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Alex Bellak

Waterford Township's 3 Stages for a Successful GIS Project

By Alex Bellak GIS Technician

CHARTER TOWNSHIP OF WATERFORD DPW

In the spring of 1997, Waterford Township's Department of Public Works began to develop its municipal water/wastewater GIS. Waterford has had several successes and challenges in those three years. A clear plan has managed to overcome the vast majority of obstacles. Waterford attributes its success to the incremental approach taken to implement its DPW project.

The project can be broken down into three distinct stages: GIS Strategic Planning, Data Development and Systems Integration.

The strategic planning stage was performed before any data collection began. This phase served as the foundation for the rest of the project. During this planning phase, the township created an oversight committee to ensure communication with other departments.

The largest initial hurdle was the standardization of computer hardware and software simultaneous with the installation of a fiber optic network. Once the GIS/IT infrastructure was in place, GIS personnel were hired, followed by the purchase of GIS software.

During strategic planning, we decided to use open architecture-based technologies as much as possible. We determined that sub-meter level accuracy was necessary. We also considered staff and their informational needs, i.e., what data does staff use on a daily basis. We considered how and to whom the data would be disseminated, such as to other departments and to the public.

The second stage was the data development phase. This stage can be broken into three sub-phases: GPS data collection, document management and data conversion. To ensure sub-meter accuracy in the water and wastewater pipe network, Waterford utilized GPS technology.

Collection of water and sewer features for a 36 square mile area is an enormous task. Good organization is critical to ensure quality data collection and to keep the collection process running smoothly.

Who is Doing What in GIS and Spatial Technology

CITY OF TROY

Population: 82,693 — Source: SEMCOG

Geographic Coverage: City-6 sq. miles

Number of Staff: 3 Full time

Representatives of the City of Troy have recognized that a geographic information system (GIS) can increase efficiency and be used as a tool in making better, more informed decisions. GIS has also allowed the City to integrate legacy data with current data for spatial analysis and inquiries.



1. Give the status of your program (when it started, who is involved, platform and software used, accomplishments to date)

GIS implementation in the City of Troy began in 1996, approximately the same time that Oakland County was starting their enterprise GIS program. We got involved with the County's GIS efforts from the very beginning to see what their plans were and to make sure there was no duplication of efforts. We determined that many of the core datasets we needed to get our GIS efforts off the ground were going to be created by the County and provided to us at no cost. We avoided a lot of up front costs by using this data along with our existing GIS datasets, allowing us to begin utilizing GIS immediately. The County also provided us with three copies of ArcView software to supplement the ten copies of ArcView and three copies of ArcInfo software that the City purchased. To date, we have trained approximately 30 staff members, on the use of GIS at the City of Troy and have sent many others through the County's GIS classes.

2. Describe any new projects or activities:

The Engineering Department has scanned all of the original plat maps and linked these digital images to the current GIS parcel data. City planners, assessors, engineers, etc. will no longer have to shuffle through paperwork and filing cabinets to find the original plat for a particular development. Users of the system will simply be able to click on any parcel in the area of interest and the original plat for that development will download to their PC. The Planning Department is using GIS to create thematic maps such as Zoning Maps, Land Use, Flood Plains and has even used the link to the Equalizer system to determine which parcels in the city are on a septic system. In addition, they have also created thematic maps showing infrastructure locations such as sewers and drains.

The Traffic/Engineering Department is mapping all of the traffic signals in the city and has an inventory of which of these signals utilize Opti-Con technology. The Opti-Con technology gives emergency personnel the ability to change the traffic signal at an approaching intersection. The Department of Public Works is beginning to convert CAD drawings that show the locations of utilities into a format that can be imported into the GIS and used for analysis by other City departments.

Over the next year or so, the City of Troy will continue to expand its use of GIS across City departments, making operations more efficient and providing easy access to common datasets used across the city. They will start to explore the use of an internet/intranet solution to expand information outreach.

Dan Michalec, GIS Analyst

VISIT *continued from page 6*

They will build the knowledge and experiences of the **Core Team** into the VISIT pedagogical and scientific knowledge base.

WHO CAN PARTICIPATE IN VISIT?

VISIT will engage school districts, teachers, and community stakeholders in six metropolitan areas, at a minimum. Detroit and Boston are the first school districts selected. Other school districts will be selected during the second year of the project.

Teachers can participate at one or more of three levels: Core Team, Investigators, and Explorers.

- The **Core Team** includes six high school science teachers, plus scientists, technologists, school administrators, professional development specialists, and students. They will construct organizational, social, pedagogical, computational and informational support structures and learning materials for other teachers. **Core Team** teachers develop as teacher leaders and have previous experience using geospatial tools and databases. They will advance their own investigation, analytical skills, and knowledge base in their content area, as they construct materials for other teachers.
- **Teacher Investigators** will participate in VISIT “investigations” during at least one semester or summer period. They will use face-to-face meetings and online activities with peers and scientists via the Internet. These teachers will gain first-hand experience in conducting geospatial analysis of real-world data with the support of other teachers and scientists, online. They will also learn how to embed curriculum content and pedagogy into project context. At least 200 teachers will participate as **Teacher Investigators** over the three year project period. EMU will provide up to three graduate level credits to teachers who complete “investigation-level” participation.
- **Teacher Explorers** seek an introduction to geospatial investigations. VISIT will create structured interactive learning materials, which introduce the concepts and methods of geospatial investigation. **Teacher Explorers**

will spend approximately 50 hours over a ten-week period, learning how to perform geospatial investigations. During the project, the VISIT objective is to reach 800 teachers and staff developers at the **Teacher Explorer** level.

WHAT TECHNOLOGIES DOES VISIT PROVIDE TO TEACHERS?

VISIT provides teachers, scientists, and students with tools and online environments for locating and using large scientific databases, visualizing and analyzing data, collaborating with each other, and building scientific knowledge together. The overall technology application is called Distributed Geographic Information Systems (DGIS). The DGIS tools being developed support data mining, scientific investigation, knowledge base development, curriculum integration, instruction management, learning assessment, and online participation.

These tools are built upon COM (Component Object Model) architecture. The major types of COM software components include the following:

- **MapObjects** — an embeddable mapping development package from Environmental Systems Research Institute (ESRI). MapObjects supports visualization and analysis of data.
- **ActiveX Components** — Active Xs support scientific analysis and computation.
- **Knowledge Building** — an environment using standard query language and frequently asked questions.
- **Java beans in Active Server Pages (ASPs)** — ASPs facilitate online participation, user interactions, and graphic interfaces. Java beans support users as they construct the knowledge base, integrate curriculum, manage instruction and assess learning.

FOR MORE INFORMATION ABOUT VISIT, PLEASE CONTACT:

- Dr. Yichun Xie at xie@online.emich.edu or 734 487-8655.
- Beverly Hunter at beverly@piedmontresearch.org or 540 937-4038.



Message from the Director

Dear IMAGIN Members:

I would like to thank you for the honor and pleasure of allowing me to serve the last three years as your Executive Director. It is time for me to move on and for IMAGIN to employ a full-time staff person. We have accomplished a great deal in the last three years and have grown the IMAGIN organization into a maturing organization. I would like to highlight some of our accomplishments in the last three years. We have:

- Obtained our 501 (c) (3) status with the IRS
- Obtained accountants and developed a professional accounting system
- Developed annual Work Program & Budget (by program area)
- Developed a new membership category system
- Developed a membership database.
- Established a cooperative relationship with the Michigan Society of Planning and share office space with them.
- Established a corporate identity with letterhead, conference material, business cards, and membership brochure
- Prepared a Strategic Plan and identified an "official committee structure"
- Established an on-time membership monthly newsletter publication
- Grew the membership from 83 to over 400
- Obtained an FGDC grant — "Don't Duck Metadata"
- Worked cooperatively with MIC on the Clearinghouse project
- Produced three spring Forums — one with record attendance from previous seven years and increased vendor participation each year
- Initiated post conference workshops to the Forum
- Produced two Fall User Conferences both with increasing attendance
- Initiated post conference workshops to the Users Conference
- Established an annual Awards Program
- Established seven committees — Events, Education, Information Resources, Website Development, Quality, Outreach and Nominating Governance
- Became members of the NSGIC
- Established a MOU with Minnesota for DataLogr
- Established a website
- Purchased display system for conferences
- Established ourselves as credit card merchants accepting VISA, Master Card and American Express
- Increased annual revenues

I hope that you will support the new Executive Director and assist him/her the way you have me. I encourage you to become active in the organization — volunteer to serve on a committee, consider service on the Board of Directors, submit an abstract for a conference talk, and/or write an article for the newsletter. The organization is as strong as your commitment to it. Support it with your time and talents! See you around.

Welcome new IMAGIN members

NEW INDIVIDUAL MEMBERSHIP

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MAIN STORY *continued from page 1*

Waterford started collecting points at the end of February, thanks to a mild spring. Weather conditions were excellent for most of the summer, which allowed the GPS team to complete the data collection in early September. The part-time technicians were able to average a GPS data capture rate of between 75 and 150 points per day. To date, Waterford Township's DPW has collected over 15,500 GPS X,Y coordinate locations on our structures, with nearly half of those points representing sewer manholes.

The document management phase, which is actually a Township-wide effort to convert massive amounts of paper documents to a digital format, has provided a wealth of digital data. GIS personnel have scanned over 4,000 engineering drawings and have linked them to the pipe network. Currently, Waterford is linking over 28,000 scanned 3 x 5 service tap cards to water service laterals. This will give the field crews critical information about each customer's water service. The paper versions of these cards are used daily by the field crews to aid them in the location of the service leads of each building serviced by water.

The third sub-area of data development is the data conversion phase. Attention to organization in this area, not unlike the GPS phase, was critical. We needed a great deal of time to organize and catalog the utility plans to avoid adding redundant or incorrect data. Waterford followed the chronological order of the contracts and then extensions of each contract. When there was incomplete or inconsistent data on the building plans, following a chronological order instead of a geographical order aided in problem solving.

The final stage of development for Waterford's DPW GIS is system integration. During the strategic planning stage, we performed a review to determine the types of data being housed at the DPW and how/if it could be tied into the GIS system. Some of the data and applications that were found to have a commonality with that of a GIS were a CMMS (Computer Maintenance Management System), water and sewer hydraulic modeling, S.C.A.D.A. (Supervisory Control And Data Acquisition) data integration and finally, billing interaction.

The largest obstacle to overcome in the integration of these datasets has been the inconsistencies of the legacy data. In order to be tied in to the GIS, there must be some sort of common item that is shared between all the data sets. These common items are usually found in a Sidwell number, an address, or an account number. For the pipe network data, a unique facility ID was added to all pipe and node segments during data conversion.

Three years of effort by the Waterford Township staff has resulted in many successes with the GIS program; however, it is still a work in progress, with an estimated two years of work to be done, before the system is in a more or less "maintenance mode." Waterford's DPW Director, Terry Biederman, and GIS Technician, Alex Bellak, recognize that the true success will be in the overall usability of the system by all members of the DPW staff and public. Hence, every effort is being made to gather feedback from potential users, at all levels of the organization, to ensure the end product meets the needs of the people that ultimately will be using the product.

Notes and News

SEVERAL IMPORTANT ITEMS FOR IMAGIN MEMBERS:

The **Fall Counties and Local Users Conference** is right around the corner. Conference brochures have been mailed. If you need another, contact the IMAGIN office. The brochure and registration are also available on the website. Please visit www.imagin.org

NEW THIS YEAR:

- Hands-on All-Day Post-Conference Workshops
- Judged Poster Session

You will not want to miss it!

We are looking for **candidates for the Board of Directors**. If you are interested in serving or would like to nominate a person you believe has leadership qualities, e-mail us through the website. Please submit a few paragraphs listing qualifications, background and information you would like posted in the candidate write-up.

IMAGIN is announcing the job opening of Executive Director.

A job announcement and description are available on the website. If you are interested in this position, please send your cover letter and resume to the IMAGIN office. Please pass this announcement along to someone you think might be interested.

TAKE PART IN THE 2000 URISA IT/GIS SALARY SURVEY!

Not only does the survey explore salaries of IT & GIS professionals, it also covers job titles and responsibilities, software applications, educational experience, and more.

The survey is only 25 questions long and should take no more than 10 minutes of your time. Go to www.urisa.org/survey_main.htm to complete the survey (by September 15).

VISIT: Virtual Immersion in Science Inquiry for Teachers

NATIONAL SCIENCE FOUNDATION PROJECT BRIEF

By: Dr. Yichun Xie, Director - CEITA

EASTERN MICHIGAN UNIVERSITY

VISIT is a three-year program, supported by a grant from the National Science Foundation (NSF). It is designed to provide high school science teachers an opportunity to be involved in scientific investigations of local community problems, using spatial analysis technologies. The Principal Investigator is Dr. Yichun Xie, Director of the Center for Environmental Information Technology and Applications (CEITA).

WHY IS VISIT IMPORTANT TO SCIENCE TEACHERS?

High school science teachers are required to teach their students how to ask questions, design, and conduct investigations using appropriate technology, explain how scientists decide what constitutes scientific knowledge, relate science to the man-made world, and analyze claims for scientific merit. Yet, few science teachers themselves have the opportunity to team with working scientists in scientific investigations using modern scientific analysis tools and empirical databases. VISIT provides this opportunity.

WHO IS INVOLVED WITH DEVELOPING THE VISIT PROJECT?

- Teachers, administrators, and students in urban high schools in both Detroit and Boston.
- Scientists and technologists from CEITA at Eastern Michigan University.
- Applied scientists from the Washtenaw County Department of Environment.
- Administrative and technical personnel with the Rouge River National Wet Weather Demonstration Project.
- A team of nationally recognized experts in education technology, online communities, project evaluation, and professional development in science education.

WHAT WILL VISIT TEACHERS LEARN?

Teachers will participate with peer leaders and VISIT scientists as they learn how to conduct investigations into

local problems, such as water pollution, epidemics and urban ecology. By combining scientific datasets and tools for visual and intuitive analysis of real data, teachers and their students will be able to share the excitement of discovery with scientists.

VISIT “investigations” are designed to provide a context for learning in chemistry, biology, ecology, and environmental science. They are tailored to local curricula and state frameworks. “Investigations” include curriculum goals, scientific datasets, metadata, scientific reasoning, knowledge base development, analytical methods, and assessment rubrics.

ENHANCED TEACHING ABILITIES GAINED FROM VISIT PARTICIPATION

- Define and conduct investigations that support process and content curriculum objectives. Proposed topics include surface water pollution in the chemistry classes and ecological studies of coastal regions and watershed assessments for environmental science classes.
- Learn to locate, acquire, and utilize large scientific databases to extract meaningful information to support investigations for their classes.
- Use software tools to perform spatial data analysis, reasoning, modeling, and problem solving tasks.
- Access scientific knowledge needed to interpret and understand findings for a particular investigation from the perspective of curriculum concepts.
- Manage projects in the classroom and organize student teams based on the nature of the investigation.
- Develop and apply rubrics to assess theirs and their students’ work and learning.

VISIT **Core Team** members will advise VISIT participants based on their own classroom experience and facilitate sharing of this knowledge base. VISIT **Investigators** will compile the expert knowledge gained from scientists and accumulate the experiences of teachers in the Collaboratory.



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IMAGIN is a nonprofit 501(c)3 organization comprised of individuals and organizations interested in the use and application of geographic information system (GIS) technology in Michigan. Our members are committed to improving the quality and availability of digital data necessary to make good use of GIS. We believe that cooperation and open communication are necessary to achieve these objectives.

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IMAGIN MEMBERSHIP BENEFITS

- Discounts to the annual IMAGIN forum, local users' fall GIS conference, workshops, training sessions and IMAGIN products.
- Subscription to monthly *imagiNews*;
- Advertising discount rates;
- For data sharing organizations, access to authoritative digital information; and
- Complimentary licensed copy of DataLogr® metadata management software for data sharing organizations (cost to other members: \$50.00; non-members: \$85.00 plus \$4.50 postage).

Frank Sobie, Board Liaison/Information Resources Committee

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