

Redistricting Computer System

December 1990

I. INTRODUCTION

The following paper was written in December 1990 to describe the computer system that was to be used by the Minnesota Legislature to redistrict in 1991 and 1992. The system was used by all four caucuses as well as by the three-judge panels in state and federal court to draw legislative and congressional plans. It was also used by the Legislature to draw Metropolitan Council districts in 1993.

The Legislative Coordinating Commission's Subcommittee on Redistricting was renamed the Subcommittee on Geographic Information Systems in 1992. It has maintained and upgraded the hardware and software used for the system, continuing to rely on SUN as the primary hardware vendor and ESRI as the primary software vendor.

II. BACKGROUND

The State of Minnesota has had a computerized geographic information system since 1967. It was originally developed and maintained by the University of Minnesota under the name Minnesota Land Management Information System (MLMIS). It was not used to support redistricting in 1972. Rather, the University's Minnesota Analysis and Planning System (MAPS), which used a computer only to tabulate the census population data, provided technical support to the Legislature and a three-judge federal court.

In 1978, primary responsibility for the State's geographic information system was transferred from the University of Minnesota's MLMIS to a new Land Management Information Center (LMIC) in the State Planning Agency.

The 1982 redistricting was done on LMIC's PRIME 550 mainframe computer using redistricting software developed by Abt Associates, Inc. under contract with the Subcommittee on Redistricting. Earl Nordstrand, as head of LMIC, supervised the creation and operation of the redistricting system. His supervisor was Al Robinette.

The State Planning Agency has since been reorganized. The functions under Mr. Robinette's supervision are now called the Planning Information Center (PIC), which includes both the Land Management Information Center and the State Demographer. In 1983 the PIC purchased a copy of ARC/INFO (the second site in the country) and has been using it to operate the Land Management Information System on a PRIME 995511 mainframe. The Minnesota Department of Natural Resources (DNR) has also purchased a copy of ARC/INFO for its own GIS. The PIC has a staff of about 16 technical personnel and has provided technical support to the DNR system as needed.

Earl Nordstrand has been hired by ESRI, Inc., the developer of ARC/INFO, to tailor ARC/INFO for use in redistricting.

For the 1992 round of redistricting, Mr. Robinette has recommended that the Subcommittee purchase its own dedicated geographic information system, rather than using the PIC mainframe. The PIC is able and willing to provide technical support, as requested.

III. SYSTEM DESCRIPTION

A. Work Sites

1. Office Space

The computerized redistricting system consists of four caucus work sites and a fifth work site for a nonpartisan system administrator. The system administrator's work site will include the first workstation and all necessary central equipment. The central plotter will be at the system administrator's work site. Additional electrical power will be installed at each work site to insure continuous operation.

2. Graphics Workstations and Peripherals

The system administrator and each caucus work site has a Sun graphics workstation with a Sony color monitor. The system administrator has a 19" monitor and 32 megabytes of memory and a processing speed of 16 MIPS. The caucus workstations have a 16" monitor and 16MB of memory and a processing speed of 15.8 MIPS. Each workstation has a 3.5 inch floppy disk drive and a cartridge tape drive. The system administrator also has a 5.25 inch floppy disk drive, a 9-track tape drive, and a CD-ROM reader. Each workstation has a 9600 Baud modem to facilitate communication with vendors and others involved in redistricting.

3. File Storage

Each caucus work site has about 2 gigabytes of hard disk storage capacity. This is sufficient not only to store the plans created there but also to store a complete copy of the geographic, population, and election database. The system administrator's work site has about 3 GB of hard disk storage.

4. Output Devices

a. Plotters

Each work site has a Hewlett Packard PaintJet XL plotter that can plot 8-1/2" x 11" (A size) and 11" x 17" (B size) maps, either in color or in black and white.

Larger maps can be printed on the Precision Image "E" size (36" x 48") plotter in the system administrator's office. Plot files can be sent to the printer either over the Ethernet network or by carrying a floppy disk to the system administrator's office.

b. Printers

Each work site has a Hewlett Packard LaserJet liP printer to print the reports needed to describe and analyze the plans created there.

5. Copies of Maps

Both the PaintJet plotters and the Precision Image plotter can plot multiple copies of color maps, but that will take considerably longer than copying black and white maps on a Xerox machine. Users will have to decide whether color is worth the wait.

The system administrator will arrange with a local copying shop to help make color copies of maps if that becomes necessary near the end of the process.

6. Backup

The system provides a cartridge tape backup both for each workstation and for the system as a whole, with copies put into vault storage at a remote location.

7. Uninterruptible Power Supply

Each workstation has a Best Power Technology uninterruptible power supply to permit it to be shut down in an orderly manner in the event of a power failure.

B. Network

1. Hardware

The five work sites are connected to each other through an Ethernet network. The network also has a fiber optic cable linking the State Capitol with the State Office Building.

2. Uses

ARC/INFO will be used to copy the common database onto each caucus's hard disk, to transmit plans to the central plotter, and to exchange plans among the caucus work sites. The operating system includes an electronic mail program and message exchange functions.

3. Security

Network security will not allow a user electronic access to the plans, maps, or reports created by any other user, except as authorized by the user who created the plan on which the maps and reports are based. The system administrator has electronic access to all data, plans, maps, and reports, but is not expected to use it except as necessary to keep the system running properly.

C. Database

1. Common Database

The elements of the redistricting database, other than any confidential data added by each caucus, will be maintained by the system administrator as a common database. The common database will be made available to

the four caucuses by periodically copying the entire common database onto each caucus work site's hard disk. Each caucus has agreed to update its copy of the common database whenever the system administrator makes additions, corrections, or deletions. These updates must be accepted and used by each caucus, at least until some point toward the end of the process, when the Subcommittee will authorize each caucus to cease accepting updates.

2. Database Elements

a. Minnesota's Census Geography

The State of Minnesota has 87 counties and about 855 cities, 1,800 towns, 4,100 precincts, and 203,000 census blocks. Some counties also include unorganized territory, that is, geographic areas not organized into a town or city and instead governed directly by the county board.

Minnesota has completed both Phase 1 and Phase 2 of the Census Bureau's 1990 Census Redistricting Data Program, so both its blocks (Phase 1) and precincts (Phase 2) should be properly delineated on the file for use in redistricting. Only 450 out of 4,100 precincts are not "true" precincts. ("True" precincts have boundaries that follow "visible, clearly recognizable physical features," as required by Minn. Stat. § 204B.14, subd. 6. They are shown on census maps exactly as they are used by the political subdivision. The 450 others do not comply with the law and have had to be adjusted for purposes of the census to follow the visible physical features that appear on the census maps. The boundaries actually used for election purposes in these 450 precincts can not be shown on the census maps or used for tabulating census data.)

b. Minnesota's Redistricting Geography

Minnesota has eight congressional districts (possibly seven after the 1990 census), 67 senate districts, and 134 house districts. The congressional districts bear no special relationship to the legislative districts, but the house districts must be nested within the senate districts, two each.

c. TIGER/Line File

(1) File Size

The Census Bureau's Initial Voting District Codes (IVDC) TIGER/Line file for the State of Minnesota, available in December 1990, is estimated to contain about 540 megabytes, which will require at least three full nine-track data tapes or one CD-ROM disk. (A CD-ROM disk holds about 500 megabytes.)

(2) Availability

The State Demographer's Office in the Planning Information Center has been designated by the Census Bureau as the state data center for census materials, so it will be receiving one copy of the pre-census, IVDC and census TIGER/Line file free of charge. The pre-census TIGER/Line file has been received both on tape and on CD. The IVDC file is available only on tape. The Census Bureau will charge \$215 for the first county in the state, plus \$40 for each additional county in the state ordered at the same time. The census TIGER/Line file will be available between January and March, 1991. Users other than the state data center will have to pay about the same as for the IVDC file.

(3) County, Town, City Boundaries

The pre-census TIGER/Line file contains information on county, town, and city boundaries as of January 1, 1988.

The city and town boundaries will be updated to January 1, 1990, as part of the Bureau's Boundary and Annexation Survey (BAS), this winter. The updated boundaries will be included in the Initial Voting District Codes file, to be available August- October, 1990. Final boundary corrections, assuming some are necessary, will be included in the census TIGER/Line file, to be available between January and March, 1991.

(4) Precinct Boundaries

Information on election precinct boundaries will not be available until the Initial Voting District Codes file is released, December 1990. This file will contain the boundaries added to the TIGER/Line file in Phase 2.

Precinct boundaries in Minnesota were "frozen" as of January 1, 1987. The precinct boundaries on the paper maps used in Phase 2 were those used in the 1988 election. However, since some precinct boundaries "float" with the city boundary when territory is annexed, and the Initial Voting District Codes file will include changes in city boundaries up to January 1, 1990, but not through the 1990 election, the precinct boundaries in the Voting District Codes file will not accurately represent those used at either the 1988 or 1990 election.

To correct the file to show the precinct boundaries actually used for the 1990 election, the Subcommittee will consult the files of the Secretary of State to determine which boundaries have changed since 1988, and compare

the Phase 2 maps, the maps produced using the Initial Voting District Codes file, and the most recent maps on file with the Secretary of State and the State Demographer showing the boundaries used in the 1990 election. A similar technique will be used to create the 1988, 1986, and 1984 precinct boundaries.

(5) Blocks and Streets

The blocks and streets shown in the pre-census TIGER/Line file date from 1984-86. The Census Bureau has sent the maps produced from that file to counties, towns, and cities to review, correct, and update them by marking on the paper maps the changes desired.

Changes received by the Bureau in the spring of 1990 will be added to the IVDC file. Changes received later, but before August 1990, will be added to the census TIGER/Line file, but will not cause the creation of new census blocks. The new city blocks will simply be shown as part of the old, larger, census blocks. The redistricting software will make it possible to show these new streets as an overlay on the census blocks.

The Metropolitan Council was the primary source the Census Bureau used to develop the TIGER/Line file for the metropolitan area. The Council provided the Bureau with paper maps, 1987 aerial photographs, and an electronic file without coordinates, which show the changes that had occurred up to about 1986. Since 1989, the Metropolitan Council's Data Center and Information Systems divisions have been using ARC/INFO on personal computers for GIS development. The Council is now cooperating with the Minnesota Department of Transportation to update metropolitan area streets to January 1, 1989, by comparing the MnDoT digital street map (created using InterGraph software) with the TIGER maps. MnDoT first translates the InterGraph file to a Document Exchange File (DXF). The Metropolitan Council then translates the DXF file to an ARC/INFO file and tries to match this ARC/INFO street file to its ARC/INFO version of the TIGER/Line file. Manual processes are used to correct and update this file. The Subcommittee has contracted with the Council to complete this update. Parts of metropolitan area will be provided to the Subcommittee by January 1, 1991, and the remainder by April 1, 1991. The Subcommittee will then use the Metropolitan Council's file to update the census TIGER/Line file, to be received between January and March, 1991. Thus, the Subcommittee's enhanced TIGER file should provide a more accurate picture of the metropolitan area than is available directly from the Census Bureau.

Outside the seven-county metropolitan area, MnDoT has been digitizing its county map series using InterGraph software. The counties adjoining the metropolitan area have been completed and are being kept current. However, the county maps contain only state and county highways, they do not contain city streets, so city streets outside the seven metropolitan counties have not been digitized and will not be digitized in the near future. MnDoT has been maintaining city streets outside the seven-county metro area only on paper maps, which are updated following each construction season. Any update of the TIGER/Line file of city streets outside the metro area, beyond what is done by local officials as part of the Census Bureau's local review program, must be done using the MnDoT paper street maps.

The Subcommittee may contract with the State Planning Agency's Land Management Information Center to update city streets and county highways in the metropolitan statistical areas of Duluth, Moorhead, St. Cloud, Rochester, and Mankato.

(6) Address Ranges

The Metropolitan Council staff took considerable pains to update the address ranges in the 1980 DIME file, and included those updates in the files they gave the Census Bureau in 1986. The Census Bureau has included those updated address ranges in it. During 1990 and 1991, the Council staff will update the pre-census TIGER/Line file address ranges to make them current. They will use the Post Office's electronic ZIP+4 address range file to update the TIGER/Line file. They have also obtained from Northern States Power Company (NSP) an electronic file of all the addresses currently served by NSP, and will be matching the NSP file with their updated TIGER address ranges. Where an NSP address can't be located using the address ranges in the TIGER file, they know they must fix up the TIGER file. (The NSP file covers approximately 75 percent of the addresses in the seven-county area.)

The Subcommittee's contract with the Council for updating streets includes this update of address ranges.

Address ranges outside the metropolitan area are a different story. The City of Rochester may have updated their address ranges, but other cities probably have not.

d. Feature Names

The TIGER/Line file contains physical features such as rivers, lakes, railroads, and power lines, and their names. It contains boundaries of political subdivisions and numerical codes to identify them, but not their names. Those names are available in a separate TIGER extract called the TIGER/GRF-N file (Geographic Reference File - Names). The TIGER/GRF-N file is available for purchase from the Census Bureau for a price of \$275.

These names will be included in the redistricting database, enabling them to be displayed on a monitor while

drawing plans and to be printed on maps and reports describing the plans.

e. Current Legislative and Congressional District Boundaries

The Subcommittee has added current legislative and congressional district boundaries to the redistricting database.

f. PL 94-171 Population Data

The PL 94-171 population data will contain about 90 megabytes. It will be available from the State Demographer's office on or about April 1, 1991, on tape and on CD some time later. The Subcommittee will borrow the tape or CD to load it into the redistricting system.

The Census Bureau must decide by July 15, 1991, whether it will make a statistical adjustment to population counts to correct for any perceived undercount. The database will be designed to accept this adjusted population data after the original data has been installed and to store it either as a replacement for the original population data or as a supplement to it.

The PL 94-171 population data is at the block level. The Census Bureau, as part of the local review process, published preliminary counts at the city and town level only in August of 1990. These preliminary counts will be included in the redistricting database until the PL 94-171 counts are received in the spring of 1991.

g. Election Data

The election database includes statewide, congressional, and legislative races for the 1984, 1986, 1988, and 1990 elections, a total of 25 races. For each of those races, it shows the votes for the DFL candidate, the IR candidate, and the total votes for "other" candidates. It also shows the number of persons voting at each of those four elections. The 1982 election data is not included in the redistricting database because of the difficulty of establishing the 1982 precinct boundaries.

Election data for the years 1984 through 1990 is kept at the precinct level. Once the block-level population counts are added to the database in April of 1991, the election data for each precinct for each year will be allocated to the blocks that were in that precinct during that election year in proportion to the 1990 voting age population in those blocks.

h. Incumbent's Residences

The residence of each incumbent, by block but not by street address, will be added to the redistricting database following the 1990 election. This will permit the redistricting software to warn the user when incumbents have been paired in creating a district and to compare the impact of different redistricting plans on each incumbent by comparing the districts to which the incumbent has been assigned in the different plans.

i. Other Data

The database management software will allow users to add other data about census units to the database. It will permit these additions to be made either interactively or in batch mode. It will facilitate conversion of data from the workstation operating system (UNIX) to DOS (ASCII format) for manipulation on micro computers. It will also facilitate conversion in the reverse direction.

The software will enable the user who adds the data to designate the users to whom it will be available. The database will be flexible enough to permit adding this data after the rest of the database is complete. The Subcommittee assumes that most of this data will be added by caucus staff for the confidential use of the caucus.

D. Redistricting Software

1. Display

a. Geography

The redistricting software will display the census geography, taken from the pre-census TIGER/Line file, along with roads, streets, lakes, rivers, and other physical features included in the TIGER/Line file, as well as the feature names taken from the TIGER/GRF-N file. The display will include a pop-up legend-menu that permits the user to select which boundaries, political subdivision names, physical features, and feature names to display, and whether to display icons showing the residences of incumbents.

The software will be capable of showing census geography at the county, city and town (MCD), precinct, or block level, and moving quickly up or down among these levels.

The software will be capable of starting with a wide area, perhaps several counties, then zooming in on selected cities, towns, precincts, or blocks, and then zooming back out to a wider area. It will be capable of panning to adjacent areas in any direction.

Once a user has begun to create districts for a plan, the software will be capable of showing at least one district currently being worked on and the districts, or unassigned census units, adjacent to it.

The software will permit the use of color coding to show the districts to which census units have been assigned in the plan. The colors will fill each district on the bottom layer, with lines and text above, so that the boundaries, physical features, and population and election attributes within the district may still be seen.

b. Population and Election Attributes

The redistricting software will enable the user to see the population and other attributes of the census units in the area being worked on. The user will be able to display these attributes on the monitor directly on the map of the area.

On the map, the user will be able to display up to five attributes of the census unit, such as total population, minority population, and partisan index, in absolute or percentage terms. The user will be able to select the attributes to be displayed on the map from an attribute menu listing all the population and election attributes in the database.

On the map, the user will be able to show by color coding or shading how census units or districts compare to each other on the basis of any attribute selected from the attribute menu, such as total population, Black population, or partisan index. The colors will be on the bottom layer, with lines and text above. The user will be able to easily select the gradients to be used for color shading.

In a pop-up window for the census unit on which the cursor rests, the user will be able to display all the population and election attributes of that census unit that are on the attribute menu.

In a window for the plan currently being worked on, the user will be able to display up to five attributes for up to seven "districts." The default attributes would be:

- Total population
- Deviation from the ideal - absolute

The user will be able to select the attributes displayed by selecting from the attribute menu.

A partisan index may be calculated from a limited number of races, chosen by the user when beginning a plan. The user will be able to change the index while working on a plan, but may have to wait as long as several hours to recalculate the index for districts previously created if working on a nearly-completed statewide plan.

The seven "districts" would be:

- Up to five districts currently being worked on, as selected by the user
- A sub-area of census units the user is considering for addition to or subtraction from one of those districts
- The hypothetical district that would result if the sub-area were added to or subtracted from the district

In a pop-up window for the plan as a whole, the user will be able to display the largest positive deviation, the largest negative deviation, and the overall range of the plan, both absolute and percentage. The user will also be able to display the number of counties, towns, cities, and precincts split by the plan, and the number of incumbents who are paired.

All attributes displayed on the map or in a window will be refreshed immediately as units are assigned, reassigned, or unassigned to districts.

The user will be able to control the portion of the screen that is used for the map and for each of the attribute windows, so that these can be changed as the user's needs and expertise change.

The programming to produce the various screen formats of map and attribute windows will be done by the vendor before installation of the system is complete.

2. Assignment

The redistricting software will allow the user to create congressional and legislative districts by assigning census units to appropriate districts. The software will be capable of assigning several levels of geography in the same plan. For example, the software will make it possible to begin assignment at the county level, then go down to the precinct or block level, and then revert to the county level, moving swiftly from level to level. The software will be

capable of assigning whole counties, cities, towns, and unorganized territory to new districts, without specifying the precincts or blocks within them. Within the seven-county metropolitan area, and in the cities outside of the metropolitan area listed in Appendix A, the software will be capable of assigning whole precincts to new districts, but will also be capable of splitting precincts and assigning population to new districts block by block. It will be capable of making assignments either unit by unit or by lassoing groups of census units.

Districts will be numbered by the user as they are created. The user will be able to assign any number appropriate for the type of plan being created (Congressional, Senate, House), so long as it does not duplicate one already assigned in that plan. The user will be able to change the number of a district already created.

The software will check to make sure that no whole census unit is assigned to more than one district, and that, when a plan is completed, no units have been left unassigned.

The software will check to make sure that units assigned to a district are contiguous to other units already assigned to the district and warn the user of an assignment of noncontiguous units.

To assist in preserving the cores of prior districts, the software will permit the user to "freeze" census units that have been assigned to a district so that they cannot be reassigned to another district unless the user confirms the desire to do so.

To avoid contests between incumbents, the software will show the user when more than one incumbent is included in a district.

3. Plans

The software will permit the boundaries of districts in one plan to be compared with the boundaries of districts in another plan by showing the boundaries of a second plan as an overlay on a map showing the boundaries of the first plan. When two plans are compared in this way, the user will also be able to display the icons showing the blocks where incumbents reside.

The software will be capable of creating plans that cover only part of the state and merging them to form a plan for the whole state, as well as creating plans for the whole state at once. The software will be capable of saving plans for modification at a later date.

The software will permit the user to create house districts that are nested within senate districts. It will permit the Senate to create senate district "1" and then divide it into two house districts, numbered "1A" and "1B." It will permit the House to create house districts, number them as "1A" and "1B," and then combine them into senate district "1."

The software will be able to import plans drawn on other systems that use census geography. That is, it will be capable of converting a file that contains a tabular listing of census units in each district from DOS (ASCII format) to UNIX, for example, and using that converted listing of census units to create a plan that the system can display, edit, and produce maps and reports describing it.

4. Maps

a. Features

The software will produce maps of the districts created. It will be capable of showing in printed form all of the information that can be displayed on the monitor, so that there can be a complete correspondence between what is on the display, what is shown in the report, and what is shown on the map. It will be able to scale the maps to print on a plotter size "A," "8," or "E," as appropriate for the area to be displayed.

The maps will show, not only the district boundaries, but the other political boundaries and major physical features in the area, with their names properly located so that the reader can clearly see the political boundary or visible physical feature that the district line runs along. The maps will also show the names of at least the largest whole census units included in each district. That is, if all of a county is in a district, the names of the cities and towns within it will not appear; if all of a city is in a district, the names of the precincts within it will not appear; and so on.

The software will be able to produce maps with color shading for the various districts and defined colors for various physical features, such as blue for water and red for major roads. The color shading will be on the bottom layer, with lines and text above.

The software will also be able to produce maps with color shading to show various kinds of statistical data about the census units and redrawn districts, such as degrees of population inequality, racial characteristics, and voting behavior. The color shading will be on the bottom layer, with lines and text above.

b. Coverage

(1) State Map

Both congressional and legislative plans will have a map of the state, showing county, city, and town boundaries and names, the largest bodies of water and their names, and interstate highways and their numbers.

(2) Metropolitan Area Maps

Both congressional and legislative plans will have a map of the seven-county metropolitan area, showing county, city, and town boundaries and names, and major highways and bodies of water and their names, similar to the Metropolitan Council map used in 1982.

Both congressional and legislative plans will have a map of the inner metropolitan area, showing city streets and their names, in addition to the information on the seven-county map, similar to the Department of Transportation map used in 1982.

(3) City Maps

For either congressional or legislative plans that split city or town boundaries outside of the seven-county metropolitan area, there will be a map of the city, showing city streets and highways and major bodies of water and their names, similar to the Department of Transportation maps used in 1982.

(4) District Maps

When a user is building a plan, the user will be able to print a hard copy of the map on the screen and a larger map that shows a particular district and all the districts adjoining it.

c. Outline Maps

To assist in drafting legal descriptions of districts that split cities, either outside or within the metropolitan area, the mapping software will be capable of drawing outline maps that show the boundaries and the names of the physical features that form the boundary where the district splits the city.

d. Map Identifier

The software will include a banner or label to identify the operator who requested the map and the date and time it was printed. The software will require this map identifier on all maps printed on the central plotter, so that the system administrator will be sure to give them only to the proper person.

5. Reports

a. Screen Prints

The software will make it possible to print in a report the same information on the population and voting characteristics of each district as is shown on the monitor's display.

b. Standard Reports

The software will produce printed reports showing the population and voting characteristics and the degree of population inequality of each district and of the plan as a whole.

For a plan, one standard report will be a summary listing only the name of each district, its total population, its absolute deviation from the ideal, its percentage deviation from the ideal (carried out to two decimal places), the absolute overall range of the plan, and the percentage overall range of the plan (carried out to two decimal places).

The user will be able to create custom reports to show additional summary data on each district. The customization will be by adding more columns of data for each district, the data to be selected from the menu of population and election attributes. To facilitate printing many columns of data, the custom reports will be printed in landscape mode.

A second standard report for a plan will be a tabular listing of the census units that make up each district, showing their name (and number, if appropriate) and total population. Only the largest whole census units in each district will be listed. That is, if all of a county is in a district, the cities and towns within it will not be listed; if all of a city is in a district, the precincts within it will not be listed; and so on.

A third standard report will show the minority population and minority voting age population of each district, both

absolute and percentage.

A fourth standard report will show the number of counties, cities, towns, and precincts split by the plan and list the districts to which the various parts of each county, city, town, or precinct were assigned.

A fifth standard report will list the district to which each incumbent member has been assigned, showing the districts where incumbents are paired and the districts that are open and the total pairs and open seats.

The system will also assist a bill drafter to produce metes and bounds descriptions of the districts. For this purpose, a sixth standard report will list the whole counties, towns, and cities in each district, and the physical features that form the boundary where a district divides a city.

c. Special Reports

The software will be capable of producing additional reports, as defined by the user, based on any of the data in the database and plans created.

d. Report Identifier

The software will print a banner or label that identifies the operator who requested the report and the date and time it was run.

E. Operation, Maintenance, and Support

1. Documentation

One set of documentation for the database management and network software will be provided. Five complete sets of documentation for the redistricting software will be provided.

2. Training

The software vendor will provide training for the system administrator in how to operate and maintain the system, and up to eight caucus staff in how to use the system to draw redistricting plans and produce maps and reports describing the plans.

3. Help Line

a. Software

The software vendor will provide telephone software support to answer user questions. When the Legislature is not in session, this will be during normal business hours. When the Legislature is in session (January to May in 1991, January to April in 1992) this service will be available 24 hours a day, seven days a week. Time to respond to a request for help should be no more than two hours for most problems.

b. Hardware

Hardware vendors will provide telephone support to answer user questions, generally on the same terms as the software telephone support.

4. Hardware Maintenance

In addition to telephone support, hardware vendors will make on-site service available with a response time of no more than four hours for most equipment.

5. Warranties

A combination of warranties and service agreements will insure continued operation of the system through June 30, 1992.

6. System Administration

Once the caucus staff have begun drawing plans, the system administrator will be on call to backup the system regularly and solve problems as they arise.

IV. USE OF SYSTEM

The computerized redistricting system will be used by the Minnesota Legislature to draw redistricting plans and to make copies of the plans available to the state and local officials who must implement them. Use of each caucus

work site is under the control of that caucus. The system administrator's work site is for the exclusive use of the system administrator to maintain the system, not to draw plans.

The system may also be used by a three-judge federal court to draw redistricting plans. The Subcommittee reserves the right to make the system available to political subdivisions in the State of Minnesota for their use in drawing redistricting plans. The system will not be made available to anyone else for their use in redistricting.

The Subcommittee reserves the right to make the database available to political subdivisions for their use, but will not allow the system software to be copied or used anywhere other than at the work sites described in this document.

The system will be retained by the Legislature and used for other geographic data analysis after June 30, 1992.

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