the proper administration of local government functions, and has encouraged counties, cities, and villages within the Region to prepare such maps. As shown on Map 1, all of Racine County has had large-scale (one inch equals 200 feet) topographic maps prepared to Commission-recommended standards, including the relocation, monumentation, and placement on the State Plane Coordinate System of the U.S. Public Land Survey corners. This area totals about 340 square miles. A total of 1,478 U.S. Public Land Survey corners have been relocated, monumented, and coordinated as part of this base mapping effort. Cadastral maps have been prepared, or are currently being prepared, to Commission-recommended standards for about 328 square miles, or about 96 percent of the approximately 340-square-mile area of Racine County. These cadastral maps contain about 43,575 real property parcels, or about 63 percent of the approximately 69,575 real property parcels in the County. The majority of the cadastral maps completed to date have been compiled at a scale of one inch equals 200 feet; however, selected areas having high parcel densities in the Cities of Burlington and Racine: the Villages of North Bay, Sturtevant, Union Grove, and Wind Point; and the Towns of Mt. Pleasant and Rochester have been compiled at a scale of one inch equals 100 feet. Therefore, a significant portion of the initial effort necessary to begin the development of a countywide automated mapping and land information system has already been accomplished. The value of the work completed to date-including remonumentation and survey control, large-scale topographic base mapping, and cadastral mapping—is estimated to total about \$3.5 million expressed in 1990 dollars. This estimate is based upon the following unit costs: U. S. Public Land Survey corner relocation and monumentation, \$350 per corner; horizontal and vertical control surveys, \$800 per corner; large-scale topographic mapping, \$4,000 per square mile; and cadastral mapping, \$10 per parcel.

#### Needs Assessment

Racine County has made substantial progress in developing the foundation elements necessary for the creation of a modern land records system. As already reported, a countywide survey control network has been created and large-scale planimetric and topographic mapping has been acquired for the entire County. Significant progress has been made in the compilation of real property boundary line maps with about two-thirds of the County's real property parcels

#### Figure 6

### A PORTION OF A TYPICAL LARGE-SCALE TOPOGRAPHIC MAP PREPARED IN ACCORDANCE WITH THE COMMISSION'S RECOMMENDED SPECIFICATIONS



Source: SEWRPC.

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#### Figure 7

### A PORTION OF A TYPICAL CADASTRAL MAP PREPARED IN ACCORDANCE WITH THE COMMISSION'S RECOMMENDED SPECIFICATIONS



Source: SEWRPC.

#### Map 1



#### STATUS OF CONTROL SURVEY NETWORK, LARGE-SCALE TOPOGRAPHIC MAPPING, AND CADASTRAL MAPPING IN RACINE COUNTY: 1990

Source: SEWRPC.

mapped on true map bases correctly referenced to both the U. S. Public Land Survey System and the surface of the earth.

In pursuing the further development of a modern land records system in Racine county, work efforts should be undertaken in the following priority order:

- 1. The completion of real property boundary line maps for those portions of the County—primarily the City of Racine—not presently covered by such maps. In the City of Racine area, such cadastral maps would be constructed at a scale of one inch equals 100 feet.
- 2. The development of specifications and standards for the conversion to digital format of the survey control network, the

large-scale planimetric and topographic maps, and the real property boundary line maps.

3. Digital conversion of the topographic and cadastral maps in accordance with the specifications and standards, such work being accomplished first in that portion of Racine County east of a line nominally two miles west of IH 94 in order to permit the water and wastewater utilities in that portion of the County to proceed with digital mapping of utility networks.

### SUMMARY

A multipurpose cadastre can be conceptualized as a public, operationally and administratively integrated, parcel-based land information sys-

tem which provides for continuous, readily available, and comprehensive land-related information at the parcel level. The National Research Council has proposed that multipurpose cadastres consist of the following five elements: 1) a geographic reference frame consisting of a geodetic network; 2) a series of current, accurate, large-scale topographic base maps properly related to the geographic reference frame; 3) a cadastral map overlay delineating all cadastral parcels, which is also properly related to the geographic reference frame; 4) a unique identifying number assigned to each parcel; and 5) a series of registers, or land data files, each including a parcel index for purposes of information retrieval and cross-referencing with information in other land data files.

The first three elements of the procedural model for the creation of a multipurpose cadastre as proposed by the National Research Council have long been embodied in the Regional Planning Commission's recommended large-scale base mapping and attendant survey control program. Recognizing the importance of good large-scale maps and attendant survey control to sound community development and redevelopment, the Commission has for almost three decades encouraged the preparation of large-scale topographic and cadastral maps within its 2,689square-mile Planning Region. These maps are based on a unique system of survey control that combines the best features of the U.S. Public Land Survey System and State Plane Coordinate System. The large-scale maps and attendant control survey system, where they already exist within the Region, provide in a highly costeffective manner the technical foundation for the creation of multipurpose cadastres within the Region, providing the first two of the five elements of such a cadastre, and a part of the third element.

Large-scale topographic maps have been prepared to Commission-recommended standards for all of Racine County. A total of 1,478 U. S. Public Land Survey corners in the County have been relocated, monumented, and coordinated, representing 100 percent of all such corner remonumentation needed in the County. Cadastral maps have been or are being prepared to Commission-recommended standards for about 328 square miles, or about 96 percent, of the County's 340-square-mile area. These completed maps contain about 43,575 real property parcels, or about 63 percent of the approximately 69,575 real property parcels in the County.

A significant portion of the initial effort necessary to begin the development of a modern land records system in Racine County has already been accomplished. In continuing the development of a modern land records system, the County should give a first priority to the completion of the real property boundary line mapping effort which is currently complete for about two-thirds of the County. Second priority should be given to the development of specifications and standards for the conversion to digital format of the survey control network, the largescale base maps, and the cadastral maps. Third priority should be given to beginning the digital conversion of the survey control network, selected features of the planimetric and topographic mapping, and the real property boundary line maps, thus creating an automated base map to which all pertinent data can be related and through which a parcel based land information system created.

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### **Chapter IV**

### **RECOMMENDED AUTOMATED MAPPING AND LAND INFORMATION SYSTEM FOR RACINE COUNTY**

### INTRODUCTION

The previous chapters of this report have presented an overview of the current status of automated mapping and land information system capability within Racine County, and have identified the National Research Council model for the creation of automated cadastres as the suggested model for the development of a multipurpose, multi-user automated mapping and land information system in Racine County. The elements of such a system have been identified, and the status of implementation of those elements within Racine County has been reported.

This chapter sets forth a recommended automated mapping and land information system plan for Racine County. The chapter begins with a statement of goals and objectives and follows with sections on the planning time period; system development standards; a multi-year program to build the land information system, including consideration of system development costs and sources of potential revenue; and proposed organizational arrangements to carry out that program.

### **PROGRAM GOALS AND OBJECTIVES**

The Racine County land information system planning effort seeks to meet the following two basic goals:

- 1. To implement over time in Racine County a multipurpose, multi-user, parcel-based, automated mapping and land information system, such system following the National Research Council model and consisting of the following five basic elements:
  - a. Geodetic reference framework.
  - b. Large-scale planimetric and topographic base maps.
  - c. Overlays, including cadastral boundaries and boundaries of various cultural and natural areas.

- d. Identifiers, including parcel numbers and codes associated with various cultural and natural areas.
- e. Nonspatial land information files, including cadastral parcel records and various cultural and natural resource data.
- 2. To reach agreement among Racine County, the local units of government in Racine County, and the various public and private utilities operating in Racine County on the design of a common automated mapping and land information system so as to ensure economy and efficiency in the development and use of that system and so as to ensure the ready entry, retrieval, and exchange of data by and between the various users of the system.

To meet these two goals, the following represent the specific objectives of the current planning effort:

- 1. To lay out a course of action that will build upon the historic Racine County base mapping effort, focusing all available fiscal resources on completing the cadastral maps for the entire County; on converting the geodetic reference framework and large-scale planimetric and hypsometric data reflected on the topographic base maps to digital—i.e., computer-readable form; on converting the real property boundary line and related information reflected on the cadastral maps to digital form; and on constructing a digital information layer consisting of zoning, floodplain, and shoreland information.
- 2. To encourage local units of government in Racine County who desire to move at a more rapid pace toward establishing an automated mapping and land information system for local government use to commit additional fiscal resources toward that end; recommending, however, that such resources be expended for work efforts which meet the agreed-upon system development standards.

- 3. To facilitate applications by Racine County and by local units of government in Racine County for state grants in support of the development of the recommended automated mapping and land information system for Racine County.
- 4. To encourage partnership efforts between public sector governments and utilities and private sector utilities that will contribute toward the development of the recommended automated mapping and land information system for Racine County.

### PLANNING PERIOD

The planning period for this initial land information system plan for Racine County is the sixyear period beginning January 1, 1991, and extending through December 31, 1996. If sufficient resources become available during this period, it is the Advisory Committee's intent that the entire automated mapping and land information system recommended for the County be completed by the end of that period. It is recognized, however, that resource constraints may prohibit achieving full system development within that time. Should resources be so constrained, it is the Committee's intent that available resources be directed first toward completing the cadastral overlays, including parcel identifiers; then toward the digital conversion of planimetric map features; then toward the digital conversion of cadastral maps; then toward the digital preparation of a zoning information layer, including floodplains and shorelands; and finally toward the digital conversion of the hypsometric map features.

### **RECOMMENDED STANDARDS**

When discussing the design of an automated mapping and land information system, it is often assumed that the "system" is the computer hardware and software and that the "system" is physically centralized—that is, a single hardware configuration upon which reside all of the digital maps and associated land information of all system users. Users of this type of system operate in terminal fashion from the central computer. For many years, this type of operation was dictated in large part by the available computer technology. Recent advances in computer hardware and software technologyparticularly as they pertain to decreasing unit costs for computational and mass data storage capability, to networking between the hardware of different vendors, and to translation capability of digital map data between some different proprietary software products—now permit a different type of "system" to be specified; that is, one in which the system users share digital maps and an agreed-upon set of map-related information, but maintain their own separate or distributed—computing capability.

If the centralized system concept is discarded, then a number of issues that have in the past been impediments to the development of shared automated mapping and land information systems are no longer pertinent. These are the organizational structure and the cost allocation among participants of a centralized operation, and the maintenance of data security on "proprietary" files in a centralized operating environment.

More importantly, perhaps, the ability to replace the centralized operating concept with a distributed operating concept permits attention to be focused on the true system components of an automated mapping and land information system. In a distributed operating environment, the "system" is not defined in terms of hardware and software, but in terms of an agreed-upon set of procedures and specifications for the production and maintenance of a basic set of digital maps and map-related information, and an agreed-upon set of procedures and specifications for the interchange of these data between system users. It must be stressed that no amount of state-of-the-art computer technology can compensate for the absence of a robust set of specifications and standards for those elements that will be used in common.

The following recommended standards for an automated mapping and land information system for Racine County assume that—initially the following set of elements—namely, a survey control network, large-scale planimetric and topographic base maps, a cadastral map overlay with parcel identifiers, and a selected set of planning-oriented overlays with identifiers would be developed for joint use. Discussions held over the past several years among local operators of automated mapping systems indicate that these elements in the aggregate represent a set of map feature information common to most of the users. The provision of a common automated mapping base in this manner would provide a base sufficient to support a wide variety of uses, including county and local government and utility preliminary site engineering, outside plant utility network mapping, the design and construction of public and private works, planning and zoning administration, vehicle routing, emergency services provision, and property assessment, among others. It is envisioned, however, that these more specialized applications would be developed by the users either singly or in small groups as may be appropriate or necessary, rather than being jointly developed.

#### System Accuracy

The issue of map accuracy in a multi-user environment has been the subject of intense debate among mapping organizations, particularly as this issue may affect the allocation of the costs of shared development among the various participants in a multi-user system. In spite of past discussion, however, the ramifications of this issue are still not fully understood or appreciated by all participants in the dialogue. Debate, unfortunately, has focused on the relative cost of various levels of accuracy and how those costs might be allocated rather than on the more basic issue, which is the level of accuracy required to support a true multipurpose, multi-user system of digital map resources. If the agreed-upon system is incapable of supporting the needs of the most demanding of the users, the development of multiple systems is inevitable and the creation of a multipurpose. multi-user system cannot, by definition, occur.

In this regard, the recommended standards for a joint automated mapping and land information system as set forth herein are based upon the Commission-recommended standards for the development of survey control networks and local large-scale mapping programs. These Commission programs already represent formally adopted or <u>de facto</u> standards for much of Southeastern Wisconsin, including Racine County. In addition, these programs have been subjected to critical review by knowledgeable professionals who have judged them to be both conceptually and procedurally sound.

The large-scale mapping and survey control systems recommended by the Commission have been in use for more than 25 years in manual mapping environments, and within the most recent decade have been successfully carried into digital mapping environments. They therefore represent successfully "field tested" standards and specifications. The maps and attendant survey control have been demonstrated to support a wide variety of operations to necessary levels of accuracy in both the public and private sectors, and are, therefore, ideally suited to a multipurpose, multi-user environment.

### Map Projection System

It is recommended that the State Plane Coordinate System, North American Datum of 1927 (NAD-27), be used as the map projection system for a countywide automated mapping and land information system. This system is already the system of choice of much of the local mapping community, and a great deal of effort and expense has been expended in its establishment and maintenance. Those organizations operating in the local area that have chosen to use the Universal Transverse Mercator (UTM) system have, in fact, converted much of their existing basic map information to the UTM system from the State Plane Coordinate System. The methodology for the precise conversion process between the two map projection systems already exists as long as both coordinate systems are based upon NAD-27-and the organizations concerned can continue to "load data" into their systems.

The map projection grid should be constructed inside the computer memory through key entry procedures. This requirement, if combined with the key entry of all survey control network data, will produce a map projection that is essentially independent of map scale. Constructed in this manner, the map projection will be able to accept and accurately reference not only digitized data from mapped sources at any scale, but also numeric data derived from direct field measurements. This capability is as important as it is subtle, given the increasing availability and affordability of high technology survey instruments, such as "total stations."

#### Survey Control Network and

#### Large-Scale Base Mapping

It was reported in Chapter III that the Commission-recommended survey control network and large-scale topographic base maps already exist throughout Racine County, and that such data are already being utilized by units of government and certain utilities in both analog and digital mapping. Even though this element of the work has been completed throughout Racine County and no additional work on these elements of a countywide automated mapping and land information system will be necessary, the procedures and specifications for this work are set forth in the interest of completeness.<sup>1</sup>

Control Surveys: The horizontal control survey work undertaken in Racine County included the recovery, or relocation, and monumentation of 1,478 U.S. Public Land Survey corners, including section and quarter-section corners, centers of sections, and correction corners. Having recovered, or relocated, and monumented these corners, high-order control survey traverses were run which utilized and incorporated all of the monumented corners as stations to determine the coordinates of the corners and the lengths and bearings of all quarter-section lines. Coordinates of the corners were computed upon the Wisconsin Coordinate System, South Zone, (NAD-27) and sufficient survey connections were made to basic National Geodetic Survey (NGS) control stations to permit the proper checks and adjustments to be made both in the traverse lengths and bearings and in the coordinate values of the monumented U.S. Public Land Survey corners. The procedures and accuracy of the horizontal control surveys conformed to the specifications for NGS Third-Order Class I traverses.

The vertical control survey work was based upon National Geodetic Vertical Datum, 1929 Adjustment (NGVD-29), as established by the NGS. Closed level circuits were run as necessary to establish permanent bench marks in the mapped area. The procedures and accuracy of the vertical control surveys conformed to the specifications for NGS Second-Order, Class II level circuits. Elevations were determined for the monuments marking the section, quarter-section, and center of section corners throughout the mapped area, and these monuments serve as permanent bench marks, each monument being supplemented by at least one reference bench mark.

Large-Scale Planimetric and Topographic Base Maps: Large-scale base maps have been prepared to National Map Accuracy Standards at a scale of 1:2400 (one inch equals 200 feet) for all of Racine County. Use of these standards ensures that all map projection grid lines. horizontal control stations, section corners, and quarter-section corners are plotted on finished maps to within 1/100 of an inch of their true coordinate position. Ninety percent of all welldefined planimetric features are plotted to within 1/30 of an inch of their true coordinate position, and no point is more than 1/20 of an inch from its true coordinate position. Ninety percent of the elevations determined from the solid-line contours of the map have an accuracy with respect to elevation of one-half contour interval, and no elevation is in error by more than a full contour interval.

The large-scale topographic maps contain the following map information:

- 1. Hypsometry by contour lines having a vertical interval of two feet.
- 2. All planimetric detail, such as pavements, curbs, walks, trails, railways, power lines, buildings, fences, wooded areas, dams, piers, dock walls, culverts and bridges, retaining walls, airport runways and taxiways, and other identifiable salient features on the aerial photography from which the maps are compiled.
- 3. All hydrographic features, such as marshes, lakes, streams, watercourses, and drainage ditches.
- 4. All section and quarter-section lines and U. S. Public Land Survey corners in their correct position and orientation, together with the attendant exact grid lengths and bearings.
- 5. Such lettering as may be secured from available maps of the area or as may be furnished by the participating organiza-

<sup>&</sup>lt;sup>1</sup>Routine maintenance work attendant to the existing survey control network and large-scale topographic base maps should be expected and be undertaken as a normal part of Racine County government functions. The County Surveyor is responsible for the routine maintenance of the survey control system. The County Planning and Development Director is responsible for securing updated large-scale topographic base maps as may be necessary. In both cases, these routine maintenance activities are funded by Racine County through the normal annual budget process. It is essential that all maintenance work meet the same standards as utilized in the original land and control survey and topographic and cadastral mapping work.

tions relative to the names of salient geographic features. The names of all state and county trunk highways, public streets, and major streams and lakes are shown on the maps.

The large-scale topographic base maps prepared throughout Racine County provide the source for the digitization of surface water and stream channels, for the digitization of the pavement edges of public streets and highways, and for the digitization of structure outlines. The topographic maps show principal structures that existed as of the date of the aerial photography flown for the photogrammetric compilation of the topographic base maps.

#### Cadastral Maps

Much of what has been historically identified as cadastral mapping in southeastern Wisconsin cannot be mathematically accurately related to the surface of the earth, and therefore does not meet the definition of a map. These "cadastral maps" are more properly identified as cadastral diagrams and are manifestly unsuited to be digitized as the cadastral layer of an automated mapping and land information system where one of the stated intents is the ability to accurately correlate real property boundary line information with earth science information, such as floodplain boundaries. To meet the rigorous requirements of a modern, parcel-based, land information system, it is usually necessary that the real property boundary line maps be recompiled on the map projection established for the land information system utilizing a permanently monumented survey control network as the mechanism for this recompilation. As reported in Chapter III, cadastral maps have been-or are being-recompiled in this manner for about 328 square miles, or about 96 percent, of the approximately 340-square-mile area of Racine County. This represents about 43,575 parcels, or about 63 percent, of the approximately 69,575 parcels in Racine County.

Within Racine County, cadastral maps are being compiled at two scales: 1:2400 (one inch equals 200 feet) and 1:1200 (one inch equals 100 feet). At the smaller scale each cadastral map covers one U. S. Public Land Survey section. At the larger scale each cadastral map covers one U. S. Public Land Survey quarter section. Generally, the larger scale maps are being prepared for the City of Racine and other densely developed areas in the County. The maps utilize the

Wisconsin State Plane Coordinate System as the map projection and show all section and quartersection lines and corners together with their grid and ground level lengths and grid bearings, all in their correct position and orientation. The State Plane Coordinate grid is plotted to within 1/100 of an inch of its true position, and each U.S. Public Land Survey section and quartersection corner is likewise plotted to within 1/100 of an inch of its true position as expressed by the State Plane Coordinate values for the corner. Ninety percent of all well-defined planimetric features plotted on the maps as an aid in the delineation of real property boundaries, such as the threads of major streams and watercourses, fence lines, pavements, and principal buildings. are plotted to within 1/30 of an inch of their true positions. Real property boundary lines are plotted to within 1/40 of an inch of their true positions.

Determination of the location of real property boundary lines is based upon the examination and interpretation of all recorded subdivision plats and certified survey maps within the area to be mapped; legal descriptions and, where available, plats of all major public utility easements in the area to be mapped; copies of legal descriptions and, where available, plats of all street right-of-way openings, reservations, or dedications in the area to be mapped; and legal descriptions contained in the most recently recorded deed transaction in the records of the County Register of Deeds for all real property boundaries in the area to be mapped not included within recorded subdivision plats or certified survey maps.

Based upon review and interpretation of these materials, the cadastral maps show, all in their correct position and orientation, all real property boundary lines, all street right-of-way lines, and all major cross-country public and utility easement lines. These lines are graphically constructed in a manner which parallels the location of the lines on the surface of the earth, following good land surveying practice in southeastern Wisconsin.

It is recognized that the recorded dimensions and orientation of real property boundaries plotted in this manner may not always agree with the horizontal control survey data also shown on the maps. This is to be expected since most property descriptions were written using field survey data obtained prior to the relocation of section and quarter-section corners and completion of the horizontal control network tied to the Wisconsin State Plane Coordinate System, and some property descriptions were written without benefit of any field survey data other than that provided by the original government survey. Further, the required survey accuracy for property boundary descriptions for land subdivisions, as defined in Chapter 236 of the Wisconsin Statutes and generally adhered to in other property boundary surveys, is 1 part in 3,000, as compared with the Second-Order accuracy of 1 part in 10,000 for the horizontal control surveys.

For these and other reasons, overlapping or separated property boundary descriptions may be expected to exist. The property boundary line maps should record all dimensions as contained in the official records of the County Register of Deeds, and wherever an overlap or gap of 2.5 feet or more exists, such overlap or gap is shown as a mapped line. Overlaps or gaps of less than 2.5 feet will be evident only from an examination of the recorded property line dimensions.

For areas covered by recorded subdivision plats and certified survey maps, the following map annotation is provided:

- 1. Subdivision name or certified survey map number.
- 2. Block and lot numbers.
- 3. Street names.
- 4. Street, alley, and other public way right-ofway widths to the highest degree of accuracy permitted by the data source.
- 5. Recorded lot dimensions to the highest degree of accuracy permitted by the data source.
- 6. Easement right-of-way widths to the highest degree of accuracy permitted by the data source together with the purpose of the easement.
- 7. Parcel identification numbers.

For all properties other than those contained in a recorded subdivision plat or certified survey map, the following map annotation is provided:

1. Street names.

- 2. Street, alley, and other public way right-ofway widths to the highest degree of accuracy permitted by the data source.
- 3. Recorded property dimensions to the highest degree of accuracy permitted by the data source.
- 4. Easement right-of-way widths to the highest degree of accuracy permitted by the data source together with the purpose of the easement.
- 5. Parcel identification numbers.

Once the cadastral maps are completed, they are ready for digitization. All line features are digitized directly from the cadastral maps. Textual information, including the parcel identification number is key entered from the cadastral maps and placed in its approximate location on the digital maps.

### Parcel Identification Numbers

The parcel identification number provides the link between the cadastral maps, which show the location of a particular parcel, and the records, either computer-readable or traditional paper records, that contain information about the parcel. Two parcel identification schemes are utilized in Racine County. One of these schemes is administered by the City of Racine Assessor's Office for those parcels located in the City of Racine. The second scheme is administered by the Racine County Real Estate Description Department for those parcels located in the balance of Racine County. These schemes are illustrated in Figure 8.

The parcel identification scheme administered by the Racine County Real Estate Description Department consists of a seventeen-character identifier made up of seven discrete fields in the format "AABBBCCDDEEFFFGGG." "AA" is a two-character numeric code that identifies Racine County. This code is assigned by the Wisconsin Department of Revenue. "BBB" is a three-character numeric code that identifies the particular minor civil division-town, village, or city—in Racine County in which the parcel lies. This code is also assigned by the Wisconsin Department of Revenue. "CC" is a two-character numeric code that identifies the displacement north of the base line of the U.S. Public Land Survey township in which the parcel lies. "DD" is a two character numeric code that identifies the displacement east of the fourth principal meridian of the U. S. Public Land Survey range in which the parcel lies. "EE" is a two-character numeric code that identifies the U. S. Public Land Survey section in the identified township and range in which the parcel lies. "FFF" is the basic parcel number and "GGG" is a parcel number suffix which is used to identify "splits" of the basic parcel. These splits may occur through the creation of parcels by "metes and bounds" descriptions, land subdivision plats, certified survey maps, or condominium plats. The resultant seventeen-character parcel identification number is unique within both Racine County and the State of Wisconsin.

The parcel identification scheme administered by the City of Racine Assessor's Office consists of an eight-character identifier made up of two discrete fields in the format "FFFFFGGG" where "FFFFF" and "GGG" constitute the base parcel number and a parcel number suffix as in the scheme administered by the Racine County Real Estate Description Department. The basic eight character parcel identifier is sufficient to uniquely identify an individual parcel in the City of Racine. Racine County staff expand the City parcel identification number to a seventeencharacter identification number for inclusion in the County's grantor/grantee index and tract index by the addition of a nine-character numeric prefix—"512760000"—where "51" is the Wisconsin Department of Revenue code for Racine County; "276" is the Wisconsin Department of Revenue code for the City of Racine; and the four zeros are used as space fillers. In addition to putting the City parcel identification numbering scheme into a format compatible with the county parcel identification numbering scheme for automated data processing purposes, this modification also results in rendering the resultant seventeen-character parcel identification number unique both within Racine County and the State of Wisconsin.

### Property Ownership and Assessment Records

The property ownership and assessment records maintained by Racine County already exist as computer-readable files. These files contain such information as an abbreviated legal description, owner's name and mailing address, property address, acreage of the property, and assessed value of the land and any improvements to that land. These records can be readily integrated into the automated mapping and land informa-

#### Figure 8

#### **RACINE COUNTY PARCEL NUMBERING SYSTEM**





CITY OF RACINE PARCEL IDENTIFICATION NUMBER SCHEME





tion system in Racine County utilizing the previously described parcel identification numbering schemes which are common to both the maps and the records. The only operational step required for this integration is the establishment of proper programming access to the existing computer files of assessment records for the purpose of "reading" them.

#### Soil Unit Maps

Digital soil unit maps already exist for all of Racine County through the efforts of the Southeastern Wisconsin Regional Planning Commission. A detailed operational soil survey for all of southeastern Wisconsin was conducted by the U. S. Soil Conservation Service in 1963 under contract to the Regional Planning Commission. The soil survey conducted in southeastern Wisconsin departed from the standard soil survey conducted in other areas of the State and United States in one important respect—namely, the type of aerial photography used as a base map for the field operation. The work specifications prepared by the Commission required that the boundaries of all soil mapping units be identified on prints of then current (1963) Commission aerial photographs. These photographs consisted of ratioed and rectified enlargements at a scale of one inch equals 1,320 feet of Commission one inch equals 6,000 feet scale high-altitude photographic negatives. Each field sheet base map covered six U. S. Public Land Survey sections. The specifications also required. that the Commission be furnished with reproducible half-tone positives of the field sheets on dimensionally stable base material at a scale of one inch equals 2,000 feet. The reproducible positives were to be suitable for the preparation of clear blue-line or black-line prints by diazo process, and were to show clearly the soil mapping units with delineations and identifying symbols so that the prints could be used in conjunction with a published Commission report on the soils of southeastern Wisconsin. The specifications further required that finished photo maps be prepared to accompany the published soil surveys at a scale of one inch equals 1,320 feet, also using the negatives of current photography provided by the Commission. Key planimetric features, such as major highways, railroads, streams, and lakes, were to be identified on the finished photo maps, as were all U. S. Public Land Survey township, range, and section lines.

These base mapping specifications for the soils mapping program in southeastern Wisconsin were unique in that the normal U. S. Soil Conservation Service practice up to that time had been to prepare controlled photomosaics for the soil mapping. The revised base mapping procedure required by the Commission, consisting of the preparation of ratioed and rectified enlargements to eliminate all distortion except that due to relief, provided instead "photo maps" on which distances and areas could subsequently be measured. Such distances and areas cannot be reliably measured on controlled photomosaics.

Soil mapping unit boundaries were digitized from the 1 inch equals 1,320 feet scale photo maps for use in the project, this scale photo print being more convenient for the digitizer operators to scale and interpret. Because the salient features of the U. S. Public Land Survey System had been previously marked on these photos, they were readily scaled for digitization using the previously computed state plane coordinates for the section and quarter-section corners. Because the digital soil unit maps prepared by the Regional Planning Commission utilized the same geometric reference framework as that specified for Racine County, they are already "integrated" with the other land information being incorporated into that system.

### Land Use

Digital historic and current land use information for Racine County already exists for the entire County, again through the efforts of the Southeastern Wisconsin Regional Planning Commission. The Commission's land use inventory -which utilizes 63 different major land use categories-also incorporates the statutorily defined wetlands originally identified by the Wisconsin Department of Natural Resources as part of a statewide inventory of these areas. The digital land use maps were originally digitized from interpreted one inch equals 400 feet scale ratioed and rectified prints of aerial photography flown for this purpose by the Commission in 1963. The ratioing and rectification of the photographs was controlled to the U.S. Public Land Survey System corners as those corners had been coordinated with the State Plane Coordinate System. The digitized land use maps were subsequently updated using aerial photography flown in 1970, 1975, 1980 and again in 1985. These maps are scheduled to be updated to 1990 conditions by the Commission utilizing new aerial photography flown for this purpose during the spring of 1990. Because the digital land use maps prepared by the Regional Planning Commission—like the digital soil unit maps utilized the same geometric reference framework as did the Racine County automated mapping and land information system, they-like the digital soil unit maps—are already "integrated" with the other land information in the system.

The aerial photo enlargements upon which the land uses were originally delineated had been ratioed and rectified to provide, in effect, "photo maps" upon which distances and areas could subsequently be accurately scaled and measured. Some distortion due to relief, however, still exists in aerial photographs after ratioing and rectification. Accordingly, the cadastral maps—when completed—should be used to adjust the land use maps as may be necessary. Where discrepancies are noted between right-of-way and land/water boundary lines on the land use and cadastral maps, they should be resolved in favor of the positions recorded on the cadastral map and adjoining land use lines adjusted accordingly. Such adjustments should all be relatively minor.

#### **Zoning Districts**

Zoning district boundaries commonly follow real property boundary lines. For this reason, digital zoning district map overlays should not be prepared until digital real property boundary line maps have been completed. The digital zoning district map overlays should then be prepared by "copying" appropriate line segments from the real property boundary line maps and digitizing any additional line segments needed.

### Flood Hazard and Shoreland Areas

The digitization of surface waters and stream channels occurs as part of the conversion to digital format of existing topographic maps. Two additional water-related areas which have particular implications for planning and engineering, and for zoning administration, and which are related one to another-floodlands and shorelands-should also be digitized as part of the creation of a countywide automated mapping and land information system. As topographic maps were prepared in Racine County, the limits of the 100-year recurrence interval floodplains were delineated by the Regional Planning Commission on the largescale topographic base maps based upon flood profiles prepared by the Commission as a part of its watershed planning programs. This information needs to be digitally captured. Through the application of the statutory definition, the limits of shorelands in Racine County on the large-scale topographic base maps should also be determined and digitally encoded.

#### Digital Graphic Data Exchange

In order to exchange digital map data between two or more physically separated automated mapping and land information systems, one of two conditions must exist. Either the systems must have compatible data structures for the storage of digital map data or an interchange mechanism between the two systems must be provided. It has been noted in this report that the existing automated mapping and land information systems in the Racine area are of several different proprietary types; therefore, before digital map data can be shared, agreement must be reached between the various organizations concerning the manner in which digital map data may be exchanged.

Currently there is no uniform, widely accepted and used, mechanism for the exchange of digital map data. Such a mechanism, if it did exist, would constitute an industry wide, or formal, standard. For the present time, it will be necessary to exchange digital map data through the use of informal digital map data exchange mechanisms. Informal exchange standards are simply those methods and formats for exchanges that can be agreed upon between two or more data compilers and/or users that want to exchange digital map data. Examples of some currently available mechanisms of the informal type are: Drawing Exchange Format (DXF); Initial Graphic Exchange Standard (IGES); Intergraph Standard Interchange Format (ISIF); and Digital Line Graph 3 (DLG3). The specific informal exchange mechanism utilized between any two specific sites will be largely a function of the specific vendor software and hardware existing at the sites.

It should be noted that the majority of currently available digital map data exchange mechanisms are "batch-oriented," meaning that they are used to load entire files of digital map information. Therefore, to update digital map files involving a transfer of files between two different vendor sets of hardware and software, it is usually necessary to reload the entire affected file rather than to load only the revisions. "Transaction-oriented" file update capability, or the ability to load only the revisions to a file, is a less well-developed capability and may be relatively easy or relatively difficult between different vendor sets of hardware and software, depending upon the similarity or dissimilarity of the internal architecture of the involved systems. As a practical matter, transaction-oriented capability may be available only through custom computer programming, or through the acquisition of the same hardware and software by the different operators involved.

In this regard, it should also be noted that the use of many of the currently available mechanisms for digital map data exchange may be expected to pose some problems for operations using IBM mainframe computers to operate automated mapping systems. IBM mainframe systems utilize digital map data storage models that differ from the models used by most other vendors, and translation between IBM models and non-IBM models is not a trivial programming task. This issue has not been addressed in the commercial market to the extent that digital graphic data exchange between other systems has been. The efficient and effective exchange of digital map data between IBM and non-IBM sites, therefore, may well require custom programming.

Finally, it should be noted that this recommendation is intended to apply to map feature elements rather than to data that may relate to map features. The National Research Council model, proposed as the model to guide the creation of the recommended automated mapping system for Racine County, utilizes the parcel identifier as a "key" to link location, or geometry, of features on maps to nongeometric information about the feature. The transfer of files of nongeometric, or attribute, data can be accomplished using existing procedures for the transfer of character data between different computer systems.

### COST ESTIMATES TO COMPLETE RECOMMENDED AUTOMATED MAPPING AND LAND INFORMATION SYSTEM BASE

The estimated costs of completing the recommended automated mapping and land information system base for Racine County are summarized in Table 1. The table has been structured to present separate cost estimates for completing the work program in the eastern and western portions of the County. The division line between the eastern and western portions is a north-south line running through Racine County nominally two miles west of IH 94. This division point was selected in accordance with the needs assessment set forth in Chapter III wherein the Advisory Committee determined that as a matter of priority the recommended automated mapping and land information system base should be completed first in the eastern portion of the County, so as to permit the water and wastewater utilities in that portion of the County to proceed with the construction of additional information layers consisting of utility networks.

The total cost of completing the work program in the eastern portion of the County is estimated at \$1.37 million. This includes the completion of the conventional cadastral mapping compilation in the City of Racine at an estimated cost of \$271,000; the digital conversion of planimetric map features from the existing topographic maps for the entire area at an estimated cost of \$244,900; the digital conversion and adjustment as may be necessary of the cadastral maps. including parcel identifiers, at an estimated cost of \$509,425; the digital conversion of the hypsometric information from the topographic maps at an estimated cost of \$248,000; and the digital conversion of existing zoning maps at an estimated cost of \$97,550.

The total estimated cost of completing the program in the western portion of the County is \$810,400. This includes the digital conversion of planimetric map features at an estimated cost of \$108,000; the digital conversion and adjustment as may be necessary of the cadastral maps, including parcel identifiers, at an estimated cost of \$228,800; the digital conversion of hypsometric data at an estimated cost of \$432,000; and the digital conversion of zoning maps at an estimated cost of \$41,600.

The total cost of completing the recommended program for the entirety of Racine County, then, is estimated at \$2.18 million, with the eastern portion estimated at \$1.37 million and the western portion at \$0.81 million. An operational automated mapping based could be put in place without the digital conversion of the hypsometric information and the digital conversion of zoning maps. The total cost of completing such a more limited mapping base for the entire County would approximate \$1.37 million. The cost for such a more limited base in the eastern portion of the County would be \$1.03 million and in the western portion of the County, \$0.34 million.

The foregoing cost estimates are based upon the following assumptions:

1. That the work efforts attendant to the compilation of remaining cadastral maps in Racine County would be accomplished either by additional staffing in the Real Estate Description Department of Racine County or through a contract with a service bureau. Table 1

### ESTIMATED COSTS TO COMPLETE THE RECOMMENDED AUTOMATED MAPPING AND LAND INFORMATION SYSTEM BASE FOR RACINE COUNTY<sup>a</sup>

Program Element	Description of Work Remaining to be Completed	Average Unit Cost of Work	Total Cost to Complete Work Element
Cadastral Maps and Digital Conversion of Data— Eastern Portion of County <sup>b</sup>	<ul> <li>Conventional cadastral map compilation— approximately 14 square miles containing 27,100 parcels</li> </ul>	\$10.00 per parcel	\$ 271,000
	<ul> <li>Digital conversion of planimetric map features—124 square miles containing 48,775 parcels</li> </ul>	\$1,975 per square mile	244,900
	<ul> <li>Digital conversion of cadastral maps—14 square miles containing 27,100 parcels</li> </ul>	\$10.00 per parcel	271,000
	<ul> <li>Digital conversion and adjustment of cadastral maps110 square miles containing 21,675 parcels</li> </ul>	\$11.00 per parcel	238,425
	<ul> <li>Digital conversion of topographic map features—124 square miles</li> </ul>	\$2,000 per square mile	248,000
	<ul> <li>Digital conversion of zoning maps— 48,775 parcels</li> </ul>	\$2.00 per parcel	97,550
	Subtotal		\$1,370,875
Cadastral Maps and Digital Conversion of Data— Western Portion of	<ul> <li>Digital conversion of planimetric map features—216 square miles containing 20,800 parcels</li> </ul>	\$500.00 per square mile	\$ 108,000
County	<ul> <li>Digital conversion and adjustment of cadastral maps—216 square miles containing 20,800 parcels</li> </ul>	\$11.00 per parcel	228,800
	<ul> <li>Digital conversion of topographic map features—216 square miles</li> </ul>	\$2,000 per square mile	432,000
	<ul> <li>Digital conversion of zoning maps— 20,800 parcels</li> </ul>	\$2.00 per parcel	41,600
	Subtotal		\$ 810,400
	Total Cost		\$2,181,275

<sup>a</sup>All dollar figures are expressed in 1991 costs. To the extent that general price inflation occurs over the period 1991-1996, and to the extent that such inflation affects these costs, additional monies will be required to achieve the system development progress reflected in this table.

<sup>b</sup>Consists of all that area of Racine County between Lake Michigan and a north-south line running through the County about two miles west of IH 94.

<sup>c</sup>Consists of all that area of Racine County west of a north-south line running through the County about two miles west of IH 94.

Source: SEWRPC.

- 2. That all digital conversion work of the planimetric and topographic map features and of the cadastral maps required to complete the automated base map would be accomplished through a contract with a service bureau.
- 3. That Racine County would not take steps to acquire the necessary hardware and software to operate the digital mapping base until either all of the digital conversion work for the entire County had been completed or until such time as the automated base map was in place for the eastern portion of the County.

Accordingly, the foregoing cost estimates do not include any costs associated with the acquisition of hardware and software by Racine County.

It should be noted that the foregoing estimates include costs—estmated at \$1.00 per parcel—that may be necessary to adjust the existing Racine County cadastral maps to the precise geometric framework developed as part of the Racine County topographic mapping and horizontal survey control program. Examination of the Racine County cadastral maps completed to date indicates that there may be some deviations in the scaled distances and angles used in the compilation of those maps from the distances and angles determined in the control surveys. These deviations may be attributed to the particular technique used by Racine County to construct cadastral maps for each U.S. Public Land Survey one-quarter section, the County having chosen to not utilize the pre-drafted cadastral base sheets for each U.S. Public Land Survey section prepared as part of the Racine County large-scale topographic mapping program. The precision adjustment required to fit the completed maps to the horizontal control survey data is accomplished as part of the cadastral map digitization process.

Finally, it should also be noted that the Wisconsin Natural Gas Company has developed a limited digital mapping base for Racine County that includes parcel and right-of-way data. The Gas Company has indicated a willingness to sell that digital mapping base to Racine County. Thus, it may be desirable and cost-effective to acquire the Gas Company digital mapping base and enhance that base to meet the standards and specifications set forth in this report. In this respect, the Gas Company has indicated that in the construction of its mapping base, any necessary adjustments of the Racine County cadastral maps to the precise Racine County geometric framework noted above have already been made. Whether or not such an implementation alternative would be more cost-effective than the conventional approach used to prepare the foregoing cost estimates would have to be determined in a pilot study that would be undertaken prior to any decision to move forward with implementation of the plan. A preliminary analysis indicates that, assuming that the Gas Company data files can be acquired for a cost of \$52,000, it may be possible to save as much as \$168,000 of the total estimated program cost by acquiring the Gas Company digital data base and then modifying that base to the recommended plan standards and specifications. This would represent a potential 8 percent reduction in overall program costs.

### POTENTIAL SOURCES OF REVENUE TO SUPPORT PROGRAM

There appear to be four potential sources of revenue that could be used to support the work efforts needed to complete the recommended automated mapping and land information system base for Racine County. These four sources are:

1. <u>Register of Deeds Filing</u> and Recording Fees

Over the six-year period 1991 through 1996, it is estimated that a total of \$594,000 will become available to Racine County from the State-mandated supplemental Register of Deeds recording and filing fees. This estimate assumes that the average number of applicable recordings and filings that obtained over the period 1985 through 1990 will continue over the period 1991 through 1996. The total number of such recordings is estimated at 27,000 annually.

The number of annual recordings subject to document filing fees can be expected to vary with changes in the national and local economies, interest rates, tax legislation, and in urban land market activity. Experience in southeastern Wisconsin indicates that fluctuations of about 10 percent more or less than the average may be expected. Accordingly, the annual revenue available from this source may be expected to vary and the amount of program work that can be supported by such revenue may also be expected to vary from year to year.

### 2. <u>State Grants from Wisconsin</u> Land Information Board

Upon approval of the Racine County land information system plan, Racine County will be eligible to apply for state grants of up to \$100,000 to support work program activities consistent with the plan. The competition for such state grants is expected to be intense. Until the Wisconsin Land Information Board adopts rules governing the process by which such grants are to be determined, it is not known how well Racine County might fare in the grant competition. While it is likely that the forthcoming rules will permit counties to use as the 25 percent required local match revenue from the supplemental Register of Deeds filing and recording fees, it is also likely that those counties which commit non-Register of Deeds revenues as the local matching share will be favored in the competition. Finally, it is possible that the forthcoming rules will permit counties to commit on an "in-kind" basis existing resources to meet the 25 percent required local match.

#### 3. <u>Contributions by Local</u> Concernments and Utiliti

service area.

<u>Governments and Utilities</u> A third potential source of revenue to support the recommended Racine County work program consist of contributions by local governments in the County and by public and private utilities operating in the County. Depending upon the intensity with which a local government wishes to secure an operational automated mapping base for local planning, engineering, and other municipal purposes, that local government may be willing to commit local monies toward that end. For example, the City of New Berlin in Waukesha County has committed local funds to accelerate up

the process of the automated mapping base in that portion of Waukesha County.

Similarly, in Kenosha County, the Keno-

sha Water Utility has committed funds to

accelerate the process of completing the

automated mapping base within its utility

### 4. County Tax Levy

A fourth potential revenue source is county tax levy monies. At the present time, no county tax levy monies are being expended to fund the development of the automated base mapping and land information system, although in the past, Racine County tax levy monies were used extensively to complete the geodetic reference framework, the large-scale topographic base maps, and the cadastral maps that have been completed to date. At the present time, the only county tax levy monies available are those which are used by the County Surveyor to maintain the control survey network and by the County Planning and Development Director to obtain, on an occasional basis, updated large-scale topographic maps. On an average annual basis over the past five vears, the County Surveyor's budget was \$14,725. Since Racine County completed the large topographic mapping program in 1977, the County has spent about \$51,250 in remapping efforts, or about \$4,000 annually over the 13-year period ending in 1990.

### WORK PROGRAM SCOPE: 1991-1996

Given the foregoing projected costs of the various elements of completing the recommended automated mapping and land information system base for Racine County, and further given the potential revenue sources noted above, three alternative but cumulative programs to carry out the work over the next six years were formulated. These three programs—entitled minimum, intermediate, and maximum—are summarized in Table 2 and are briefly described as follows:

### 1. Minimum Program

Under the minimum program, Racine County would carry out over the six-year period 1991 through 1996 a work effort scaled against the anticipated Register of Deeds filing and recording fee revenue. The total cost of this program is estimated at \$594,000, or an average annual cost of \$99,000. Under this minimum program, all cadastral map compilation work could be completed; all digital conversion work attendant to the planimetric map data in the eastern portion of the County could be completed; and work could begin—but not

### Table 2

### COSTS AND REVENUES OF MINIMUM, INTERMEDIATE, AND MAXIMUM PROGRAMS ATTENDANT TO THE RECOMMENDED AUTOMATED MAPPING AND LAND INFORMATION BASE FOR RACINE COUNTY: 1991-1996

		Proposed Program Expenditures Over Six-Year Period 1991-1996		ires 996	Proposed Program Revenues Over Six-Year Period 1991-1996		
Program	Projected Program Status as of December 31, 1996	Work Item	Total	Average Annual	Source	Total	Average Annual
Minimum	Substantial progress toward an operational automated	Cadastral map compilation	\$ 271,000	\$ 45,167	Filing fees	\$ 271,000	\$ 45,167
	mapping base for the east- ern portion of Racine County	Digital conversion of planimetric maps eastern portion Begin digital con- version of cadastral mapseastern portion	244,900 78,100	40,817	Filing fees Filing fees	244,900 78,100	40,817
		Total	\$ 594,000	\$ 99,000	Total	\$ 594,000	\$ 99,000
Intermediate	Completion of a limited operational automated	Cadastral map compilation	\$ 271,000	\$ 45,167	Filing fees	\$ 271,000	\$ 45,167
	mapping base for the eastern portion of Racine County	Digital conversion of planimetric maps— eastern portion	244,900	40,817	Filing fees	244,900	40,817
		Digital conversion of cadastral maps—	509,425	84,904	Filing fees State LIS grants	78,100 431,325	13,016 71,888
		Digital conversion of zoning maps—	97,550	16,258	State LIS grants	97,550	16,258
		eastern portion Begin digital con- version of hyp- sometry data	71,125	11,854	State LIS grants	71,125	11,854
		Total	\$1,194,000	\$199,000	Filing fees State LIS grants	\$ 594,000 600,000	\$ 99,000 100,000
					Total	\$1,194,000	\$199,000
Maximum	Completion of an opera- tional automated mapping	Cadastral map compilation	\$ 271,000	\$ 45,167	Filing fees	\$ 271,000	\$ 45,167
	base for all of Racine County	Digital conversion of planimetric maps—	352,900	58,817	Filing fees State LIS grants	323,000 29,900	53,833 4,983
		Digital conversion of cadastral maps—	738,225	123,037	State LIS grants County tax levy	570,100 168,125	95,017 28,021
		entire county Digital conversion of zoning maps—	139,150	23,192	County tax levy	139,150	23,192
		entire county Digital conversion of hypsometry data entire county	680,000	113,333	County tax levy	680,000	113,333
		Total	\$2,181,275	\$363,546	Filing fees State LIS grants County tax levy	\$ 594,000 600,000 987,275	\$ 99,000 100,000 164,546
					Total	\$2,181,275	\$363,546

Source: SEWRPC.

be completed—on the digital conversion of cadastral maps in the eastern portion of the County. Thus, while substantial progress would be made over the next six years toward the desired end result, there would not be in place an operational automated mapping base for even the eastern portion of the County at the end of that period.

#### 2. Intermediate Program

Under the intermediate program, it is assumed that Racine County would apply for and receive the maximum available state grants from the Wisconsin Land Information Board over the six-year period. Under the state program, Racine County would be eligible to apply for a grant of up to \$100,000 annually. This program is based on the assumption that Racine County would apply for and receive a total of \$600,000 in State funds during the planning period. Under this assumed program, and taking into account both the retained Register of Deeds filing fees described under the minimum program and the assumed state grants, a total of \$1.19 million would be available to complete work toward the countywide automated mapping base. As shown in Table 2, this would permit the completion of an operational automated mapping base for the eastern portion of Racine County. The only missing information in that base would be the hypsometric data from the topographic maps, only a small portion of which would be converted to digital form under the intermediate program.

### 3. <u>Maximum Program</u>

Under the maximum program, all work attendant to the creation of an operational automated mapping base for the entirety of Racine County would be completed. In addition to the retained Register of Deeds filing fees and state land information system grants assumed under the intermediate program, this program makes the further assumption that Racine County would levy an average annual property tax of about \$165,000 over the six-year period. When combined with the filing fees and assumed state grants, such a tax levy would permit the completion of the automated mapping base throughout the County.

In considering the foregoing program scopes and attendant fiscal impacts, the Advisory Committee recommended that Racine County proceed with the intermediate program. Under that program, the County would use the retained Register of Deeds filing and recording fees and all potentially available state grants from the Wisconsin Land Information Board to complete over the next six years a limited, but fully functional, automated mapping base for the eastern portion of Racine County. In addition, the Advisory Committee recommends that the Racine County Board and County Executive give careful consideration to funding additional work through the property tax levy so that a fully functional automated mapping base can be completed for all of Racine County.

### PROPOSED COLLATERAL STUDIES AND WORK EFFORTS

As work proceeds over the next six years to further develop and hopefully complete the automated mapping and land information system base for Racine County, additional activities need to be undertaken to help direct the development and management of the overall system. Toward this end, the following specific work activities are recommended to be undertaken by Racine County during the planning period:

### 1. <u>Specifications and Standards</u> for Digital Conversion

A special technical study needs to be undertaken to develop and document specifications and standards for the conversion to digital format of the survey control network, the large-scale planimetric and topographic maps, and the real property boundary line maps. This study should be undertaken at the beginning of the planning period, since specifications need to be in place before resources are committed to digital conversion efforts. In part, this work effort involves defining the digital "layers" of information to be developed. As a first step in this work effort, Table 3 includes an initial set of such digital "layers." This initial set should be reviewed and revised as may be necessary. It is recommended that this work effort be the responsibility of the Racine County Information Systems Director, and that the Racine County Information Systems staff perform the work.

### Table 3

# PROPOSED INITIAL SET OF DIGITAL LAYERS OF INFORMATION UNDER THE RACINE COUNTY LAND INFORMATION SYSTEM PLAN

Multipurpose Cadastre Element	Information Category	Digital Information Layer
Geodetic Reference Framework	Map projection system	<ul> <li>Wisconsin State Plane Coordinate System, South Zone, North American Datum of 1927, 1,000 feet interval grid intersections and corresponding state plane coordinate values<sup>a</sup></li> </ul>
	U. S. Public Land Survey System	<ul> <li>U. S. Public Land Survey corners and monument symbols and state plane coordinates</li> <li>U. S. Public Land Survey section and and quarter-section lines and grid lengths and grid bearings</li> </ul>
Large-Scale Base Maps	Natural features	<ul> <li>Lakes, ponds, streams, watercourses, and drainage ditches symbolized as open water and associated lettering</li> <li>Streams, watercourses, and drainage ditches not symbolized as open water and associated lettering</li> <li>Marshes and associated lettering</li> <li>Accentuated contour lines and elevations</li> <li>Other contour lines</li> <li>Accentuated depression contour lines and elevations</li> <li>Other depression contour lines</li> <li>Spot elevations and associated lettering</li> <li>Water surface elevations and associated lettering</li> <li>U. S. Public Land Survey corner elevations</li> </ul>
	Cultural features	<ul> <li>Pavements and curbs and their associated lettering</li> <li>Unimproved roads and their associated lettering</li> <li>Driveways and their associated lettering</li> <li>Trails and their associated lettering</li> <li>Power line towers and fences and their associated lettering</li> <li>Railways and their associated lettering</li> <li>Buildings, building foundations, and ruins and their associated lettering</li> <li>Wooded areas and their associated lettering</li> <li>Dams, piers, dock walls, and similar water-related structures and their associated lettering</li> <li>Culverts and culvert headwalls and their associated lettering</li> <li>Bridge decks and their associated lettering</li> <li>Bridge wing walls, retaining walls, and similar transportation-related structures and their associated lettering</li> <li>Runways, taxiways, and similar aviation-related features and their associated lettering</li> <li>All other identifiable planimetric features not separately enumerated above and their associated lettering</li> </ul>
Overlays	Cadastral boundary	<ul> <li>Right-of-way lines and their associated lettering</li> <li>Public easement lines and their associated lettering</li> <li>Land subdivision boundaries and their associated lettering</li> <li>Certified survey map boundaries and their associated lettering</li> <li>Real property parcel lines</li> <li>Real property parcel dimensions</li> <li>Real property parcel polygons</li> </ul>

#### Table 3 (continued)

Multipurpose Cadastre Element	Information Category	Digital Information Layer
Overlays (continued)	Cultural area boundary	<ul> <li>Civil division boundary lines and their associated text</li> <li>Land use polygons</li> <li>Zoning district polygons</li> <li>Shoreland district polygons</li> </ul>
	Natural area boundary	<ul> <li>Floodplain polygons</li> <li>Soil mapping unit polygons</li> </ul>
Identifiers	Parcel numbers	Racine County real property parcel identification     numbers
	Area identifiers	<ul> <li>SEWRPC land use codes</li> <li>Local jurisdiction zoning district identifiers</li> <li>SCS soil mapping unit identifiers</li> </ul>
Land Information Files	Cadastral parcel records	<ul> <li>Real property ownership records</li> <li>Real property assessment records</li> <li>Real property tax records</li> <li>Permits</li> </ul>
	Cultural Data	<ul> <li>Civil division areas</li> <li>Land use areas</li> <li>Zoning district areas</li> </ul>
	Natural resource data	SCS soil suitability and characteristic records

<sup>a</sup>Assumes standard one inch equals 200 feet scale mapping; for one inch equals 100 feet scale mapping, the grid interval would be 500 feet.

Source: SEWRPC.

### 2. Parcel Identification Numbers

Early in the planning period, Racine County should conduct a special study of the present system of identifying parcels. This study should identify in detail how the current Racine County and City of Racine parcel numbering system should be adapted to meet the unique parcel identification numbering system promulgated by the Wisconsin Land Information Board. The study should, in particular, identify how the parcels can be coded to the U.S. Public Land Survey one-quarter section. It is recommended that this work effort be the responsibility of the Supervisor of the Racine County Real Estate Description Department, and that personnel in that Department perform the work at no additional cost to the program.

## 3. Data Custody, Control, and Maintenance

During the planning period, it is recommended that Racine County also conduct a cooperative study with the local units of government in the County attendant to issues involving the custody, control, and maintenance of land records information, including issues attendant to the security of the system and to public access. Agreement needs to be reached in such a study on the best way in which to maintain the cadastral maps throughout the County. Consideration should be given in the study also to the costs associated with maintaining the digital land information base once that base is completed. This would include the maintenance efforts associated with the Public Land Survey system, topographic mapping, and cadastral mapping.

The study should ascertain any needs attendant to the security of the land information system. The study should propose recommendations attendant to all of these interrelated matters and, as may be necessary, include a recommended system maintenance budget for consideration by the Racine County Board of Supervisors. It is recommended that this work effort be the responsibility of the Racine Information Systems Director, and that existing Information Systems staff perform the work. Close coordination with the Racine County Real Estate Description and Public Works Departments will be required in this respect.

### 4. <u>Hardware and Software</u>

#### Analyses for <u>Racine County</u>

During the six-year planning period it is also recommended that Racine County undertake an analysis of its internal geoprocessing needs. This analysis should examine such needs throughout the entire structure of county government and should be predicated upon the ultimate completion of the automated mapping base described earlier in this chapter. The study should culminate in the making of recommendations to the Racine County Board of Supervisors attendant to the acquisition of hardware and software needed to meet Racine County internal geoprocessing needs, together with recommendations for building the information "layers" uniquely suited to meet Racine County's needs as a unit of government. The study should also explicitly identify and address any security issues attendant to the development and maintenance of the unique information base to be constructed for Racine County. Public access needs attendant to that information base should also be addressed, as well as any needs attendant to the preservation of an individual's right to privacy as might be associated with, for example, certain types of law enforcement records. Finally, the study should identify a strategy for education and training of county personnel in particular attendant to the use of the County's land information system. It is recommended that this work effort be the responsibility of the Racine County Information Systems Director. The **Racine County Information Systems Direc-** tor may desire to combine this study with the study described above attendant to the specifications and standards for digital conversion.

### 5. <u>Image Storage and Retrieval</u>

System in Register of Deed's Office During the planning period, it is recommended that Racine County undertake a study of the benefits and costs associated with using optical disk technology to establish a computerized image indexing, storage, retrieval, transmittal, and copying system in the Register of Deed's office. Under such a system, original documents brought to the Register of Deeds for recording or filing are processed through a scanning device that electronically captures the image on each page of the document and stores that image on an optical platter similar to a compact disk used in audiovisual recording. Once properly indexed and processed through the scanning device, all documents are readily accessible for retrieval and viewing on computer terminals. In effect, the optical disk is an "electronic filing cabinet." The technology used normally is "read only memory," meaning that a user retrieving a document cannot change its content.

It is possible, with the proper attached devices, to produce from computer terminals a hard copy of the image being viewed on the computer screen or to direct that image to be sent over a telephone line to a remote user where a hard copy is received on a facsimile machine. Such imaging processing systems greatly speed access to and retrieval of documents and reduce archive floor space needs. The technology permits the establishment of remote access systems whereby heavy users of documents, such as title companies, can, for a fee, connect terminals at their offices to the "electronic filing cabinet" in the Register of Deed's office. It is recommended that this work effort be the responsibility of the Racine County Register of Deeds as the designated Land Information Officer for Racine County.

It is important to note that the establishment of an optical image storage and retrieval system should not affect the way in which the automated land information mapping data base for Racine County described in this report would be developed. That automated data base cannot be "image driven," that is, it cannot be related to the information, whether written or graphic, contained on a single "hard copy" sheet. Rather, that data base must be interactive in nature, capable of being updated and revised. The optical disk imaging system only deals with the storage, retrieval, and production of individual sheets, or images, and is not capable of being updated and revised. Nevertheless, it would be possible, using the proposed automated mapping base, to produce a map of a given geographic area as an image on a single sheet of material and then capture that image using optical disk technology and thereby make that image available to all users in "read only memory" form.

6. State Grant Applications

It may be expected that both Racine County as a unit of government and perhaps one or more local units of government within Racine County will over the six-year period seek state grants in support of the development of the recommended automated mapping and land information system. It is recommended that any such grant applications, before being submitted to the Wisconsin Land Information Board, first be found to be consistent with the program objectives and standards set forth in this document. It is recommended that upon such a finding, Racine County submit to the Wisconsin Land Information Board any application by a local unit government in the County with a recommendation for approval.

### PROPOSED ORGANIZATIONAL ARRANGEMENTS

Institutional Structure to Conduct Program The following institutional structure is recommended to carry out the aforedescribed work program during the period 1991 through 1996:

1. It is recommended that all activities attendant to the development of the proposed Racine County automated mapping base be under the policy direction of the Racine County Planning and Development Committee. That Committee was designated by the Racine County Board of Supervisors as having policy responsibility for land information matters. It is further recommended that the Racine County Register of Deeds, who is the designated Land Information Officer for Racine County, work with the Planning and Development Committee in carrying out the recommended work program. Working with the Register of Deeds, the Information Systems Director, and the Supervisor of the Real Estate Description Department, the Planning and Development Committee should sponsor the digital specifications and standards; parcel identification; data custody, control, and maintenance; county hardware and software; and image storage and retrieval studies described earlier in this chapter. Any fiscal and policy findings and recommendations coming out of those special studies should, as a matter of course, be reported to the Racine County Board of Supervisors and County Executive for funding and policy determination.

2. It is recommended that the Racine County Register of Deeds serve as the agent for Racine County in the development and submittal of any grant applications for Racine County that seek state grants from the Wisconsin Land Information Board. It is further recommended that the County Planning and Development Committee serve as the body for reviewing any applications submitted by a local unit of government in Racine County for state funds in support of land information system development work. If the Planning and Development Committee finds that an application by a local unit of government is consistent with the plan objectives and standards set forth in this document, it should forward the application to the Wisconsin Land Information Board with a favorable recommendation for approval. If the Committee cannot make such a finding, then it should return the application to the local unit of government, together with a statement of the reasons why the application is inconsistent with the objectives and standards set forth in this plan and any suggestions that the Committee

might have to modify the application to make it consistent with the plan.

#### Public Access to Records

All of the information that comprises the Racine County Land Information System base-including monumentation and survey control data, planimetric and topographic base mapping data, cadastral mapping data, and parcel identification data-may constitute public information under the Wisconsin Open Records Law. Consequently, Racine County will make such data available to both public and private sector interests upon request. In adopting this plan document, Racine County recognizes the Register of Deeds as the official custodian of all data attendant to the County Land Information System base. In accordance with established Racine County policy, all requests for data from that base should be submitted to the Register of Deeds on such forms and in such manner that the Register of Deeds may prescribe. All reasonable costs associated with fulfilling such requests shall be paid for by the requesting party.

As Racine County in future years builds upon the automated mapping base described in this plan, it may be expected that additional "layers" of information will be added to that base. Some of those "layers" of information may consist of data that under Wisconsin law is to be kept confidential in order to protect individual rights of privacy. The detailed study of Racine County geoprocessing needs recommended earlier in this chapter should explicitly address public access considerations attendant to these additional "layers" of information.

### Administrative Considerations

The guidelines promulgated by the Wisconsin Land Information Board call for the explicit response of Racine County to certain administrative standards and requirements. The following explicitly addresses those guidelines:

1. <u>Relationship to Wisconsin</u> Land Information Program

By adopting the Racine County Land Information System Plan set forth in this document, Racine County agrees to observe and follow Wisconsin Statutes attendant to the Wisconsin Land Information Program. 2. Access to Books, Records, and Projects By adopting the Racine County Land Information System Plan set forth in this document, Racine County agrees to permit the Wisconsin Land Information Board, upon reasonable notice, access to books, records, and project materials for inspection and audit purposes.

### 3. Annual Report

By adopting the Racine County Land Information System Plan set forth in this document, Racine County agrees to prepare an annual report on the status of plan implementation and submit that report to the Wisconsin Land Information Board.

4. <u>Plan Update and Revision</u> By adopting the Racine County Land Information System Plan set forth in this document, Racine County agrees to revise, update, and extend the Racine County plan, such updating work to be undertaken during calendar year 1995.

### SUMMARY

This chapter sets forth a recommended automated mapping and land information system plan for Racine County. The following summarizes the salient elements of that plan:

- 1. It is the goal of Racine County to implement over time a multipurpose, multi-user automated mapping and land information system, such system to follow the National Research Council model. The system would have five basic elements including a geodetic reference framework: large-scale planimetric and topographic base maps; overlays, including cadastral boundaries and boundaries of various cultural and natural areas; identifiers, including parcel numbers and codes associated with various cultural and natural areas; and nonspatial land information files, including cadastral parcel records and various cultural and natural resource data.
- 2. The planning period for the initial land information system plan for Racine County is the six-year period beginning January 1, 1991, and extending through December 31, 1996. Should sufficient fiscal

resources become available, it is intended that the entire automated mapping and land information system recommended for Racine County be completed by the end of that period.

- 3. The recommended standards for the automated mapping and land information system for Racine County are based upon the standards for the development of survey control networks and local largescale mapping programs promulgated by the Southeastern Wisconsin Regional Planning Commission. The standards have been used for many years throughout Southeastern Wisconsin, including Racine County, and have proven to be both conceptually and procedurally sound. The standards include the use of the State Plane Coordinate System, North American Datum of 1927 (NAD-27) as the map projection system for the Racine County automated mapping and land information system; the recovery, or relocation, and monumentation of U.S. Public Land Survey corners, including section and quarter section and center of section corners; the establishment through high order control surveys of coordinates for such corners based upon the Wisconsin Coordinate System, South Zone, (NAD-27); the establishment through high order control surveys of elevations of all such corners based upon National Geodetic Vertical Datum, 1929 adjustment (NGVD-29); the preparation to National Map Accuracy Standards of large-scale planimetric and topographic base maps; the preparation of companion large-scale cadastral maps identifying real property boundary lines and related information; and parcel identification numbers.
- 4. The total cost of completing the entire recommended automated mapping and land information system base for Racine County is estimated at \$2.18 million. Of this total, \$1.37 million is required to complete the mapping base within the eastern portion of Racine County—defined as all that area of Racine County east of a line nominally two-miles west of IH 94 and the remaining \$0.81 million required to complete the western portion of the

County. The work included within these cost estimates includes the completion of the conventional cadastral mapping compilation in Racine County, all of which is located in the City of Racine; the digital conversion of planimetric mapping features from the existing topographic maps of the County; the digital conversion and adjustment as may be necessary of the cadastral maps throughout the entire County; the digital conversion of the hypsometric information from the topographic maps; and the digital conversion of existing zoning maps, including floodplains and shorelands.

- 5. Four potential sources of revenue were identified to support the recommended work program. These include the supplemental Register of Deeds recording and filing fees mandated under the Wisconsin Land Information Program, potential state grants from the Wisconsin Land Information Board, contributions by local governments and utilities, and county tax levy monies. The Racine County-retained Register of Deeds filing and recording fees are anticipated to total about \$594,000 over the six-year planning period, or about \$99,000 annually. State grants of up to \$100,000 can be sought on an annual basis with a required 25 percent local match. At the present time, no local government or public or private utility in the County has come forth with a commitment to provide funds to support the program. Also at the present time, no county tax levy monies are being made available to support the further development of the system, although periodically county tax monies are made available to maintain the existing components of the system, consisting of the survey control network and the topographic mapping.
- 6. The Advisory Committee formulated three alternative but cumulative work programs over the six-year period 1991-1996. Under a minimum program, defined as a work effort scaled against only the anticipated Register of Deeds filing and recording fees, substantial progress would be made over the planning period in completing cadastral map compilation work and beginning

the process of digitally converting available information. At the end of the planning period, however, there would not, under the minimum program, be in place an operational automated mapping base for the eastern portion of the County. Under the intermediate program, it was assumed that Racine County would be successful in receiving the maximum available state grant of \$100,000 annually from the Wisconsin Land Information Board. When combined with the filing and recording fees, about \$199,000 annually would be available for work toward completion of the automated mapping base. Under the intermediate program, an operational automated mapping base for the eastern portion of Racine County would be completed at the end of the six-year planning period. Under the maximum program, it was assumed that Racine County would levy an average annual property tax of about \$165,000 over the six-year period for the purpose of automated base mapping. When combined with the filing fees and assumed state grants, this property tax levy would permit the completion of the automated mapping base throughout the County. The Advisory Committee recommended that Racine County proceed with the intermediate program and seek all available state grants. In addition, the Advisory Committee recommended that the Racine County Board and County Executive give careful consideration to funding additional work through a property tax levy so that a fully functional automated mapping base can be completed for the entire County.

7. As the automated base mapping work continues over the next six years, several technical studies need to be undertaken. These include studies relating to specifications and standards for digital conversion; data custody, control, and maintenance; and hardware and software for Racine County, all recommended to be the responsibility of the Racine County Information Systems Director. In addition, a study is required with respect to parcel identification numbers, identifying in detail how the existing Racine County and City of Racine parcel numbering systems should be adapted to meet the unique parcel identification numbering system promulgated by the Wisconsin Land Information Board. This latter study is recommended to be the responsibility of the Supervisor of the Racine County Real Estate Description Department. Finally, it is recommended that a pilot study be undertaken to identify the benefits and costs associated with using optical disk technology to establish a computerized image storage and retrieval system in the Register of Deeds office. All five studies should be conducted under the sponsorship of the Racine County Planning and Development Committee.

- 8. Upon approval of the Racine County land information system plan by the Racine County Board of Supervisors, the Racine County Executive, and by the Wisconsin Land Information Board, local units of government in Racine County would be eligible to seek state grants from that Board. It is recommended that any locally sponsored land information project seeking such state funds meet the system standards identified in this chapter. In that way all projects will contribute toward achieving the overall objectives underlying the county plan. All local applications for state grants should be reviewed by the County Planning and Development Committee. Upon a finding by that Committee that an application is consistent with the Racine County plan, the application should be forwarded to the Wisconsin Land Information Board with a favorable recommendation for approval.
- 9. In order to meet the administrative standards and requirements promulgated by the Wisconsin Land Information Board, Racine County by adopting this document agrees to observe and follow Wisconsin Statutes attendant to the Wisconsin Land Information Program; to permit the Wisconsin Land Information Board access to books, records, and project materials for inspection and audit purposes; to prepare and submit to the Wisconsin Land Information Board an annual report on the status of plan implementation; and to revise, update, and extend the Racine County plan by the end of calendar year 1995.

#### Chapter V

### SUMMARY AND CONCLUSIONS

#### INTRODUCTION

On July 24, 1990, the Racine County Board of Supervisors adopted, and the Racine County Executive subsequently approved, a resolution requesting the Southeastern Wisconsin Regional Planning Commission to assist the County in the preparation of a plan for land records modernization, focusing on the development of an automated mapping and parcel-based land information system. The County Executive and County Board also created an Advisory Committee to help guide the preparation of the plan. The Committee consists of knowledgeable representatives of Racine County, of local units and agencies of government in the County, and of private utilities serving the County. This report sets forth the findings and recommendations of that Committee. The Committee was chaired by the Racine County Register of Deeds, who was designated by the County Board and County Executive as the official contact person for the County Land Information Office. The policymaking body for the Land Information Office is the Planning and Development Committee of the County Board.

The Advisory Committee reviewed the pertinent conclusions of previous research efforts in the area of land records modernization, including importantly—the reports of the National Research Council of the National Academy of Sciences, the reports of the Wisconsin Land Records Committee, the guidelines promulgated by the Wisconsin Land Information Board, and the long-standing recommendations of the Southeastern Wisconsin Regional Planning Commission. The Advisory Committee also reviewed the accomplishments to date of public and private efforts to create automated mapping and land records systems covering all or portions of Racine County.

The Advisory Committee concluded that a modernized land records system in Racine County could best be created by provision of a single automated mapping base for the entire County. This single mapping base would be prepared to a set of specifications sufficient to meet the most stringent of accuracy and map feature content requirements of all of the users concerned. Such specifications are set forth in Chapter IV of this report. Each organization using the automated base would provide its own operating environment-that is, computer hardware and software. Only the digital maps and parcel identification system would be shared. This basic system would provide an automated mapping capability suitable for the development by individual operators of a wide variety of applications such as land ownership and title recordation systems, real property assessment and taxation systems, public and private utility inventory and management systems, environmental inventory and management systems, zoning and other code monitoring and enforcement systems, and emergency and service vehicle response and routing systems.

The plan set forth in this document is recommended to the Racine County Board of Supervisors and County Executive for adoption. Upon adoption of the plan, the Committee recommends that the plan be formally submitted to the Wisconsin Land Information Board with a request that the plan be approved by that Board. Upon approval by that Board, Racine County would be in a position to begin expending the supplemental Register of Deeds filing and recording fees authorized under the Wisconsin Land Information Program in a manner consistent with the plan recommendations. In addition. Racine County would be in a position to submit applications for the state grants in support of the activities specified in the plan. Finally, local units of government in Racine County would also be in a position to submit applications for state grants. Such applications under state law would have to come through Racine County and be endorsed by the County so that any state funds expended are directed at activities consistent with the adopted plan.

### RECOMMENDED CONCEPTUAL FRAMEWORK

The conceptual framework for a multipurpose cadastre as set forth by the National Research Council and as adapted for use by Racine County consists of the following elements:

- 1. A geodetic reference framework to identify the spatial location of all land-related data. This reference framework—or survey control network—consists of a system of survey monuments for which geodetically based coordinates have been determined through high order control surveys. In accordance with the long-standing recommendations of the Southeastern Wisconsin Regional Planning Commission, the geodetic reference framework to be used in Racine County is to consist of the corners of the U. S. Public Land Survey System tied to the State Plane Coordinate System.
- 2. Large-scale topographic base maps showing in their correct location and orientation the principal natural and cultural features of the area concerned and the elevation and configuration of the surface of the earth. Within the context of the Racine County program, large-scale means one inch equals 200 feet scale, two-foot contour interval topographic maps. These maps must meet National Map Accuracy Standards in accordance with specifications promulgated by the Southeastern Wisconsin Regional Planning Commission.
- 3. A cadastral overlay to the topographic base map which identifies and delineates the most fundamental units of land ownership—the cadastral parcels. Such cadastral overlay maps are also to be prepared in accordance with specifications promulgated by the Southeastern Wisconsin Regional Planning Commission.
- 4. A parcel identifier constituting the means for linking all spatially related data to the mapping base and of storing, retrieving, and exchanging such data. Every parcel must have a unique identifier code.
- 5. Land information files which contain data about the land parcels and which are related to the mapping base through the parcel identifier. Such files can be either graphic or nongraphic in nature.

It is intended that the first four of the five elements of the multipurpose cadastre in Racine County, together with a portion of the fifth element—that dealing with zoning information, including floodplains and shorelands—be provided by the County and that such elements be made available in digital—i.e., computerreadable—form. These elements collectively would constitute the automated mapping base. Building upon that base, Racine County, the local units of government in the County, and public and private utilities operating in the County can create the remainder of the fifth element of the cadastre, namely, the supplemental land information files required to support the particular functions of the public and private agencies concerned.

The recommended standards for the automated mapping and land information system for Racine County are based upon the standards for the development of survey control networks and local large-scale mapping programs promulgated by the Southeastern Wisconsin Regional Planning Commission. These standards have been used for many years throughout the Region, including Racine County, and have proven to be both conceptually and procedurally sound. The standards include the use of the State Plane Coordinate System. North American Datum of 1927 (NAD-27), as the map projection system for the Racine County automated mapping and land information system; the recovery, or relocation, and monumentation of U.S. Public Land Survey corners: the establishment through high order control surveys of coordinates for such corners based upon the Wisconsin Coordinate System, South Zone, (NAD-27); the establishment through high order control surveys of elevations of all such corners based upon National Geodetic Vertical Datum, 1929 Adjustment (NGVD-29); the preparation to National Map Accuracy Standards of large-scale planimetric and topographic base maps; the preparation of companion large-scale cadastral maps identifying real property boundary lines and related information; and parcel identification numbers.

### STATUS OF DEVELOPMENT OF AUTOMATED MAPPING BASE

The following summarizes the status of the development of the recommended automated mapping base in Racine County as of December 31, 1990:

1. Working cooperatively, Racine County and the Regional Planning Commission have completed the required geodetic reference framework throughout the County. All the 1,478 U. S. Public Land Survey corners in the County have been recovered and remonumented. In addition, State Plane Coordinates and elevations have been obtained for all corners.

- 2. Large-scale topographic base maps have been obtained for the entire 340-squaremile area of Racine County. All such maps were obtained in "hard copy" analog form. This topographic mapping needs to be converted to digital form.
- 3. Cadastral maps, either at a scale of one inch equals 100 feet or at a scale of one inch equals 200 feet, have been prepared for about 328 square miles, or about 96 percent, of the area of the County. The cadastral mapping process includes the assignment of the required parcel identifier. The mapping completed to date represents about 43,575 parcels, or about 63 percent of the approximately 69,575 parcels in Racine County. Such cadastral maps need to be completed for the remainder of Racine County, and all cadastral maps need to be converted to digital form.

### **RECOMMENDED PLAN**

The recommended Racine County land information system plan was prepared for the six-year period 1991 through 1996. This planning period corresponds with the state legislation which established the supplemental Register of Deeds recording and filing fees. Based on current state law, the additional filing fees expire at the end of state fiscal year 1996. Should sufficient fiscal resources become available, it is the recommendation of the Advisory Committee that the entire automated mapping base recommended for Racine County be completed by the end of 1996. The Advisory Committee recognizes, however, that there may be fiscal constraints that would preclude reaching that goal by the end of this initial six-year planning period.

The total cost of completing the entire automated mapping and land information system base for Racine County is estimated at \$2.18 million. Of this total, \$1.37 million is required to complete the mapping base for the eastern portion of Racine County—defined as all that area of Racine County east of a line nominally two miles west of IH 94. The remaining \$0.81 million would be required to complete the western portion of the County. The work included within these cost estimates consists of the completion of the conventional cadastral mapping compilation in Racine County, all of which is located in the City of Racine; the digital conversion of planimetric mapping features from the existing topographic maps of the entire County; the digital conversion and adjustment as may be necessary of the cadastral maps throughout the entire County; the digital conversion of the hypsometric information from the topographic maps; and the digital conversion of existing zoning maps, including floodplains and shorelands.

The Advisory Committee identified four potential sources of revenue to support the recommended work program. These include the supplemental Register of Deeds recording and filing fees mandated under the Wisconsin Land Information Program, potential state grants from the Wisconsin Land Information Board, contributions by local governments and utilities, and county tax levy monies. The recording and filing fees are expected to total about \$594,000 over the six-year planning period, or about \$99,000 annually. State grants of up to \$100,000 can be sought on an annual basis with a required 25 percent local match. No county tax levy monies or local government or public or private utility funds appear to be available at the present time to support the further development of the system.

Three alternative but cumulative work programs were formulated by the Advisory Committee for the six-year period 1991-1996. Under a minimum program, defined as a work effort scaled against only the anticipated filing and recording fees, substantial progress would be made over the planning period in completing cadastral map compilation work and beginning the process of digitally converting available data. At the end of the planning period, however, there would not under this minimal program be in place an operational automated mapping base for even the eastern portion of Racine County.

Under the intermediate program, an assumption was made that Racine County would apply for and be successful in obtaining annual grants in the amount of \$100,000 from the Wisconsin Land Information Board. When combined with the retained Register of Deeds filing and recording fees, sufficient funds would become available to permit the completion of a limited, but fully operational, automated mapping base for the eastern portion of Racine County by the end of the six-year planning period.

Under the maximum program, it was assumed that Racine County would not only be successful in receiving state grants in the amount of \$100,000 annually from the Wisconsin Land Information Board, but that Racine County would levy an average annual property tax of about \$165,000 over the six-year period. With such additional local monies, it would be possible to fully complete the automated mapping base for the entire County.

In considering these alternative programs, the Advisory Committee recommended that Racine County proceed with the intermediate program and seek all available state grants. In addition, the Advisory Committee recommended that the County Board and County Executive give careful consideration to funding additional work through a property tax levy in order to permit the completion of a fully functional automated mapping base for the entire County.

It is recommended that the Racine County Planning and Development Committee oversee all work associated with the development of the Racine County automated mapping and land information system base over the next six-year period. As the designated County land information officer, the Racine County Register of Deeds would work with the Planning and Development Committee in carrying out the work program. The Planning and Development Committee should also sponsor four technical studies needed to provide additional guidance in the development of the land information system for the County. These studies are:

- 1. A study to develop detailed specifications and standards for the digital conversion of data.
- 2. A study to identify and address issues attendant to data custody, control, and maintenance.
- 3. A study to identify the geoprocessing hardware and software requirements for Racine County as a unit of government.
- 4. A study to determine how the existing Racine County and City of Racine parcel

numbering systems can best be adapted to meet the unique parcel identification numbering system promulgated by the Wisconsin Land Information Board.

The first three of these studies should be the responsibility of the Racine County Information Systems Director. The fourth should be the responsibility of the Supervisor of the Racine County Real Estate Description Department.

Finally, it is recommended that the Racine County Planning and Development Committee also sponsor a fifth study, a pilot study to identify the benefits and costs associated with using optical disk technology to establish a computerized image storage and retrieval system in the Register of Deeds office. This study should be the responsibility of the Register of Deeds.

The Advisory Committee also recommends that Racine County commit to meeting all of the administrative requirements for County land information programs established by the Wisconsin Land Information Board. In particular, Racine County should prepare and submit to that Board an annual report on the status of plan implementation. Furthermore, Racine County should commit to revise, update, and extend this plan by the end of calendar year 1995.

### CONCLUDING STATEMENT

The Racine County Land Information Modernization Plan Advisory Committee has herein set forth a plan and program for the development over time of an automated base map suitable for the development within the County of a parcelbased land information system usable by all Racine County departments, by local governments in Racine County, and by public and private utilities. The plan includes technical specifications for the mapping work involved, and recommends an organizational structure for the conduct of that work. The Advisory Committee recommends that the plan and program set forth herein be approved by the Racine County Board of Supervisors and the County Executive and that work efforts proceed over the next six years in accordance with the outline and organizational structure recommended in this report.

APPENDICES

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### Appendix A

### **RESOLUTION OF THE RACINE COUNTY BOARD OF SUPERVISORS REQUESTING THE SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION TO HELP PREPARE A COUNTY LAND INFORMATION SYSTEM PLAN**

**RESOLUTION NO. 90-73** July 10, 1990

RESOLUTION BY THE PLANNING AND DEVELOPMENT COMMITTEE (LAND INFORMATION COMMITTEE) AUTHORIZING RACINE COUNTY TO RETAIN SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION TO DRAFT A COUNTY-WIDE PLAN FOR LAND RECORDS MODERNIZATION

To the Honorable Members of the Racine County Board of Supervisors:

WHEREAS, the Racine County Board of Supervisors adopted Ordinance No. 90-44 establishing a Land Records Office and a Land Information Committee; and

WHEREAS, the Land Information Committee recommends that the Southeastern Wisconsin Regional Planning Commission be retained to draft a long range plan for Land Records Modernization for Racine County; and

WHEREAS, this long range plan must be filed with the Wisconsin Land Information Board (WLIB) before Racine County can apply for any grants from the WLIB.

**BE IT RESOLVED** by the Racine County Board of Supervisors that Racine County authorizes the Southeastern Wisconsin Regional Planning Commission to prepare a long range plan for Land Record Modernization to fulfill the requirements of Sec. 59.88 WIS. STATS. which is to be filed with the Wisconsin Land Information Board (WLIB).

**BE IT FURTHER RESOLVED** by the Racine County Board of Supervisors that the Southeastern Wisconsin Regional Planning Commission shall be paid a sum not be exceed \$3,000.00 by Racine County for said long range plan and said sums are to be disbursed out of the Land Information expense account which is a non-lapsing account.

1st Reading  $7 \cdot 10^{-90}$  2nd Reading  $7 \cdot 24 \cdot 90$ 

VOTE REQUIRED: 2/3's (M.E.)

Prepared by: Corporation Counsel

Respectfully submitted,

PLANNING & DEVELOPMENT COMMITTEE

Richard G. Rehberg, Chairman

Vice-Chairman

Ε. Ross Hérmes, Secretary

Betsv Geora Patrick J. Verbeter H. John Anderson 57

BOARD ACTION Adopted

Absent

For Against

Wilbert P. Gumm

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### Appendix B

### **RESOLUTION OF THE RACINE COUNTY BOARD OF SUPERVISORS** ESTABLISHING A COUNTY LAND INFORMATION OFFICE

June 12, 1990

#### ORDINANCE NO. 90-44

ORDINANCE BY THE PLANNING AND DEVELOPMENT COMMITTEE ESTABLISHING A LAND INFORMATION OFFICE

To the Honorable Members of the Racine County Board Of Supervisors:

The Racine County Board of Supervisors do ordain as follows:

#### Part 1

Section 3.11 of the Racine County Code of Ordinances relating to the creation of the Land Information Office is hereby created to read as follows:

#### 3.11 LAND INFORMATION OFFICE

- 3.111 **Land Information Office**. Racine County establishes and appoints the Racine County Register of Deeds Office as the Racine County Land Information Office pursuant to Section 59.88 of the Wisconsin Statutes.
- 3.1.12 **Duties.** The responsibilities and duties of the Land Information Office are:
  - a. Coordinate land information projects within the County, between the County and local governmental units, between the State and local governmental units and among local governmental 'units, Federal government and the private sector.
  - Within two (2) years after the Land Information
     Office is established, develop a county-wide
     plan for land records modernization.
  - c. Review and recommend projects from local governmental units for grants from the Land Information Board under section 16.967(7) of the Wisconsin Statutes.
  - d. Any other duties and responsibilities as mandated by the Wisconsin Statutes.

June 12, 1990

Ordinance No. 90-44 Page Two

3.113

- **Recording Fees**. Racine County shall set its recording fees for instruments that are recorded with the Register of Deeds Office for Racine County at the maximum levels permitted under the Wisconsin Statutes.
  - a. Racine County shall retain any fees that it is authorized to retain pursuant to Section
     59.88(5) of the Wisconsin Statutes or any subsequent amendments of said section.
  - b. The fees retained under Paragraph 3.113(a) shall be used to develop, implement and maintain the county-wide plan for records modernization.
- 3.114 **County Board Committee**. The Racine County Planning and Development Committee of the Racine County Board is designated as the Land Information Committee for the purposes of Section 59.88 of the Wisconsin Statutes and shall be responsible for setting general policy guidelines for the Land Information Office.

Respectfully submitted,

1st Reading <u>6-/2-</u>90

2nd Reading (26.90)

BOARD ACTION Adopted For Against Absent

402) \_3/\_ \_0\_\_\_\_

VOTE REQUIRED: Majority

Prepared by: Corporation Counsel PLANNING & DEVELOPMENT COMMITTEE

Chairman Rehberg, Richard G.

Vice-Chairman Peter Hansen.

E. Ross Hermes, Secretary

Ρ. Wilbert Gumm

Patrick J. Verbeten Н. John Anderson