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GIS Gains Momentum in Michigan

Dr. Bin Li, Department of Geography, Central Michigan University

GIS education gained a major boost in Michigan when thirteen public universities and colleges signed the Environmental System Research Institute (ESRI) statewide software license this past March.

The license allows unlimited on-campus installations of GIS software from ESRI, including ArcGIS, ArcIMS, ArcView GIS, ArcPress, NetEngine, PC ArcInfo, MapObjects, Arc Logistic Route, ArcPad, BusinessMap Pro, and selected extensions. With substantially lower fees, the statewide license eases access to state-of-the-art technology and will play a significant role in promoting GIS applications in Michigan. On February 19, representatives from several Michigan institutions met at CMU, the administrative contact of the statewide license, to discuss issues related to the license and to explore opportunities for future collaboration. Representatives from CMU, Schoolcraft College, Saginaw Valley State University, the University of Michigan, and Eastern Michigan University gave presentations on campus-wide GIS activities. Milton

Ospina, ESRI Higher Education Solutions Manager, attended the meeting and gave an overview on the license and a preview of upcoming GIS products. Dr. Berry addressed the group, speaking of the growth in GIS activities at CMU. Erica Brown, also of CMU, was elected Chair of an ad-hoc committee of GIS representatives from the participating institutions.

Dr. Robert Berry, Chief Technology Officer at Central Michigan University (CMU), was instrumental in initiating the statewide license. Ms. Brown has done an outstanding job in planning, organizing and executing the statewide license. She has also set up a list-server to facilitate communications among individual campuses; the address is MIGIS@cmich.edu. For further information on how to participate in the statewide license, please contact Ms. Brown at (989) 774-1771 or brown1ea@cmich.edu.

In recent years, CMU has seen rapid growth in GIS education, research, and application. The GIS Center, led by Dr. Roy Klopčic, provides the point of contact for GIS on campus and in the Central Michigan community. The center has conducted numerous GIS projects and is currently working with the City of Saginaw on building a water utility

Who's Doing What in GIS and Spatial Technology?

By **Steve Rood** and **Charlie Bristol**, Camp Dresser & McKee and **Krishnan Nadella**, Detroit Water and Sewerage Department



The wastewater system includes 14 pump stations, three storm water detention basins and more than 3,000 miles (4828 km) of sewer lines that transport rainwater and wastewater to one of the largest single-site wastewater treatment plants in the US. The plant treats 720 million gallons (2.725 million cubic meters) of flow daily. The service area is shown in Figure 1.



Figure 1: The DWSD Service Area

To support this 50-year master plan study, the GIS team has assembled a variety of data sets from many different sources including:

- Population and employment data (Access/EXCEL) by traffic analysis zones (ArcInfo coverage format) from the Southeast Michigan Council of Governments (SEMCOG)
- Sewer pipe data (Oracle) and location (over 650 files in MicroStation DGN format) throughout the service area from DWSD
- A regional base map from the State of Michigan (ArcInfo format)
- Digital Elevation Model (DEM) data purchased from a third party vendor (ArcInfo format)
- Sewer model pipes from other DWSD projects (SWMM model file formats and ArcView format)
- Sewer district maps from the respective county drain commissions (Various formats: ArcView, AutoCad, and paper)
- Model metered areas and sub-area maps from the Greater Detroit Regional Sewer System project team (ArcView format)
- Land use and soils data from SEMCOG (ArcInfo format)

USING GIS TO SUPPORT MASTER PLANNING

The Detroit Water and Sewerage Department (DWSD) has undertaken a major master planning effort for the city's wastewater collection system to prepare for the needs of its customers over the next 50 years. In support of this master planning process, a myriad of required data sets have been integrated into a GIS project environment. This environment consists of many data set types: a variety of off-the-shelf software, computer hardware and software, as well as technical staff to provide support to the rest of the project team. Each of these elements is described herein.

PROJECT DATA SETS: DWSD SYSTEM OVERVIEW

The DWSD provides wastewater service and treatment to approximately 3 million people in a 903 square mile (2339 km²) area serving 35 percent of Michigan's population. This area includes Detroit and 77 neighboring communities.

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News and Notes

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The ESRI Northern Michigan Users Group (ENMUG)

has scheduled its next meeting for
July 23, 2002
at the Government Center
in Traverse City.

All are welcome
to attend.

For additional information
on the ENMUG, visit the
group's web page at:

<http://www.infogeographics.com/enmug>



ESRI
TM

GIS GAINS MOMENTUM continued from page 1

database. The center is becoming a bridge between CMU and the GIS community in the region. On the education front, the University approved the Master of Science program in Geographic Information Science. As the home department for the graduate program, the Geography Department has substantially increased its capacity in faculty personnel and computer hardware and software. The Department has allocated six faculty positions for courses in GIS, Cartography, and Remote Sensing. The geography faculty members are actively involved in a variety of research projects ranging from air quality studies, land use changes and conflicts, to spatial data mining, geographic information services, multivariate classification, and cognitive mapping in the brain. Both undergraduate and graduate students are involved in these projects and gain valuable experiences. For further information about the graduate program, please visit the Geography Department's web site at <http://www.cst.cmich.edu/units/geo>

CMU also spearheaded the application of GIS to institutional research, marketing, and campus facility management. Using GIS, the Office of Institutional Research (OIR) maps the statewide changes of market shares among public universities

and makes recommendations on recruiting strategies. Encouraged by the success, the OIR is planning to expand the GIS project to include more vigorous analysis of its extensive database. OIR anticipates more fruitful outcomes from the integration of GIS with data mining technology. The College of Extended Learning, with sites throughout the country and around the world, has been aggressively utilizing GIS for market analysis and site assessment, e.g. identifying sites for new campuses. The college is also exploring opportunities in distance learning for GIS. University management, as indicated by Milton Ospina of ESRI, is an area with great potential for GIS applications such as facilities management and emergency services. With concrete results in improving administrative efficiency, the campus GIS is also a promising strategy to justify the cost of software licensing.

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Figure 2: DGN file depicting the wastewater system

The wastewater system maps are maintained by DWSD in MicroStation DGN format with links to attributes stored in an Oracle database. Both environments were brought into the project GIS. An example DGN file is shown in Figure 2.

PROJECT GIS ENVIRONMENT

All the master planning project data sets have been organized and stored on a project server accessible to the project team. The hardware and software used for this project include:

- Project server (WIN NT 4) with several desktop and laptop connections;
- Large-scale plotter (E size) in addition to a laser printer and small-scale plotter (report size);

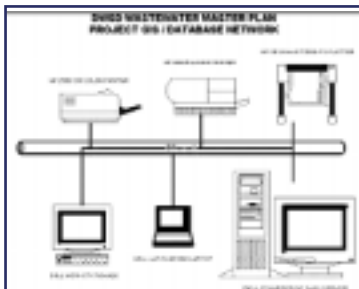


Figure 3: DWSD GIS hardware network

- GeoMedia Professional for creating a seamless project GIS;
- MS Access for spatial (in GeoMedia) and attribute data storage;
- MS EXCEL for data set storage; and
- ArcView for map production

SUPPORT FUNCTIONS/ APPLICATIONS

The project GIS team provides various support functions including spatial data analysis, map production, presentation of mathematical simulation model results, and map and data table creation in support of document production.

A major aspect of the master planning process is the prediction of system requirements over the next 50 years. To this end, mathematical simulation models are used to determine sewer system capacity to 2050 using the population and employment projection information supplied by SEMCOG.

The GIS is used to assist model creation and calibration in a number of ways, such as tributary area determination, flow routing and the determination of runoff coefficients using land-use data. The GIS also facilitates model-alternatives analysis by assisting in the recalculation of model input data sets. In addition, model results are displayed by relating model schematic pipes to real-world pipes, allowing for the production of project maps that show modeling results. The GIS will also assist in the development and management of alternative option sewer pipe networks.

Figure 4 shows the primary wastewater system that is being analyzed in the master plan.

The GIS has also been used to help determine potential on-site sewage locations in Detroit by geocoding addresses of those parcels that receive water bills but do not receive wastewater bills and have not been issued septic permits. Those sites will be investigated. Potential sites were also analyzed for nearness to existing sewers to determine the feasibility of connection to the system.

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Figure 4: DWSD Primary Wastewater System

Map production is integral to the project. It both communicates ideas and results and assists the project workgroups in their varied tasks. All maps created are stored as Adobe Acrobat files to minimize storage, facilitate file management, and provide easy viewing, printing and transport.

When working with data sets from so many varied sources, it is essential to maintain good metadata. It is also important to keep in mind the limitations of the data sets, especially when using multiple data sets from different sources for spatial analysis tasks.



Figure 5: DWSD Web Site

INFORMATION DISSEMINATION

The Wastewater Master Plan project is also responsible for keeping project team members, DWSD staff, and wastewater communities informed of its activities. A project web site includes such information as a calendar of events, a project schedule, a team member directory, a searchable document library and links to other pertinent web sites. Also on the web site is a GIS section that contains project maps stored in Adobe Acrobat format. This allows team members to download and print maps. The GIS section also contains a searchable map layer library that allows team members to see layers and request the creation of customized maps containing multiple layers tailored to their specific needs.

The Internet site for the comprehensive water master plan can be found at www.dwsd.org/projects. The Internet site for the wastewater master plan is under development using the private, Intranet site as a source of information.

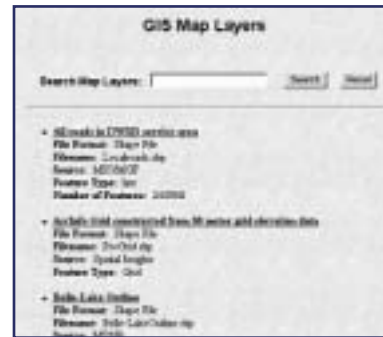


Figure 5: DWSD Data Set Library

For more information, please contact Steve Rood of Camp Dresser & McKee at roodsg@cdm.com or Krishnan Nadella of DWSD at Nadella@dwsd.org.

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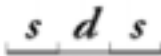
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