

CITY OF MILWAUKEE
COMPUTER GRAPHICS SYSTEM - THE FIRST 18 MONTHS

William E. Huxhold
Project Director
Central Electronic Data Services
P.D.I.S. Section
783 North Water Street - Room 200
Milwaukee, WI 53202

The City of Milwaukee has been using a computer graphics system since January, 1978. Now operating two digitizing stations on three shifts per day and a third station on one shift, about 50 percent of the City has been digitized to the parcel level. This paper will describe the map information being stored in the data base, the current uses being made of the data base that has been digitized, and some of the planned applications of the system for the future.

Sources of the Data Base

Four different map series from three different city departments are being used to create the map data base. These maps are described below.

Engineers Quarter Section Maps in the Department of Public Works are the record of public rights-of-way, subdivisions, and certified survey maps of platted property boundaries. Beginning in 1924, copies of all subdivision plats were used to create these maps. They are drawn at a scale of 1" = 100' and cover an area of one-half mile by one-half mile. There are 442 quarter section maps in Milwaukee.

- . Official Maps are quarter-section based maps maintained by public works as a record of open right-of-way only, with no platted lot boundaries. These maps are drawn at a scale of 1" = 200' and there are also 442 of these maps in the City.
- . Plat Page Maps are the City Tax Assessor's record of property ownership boundaries (changes in property boundaries caused by divisions of parcels are recorded as dotted lines - the original platted boundaries remain). These maps are drawn at various scales from 1" = 40' to 1" = 200'. Since each map covers one city block, there are approximately 8,000 of these maps.
- . Land Use Quarter Section Maps are maintained by the planning department as a record of existing land use for each parcel in the city. A land use symbol is placed on each ownership parcel on these maps. They are drawn at a scale of 1" = 200' and since they are also quarter-section based, there are 442 of these maps.

Unique information from each map series is being digitized onto one common map data base. The data base is structured such that all common map elements (e.g. street names) are recorded onto the same "level," or layer. By combining desired levels, the operator can prepare the exact map he desires. For plotting one of the four standard map described above, the appropriate combinations of levels must be selected. A list of the levels used in the system can be found in Figure 1.

There are approximately 160,000 parcels of land in the City of Milwaukee, covering about 96 square miles. At the current rate of digitization completion of the data base is expected by the end of 1981. That would make the digitizing task a four year effort.

Current Uses of the System

In addition to the massive digitizing effort of converting the existing maps to digital form, the system is being used for a number of different purposes for the area of the city that has already been digitized. As more and more of the city is digitized, the system becomes more and more beneficial to the city in these areas.

Map updating

As changes in property boundaries, right-of-way lines, street names, and land use take place, these changes are recorded on the system. A change to a portion of one map automatically changes the same information on the other map series which are affected. For example, if the name of a street is changed on the Engineer's Quarter Section Map, the change is automatically recorded on the Official Map, the Tax Assessor's Plat Page Map, and the Land Use Quarter Section Map. Thus, the change is made only once and by only one department. This is especially beneficial in the recording of newly platted subdivisions, which normally require extensive drafting time by all three departments to update their maps. Map updating time has been cut significantly with the computerized system.

Background drawings for paving plans

When the Public Ways Division of the Bureau of Engineers begins to prepare plans for a street paving project, the graphics system is used to prepare the background drawing. The background drawing is a plot (usually ink on mylar or vellum) of the existing legal information on the street segment to be paved. This plot, usually drawn at a scale of 1"= 10', shows right-of-way, dimensions, ownership boundaries, parcel numbers, etc. from the data base. It is taken to the field where the existing physical information is added as well as elevations.

This process of plotting selected levels for one street segment at a scale which is different from the source maps eliminates a time-consuming task. No longer must the draftsman copy selected information from the Engineer's Quarter Section Map onto a different sheet of paper, changing the scale in the process, and then obtain the appropriate tax maps for adding the ownership information. The system has saved time by having all the map information on one data base available for plotting at any desired scale.

Base maps for Sewer Engineering

The map data base is currently being used to prepare new base maps for the Sewer Engineering Division of public works. Two different maps are being plotted: the

House Connection Atlas, and the Sewer System map.

The House Connection Atlas is a record of the location of sewer connections for each house in the city. These maps, drawn on muslin-backed paper over 50 years ago, are deteriorating because of repeated revisions and because of age. In addition, there is no systematic indexing system (they are drawn at 1" = 60') and no standard sheet size. It was clear that new base maps, using the quarter-section indexing system, were needed. The graphics system is saving most of the re-drawing time by plotting quarter quarter-section base maps from the area of the city that has been digitized.

Similarly, the Sewer System Map which is a record of the sewer network, is old and cannot be easily revised and reproduced. Again, redrawing these maps — one for the storm sewer system and another for the sanitary sewer system — is needed. The system is now being used to make two original plots (one for storm, the other for sanitary) of the background information, thus saving a large amount of redrawing time.

Future Uses of the System

As the digitizing task progresses, new applications of the system are being analyzed, designed, and tested by personnel from the data processing department. Not only are additional uses of the existing data base being developed, but also uses of an expanded data base and uses of new data bases are being planned.

Additional uses of the existing data base

A revolutionary use of computer graphics in a cadastral mapping system is being planned. The marriage of computer graphics and data base management has provided the capability to display any portion of a map and selectively retrieve and display textual information from a non-graphic data base onto that map.

This Graphics Inquiry Capability provides the capability to display onto the parcel-based maps that have been digitized, whatever data is requested for each parcel from the City of Milwaukee Master Property File (MPROP). MPROP is a data base which contains a record of approximately 50 elements of data on every parcel in the city. Graphics Inquiry provides the user with the ability to

point to a parcel of land on the CRT terminal (by manipulating a cursor), ask for the name of the owner and the assessed valuation (or any other element in the file), and then have that information display immediately on the parcel on the screen. Similarly, inquiries can be made on geographic areas and have information displayed on each parcel within that area. Graphics Inquiry will be installed in 1980.

Expansion of the existing data base

Once digitizing the existing maps is complete (near the end of 1981) digitizing the existing curbs, pavements, and sidewalks will begin. By adding these levels to the data base, the background information for construction plans for the following activities can be automatically plotted:

- . Sewers
- . Water mains
- . Street lighting
- . Traffic control devices
- . Combined underground utilities

Also, zoning boundaries will be added to the existing data base by the planning department. This will eliminate a considerable amount of duplication since several separate sets of zoning maps (three maps per set: use, area, height) with all the associated base map revisions can be replaced by one integrated set of data on the computer.

Additional data base

During the month of October, a thematic mapping capability was added to the system. This allows city planners to prepare color choropleth maps on four different geographies:

- . City of Milwaukee Census Tracts
- . City of Milwaukee Block Groups
- . Milwaukee SMSA Municipalities
- . State of Wisconsin Counties

The maps can be produced in three different sizes. Eleven colors (including black and clear) are available for shading the tracts, block groups, municipalities, and counties.

A graphic representation of the U.S. Census Bureau's GBF/DIME file also has been digitized. This map, showing street segments, segment numbers, and node numbers, was digitized on the same coordinate system as the parcel data base described in the first sections of this paper. It will be used in such applications as vehicle routing and street segment and intersection thematic mapping traffic accidents, crime incidents, fire incidents, etc.).

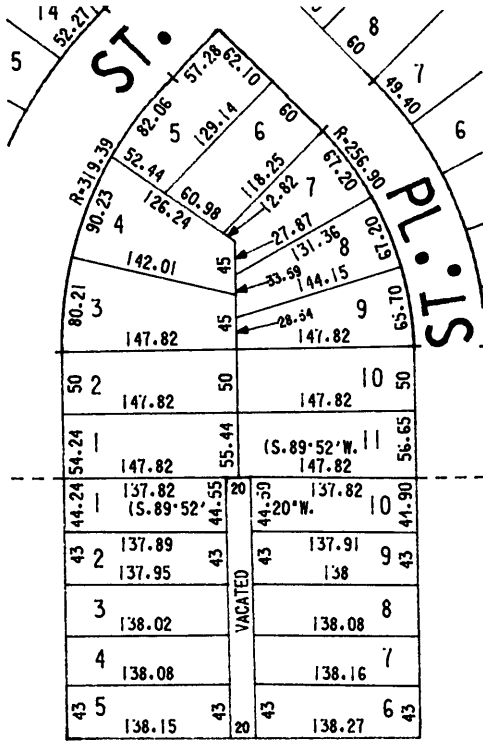
Conclusion

By the end of 1981, when the City has a complete and up-to-date parcel based map data base, many efficiencies in drafting will be realized, as were described earlier in this paper. But what is even more significant than having a computer do some work for the draftsman, is that three different City departments will have cooperated in developing a common data base for most of their mapping needs. With cooperation and commitment like that among departments, the system will continue to be a success (as has already been demonstrated over the past 18 months).

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Figure 1

Level Number	BASE MAP LEVEL DEFINITIONS	MAP			
		Qtr. Sec	Official	Plat Page	Land Use
DESCRIPTION					
1	Section and Quarter Section lines	x	x	x	x
2	Dimensions for Sec. & Qtr. Sec. lines	x	x		
3	Title block for Qtr. Sec. Map	x			
4	City limits line	x	x		x*
5	Public rights-of-way	x	x	x	x*
6	Dimensions for public rights-of-way	x	x	x	
7	Street and place names	x	x	x	x*
8	Subdivision outlines	x		x	
9	Lot lines and parcel lines	x		x	x*
10	Dimensions for lots and parcels	x		x	
11	Lot and parcel numbers	x		x	
12	Subdivision names	x		x	
13	Block numbers	x		x	
14	Dimensions for Exterior of Subdivision	x		x	
15	Easements, other than rights-of-way	x		x	x*
16	Dimensions and names for easements	x		x	x*
17	Border information from Qtr. Sections	x	x		x*
18	Dimensions for block outlines		x		
19	Proposed changes to the Official Map		x		
20	Basic Official Map information		x		
21	Title block for Official Map		x		
22	Ownerships, vinculums, deed changes			x	x*
23	Dimensions for deed changes			x	
24	Tax Key numbers			x	
25	House numbers			x	
26	Title Block for Land Use Map				x
27	Land Use Base Map(Levels 4,5,7,9,22 with changes)				x
28	Land Use Symbols				x
29	Accessory Parking Lots & Building Names				x
30	Border information for Land Use Map				x
31	Ownership lines on non-subdivided property (Lands)	x		x	x*
32	Dimensions for Lands	x		x	
(* denotes copied to another level)					



CUSTER

40	1	138.25 138.31	40	28	40	138.41 138.49	28	40
	2	138.37				138.57	27	
	3	138.43				138.65	26	
	4	138.49				138.73	25	
	5	138.55				138.81	24	
	6	138.61				138.89	23	
	7	138.67				138.97	22	
	8	138.73				139.05	21	

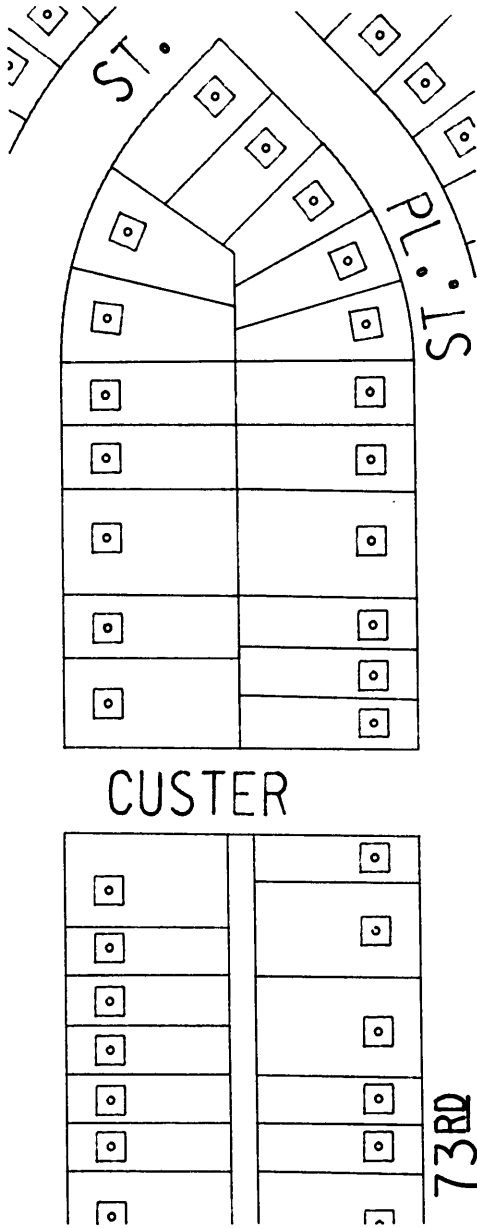
FONDTOSA

ALLEY DISCONTINUED

HIGHLANDS

73RD

A Portion of the Quarter Section Map



A Portion of the Land Use Quarter Section Map