THE FARGO-MOORHEAD ADVANCED METROPOLITAN GIS PLAN

Prepared by
PlanSight[LLC]
3624 Talmage Circle
Suite 201
Vadnais Heights, MN 55110
Ph: 651 653-5141
www.plansight.com

Note:
The entire 112 page report can be viewed at:
http://www.plansight.com/fmcog/metro_reports.html

TABLE OF CONTENTS

EXECUTIVE SUMMARY

A Geographic Information System (GIS) is a combination of computer hardware, software and data that allows the user to collect, input, manage, analyze and display large amounts of spatially referenced information. The jurisdictions in the Fargo-Moorhead region have been working with GIS at various levels for several years. A Regional GIS Steering Committee, comprised of GIS professionals from each jurisdiction, was established to help coordinate GIS in the metropolitan area. As a result, several good tools were developed (i.e. the GEODEC Standards, etc.) to outline practical steps that could be taken to make each jurisdiction's GIS compatible with the others. Recently, the GIS Committee has identified the need to continue to build on the previous GIS successes and take the next steps in developing a truly regional GIS. This need has become paramount as each of the jurisdictions is becoming increasingly active in GIS. Now is the time to plan for the benefits that can be derived from a collaborative, coordinated approach to solving common, regional GIS issues. As a first step in upgrading and expanding the use of GIS throughout the metropolitan area, PlanSight^{LLC}, a Minnesota-based GIS consulting company, was hired to work with the jurisdictions of the Fargo-Moorhead Metropolitan Area on the development of the *Advanced Metropolitan GIS Plan*. The purpose of the study was to review the current GIS environment, establish goals for future metropolitan-wide GIS use, and the development of a coordinated approach to meet those goals. The plan also identifies potential hurtles that will need to be overcome before a metropolitan-wide GIS can be successfully established. The plan addresses the policies, tasks and associated costs required to develop a regional GIS. It does not address specific efforts required for local jurisdictions to develop their own internal GIS.

During March and April of 2000, as part of the *Advanced Metropolitan GIS Plan* personnel from each jurisdiction were interviewed to identify how GIS is or could be used to improve staff efficiency or enhance the quality of services provided by each jurisdiction's staff. Interviews focused on ascertaining the current level of GIS use within each jurisdiction, identifying potential GIS uses, discussing the potential benefits and possible pitfalls of GIS, establishing jurisdictional GIS goals, and developing a rough cost estimate required to meet those goals. In addition, the large amount of information collected and maintained by each jurisdiction was reviewed to assess the importance of each database as it may apply to a metropolitan-wide GIS.

Regional GIS Goals Identified:

- *Regional datasets (including Parcels, Centerlines, Flood Data, Land Use, Addresses)*
- *Upgraded GIS software functionality*
- *Additional, qualified GIS technical staff*
- *GIS training for staff*
- *Custom applications to automate or simplify routine or complex tasks*
- *Improved data sharing & Public access to GIS data via the internet*

Based on research of how other metropolitan areas are addressing regional GIS concerns, the Plan outlines several organizational options and policies that could be adopted to jointly develop a strong regional GIS. They include: 1) Status Quo Option, 2) County-Centric Regional GIS, 3) F-M COG Centric Regional GIS, 4) F-M COG/County Regional Partnership, and 5) Consultant Driven Regional GIS. Each of these options reviews the role of each jurisdiction and identifies the pros and cons of each approach. Upon review, the GIS Steering Committee adopted option 4) F-M COG/County Regional Partnership, as the most advantageous model for developing a regional GIS.

The Plan also details the tasks typically associated with developing a regional GIS and the amount of time/costs associated with those tasks. Several examples are provided for clarification. While determin-

ing the actual costs for developing a regional GIS is difficult and depends largely on which of the approaches to regional GIS implementation the Steering Committee chooses, a first pass at the estimated costs puts it at around $100,000/year. This would cover the cost of staff, hardware, software, and database and application development. The resulting benefits to the region as a whole will come from avoiding duplication of efforts, improving data access by staff and the public, increasing the efficiency in which staff perform everyday tasks, increasing the sharing of data between jurisdictions, and developing new and better ways to analyze data.

The Fargo-Moorhead Advanced Metropolitan GIS Plan is intended to be a tool to bring the metropolitan area under one GIS umbrella. By creating an efficient, coordinated plan, and implementing a regional GIS, the Fargo-Moorhead Metropolitan Council of Governments and the jurisdictions in the metropolitan area should see benefits within in a short time period. It will be important that all jurisdictions as well as private and public entities be included and are active in the Metropolitan GIS effort. The level of cooperation between jurisdictions required to successfully implement a regional GIS will be significant, but based on the information outlined in this plan and the success of past regional GIS efforts undertaken by F-M COG and the jurisdictions, there is a good probability that a truly regional GIS can be developed that will benefit both F-M COG and all of the participating jurisdictions.

INTRODUCTION

A Geographic Information System (GIS) is a computer system that is able to analyze a wide range of data across a geographic area and display the information spatially in a manner that can be quickly and easily understood. The types of information involved typically include census, natural resources, transportation, land use, housing, water & gas line, sanitary and storm sewer line, and other data sets that are relevant to the area being investigated. Once this information is gathered, it can be displayed rapidly in any number of configurations to allow the user to better discern underlying patterns. GIS is an important and growing technology that can be used by a variety of county and municipal departments to inventory, organize, analyze, and display information in a clear and concise manner. Implemented correctly, GIS can be a powerful tool to help governments be more effective by improving overall efficiency, disseminating data to the public, and providing easy access to GIS data.

Project Overview

As all of the jurisdictions within the Fargo-Moorhead metropolitan area become increasingly active in GIS, the need for a coordinated approach to GIS data development and access becomes very important. If each of the jurisdictions develops data in separate ways or creates GIS tools or applications separately, there will surely be substantial duplication of efforts among the jurisdictions. In fact, this is already occurring in several jurisdictions. The purpose behind the *Advanced Metropolitan GIS Plan* is to ensure that there is a common, regional approach to the development and use of GIS. The plan attempts to identify and document common goals among jurisdictions and determine the best approach for jointly reaching those goals.

The Fargo-Moorhead Council of Governments (F-M COG) initiated the *Advanced Metropolitan GIS Plan* project. F-M COG currently uses GIS data from each of the jurisdictions coupled with its own data to support its planning efforts. Obtaining needed GIS data from each of the jurisdictions and then combining it into a single, regional GIS database has proved to be very problematic due to the diverse ways each jurisdictions manages its data. A regional, coordinated approach to GIS data development, management, and use, adopted and adhered to by each of the jurisdictions, would dramatically simplify many of the GIS issues being faced by F-M COG staff. Previous attempts to do this, such as the creation of the GEODEC Standards, have provided a solid framework for the development of a more collaborative regional GIS program. However, additional steps need to be taken to ensure that all of the jurisdictions are "on the same page" and at a common level of GIS.

The *Advanced Metropolitan GIS Plan* is intended to guide the region through the development of a collaborative, multi-jurisdictional GIS. Essentially, the plan:

- Reviews the state of GIS within each of the jurisdictions.
- Identifies goals within each jurisdiction and determines where there are common, shared goals among all jurisdictions.
- Overviews the costs and tasks associated with the development of a regional GIS.
- Reviews similar regional GIS programs already underway in other areas of the country.
- Provides several options for the development of a regional GIS in the F-M COG area.
- Provides an overview of several major GIS issues related to the development of a regional GIS, such as:
    - legal considerations,
    - training options, and
    - available custom applications.

The plan addresses where the region is at in regards to GIS, where it would like to be in the future, and several ways of getting there. Successfully implementing a regional GIS and reaching the goals expressed by each of the jurisdictions will require significant coordination and a team effort by all of the participants. The plan provides a framework, but is only a tool to help the participants clearly see common ground as they move forward together.

Key Players in F-M COG

The *Advanced Metropolitan GIS Plan* is multi-jurisdictional. It is critical that the major jurisdictions of this area participate in order for this project to be successful both in the short term and in the future. The key players are:

- Cass County
- Clay County
- City of Fargo
- City of Moorhead
- City of West Fargo
- City of Dilworth
- Fargo-Moorhead Metropolitan Council of Governments (F-M COG)

Several other organizations have participated in the development of this plan and are discussed later in the report.

History of GIS in the Fargo-Moorhead Region

The Fargo – Moorhead Metropolitan Area has a long history of GIS support and planning. As early as 1986 F-M COG began planning a strategy to begin automated mapping. This was the beginning of the effort to use computers to create maps and analyze geographic data.

In 1992 EMA Services, Inc. was commissioned to create a GIS feasibility study for the Metropolitan area. The study began a cooperative effort within the Metropolitan area to share data and lay the groundwork for advanced GIS applications

In 1993 the Metropolitan GIS Committee realized that in order to make a truly metropolitan wide GIS they needed to standardize sharing practices. As a result, they implemented GEODEC or the GEOgraphic Data Exchange Consortium. The agreement created a way to share geographic data and assigned someone to oversee the creation and maintenance of an area-wide land-base map. Over the next six years "pass-through funds" from the Intermodal Transportation Efficiency Act (ISTEA) through F-M COG were used to develop GIS at the local level. One of the projects using these funds was the creation of ground control to improve the overall accuracy of the regions GIS data. Participating jurisdictions worked together to create common tie points along the Red River for edge matching purposes. The tie points would allow GIS data created on either side of the river to be brought together in one seamless format.

From 1993 through 1997 several of the larger jurisdictions formalized their GIS plans through GIS needs assessments. The plans created a foundation for GIS throughout the Metropolitan Area. Through all of the planning, F-M COG has been a stabilizing force, helping the rest of the jurisdictions with their GIS planning. The Advanced Metropolitan GIS Plan will bring all of these elements together and allow all users to access data. A truly Metropolitan-wide GIS.

Key Players History SnapShot

Following is a brief overview of each jurisdictions GIS history. A more thorough review can be found later in this document.

Cass County

There has not been much GIS activity in Cass County until recently. They have begun creating a parcel base for the entire county that is scheduled for completion in early 2001. PlanSight^{LLC} is currently creating a GIS Needs Assessment for the County in order to define how they can get up and running with GIS within a short period of time.

Clay County

Clay County has a long-term commitment to GIS. They are completing their parcel base and have hired a GIS Coordinator. They also have made a substantial commitment to funding a County Wide GIS. A second staff person, primarily responsible for parcel maintenance, is shared with the City of Moorhead.

(Continued on page 8)

GIS BACKGROUND

City of Fargo

The City of Fargo was one of the earliest to look into GIS technology in the Metropolitan Area. In 1990 they completed a needs assessment and began planning their GIS. Although Fargo does not have a strong city-wide GIS element at this time, they have created some solid data that can be used for GIS purposes. They are presently using Computer Aided Drafting (CAD) in conjunction with GIS and are continuing to port the CAD data to GIS format for citywide access. The city is in the process of reviewing the GIS needs within the organization and developing a coordinated approach to citywide GIS implementation.

City of Moorhead

The City of Moorhead began the construction of its parcel base map in 1993. City staff are currently using ArcView Desktop GIS to display and analyze their data. In addition, the City has contracted for the development of several custom applications that make accessing and using GIS for specific tasks much easier. The City provides partial funding for a GIS staff person with Clay county. She is primarily responsible for parcel maintenance.

City of West Fargo

The City of West Fargo began their basemap in 1994. They currently have a dedicated staff person responsible for GIS maintenance. They also have a pavement management system that is tied to the GIS.

City of Dilworth

Clay County completed a parcel base map for the City of Dilworth in 1995, shortly after F-M COG completed a needs assessment for the City of Dilworth. The City has not been actively using GIS technology and has looked to Clay County and F-M COG for most GIS needs.

F-M COG

GIS JURISDICTIONAL OVERVIEW—Cass County

JURISDICTIONAL OVERVIEWS

In January, 2000, the Fargo-Moorhead Metropolitan Council of Governments (F-M COG) contracted with PlanSight^{LLC} to perform an *Advanced Metropolitan GIS Plan*. PlanSight^{LLC} staff met with the GIS Steering Committee to kick off the study. Over the next few months, PlanSight^{LLC} interviewed key members of each jurisdiction in order to review existing GIS activities, identify and articulate GIS needs, and later, to prepare the Advanced Metropolitan GIS Plan. The goal of these meetings was to:

- Review the current level of GIS use within each jurisdiction
- Discuss the various uses of GIS for each jurisdiction
- Outline potential goals for GIS usage in each jurisdiction
- Gather information on departmental and jurisdictional data

Following are summaries and findings of the jurisdictional meetings:

CASS COUNTY

GIS Snapshot

Cass County does not have a long GIS history, but has recently begun a concerted effort to modernize their GIS capabilities. An important first step in these efforts involves the creation of a parcel layer that is expected to be finished in spring 2001. There are few other existing GIS datasets at the county level. Although there is minimal use of GIS in most departments, many are familiar with GIS and are eager to begin using it. The potential for GIS is great and many of the departments already have good ideas on how to put GIS to work for them. The County GIS Committee members are also very active and are excited about elevating the Counties GIS capabilities and promoting everyday use of the technology. It is the goal of the County to become more active in GIS, starting by creating critical datasets.

As part of the Advanced Metropolitan GIS Plan, Cass County is undertaking its own detailed review of GIS activities within the county and is organizing a plan for future GIS use. This detailed plan describes what Cass County must do to elevate its GIS capabilities in order to perform tasks needed by the County as well as those additional tasks that may be required to fulfill the regional needs being outlined by the Advanced Metropolitan GIS Plan.

Cass County Planning, Highways, and Water Resource District - Staff in these departments have had exposure to GIS and digital mapping. There is some awareness of what GIS can do for the departments, but Planning has the only GIS software. The Water board and Highways currently have no GIS. Some mapping has been done in these departments and lots of database and spreadsheet analysis that may be ported into GIS at some point. For example, the bridge inventory database tied to a map via GIS would be very helpful. The pavement management database is all maintained in a LOTUS spreadsheet, so it may also be linked to a GIS. There is no actual "pavement management system" per se., so this information used within a GIS format would be very useful. The Highway department also maintains a sign database. Signs are located using linear measurements from intersections or other known points, making this information perfect for use in a GIS.

Each of these departments has specific GIS related needs. Planning needs information on individual lots as well as parcels. For example, the water resource special assessments are based on the number of lots as well as area. Planning also needs to be able to track subdivision splits and how they occurred. There is a real need for accurate flood plain information overlaid with accurate parcels to be able to identify parcels within different flood plains. The application being used by the City of Moorhead was discussed as an example of what is desired. The Federal Emergency Management Agency (FEMA) data is not accurate enough for County needs. The Corp of Engineers is under contract to increase the accuracy of the information for much of the County. There are also local dollars being spent to collect high accuracy elevations in developing areas. Phase I of this collection project is complete. Now phase II is underway and should be completed by the end of the year. The new flood plain data is still a couple of years away. Regardless, some application is needed to be able to determine a parcels proximity to a flood zone. The FEMA data could be used in the short term and the more accurate data in the future. Ultimately, this data should be made available to the public on the Internet.

The County would like to work with the F-M COG to put flood plain and other information on the Internet. Yet, staff are es-

GIS JURISDICTIONAL OVERVIEW—Cass County

pecially concerned with the accuracy of publicly disseminated data. Specific concerns are repercussions from the public if they are given the wrong data. For example, Information such as flood plain location can be misinterpreted because a location can be flood prone without being in a flood plain.

Using GIS with emergency 911 is a major goal for the county. Some problems with this revolve around inconsistent addresses between tax system, deeds and 911. The dispatchers and emergency responders need to get updated information more regularly.

Sheriff's Department—The Sheriffs Department is very supportive of adopting GIS for the day to day activities of staff. Employees have seen several GIS demonstrations and understand the benefits of using it. The department is anxious to implement GIS and is eager to move ahead quickly. Departmental staff are very supportive of finding ways to share GIS data, applications and costs with other jurisdictions, especially the Cities of Fargo and West Fargo. Currently, all patrol deputies have computers in the field. The department would like to take advantage of this by equipping the computers with GIS. Ultimately, the department hopes to have read access GIS on most staff computers (approximately 45), with a handful more having write access. To be effective, GIS should be very accessible and have a user-friendly format. Preferably, this would be accomplished through web-browser applications.

Social Services—The Social Services Department has identified many uses of GIS. The Department maintains a wealth of data with geographic components that they could link to a GIS to help them better understand the geographic distribution of individuals receiving departmental services.

Auditor/Equalization - Auditing and equalization departments would like to use GIS to disseminate information to the general public in a user friendly format and to analyze departmental data based on its geographic location. GIS could also be used as a quality control tool to help the department identify data errors or anomalies.

County Coordinator—The County Coordinator has only limited use for GIS, but is supportive of widespread organizational use of this tool. Simplified access to county data via GIS and the internet would improve the spread of important information to the public. GIS may also be used to help manage the infrastructure at the new correctional facility.

General GIS Goals:

- Easy access to critical information from other departments by County staff.
- Update data in a timely manner.
- Public access to information via the internet.
- Implement GIS in timely fashion.
- Provide staff with simple GIS tools.
- Share data and applications with regional jurisdictions.

Specific GIS Applications:

- Timely parcel information access and query application
- Flood plain application
- Complaint response application
- Mailing label application
- Vehicle Routing application
- Land use application

Key Goals and Applications Topics:

Parcels

Parcels are one of the most important datasets for a jurisdiction. They can be linked to many other free standing databases to show demographics, property details, addresses, .etc. Cass County has contracted for the parcel base to be completed by spring 2001. Once parcels are completed, the information that will be linked to them should be standardized so that all de-

(Continued on page 11)

partments are formatting their data in the same way.

Addresses
Parcel addresses are used for many applications. For the computer to correctly find and match addresses, they must be in a consistent format. However, there is currently no address format standard used by all of the departments in the county. An address standard needs to be adopted and adhered to by each department.

Land use
Land use is a function of the parcel layer. There cannot be an accurate land use map if parcels do not have land use codes. From the parcel data, both existing and future land use maps can be created.

Flood Plain
The Metro Area is highly susceptible to flooding. Access to flooding data is a high priority for many departments. This information encompasses many different areas and incorporates many different data sets. It is not a one step process to get usable flooding information. Parcels, roads, flood plain, and water elevation are just a few of the pieces that make up the analysis of flood prone areas.

Emergency
Information used in emergency situations encompass many different types of data. Parcels and the information that can be linked to the parcels are very important to emergency response. Data such as elderly housing and daycares for evacuation purposes, hazardous materials to comply with federal right-to-know and others are most likely free standing databases. These databases will need to be linked to the parcels. The street centerlines will be used for routing emergency vehicles and is an alternative way to pinpoint addresses. It can also be used for routing other vehicles such as garbage trucks, leaf pickup vehicles, etc.

Public access to data via internet/intranet
The internet/intranet has qualities that make it an excellent choice for allowing public access to information. Emerging technology is making it very easy to interact with geographic data over the internet/intranet. Throughout the interview process, certain types of data were pinpointed for web based applications. These types of data are parcels, land use and flood plain. This technology will not only allow the public to access data but it may be the best way to access metro-wide data sets and applications for jurisdictional employees.

Public notification
Public notification is a concern among many of the departments. There are numerous times when departments will need to notify the public about maintenance or other general information. Often, this information does not need to be sent to all residents. It is more time and cost effective to send the notification only to the people effected. GIS can be used to pinpoint exactly who needs to be notified and quickly provide the user with the required information. GIS can dramatically cut down on the current level of effort required for public notification.

Complaint management
Dealing with the public every day is the main function of local government. Many departments which serve the public get complaints. Using GIS in conjunction with the parcel base and address data, employees can log calls and pinpoint the location of the complaint. The calls can then be managed by the GIS.

User friendly applications
Often times the biggest obstacle to a successful GIS is access to data in a user friendly environment. Most GIS software is too complex for people who are not full time users to become proficient. Because of this, the software must be customized so the user has very little to learn in order to get the desired answers.

Implementing GIS in a timely fashion
Another obstacle to GIS is time. Too often people set lofty goals but never realize them because of the reality of budget constraints, turnover, and just plain loss of interest. When this happens, all of the time and money spent to that point, seems

wasted.

GIS must be realized within a sensible time frame. Elected officials will want to see quick return from money spent on GIS. If they are satisfied, they will continue to support the budget and effort spent on GIS.

Standardize databases into a GIS readable format

The different departments and jurisdictions in Cass County have many databases in many different formats. There is a great deal of information in these databases that can be linked to the GIS. However, most of the formats are very old and difficult for the GIS to read. Therefore, these databases must be translated into new, more functional databases.

Suggested course of ACTION:

- ⇒ *Actively explore partnering options with the other jurisdictions.*
- ⇒ *Begin parcel maintenance.*
- ⇒ *Look for custom applications to help with the parcel maintenance.*
- ⇒ *Look for custom flood applications.*
- ⇒ *Create work group with members from all jurisdictions to research different flood analysis schemes.*
- ⇒ *Implement a data provider policy.*
- ⇒ *Add staff/consultant as necessary to meet time frame goals.*
- ⇒ *Research vendor's road centerline data that is already created or partnership with private firm(s) for development.*
- ⇒ *Participate in a work group with members from all jurisdictions for land use standardization.*
- ⇒ *Participate in a work group with members from all jurisdictions for address standardization.*
- ⇒ *Participate in a work group with members from all jurisdictions for format standardization.*
- ⇒ *Prioritize custom applications.*
- ⇒ *Research "off the shelf" applications.*
- ⇒ *Research consultants who provide custom application service.*
- ⇒ *Help develop policy for data dissemination via Internet.*
- ⇒ *Help brainstorm for live web mapping applications.*

GIS JURISDICTIONAL OVERVIEW—City of Fargo

CITY OF FARGO

GIS Snapshot

The City of Fargo has been planning and slowly implementing GIS for some time. Fargo is currently conducting a detailed GIS implementation plan in conjunction with the Fargo-Moorhead Advanced Metropolitan GIS Plan that should help Fargo speed up the implementation and everyday use of GIS. The City has expressed interest in partnering with Cass County on dataset creation and updating, application development and even shared staff. They are also interested in gaining access to data from other jurisdictions.

While planning to implement GIS, Fargo has created some solid datasets. Some of this data resides in a CAD environment and should be ported to GIS, other pieces have already migrated to a GIS format. The datasets are:

- Ground controlled parcels
- Digital orthographic photos
- Pavement management system
- Digital sign inventory

Most City departments only use GIS sparingly or not at all, but most understand how useful it can be and are very interested in implementing it. Some of the departments have ideas about what they would use GIS for, others have solid plans for implementation and some have procured grant money in order to fund it.

Fargo does have a parcel base that is updated regularly. The parcel layer is updated by the city's engineering department, but the City has expressed interest in having the County maintain this dataset. Cass County, Fargo, and West Fargo are currently involved in a series of meetings to discuss this matter.

Planning Department—The department is currently using GIS and maintains a large amount of data pertaining to parcels. They would like to see other data added to their system, however, they do not have an efficient way to enter this data. They are looking to the future and anticipating many other attributes that will need to be added. Many of the attributes to be linked to GIS are address related, so address standardization is a big issue for the department.

Police Department—The police will be implementing GIS during 2000. They have received a grant from Environmental Systems Research Institute (ESRI) which provided them with a copy of ArcView GIS and some development tools. The Police Departments main concern is address formatting. They feel that it should be consistent with E911 addressing.

Public Works, Forestry and Streets Departments– Staff in these departments are not currently using GIS but staff recognizes that there are potentially unlimited uses of GIS for them. They are very anxious to get access to the GIS data in a format in which they can more easily use it. Water mains and hydrants are currently being mapped in CAD but are not tied together in one layer or referenced to city coordinates. Forestry staff are very interested in using GIS to manage approximately 36,000 trees and 16,000 planting locations.

Engineering Department—Most of the GIS data in the City is maintained by Engineering. They maintain the parcel level basemap showing lots, blocks and ownership splits. The department thinks it may be a good idea for Cass County to take care of the splits because they are the first to receive the information.

General GIS Goals:

- Implement custom GIS applications for everyday use.
- Access to critical information from other departments and jurisdictions.
- Develop complete Land Use coverage.
- Create detailed Flood Zone information.

(Continued on page 14)

GIS JURISDICTIONAL OVERVIEW—City of Fargo

- Utilize GIS for vehicle routing
- Utilize GIS for Parcel maintenance and updating
- Implement GIS in a timely fashion

Specific GIS Applications:
- Customer notification
- Complaint management
- Parcel maintenance
- Emergency notification (Flood/Chemical)
- Vehicle routing

Data
- Ground controlled parcels
- Digital orthographic photos
- Pavement management system
- Digital sign inventory
- Elevation data
- Street centerline with address ranges
- Underground utility plats

Key GIS Goals, Applications, and Data Topics:

Parcels

Parcels are created and maintained by the Engineering Department. Parcels is one of the most important pieces of information to the city. This tasks takes up a considerable amount of time and the Engineering department is conferring with Cass County to determine who should ultimately be the caretaker of this information.

Addresses

The departments were very adamant about standardizing addresses within the city and surrounding area. This is critical for successfully linking existing databases to a GIS.

Land use

Land use is used extensively by many of the city departments. They would like to see it linked to the parcel layer for display and analysis.

Flood plain

The Metro Area is highly susceptible to flooding. Access to flooding data is a high priority for many departments. This information encompasses many different areas and incorporates many different data sets. It is not a one step process to get usable flooding information. Parcels, roads, flood plain, and water elevation are just a few of the pieces that make up analysis of flood prone areas.

Emergency

Much of the information that would be very helpful to first responders and other health/emergency officials is kept by departments other than police, fire, etc . Access to this data in a readable format is a primary goal.

Public access to data via internet/intranet

Almost every department expressed interest in allowing the public to access data over the internet. This would reduce the effort staff are expending for requests from the public.

Public notification

Projects that effect only a small number of people happen frequently. The people whose task it is to notify the public would

(Continued on page 15)

like a user friendly application to assist them with it.

Complaint Management
Many of the city departments field complaints from the public. The staff would like to be able to manage the complaints graphically so that they will know exactly where the complaint is coming from.

User friendly applications
Many similar applications were brought up by different departments. The main focus was the ability for non-GIS people to be able to use these.

Implement GIS in a timely fashion
All the departments expressed interest in getting GIS into daily use as fast as possible.

Standardize databases into a GIS readable format
Many of the databases in the city exist in old, hard to read formats. In order for departments and others around the metropolitan area to access this data easily, they will need to reformat the data in new, user friendly formats.

Routing
Things such as garbage trucks, emergency vehicles, mass transportation and elderly care are all applications that were pinpointed for routing applications. The city will need to have a more accurate centerline with attributes for routing applications.

Suggested course of ACTION:

⇒ *Actively explore partnering options with the other jurisdictions.*
⇒ *Partner with Cass County on parcel maintenance.*
⇒ *Look for custom flood applications.*
⇒ *Create a work group with members from all jurisdictions to research different flood analysis schemes*
⇒ *Implement a data provider policy.*
⇒ *Add staff/consultant as necessary to meet time frame goals.*
⇒ *Research vendor road centerline data already created or partnership with a private firms for development*
⇒ *Participate in a work group with members from all jurisdictions for land use standardization*
⇒ *Participate in a work group with members from all jurisdictions for address standardization*
⇒ *Participate in a work group with members from all jurisdictions for format standardization*
⇒ *Prioritize custom applications*
⇒ *Research "off the shelf" applications*
⇒ *Research consultants who provide custom application service*
⇒ *Help develop policy for data dissemination via Internet*
⇒ *Help brainstorm for live web mapping applications*

GIS JURISDICTIONAL OVERVIEW—City of Dilworth

CITY OF DILWORTH

GIS Snapshot:
The City of Dilworth does not currently have any GIS software in-house. All GIS services are performed by outside organizations including FMCOG, Clay County, and the City's engineering consultant (Ultieg Engineers). City staff typically do not work directly with GIS data, instead they depend heavily on these other organizations to provide staff with hardcopy GIS maps to meet their needs. Since budget constraints will likely prohibit hiring any full or part-time GIS staff anytime in the foreseeable future, Dilworth staff would look favorably upon an arrangement in which they could continue to contract with other organizations for the bulk of their GIS needs. Other reasons given for not working directly with GIS include small staff size and training requirements.

The small size of the City of Dilworth makes many of the benefits a GIS can provide less pronounced than would be the case in a larger jurisdiction. Current staff know the City well and have little difficulty performing search and query tasks manually (tasks typically performed within a GIS). Using GIS-created hard-copy maps supplied by the GIS support organizations mentioned earlier provides staff with a low-tech solution that is adequate for their needs. So while staff is very supportive of GIS efforts at the County and metropolitan level, they currently have only limited needs in-house. However, this discussion led to the conclusion that GIS would be a useful tool to document and transfer the current staffs knowledge of the City to new staff. Some concern was expressed that much of what existed in the City was, in many ways, only fully understood by staff and not written down in any formal way that could be quickly accessed by others. Staff agreed that GIS would be a good tool to better document, organize and make this information available to others.

Data: A preliminary list of data available to the city includes:
- parcel basemap,
- land use,
- zoning,
- sewer,
- water,
- street map.

Key Topics:

Flood Plain location: Overlaying FEMA data onto parcels would be useful to enable staff to more efficiently respond to public inquiries about the location of specific properties in respect to flood zones. This information is in high demand by real estate and lending organizations. The ability to quickly find an address and its location in respect to the flood plain would be a very useful application of GIS.

The issue of data accuracy was brought up during this discussion. The FEMA flood plain designation boundaries are significantly less accurate than the parcel information. Given these two data sources were used together, disclaimers should be provided ensure the end user understands any potential problems. Accurate elevation contours would be useful to more precisely define flood plain boundaries. Staff felt that this type of application may also be appropriate (with disclaimers) for Internet access by the public.

Utility inventory: Using GIS to assist with a hydrant inventory and to manage and query shut-offs and service lines were a few of the potential projects outlined by engineering and public works.

Emergency response: Emergency response emerged as a potential use of GIS during the meeting. The ability to quickly access maps and data related to parcels by police and fire on existing mobile laptop computers would be very useful in many instances.

Need for external data: Staff have little need for data from outside the jurisdiction except for those projects on or near the City limits. Exceptions include information on sewer lines used by both the City of Dilworth and the City of Moorhead, in-

formation on road closings due to improvements, and information on townships outside the City that are serviced by the Dilworth Fire Department.

Custom Application Demonstrations: The meeting was followed up by a demonstration of custom GIS applications in use by other jurisdictions throughout Minnesota. These demonstrations were intended to show that GIS could be made easily accessible and very user-friendly. The demonstrations sparked a new round of discussions on potential uses of GIS by both staff and the public. Internet GIS applications and access to data was addressed. Staff felt that the Internet would be a good medium for both staff and public to access applications that may have county-wide or metropolitan-wide uses. Internet security and data privacy issues were brought up. Staff felt that these were important issues that should definitely be addressed during the project. Staff also encouraged and supported the idea of shared applications that could be used by more than one jurisdiction.

Shared applications
Since the staff agreed that keeping GIS expenses to a minimum was a good idea, they were very impressed with the idea of sharing custom applications. This way, instead of relying on all of their hardcopy maps to be made by outside organization, they could do it themselves.

Internet applications
Internet GIS access was a topic that the staff thought was a good idea to implement. However, since they do not maintain most of their data, it would need to be implemented by someone else. The use of this would be very beneficial and cost effective.

Suggested course of ACTION:

- ⇒ *Participate in work group with members from all jurisdictions to research different flood analysis schemes*
- ⇒ *Research vendor road centerline data already created or partnership with private firm for development*
- ⇒ *Participate in work group with members from all jurisdictions for land use standardization*
- ⇒ *Participate in work group with members from all jurisdictions for address standardization*
- ⇒ *Participate in work group with members from all jurisdictions for format standardization*
- ⇒ *Prioritize custom applications*
- ⇒ *Research "off the shelf" applications*
- ⇒ *Research consultants who provide custom application service*
- ⇒ *Help develop policy for data dissemination via Internet*
- ⇒ *Help brainstorm for live web mapping applications*

JURISDICTIONAL GIS OVERVIEW—F-M COG

FARGO MOORHEAD METROPOLITAN COUNCIL OF GOVERNMENTS

GIS Snapshot

GIS plays an important role at F-M COG. Currently there are six full time staff and two interns, but only one GIS user. GIS uses at F-M COG focus primarily on mapping and, to a lesser extent, data analysis. Land use, building values, households, road widths, and centerline information are a few of the key datasets required by F-M COG staff. Most of the internal requests for GIS services come from the planning staff. F-M COG GIS staff also do some technical advising to Cass County, Moorhead, and other jurisdictions on ArcView procedures.

Most of the mapping and analysis performed by F-M COG is dependant on accurate parcel data. F-M COG uses parcel data from six jurisdictions. Obtaining and compiling parcel data from these jurisdictions is a major task that must be undertaken by F-M COG staff to ensure that this critical database is available to meet the internal business needs of the organization. Problems with parcel data revolve around different formats, projections, accuracy and update schedules.

Another important GIS dataset for F-M COG is centerline data. Unfortunately, the centerline database is plagued by many of the same issues surrounding parcel data. To improve the accuracy and usability of the centerline data, F-M COG GIS staff have been working to assign each centerline segment a unique id number and use this unique ID to link to other databases that include important information regarding each road segment. Some important attributes to centerlines are speed limits, road width, emergency snow routes and number of lanes. This project is currently in the data collection phase.

F-M COG's position in the region in terms of GIS data creation and use in unique. Unlike most of the other jurisdictions and organizations, F-M COG requires large amounts of GIS data from all of the regional participants, yet creates relatively little GIS data itself. Most of the GIS data management activities revolve around combining similar datasets provided to it by each jurisdiction to create regional datasets of similar data. This data is then used by F-M COG in day-to-day activities. An estimated 1/3 (600+ hours) of the GIS staff time is spent collecting and combining GIS related data obtained from the jurisdictions.

One of the major problems currently facing F-M COG are the dissimilarities in the same types of information provide by each of the jurisdictions. Parcels, for example, are a critical dataset for F-M COG to be able to perform its needed GIS activities. Yet parcels are provided to F-M COG in several different coordinate systems with different levels of accuracy and completeness, and even in different file types. These dissimilarities in otherwise similar data require that much of the time spent by F-M COG staff on GIS is spent on getting these datasets to work together. The first step in resolving this problem was the creation of the GEODEC standards, which layout a good framework for how to standardize GIS data. However, these standards need to be reviewed, updated and enhanced to take into account new technologies, file types, distribution requirements, etc. In addition, the GEODEC standards need to be expanded to encompass areas like coordinate systems, addresses, parcel identification numbers, data accuracy and precision, and more.

GIS Applications and Data:

The tables: *Key GIS Tasks Performed by F-M COG* (page 20), and *Key GIS Databases* (page 19) outline priority GIS tasks and associated data. F-M COG has a responsibility to perform critical planning and other transportation related tasks for the Metropolitan area. GIS can be used to complete many of these tasks much more efficiently. Some of the specific needs of the F-M COG can be seen in applications they use GIS for (see table, *Key GIS Tasks Performed by F-M COG* (page 20)). By looking at these applications, it is evident that political boundaries, parcel information, and road network information are critical GIS data needs for the F-M COG. Also, information from the cities' and counties' databases such as demographic information, land use, zoning, property owners, etc, are also a critical need for the F-M COG.

Since much of the GIS data needed by the F-M COG is created and maintained by each of the jurisdictions in the metropolitan area, staff has to piece data together from each jurisdiction to get a Metropolitan-wide data set to work with. One of the overriding goals for the region should be for the jurisdictions in the Metropolitan area to adopt common formats and coordinate systems that will make the task of combining this data much easier.

JURISDICTIONAL GIS OVERVIEW—F-M COG

Key GIS Databases for F-M COG activities:

Data	Update Frequency	Data Providers	Estimated Integration Time (hours)
Roadway & Multimodal Transportation Data			
Roadway Miles (by functional class)	Four Years	DOT/City/County	20
Road Capacity (new roads, newly paved roads, lane additions, traffic signal improvements, major rehabilitation projects)	Annual	DOT/City/County	80
Traffic Counts	Annual	DOT/City/County/COG	160
Screen Lines	Annual	COG	20
Bicycle/Pedestrian facilities	Annual	City/County/Park District	20
Traffic Control Devices	Annual	DOT/City/County	0
Transit Data			
Transit System (route changes & service changes)	Annual	Transit	20
Transit Routes	Per Change	Transit	20
Socioeconomic Data			
Population	10 Years	Census	20
Households	Annual	COG	20
Large Employers	2 Years	COG	20
Dwelling Units	Annual	Census/State Data Centers	20
Census Data (STF 1, 2, & 3)	As Available	Census	20
Census Transportation Planning Package (CTPP)	As Available	Census/DOTs	20
Existing Land Use	Annual	City/County	20
Land Use Plans	Annual	City/County	20
Specific Land Use Data (i.e. Square footage)	Annual	City/County	20
Parcel Maps	Semi-Annual	City/County	40
Annexations	Semi-Annual	City/County	40
Extraterritorial Boundaries	Annual	City	20
Zoning	Annual	City/County	10
Projections	5 Years	COG/State Data Centers	30
		Total Data Processing hours	*673*
		Full-Time Equivalent	*0.34*

GENERAL GIS GOALS:

- Access to data GIS data from surrounding jurisdictions.
- Access data in common format.
- Access data in common coordinate systems.
- Update street centerline with name, id, speed limit, width, lanes, emergency snow routes.

JURISDICTIONAL GIS OVERVIEW—F-M COG

Key GIS Tasks performed by F-M COG staff:

F-M COG GIS Task	Data Update Frequency	Data Required	Data Providers
Access Land Base Data and overlay transportation facilities on it.	Semi-Annual	Parcel Maps	City/County
Analyze traffic volumes	Annual	Traffic Counts	DOT/City/County/COG
Display and analyze transit routes	Annual	Transit Routes	
Analyze Bikeways	Annual	Bicycle/Pedestrian facilities	City/County/Park District
Track condition and maintenance of bikeways	5 Years	Bicycle Facilities/Parcels	City/County/Park District
Display roadway designations	Per Change	Roadway Miles (by functional class)	DOT/NHS/ND Urban Road Program
Display future projects by location, timeframe, roadway width, and costs.	Annual	Road Capacity	DOT/City/County
Overlay/Analyze Census and TAZ data	10 years	Census/TAZ/CTPP journey to work data	Census/COG/CTPP
Display & Overlay environmentally sensitive sites with transportation facilities	Per Mitigation	NWI/various	NWI/various
Display & Overlay historic preservation sites with transportation facilities	Per addition or change	Various Historic Preservation data as available/transportation facilities	DOT/COG/City/County/Historic Preservation organizations
Display & Overlay endangered species habitats with transportation facilities.	Per new habitat	none currently	none currently
Display location of large employers and data associated with number of employees, type of business, & future growth plans	Annual	Large employers/Parcels	COG/City/County
Analyze and display locations of traffic congestion	5 years		COG
Display & describe intermodal facilities	Annual		
Display & query sidewalk locations, width, & handicap accessibility	Annual	Sidewalks/Parcels/streets	City/County/COG
Display & overlay property lines, ownership, zoning, & land use type to identify owners in areas affected by improvements	Annual	Parcel/Zoning/Land Use/Road Improvements	City/County/COG
Display & overlay utility locations in relation to transportation facilities	Annual	Utilities/Transportation facilities	City/County/COG/Electric/other
Display Future Bike Facilities	Per Bike Plan Updates	Bicycle/Pedestrian facilities	City/County/Park District
Display Tie Points	none		
Display Bus shelters	Annual	Roadway data	Transit/COG
Display High Use Transit sites	Annual	Transit System (route changes & service changes)	Transit
Display Truck Routes	Annual	Roadway data	COG
Display Mosquito abatement Areas	Per Change	Parcels/Abatement areas	City/County/COG
Display School Districts Boundaries	Annual	Parcels/School District Boundaries	City/County/School Districts
Display City Boundaries	Per Change	Parcels	City/County
Display ET Areas	Annual	Parcels/ET boundaries	City/County
Display urban area boundary	Per Change	Parcels/Urban Area Boundaries	City/County/COG
Display Parks	Annual	Parcels/Parks info	City/County/Parks

JURISDICTIONAL GIS OVERVIEW—F-M COG

Key Goals and Applications Topics:

Access surrounding jurisdictions data

The F-M COG has critical tasks that it must perform. This encompasses six jurisdictions. In order to perform these tasks, it must have data from these jurisdictions. Therefore, increased sharing of data in ESRI format and in a common coordinate system. Is an important goal of F-M COG.

Parcels

Tasks such as overlaying and displaying property lines, ownership, zoning and land use are critical for the F-M COG. Therefore, parcels are a priority. Having all the jurisdictions within the F-M COG boundary updating GIS parcel boundaries on a regular basis is key to F-M COG.

Street centerline

Other tasks, such as analyzing traffic volumes, displaying transit routes, bike routes, etc., need an accurate, up-to-date street centerline. Creating a regional centerline coverage is another key dataset for F-M COG.

Shared applications:

Any application that can be shared with the other jurisdictions for simple query and map creation would help the F-M COG. They are also interested in targeted mailing applications using GIS.

Internet applications

As an entity that serves the people of the Fargo-Moorhead Metropolitan Area, dissemination of data to the public is very important. Internet applications that will allow easy access to this data is interesting and helpful to the F-M COG.

Suggested course of ACTION:

- ⇒ *Discuss options of creating regional parcel dataset with jurisdictions*
- ⇒ *Discuss options of creating regional centerline dataset with jurisdictions*
- ⇒ *Participate in a work group with members from all jurisdictions for land use standardization*
- ⇒ *Participate in a work group with members from all jurisdictions for address standardization*
- ⇒ *Participate in a work group with members from all jurisdictions for format standardization*
- ⇒ *Rank need of custom applications by importance*
- ⇒ *Research "off the shelf" applications*
- ⇒ *Research consultants who provide custom application service*
- ⇒ *Help develop policy for data dissemination via Internet*
- ⇒ *Help brainstorm for live web mapping applications*

JURISDICTIONAL GIS OVERVIEW—Clay County

CLAY COUNTY

GIS Snapshot

Clay County is very progressive in GIS. They have dedicated staff for parcel update and maintenance, which they provide for the entire county including Moorhead and Dilworth. The County would like to provide access to the data on their server for other jurisdictions. They feel that this will foster data sharing and be helpful to the entire metro area. They have also identified dissemination of geographic information to the public as a key goal. Parcel and flooding information are two of the internet applications that would be very helpful to the public. Internet Mapping software, which the County owns, will allow them to create the applications to accomplish two of their main goals.

911 is another priority for the County. They have pinpointed address standards, rural addressing and centerline data as key datasets that will help the 911 system.

General GIS Goals:

- Make GIS data easily accessible to the public
- Develop accurate address information
- Integrate GIS map display with E-911
- Refine and incorporate rural addressing system
- Create graphical index to record plats and access all tract information

Specific GIS Applications:

- Determine areas of prime farmland and natural areas based on soil types and crop equivalency ratings
- Track permits by parcel
- View easements
- Accurately establish parcels affected by a floodplain
- Identify landowners and/or residents that are affected by a proposed project
- Address queries regarding ownership of properties
- Water quality analysis
- Perform districting to define ambulance, fire, police and response teams' districts in order to coordinate service
- View Ditch layout location with ROW's
- Route selection for all first responders

Key Goals and Applications Topics

Addresses: Addresses are used for many applications. For this reason, they must be standardized. Each department will need to adhere to the address standards for all data pertaining to addresses.

Emergency 911

Interface 911 system to display map of caller's location. Accurate and rural addressing also has an impact on this goal. Parcel level data will also need to be incorporated.

Public access to data via internet/intranet

The internet/intranet has qualities that make it an excellent choice for allowing public access to information. Emerging technology makes it very easy to interact with geographic data over the internet/intranet. Throughout the interview process, certain types of data were pinpointed for web based applications. These types of data are parcels, land use and flood plain. This technology will not only allow the public to access data but it may be the best way to access Metropolitan- wide data sets and applications for employees.

Public Notification

Several departments outlined notifying the public within a certain distance of a proposed project as a major goal. The tasks takes several hours now and they would like to automate the process.

Flood plain
Many shared the need for accurately establishing parcels affected by flood plain. Since flooding is such a problem in this area, it was a highly supported goal.

Routing
Perform automated route selection for vehicles dealing with client pickup, visits and first responders

Suggested course of ACTION:

- ⇒ *Actively explore partnering options with the other jurisdictions*
- ⇒ *Look for custom flood applications*
- ⇒ *Create work groups with members from all jurisdictions to research different flood analysis schemes*
- ⇒ *Research vendor road centerline data already created or partnership with private firm for development*
- ⇒ *Participate a in work group with members from all jurisdictions for address standardization*
- ⇒ *Prioritize custom applications by importance*
- ⇒ *Research "off the shelf" applications*
- ⇒ *Research consultants who provide custom application service*
- ⇒ *Help develop policy for data dissemination via Internet*
- ⇒ *Help brainstorm for live web mapping applications*

JURISDICTIONAL GIS OVERVIEW—City of Moorhead

City of Moorhead

GIS SNAPSHOT

The City of Moorhead has been involved with GIS as a partner with F-M COG since the region first become involved with GIS. They started by establishing ground control points and stereo orthophotography. Parcel data has been entered using Co-ordinate Geometry (COGO) and is accurate to +/- 2 feet or less. However, there are some problems with parcel accuracy along railroad lease parcels due to missing or incomplete data. The City currently shares a staff position with Clay County to help update data. The City currently downloads parcel attribute data files nightly from the Clay County AS400.

Approximately six staff across several departments are currently using GIS to varying degrees. These include engineering, planning, assessing, police (through engineering), wastewater, building codes and parks. Moorhead Public Services is just getting into GIS using AutoCAD & AutoCAD Map. The City has fiber-optic connections with the Wastewater Treatment and the Streets Department. The Wastewater Department is using GIS and has purchased its own plotter. Engineering is doing a lot of the work for many of the other departments. Overall, GIS is not progressing as quickly as the City would like, primarily due to perceived difficulty using GIS and a need for more GIS training.

The City sees the need to continue standardizing data and has put a lot of effort into standardizing its address data into US Postal Service format. One role of F-M COG may be to develop shareable custom applications for entire metro, similar to those developed by Moorhead. Moorhead consultants have developed several custom applications on ArcView. These applications simplify GIS for the end users. The most advanced of these is the cities flood modeling application. The whole intent is to ultimately get this GIS data to the public via the Internet.

GENERAL GIS GOALS:

- Get GIS property info and flood modeling data and info on Internet.
- Get other departments up to speed, especially police department.
- Use F-M COG as funnel for all regional GIS data. Similar to North Metro I35W GIS in Twin Cities.
- Develop and share custom applications metro-wide.
- Develop user friendly applications for use in each department.

SPECIFIC GIS APPLICATIONS:

- Regional flood model.
- Regional property query
- Custom applications specific to each department

DATA:

- Sanitary Sewer completed
- Images
- Storm sewer under development
- Signs
- Parcels
- Centerlines

Parcels

The City would like access to property and parcel information for query and analysis.

Flood information

A primary goal is to create data and a flood modeling application for planning and emergency use.

JURISDICTIONAL GIS OVERVIEW—City of Moorhead

Internet applications
Many of the staff members expressed great interest in getting GIS data and info on Internet so that the public can view and interact with data.

Implement GIS in a timely manner
Get other departments up to speed using GIS so that everyone can be at a common level of GIS. This will help staff to be able to use custom applications and third party "off-the-shelf" products. The City would also like to see a central GIS data clearinghouse maintained by a regional jurisdiction and suggests that F-M COG could do parcel updating, etc. to allow jurisdictions to focus on GIS use instead of data updating.

User friendly applications
Develop and share custom applications metro-wide and for use in each department.

Suggested course of ACTION:

⇒ *Actively explore partnering options with the other jurisdictions*
⇒ *Look for custom flood applications*
⇒ *Create work group with members from all jurisdictions to research different flood analysis schemes*
⇒ *Add staff/consultant(s) as necessary to meet time frame goal*
⇒ *Research vendor road centerline data already created or partnership with private firm for development*
⇒ *Participate in a work group with members from all jurisdictions for address standardization*
⇒ *Participate in a work group with members from all jurisdictions for format standardization*
⇒ *Rank the need of custom applications by importance*
⇒ *Research "off the shelf" applications*
⇒ *Research consultants who provide custom application service*
⇒ *Help develop policy for data dissemination via Internet*
⇒ *Help brainstorm for live web mapping applications*

JURISDICTIONAL GIS OVERVIEW—City of West Fargo

City of West Fargo

GIS SNAPSHOT

The City of West Fargo contains approximately 5000 parcels and is currently using two copies of ArcView and one copy of AutoCAD to create, manage, and use GIS information. The City's current network and computer capabilities are robust enough to handle most existing and planned GIS applications.

The public works department is the most active user of GIS within the City. The Department is responsible for the creation and maintenance of the City's parcel data. Currently, this data is updated twice per year. The parcel data is not as accurate as the parcel data being prepared by Clay County or Fargo, and is simply a representation of approximate parcel configurations. The data is fine for reference purposes, but should not be used where a high degree of accuracy is required. The City is hoping to use aerial photography to rectify the parcels to increase the data's accuracy. There are significant amounts of data currently linked to parcels via Parcel Identification Numbers (PIN's) such as sump pump locations, variances, etc. The Public Works Department also uses Cartegraph™ software to manage their completed pavement layer and to manage sewers, water, and street signs.

The Police Department is not currently active with GIS, but would like to explore the use of vehicle tracking and 911 dispatch software. Issues arise from the Department's response area going beyond the West Fargo City limits (the same is true for the Fire Department). As a result, the Police Department requires GIS data from neighboring jurisdictions to develop a complete GIS database. The Police Department does currently have a T-1 connection to Cass County. The high-speed connection could be used to transfer large amounts of data between organizations.

The Planning Department uses land use and zoning data in conjunction with the current parcel database. The Department hopes to see improvements in the parcel data, and subsequently its land use data. The Planning Department does have a copy of ArcView, but use it infrequently.

The City Auditor is not currently active in GIS but understands the potential benefits that could be derived from it. The Auditor would like to be able to query the GIS data by PIN, address, or owner, create address mailing labels automatically, view property values by parcel and link assessment database (currently in Microsoft Access) to GIS parcels. The City currently gets 15-20 calls per day requesting property information. Therefore, the department is very interested in providing the public some type of access to public land data via the Internet.

Overall, City staff are anxious to get all departments utilizing GIS. To do so, they feel the need for extremely user friendly applications accessible by all staff.

GENERAL GIS GOALS:

- Improve the accuracy of the parcel database.
- Integrate GIS, vehicle tracking, and 911 dispatch for the police department.
- Improve address data.
- Create user-friendly GIS access and query capabilities for staff.
- Integrate Assessment database with GIS.
- Access extraterritorial (ET) areas via GIS.
- Avoid duplicate efforts both internally and within the county/region.
- Integrate historical data if useful.
- Allow public access to GIS data via the Internet.

SPECIFIC GIS APPLICATIONS:

- Simple query interface for searching GIS parcels by address, pin, or owner
- Mailing label generation
- Internet GIS data application for public access to land data maintained by the city
- 911/vehicle tracking application.

JURISDICTIONAL GIS OVERVIEW—City of West Fargo

Key Goals and Applications Topics:

Parcels
Improve accuracy of parcel database. At this time the accuracy is not sufficient for all of the uses West Fargo would like to have the parcel base for. This should be corrected when the Cass County parcels are finished. The City needs to work with Cass County to ensure the quality of GIS data developed for West Fargo is sufficient.

Routing
Integrate GIS, vehicle tracking and 911 dispatch for police department is a major goal. The Police Department is very interested in GIS.

Address
Improve address data by standardizing and error checking data in city and surrounding area.

User-friendly applications
Access and query capabilities in an applications easily used by non-GIS staff.

Share data
Access extraterritorial (ET) areas via GIS.

Internet access
Public access to GIS data via the Internet to make dissemination of data easier.

Suggested course of ACTION:

- ⇒ *Actively explore partnering options with the other jurisdictions*
- ⇒ *Partner with Cass County for parcel maintenance*
- ⇒ *Participate in a work group with members from all jurisdictions for land use standardization*
- ⇒ *Participate in a work group with members from all jurisdictions for address standardization*
- ⇒ *Participate in a work group with members from all jurisdictions for format standardization*
- ⇒ *Prioritize custom applications*
- ⇒ *Research "off the shelf" applications*
- ⇒ *Research consultants who provide custom application service*
- ⇒ *Help develop policy for data dissemination via Internet*
- ⇒ *Help brainstorm for live web mapping applications*

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

ADVANCED METROPOLITAN GIS

Bringing all jurisdictions in the metropolitan area under a common GIS umbrella is the focus of this section. By setting standards, communicating, sharing data and applications, and working together, the process of using GIS in everyday tasks will become much easier. There are several aspects to look at when deciding how the jurisdictions of the metropolitan area should work together on GIS. What will be the degree of collaboration? Once the degree of collaboration is agreed upon, what collaborative structure will be the best? How will the regional GIS be funded? Because of the nature of a metro-wide collaboration, it would be helpful to implement some type of cost sharing for data that will be useful for everyone. In 1999, MetroGIS of the Twin Cities created a document outlining their Fair-Share Financial Model. Please see appendix F for this document. It will help participants see that they will not be alone in funding the metro-wide GIS initiative.

The regional GIS is not meant to replace local GIS efforts, and all policies and procedures outlined in this plan are in addition to existing or planned GIS activities at the local level. Some local policy, procedures, and data may need to be altered to better fit into a regional scheme, but it is left to the discretion of the jurisdictions to determine how to best meet the regional GIS requirements. Some aspects of the regional GIS will improve or enhance the functionality of local GIS systems, but will, in no way, replace GIS at the local level.

Collaboration

The structure for the metropolitan area will depend on the degree of collaboration. The different degrees of collaboration range from the basic:

- regional facilitator maintaining a place for other jurisdictions to download their critical regional datasets as well as other jurisdictional datasets

to the high end:

- creating/maintaining all regional datasets important to the entire metropolitan coalition, enforcing data standards, and providing GIS expertise and consulting.

At the highest degree of collaboration, a regional facilitator must have the staff, software, hardware and funds to support it. The funds can come from many places. The facilitator may apply for grants, recoup money by selling value added data and/or recoup funds from the participants of the project

This study anticipates the need for a high level of collaboration to meet the regional needs and goals outlined later.

Collaboration Options

To meet the regional GIS goals set out later in this plan, an agency or agencies need to take a lead role as REGIONAL GIS FACILITATOR to compile regional GIS datasets and applications. This section outlines five options for the development of an advanced regional GIS. The first is a "do nothing" option in which all of the jurisdiction continue down the current path and continue to participate in the same format observed over the last few years. The other four options take a closer look at what options are available to restructure the current GIS policies and organizations to facilitate the development of a strong regional GIS program. Each option has both benefits and drawbacks and requires jurisdictions to take on different roles to attain the regional GIS goals set forth in this document.

There are a number of options for developing a stronger regional GIS in the Fargo-Moorhead area. This plan outlines five options. The organization structural options identified include:

1) Status Quo option
2) County Centric -Regional GIS Coordination
3) FMCOG Centric -Regional GIS Coordination
4) FMCOG-County Partnership
5) Consultant-driven Regional GIS Coordination

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

1) Status Quo Option.

The Status Quo option assumes that there will be no major change in regional GIS policy or initiatives in the near future. Jurisdictions continue to supply F-M COG with local data in current formats. Counties continue to focus on meeting internal needs, and to work with jurisdictions within each county to meet subregional needs. Municipalities supply data to counties and F-M COG on an as needed basis in non standard formats. F-M COG develops regional datasets and applications only as needed internally. Development of regional datasets and applications that are not directly beneficial to F-M COG remain problematic, most likely resulting in duplication of efforts between the two counties.

BENEFITS

- Same level of effort and cooperation by jurisdictions
- No staff/funding increases required to meet regional needs.

DRAWBACKS

- Duplication of effort
- Regional GIS development continues to be problematic, especially for F-M COG.
- Regional goals identified by jurisdictions go largely unmet.
- Past regional GIS efforts become increasingly inconsequential and ultimately dismissed as technology changes.

SUMMARY

While improvements to the internal GIS operations of F-M COG will likely be supported under this option, and enhancements to critical datasets by local primary data providers will continue to evolve, significant advances in a regional GIS are unlikely. F-M COG staff will continue to struggle to find time/funding to meet their own internal business needs, not to mention address the regional goals identified in this report. The Status Quo option is not viable if an enhanced regional GIS is the goal. Changes in the dynamics of jurisdictional GIS and changes in technology require new regional GIS policy initiatives. Improvements in, and adherence to, regional GIS data standards; and the development and regular maintenance of coordinated regional datasets and applications by the primary data providers seem unlikely under the current format

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

2) County Centric Regional GIS

In the County Centric Regional GIS option, GIS activities at the county level are enhanced to encompass regional needs and goals. Cass and Clay County would be jointly responsible for creating and managing all regional datasets and applications. Counties would work together on projects with F-M COG as a moderator and facilitator. F-M COG would work to fairly define data and application development and maintenance tasks for each of the counties that all parties agree to. F-M COG's role in this option, beyond that of a moderator or facilitator, would be primarily in support of its own internal business needs.

The County Centric option relies on Cass County to quickly reach a common level of GIS program development as Clay County, as per the Cass County GIS Plan developed in conjunction with this report.

Municipalities and F-M COG's roles in this option would be primarily in support of their own internal business needs. Municipalities would work with counties to ensure that regional data standards meet local needs. Counties and F-M COG then work together to implement data standards. However, F-M COGs role in this would be limited to facilitating or moderating data standards creation

JURISDICTIONAL ROLES

In this option, the counties obtain data from F-M COG, the cities, and other jurisdictions to jointly compile into regional datasets and develop regionally useful applications. F-M COG's role is to help organize and coordinate the effort, but not to actively participate in the creation of regional data or applications. The cities and other jurisdictions provide data as needed, but otherwise focus on internal business needs.

Counties Role:

- Work together and with F-M COG and all participants to develop/enhance data standards.
- Adherence to data standards critical for success.
- Work together and with F-M COG and all participants in the planning of regional GIS applications and data.
- Jointly develop all regional GIS databases.
- Jointly develop all regional GIS applications.
- Additional staff and funding likely required by both counties (roughly 1500+ hours/year per county additional staff time to support regional GIS data and application development).

F-M COG Role:

- Work together and with all regional participants to develop/enhance data standards.
- Work together and with F-M COG and all participants in the planning of regional GIS applications and data.
- Act as moderator during planning stages.
- Use regional databases and applications developed by joint-counties to address internal needs.
- Develop only those regional databases that utilize data created in-house.
- No additional staff or funding required (this option should free up as much as 600 hours per year of existing staff time).

Municipalities Role

- Work with county during planning stages to ensure that regional data and applications will meet local needs.
- Provide county with local data needed to create regional databases and applications.
- Use regional databases and applications developed by joint-counties as needed to meet internal needs.
- No additional staff required to meet regional needs.

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

Other Participating Organizations Role

- Work with F-M COG during planning stages to ensure that regional data and applications will meet local needs
- Provide county with data needed to create regional databases and applications.
- Use regional databases and applications developed by joint-counties as needed to meet internal needs
- No additional staff or funding required to support regional GIS.

BENEFITS:

- GIS Technical skills already (or soon to be) available at the County level.
- Adequate GIS hardware/software already (or soon to be) in place at County level
- Creation of regional databases resides with primary data providers (counties).
- Counties coordinate activities with local jurisdictions.
- F-M COG GIS workload lessens as counties jointly create regional datasets needed by F-M COG.
- F-M COG focuses more of existing GIS staff time on meeting internal business needs.

DRAWBACKS

- Additional workload for counties (more staff and funding likely needed)
- F-M COG more dependent on Counties for regional datasets.
- Possible difficulties in equally sharing regional GIS workload between counties.
- High degree of standardization, adherence, and cooperation required.
- Little incentive for counties to develop regional GIS data and applications that benefit F-M COG exclusively.
- Requires improved coordination and cooperation between counties and local jurisdiction as well as between counties.

SUMMARY

This organizational structure is certainly a viable option should F-M COG level of activity in regional GIS development remain as is. Regional GIS activities are already drifting in this direction with Cass County increasing its role and Clay becoming more active. There is some concern about the level of cooperation required between jurisdictions. Another concern is the question as to whether this would truly meet F-M COG's internal business needs. This option gives F-M COG very little control over the actual development of regional GIS datasets and applications. As the primary user of regional datasets, it is critical that those datasets are developed and provided to F-M COG in a timely fashion in a format readily usable by F-M COG. Issues regarding timing of GIS deliverables for the counties, database structure and format, and updating, needs to be considered carefully by all of the participants before adopting this organizational option.

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

3) F-M COG Centric Regional GIS

The F-M COG option places F-M COG in the center of all regional GIS activities. F-M COG would be acting as a Regional GIS Coordinator with a much more active role in GIS activities in the entire region. F-M COG would be responsible for all regional dataset and application needs. Counties and jurisdictions provide required data to F-M COG, but focus on internal needs. This is the most labor and financially intensive option for F-M COG and would require substantial commitment by the organization.

F-M COG would need to add staff and hardware/software capability to take on this role. F-M COG staff could then act as a regional GIS resource for the other jurisdictions as needed. An estimated 1200 additional staff hours (.33-.66 Full Time Equivalents) would be required to meet the ongoing regional needs. More time may be required if F-M COG took on a more active role as regional GIS technical support provider. This time would be in addition to the 650+/- hours currently being spent by F-M COG staff to develop regional GIS datasets for internal uses.

Regional GIS collaboratives organized similarly to this option are the most prevalent in the GIS organizations reviewed for this plan. Most local jurisdictions in other regions defer to a centralized approach like the one outlined in this option.

Much of the GIS data needed by the COG is created and maintained by each of the jurisdictions in the Metropolitan Area. Therefore, in a F-M COG-centric approach, F-M COG needs to piece data together from each jurisdiction to get a Metropolitan-wide data set to work with. In order to make this data easily fit into a metropolitan-wide dataset, the jurisdictions in the metropolitan area need to adopt common formats and coordinate systems. This will make the COG's tasks easier. However, in order to cultivate this sharing, the COG must actively assist the jurisdictions with time and money. In order to do this, the COG must bring its GIS capabilities up to the same level. The following details what F-M COG should implement in order to attain that level.

In this role, F-M COG would take an aggressive lead in organizing GIS activities in the region to meet the needs of not only F-M COG, but also the common needs of all jurisdictions. In some respects, F-M COG has been filling this role in a limited fashion for some time now. As a more active Regional GIS Facilitator, F-M COG would take on the added responsibility of developing regional datasets, conducting regional analysis, and creating custom applications that can be shared throughout the region by all participating jurisdictions. This report has identified a significant number of common GIS needs shared by multiple jurisdictions throughout the region. As Regional GIS Facilitator, it would fall on F-M COG to be the primary agency responsible for meeting those needs.

JURISDICTIONAL ROLES

In essence, all jurisdictions would provide required data directly to F-M COG. F-M COG would then compile this information into regional databases for all to use. F-M COG would also use regional data created to develop regional applications accessible by all. Outside of providing data for compilation into regional datasets, the jurisdictions other than F-M COG would focus primarily on internal business needs.

F-M COG ROLE

- Work with GIS Steering Committee during planning stages to ensure that regional data and applications will meet local needs.
- Obtain data from jurisdictions.
- Develop all regional databases.
- Create and maintain all regional applications.
- Fund additional staff (1 FTE minimum+ hardware/software)

Counties Role

- Focus on internal business needs
- Work with GIS Steering Committee during planning stages to ensure that regional data and applications will meet local needs
- Supply F-M COG with data as needed to support regional database and application creation.

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

- No additional staff or funding required to meet regional needs.

Municipalities Role

- Work with GIS Steering Committee during planning stages to ensure that regional data and applications will meet local needs.
- Provide F-M COG with local data needed to create regional databases and applications.
- Use regional databases and applications developed by F-M COG as needed to meet internal needs.
- No additional staff required to meet regional needs.

Participating Organizations Role

- Work with F-M COG during planning stages to ensure that regional data and applications will meet local needs.
- Provide F-M COG with data needed to create regional databases and applications.
- No additional staff required to meet regional needs.
- Use regional databases and applications developed by F-M COG as needed to meet internal needs.

BENEFITS:

- Little or no increase in workload or responsibilities at jurisdictional level.
- Single entity responsible for regional GIS reduces coordination and cooperation issues.
- F-M COG becomes major data and application provider and resource for jurisdictional GIS.
- Centralized regional GIS reduces redundancy and simplifies processes.

DRAWBACKS:

- Substantial increase in GIS staff/funding at F-M COG.
- Limited control of regional GIS at local level.
- Politically problematic.

SUMMARY

The F-M COG-centric approach to developing a regional GIS would seem to be the most logical and straightforward method. The benefits of centralizing the development of regional GIS databases and application seem obvious. In fact, a centralized regional GIS structure is the most widely practiced in other, similar regional GIS collaboratives. However, the realities of organizational, financial and political issues associated with F-M COG taking over a majority of the regional GIS activities make this option less attractive than others.

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

4) F-M COG-County Regional Partnership

In this organizational structure, F-M COG and both Counties work together to enhance and develop data standards and develop regional GIS datasets and applications. F-M COG becomes responsible for developing regional datasets and applications that directly relate to F-M COG's internal business needs. The counties work together to address regional database and application needs that go beyond the needs of F-M COG or that are already the counties primary responsibility to create (i.e. parcels). This option is essentially a highbred of options 2 and 3.

County Role

- Focus on jointly developing regional GIS datasets and applications that are not encompassed by F-M COG internal business needs.
- Jointly develop regional versions of GIS data
- Enhance regional datasets created by F-M COG to ensure applicability to all regional needs (as needed)
- Some additional staff or funding required (600-800 additional staff hours per county)

F-M COG Role

- Focus on developing regional GIS datasets and applications that directly affect internal business needs.
- Some additional staff or funding required (600-800 additional staff hours)

Municipalities Role

- Focus on internal needs
- Work with GIS Steering Committee during planning stages to ensure that regional data and applications will meet local needs
- Provide Counties and/or F-M COG with local data needed to create regional databases and applications.
- Use regional databases and applications developed by joint-counties and F-M COG as needed to meet internal needs
- No additional staff required to meet regional GIS needs.

Participating Organizations Role

- Work with F-M COG during planning stages to ensure that regional data and applications will meet local needs
- Provide Counties and/or F-M COG with data needed to create regional databases and applications.
- No additional staff required to meet regional GIS needs.
- Use data and applications developed by regional GIS

BENEFITS:

- F-M COG and Counties share the regional database and application development load.
- No group dominates regional GIS activities.
- Participants have higher level of control of datasets that are most critical for internal business needs.

DRAWBACKS:

- High level of cooperation and coordination required between all participants
- Some additional staff/funding required at both F-M COG and Counties.

SUMMARY

A truly collaborative approach to the development of a robust regional GIS, this option provides all key stakeholders with important roles. This solution assigns the primary regional data providers (counties) and the primary regional data user (F-M COG) equal responsibility in the creation of a regional GIS. This is an attractive solution to many as it does not have a large impact on the finances or resources of any single organization, nor does it centralize power in any single jurisdiction. If coordination issues between the two counties and F-M COG can be overcome, this option may prove to be the best solution given the fiscal and political realities facing the region.

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

5) Consultant driven Regional GIS

All regional GIS activities are assigned to consultants in this option. F-M COG and jurisdictions would continue to focus on meeting internal business needs. All development and management of regional GIS activities would be contracted to qualified consultants managed by F-M COG and the GIS steering committee. In many cases, it is much easier for jurisdictions to contract out GIS services than to justify adding staff. In these cases, finding and hiring qualified consultants is essential. Regardless of the staffing and structure option adopted by the region, consulting service will likely play some role. The **GIS VENDOR EVALUATION PROCEDURES,** outlined on page 62, provides a good approach for finding and managing GIS consultants. GIS consulting rates can range as low as $25.00-30.00/hour in the case of contracting for full time services to as high as $100-220.00/hour for highly skilled consultants. Typical GIS consulting services in this region range from $60.00 - $100.00/hour depending on the type of project and consultant. Two other options for hiring consultants to do the required GIS work would include using GIS Circuit Rider/Shared Staff Person and GIS Application Service Providers.

GIS Circuit Rider/Shared GIS Staff Person – If part-time on-site GIS services would be beneficial for a number of organizations, the option of hiring a GIS Circuit Rider or Shared GIS Staff person becomes a good option. Several jurisdictions could use regular on-site GIS assistance, but do not have the budget for a full time staff person. A possible solution would be to jointly hire a full time staff and share that person's time. Some GIS consultants offer full and part-time staffing options that often include a team approach where 2-3 people staff 1 full time equivalent (FTE) position.

This option does not have to be limited to acquiring staffing from consultants. Jurisdictions within a region could jointly hire and share qualified individuals. This could also be an opportunity for F-M COG to staff the position(s) if they became available.

Estimated Cost: $50,000-$60,000 per FTE.

BENEFITS

- A low per hourly costs for GIS services.
- On-site GIS technicians for participating jurisdictions.
- Data standardization and application sharing amongst participating jurisdictions is a focus.
- Groups of jurisdictions are able to hire qualified individuals to staff a shared position with less difficulty than individual jurisdictions can hire several a part-time positions.
- The team approach offers improved services and continuity in the event of GIS staff turnover.
- The consultant administers staff pay, insurance, benefits, training, etc.

DRAWBACKS

- Local GIS Consultant currently offering GIS Circuit Rider Staffing is not available.
- It requires significant degree of cooperation between jurisdictions, often including joint-powers agreements.
- The jurisdictions must provide hardware, software, and workspace.
- Τηε GIS Circuit Rider staff are only available part-time within each jurisdiction.

GIS Application Service Providers (ASP) – A viable option for the development of Internet applications for the Fargo-Moorhead region would be to use GIS Application Service Providers. The new Internet Map Server (IMS) technology allows Internet GIS applications used to access data to be built and housed off-site by consultants. Several consultants are now offering this service. Access to the IMS technology is rented or leased from the ASP instead of being purchased by the clients, typically saving up to $7000 in software purchases. The ASP consultant offers a variety of applications that can be customized to access your data. Data can be stored and accessed from the consultant's server or directly from the client's server via the Internet. ASP consultants typically offer complete GIS Internet Map Server Application development and hosting packages for about the same cost as purchasing the software and hardware and setting up the application in-house. Long term maintenance costs and higher costs per additional application are possible drawbacks.

BENEFITS

- Lower short term costs for leasing IMS technology than buying
- Consultant is responsible for software and hardware setup and maintenance.

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

- No qualified staff needed to develop and administer the application
- Quick set-up.

DRAWBACKS

- Less local control over application functionality
- Higher per application cost.
- Higher long term cost.

F-M COG Role:

- Work with GIS Steering Committee during planning stages to ensure that regional data and applications will meet local needs.
- Manage GIS consultants.
- Facilitate access to data from jurisdictions.
- Use regional databases and applications developed by consultants as needed to meet internal needs
- No additional staff required to meet regional GIS needs.
- Additional Funding required.

Counties Role

- Focus on internal business needs.
- Work with GIS Steering Committee during planning stages to ensure that consultant derived regional data and applications will meet local needs.
- Supply F-M COG/consultant with data and information as needed to support regional database and application creation..
- No additional staff required to meet regional GIS needs.
- Some additional funding required.

Municipalities Role

- Focus on internal business needs.
- Work with GIS Steering Committee during planning stages to ensure that consultant derived regional data and applications will meet local needs.
- Supply F-M COG/consultant with data and information as needed to support regional database and application creation.
- No additional staff required to meet regional GIS needs.

Participating Organizations Role

- Focus on internal business needs.
- Work with GIS Steering Committee during planning stages to ensure that consultant derived regional data and applications will meet local needs.
- Supply F-M COG/consultant with data and information as needed to support regional database and application creation.
- No additional staff required to meet regional GIS needs.

SUMMARY

Using GIS consulting services as the sole source for regional GIS development is probably only feasible if a special relationship can be arranged with the consultant to make services less costly than the tradition client-consultant relationship. Concepts such as Circuit Riders or Application Service Providers may allow for the successful creation of a regional GIS program at an affordable rate. More likely, however, is the use of GIS consulting services to augment activities outlined in the previous options.

REGIONAL GIS ORGANIZATION STRUCTURE OPTIONS

Organizational Structure Summary

Options 2-5 all represent viable options for the development of a regional GIS. Of these options, the F-M COG –County Partnership organizational structure holds the most promise for a workable solution. The option allows the major data produces to retain a significant level of ownership in the data that most affects them, while still providing a workable solution for the development of a coordinated regional GIS. It also has one of the lowest impacts on existing staff and resources on the individual jurisdictions. This organizational structure could also be combined with the use of consulting services (outlined in option 5) to create a regional GIS structure that is technically, politically, and financially feasible.

COMMONLY SHARED REGIONAL GIS GOALS

Regional Goals Introduction:
Regardless of the regional GIS organization structure ultimately adopted, the common goals identified by all the jurisdictions will remain the same. During the course of developing the Advanced Metropolitan GIS Plan, the authors met with nearly 30 departments, jurisdictions, and organizations in the metropolitan areas. Each of those groups shared their GIS goals and aspirations. Following are a list of the most common GIS goals expressed by the groups. They represent the areas where sharing the cost and burden of attaining the goals is most feasible. These goals represent commonalities between the F-M COG, jurisdictions and other participating organizations. They were chosen so as to be the most inclusive of what all the groups are expecting from GIS. In general, the common regional goals expressed by the jurisdictions included:

- Create and Format Critical Data
  - Parcel
  - Land Use
  - Flood Plain
  - Routing
- Staff/Public access to GIS data via the internet/intranet
- Access to User Friendly GIS Applications
- Implementation of GIS in a timely fashion
- Access to other jurisdictional data

Following is a discussion of these common regional goals and required action needed to obtain them.

GOAL

Create and Format Critical Data

One of the major goals is to create data that is pertinent to all jurisdictions and in a format that is easily usable for all jurisdictions. The data deemed most useful for use at a regional level was

- Parcel
- Land Use
- Flood Plain
- Routing

Attainment

Parcels

Parcels are one of the most important datasets for a jurisdiction. They can be linked to many other free standing databases to show demographics, property details, addresses, .etc. A significant number of participating groups identified a regional parcel coverage as one of the most useful coverages, particularly when linked to land ownership and descriptive data. For this reason developing an up to date and easily accessible parcel database will be one of the main focuses for the Advanced GIS Plan.

It is imperative that all parties involved keep their portion up to date and allow it to be easily accessed. This task should also adhere to specifications laid out in previous studies. The GEODEC must also be followed so that all parties are agreeing to the same form of sharing.

Other considerations for this task are:

1. **Error check and standardize parcel addresses:** Create a master database of standardized addresses. It is up to each jurisdiction to follow this standard when revising or creating address databases they maintain in house.

   There are many different ways to input an address. PlanSight^{LLC} suggests conforming to the US Postal Service address standards. The benefits of adhering to a federal government staple such as the Postal Service are numerous.
   - This government body has spent a great deal of time and money researching this topic

COMMONLY SHARED REGIONAL GIS GOALS

- The work has been done and outlined in a document readily available to the public
- It will be easy to provide justification and documentation for people interested in why and how the standards were chosen

A workgroup should be created which will take on the responsibility of assembling the data needed for this project. They will also coordinate the effort and appoint current staff that will be key to the success of this project.

2. **Creation of land use:** Land use is a function of the parcel layer. There can not be an accurate land use map if there are no parcels with land use codes. From the parcel data, both existing and future land use maps can be created.

   One of the problems with a multi-jurisdictional land use map is the employment of different land use codes. Each jurisdiction may have different codes for the same type of land use. Standards must be agreed upon for an area wide land use map. The National Planning Association (APA) has released a new coding system for land use. These codes should be researched when devising a common theme in the Metropolitan Area.

Suggested course of ACTION:

⇒ *Create workgroup from all participants to discuss address standards*

⇒ *Evaluate who will need help implementing address standards*

⇒ *Procure internal or outside help*

⇒ *Create master database of standardized addresses*

⇒ *Create workgroup from all participants to discuss land use standards*

⇒ *Implementing land use standards*

⇒ *Discuss creating regional parcel coverage*

⇒ *Designate person from regional facilitator office to oversee implementation*

Flood Plain

The Metropolitan Area is highly susceptible to flooding. Access to flooding data is a high priority for many jurisdictions and organizations. This information encompasses many different areas and incorporates many different data sets. It is not a one step process to get usable flooding information. Parcels, roads, flood plain, and water elevation are just a few of the pieces that make up analysis of flood prone areas. There are two ways to analyze this information and both depend on two different types of data.

1. Both Fargo and Moorhead have very accurate, small interval elevation information. Some also employ custom applications to track flooding. This allows these to jurisdictions to very accurately predict who will be affected by flooding.

   Equally detailed elevation data must be created for the rest of the metropolitan-area if there is a desire to have this type of accurate prediction capabilities.

2. The FEMA flood plain information can be used in conjunction with the parcel data in order to find susceptibility of land to flooding. This will be relatively easy because the FEMA data is readily available on CD-ROM at a cost of $50 per state.

   This approach is not as accurate as the previously described option. However, it does give a general idea of who will be effected by flooding. It is also a very inexpensive solution. This may also be the best solution for an inter-

net application due to the less intense analysis.

Suggested course of ACTION:

⇒ *Create workgroup from all participants to discuss flood plain needs*

⇒ *Create plan based on high accuracy/low accuracy flood data*

⇒ *Investigate vendors to help implement metropolitan flood plain application*

Emergency Response

Information used in emergency situations encompasses many different types of data. Mostly it revolves around parcels and information that can be linked to the parcels. Data such as elderly housing and daycares for evacuation purposes, hazardous materials to comply with federal right-to-know and others are most likely free standing databases. These databases will need to be linked to the parcels. This will entail several things.

Suggested course of ACTION:

⇒ *Compiling the correct information for each emergency application*

⇒ *Insuring all the data records have a PIN number corresponding to the parcel data*

⇒ *Translating the databases into a format readable by GIS*

Routing

Routing is a very important GIS application. It can cover simple things like the most efficient route for a garbage truck, creating service areas to more complex things like routing emergency vehicles around a barrier. It can also be used for Geocoding addresses. However, in order to create a network which will allow routing capability, there is a great deal of expense and upkeep. Address ranges must be created. This data changes frequently so the updating process is critical. Depending on the use, other attribute such as tagging one-way streets, grade separation and speed limits are needed for analysis.

Attainment

The jurisdictions can cooperate and create their own network from the street centerline data and update it with address ranges. There are also commercial products that may be more economical to purchase. Since this data can be very costly to create and maintain, a group should be assembled to look at the specifications needed for such a dataset. Then the group should look at the cost/benefit of creating or purchasing a street network. This is a dataset that has also been identified as a prime set of information for FMCOG to develop and make available to the jurisdictions.

Suggested course of ACTION:

⇒ *Evaluate state of centerline data as it pertains to fitness for routing*

⇒ *Use standard addressing schema for street addresses*

⇒ *Decide how complex centerline file should be (one-way, separated grade, .etc)*

⇒ *Investigate "off the shelf" products that could be used*

⇒ *Investigate vendors who can create regional centerline file*

GOAL

Staff/Public access to data via internet/intranet

One of the most discussed needs identified by the groups interviewed was the need to make GIS or related information available to the public, preferably via the Internet. The internet/intranet have qualities that make it an excellent choice for allowing public access to information. Emerging technology, such as ESRI's ArcIMS, make it very easy to interact with geographic data. Throughout the interview process, certain types of data were pinpointed for web-based applications. These types of data are parcels, land use and flood plain. This technology will not only allow the public to access data but it may be the best way to access Metropolitan wide data for employees, real estate agents, developers, etc. Data can be presented in many different ways on the internet. Different applications can be developed to show different types of information or to tar-

COMMONLY SHARED REGIONAL GIS GOALS

get different audiences. For example, an economic develop application could be developed that would provide developers with information on parcel available for development or redevelopment, for lease or sale. Other applications may focus on crime statistics, land use or zoning, or general info like location of polling places, ownership, parcel valuation, etc.

Unsurprisingly, there are many different options when considering Internet technology for distributing GIS data to the public. FMCOG or any of the jurisdictions can choose to purchase the software ($7000) and create and application to host themselves, or the region could, through a coordinated effort with FMCOG, develop a joint site that provides on-stop access to all the jurisdictions data. The software and application can be hosted by any jurisdiction with web hosting capabilities, or possibly by a third party consultant that offers IMS hosting services. Data can reside on the host computer, or be accessed remotely over the Internet by the application computer.

Thoroughly planning and testing custom Internet applications will be key. Special attention will have to be paid to complex applications that draw data from several different sources.

Attainment

Once the data is created, several things are needed to achieve this goal. Custom interfaces must be built for each application. Since the metropolitan may not have the expertise to do this, consultants should be interviewed. The consultant will also need to coordinate with the metropolitan where the data will reside and how it will be accessed.

Suggested course of ACTION:

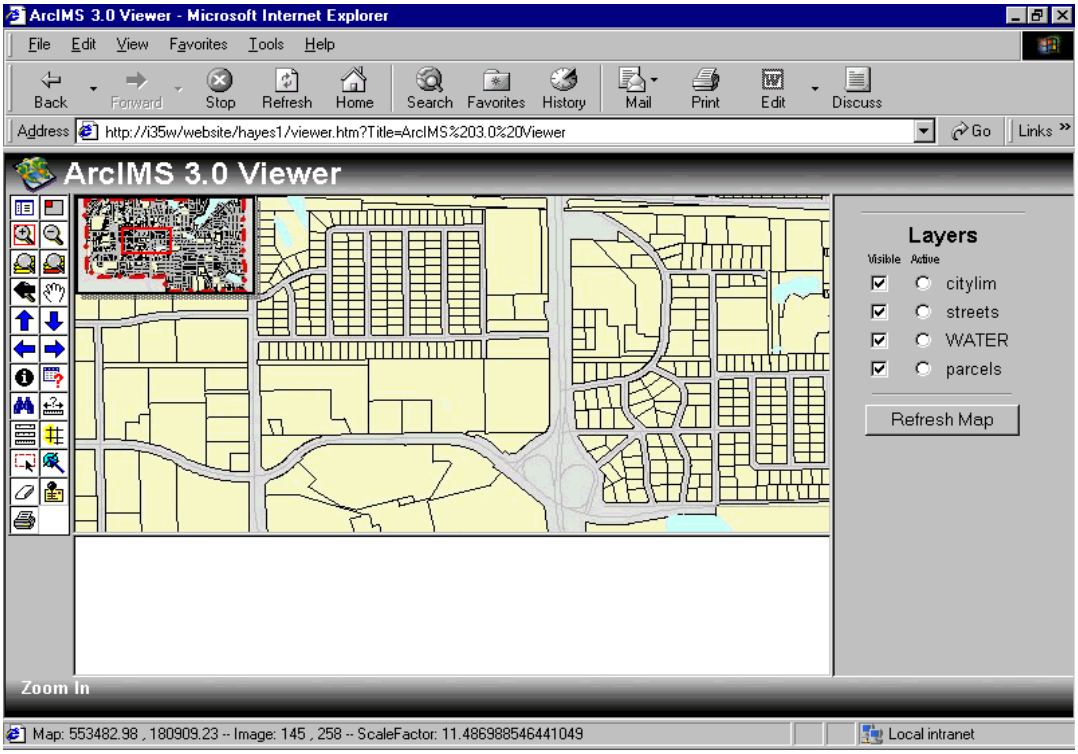
⇒ *Evaluate local expertise in this area*

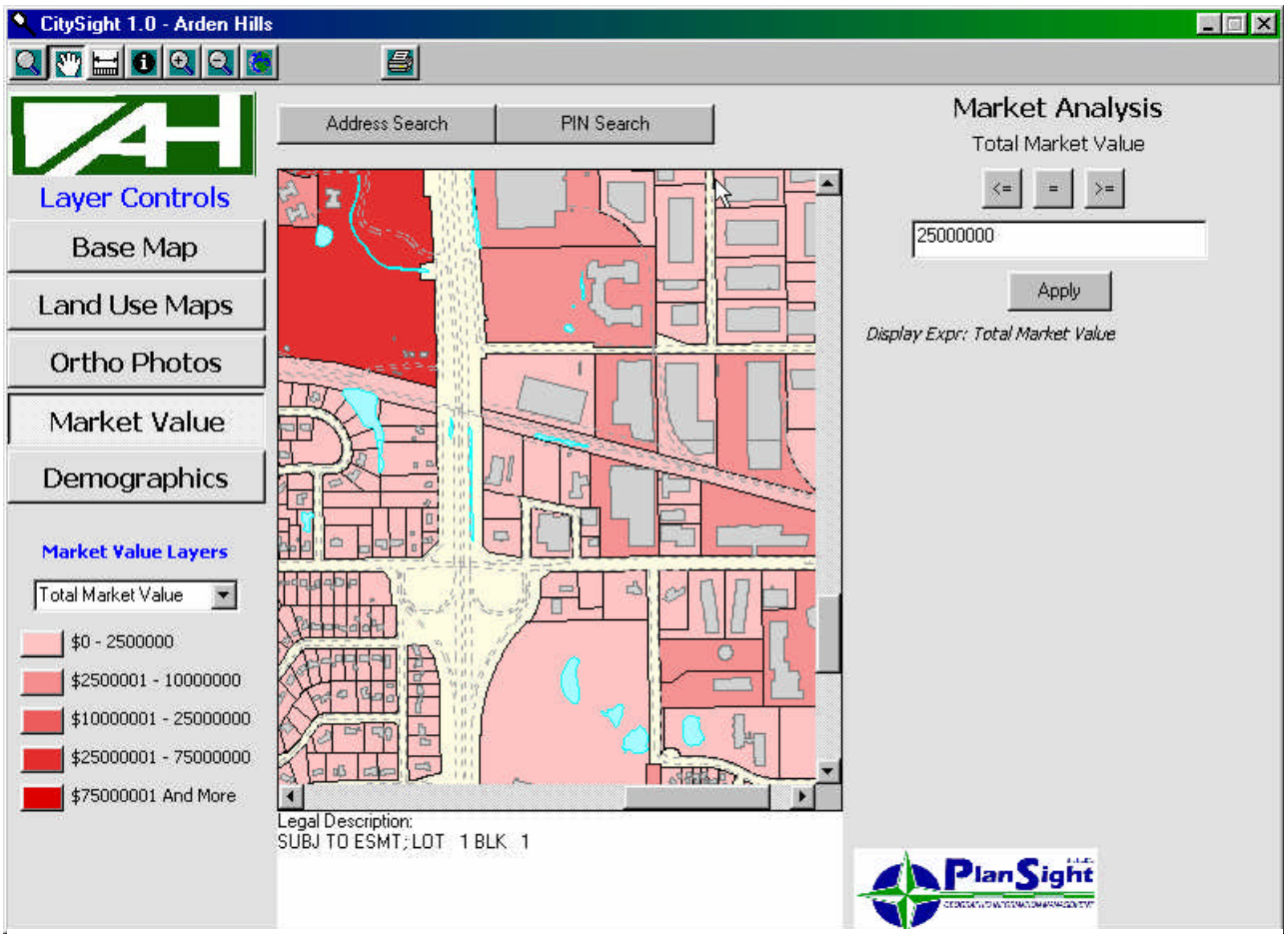
⇒ *Work with jurisdictions that already have IMS software*

⇒ *Work with jurisdictions on internet data distribution policy*

⇒ *Decide on critical applications that should be on the internet first*

⇒ *Interview consultants*





Sample MapObjects LT custom application

GOAL

User Friendly Applications

The importance of developing/acquiring user-friendly custom applications should not be overlooked. Again and again the jurisdictions identified the difficulty with using out-of-the box GIS as the main reason existing GIS data was not used to its fullest potential (or at all in many cases). Most of the time, the biggest obstacle to a successful GIS is access to data in a user friendly environment. Most GIS software is too complex for people who are not full time users to become proficient. Because of this, the software must be customized so the user has very little to learn in order to get the desired answers. There are several different options for creating user-friendly custom GIS interfaces that can actually perform very powerful analysis very easily., and often at very reasonable costs.

Attainment

GIS software such as ESRI's ArcView or ArcInfo can be customized within the application environment to give the user a few tools to perform certain tasks. Also, stand alone products using ESRI's MapObjects can be created which will have only the functionality needed for a particular task. This can either be done by a consultant or internally.

Another option is to develop freestanding custom GIS applications utilizing ESRI's MapObjects software. This type of application can very effectively allow non-technical users to access and use GIS data in an extremely user-friendly format. If

COMMONLY SHARED REGIONAL GIS GOALS

these types of applications are built for widespread dissemination, costs can be less than $50/desktop. A number of custom applications that are currently available to meet a broad variety of user needs has been included in appendix A.

Suggested course of ACTION:

⇒ *Organize jurisdictions to take advantage of shared applications*

⇒ *Decide which applications are critical to all participants*

⇒ *Interview consultant who can create the applications*

⇒ *Research creating in house shared applications*

GOAL

Implement GIS in a timely fashion

Another obstacle to GIS is time. Too often people get lofty goals and never realize them because of the reality of budget constraints, turnover, and just plain loss of interest. When this happens, all of the time and money spent to that point seems wasted.

Too many GIS projects that have not reached their potential because they did not have any benefits. In order for people to buy in, they must get something back for their effort.

Attainment

An aggressive plan with tangible results and actual applications that can help employees must be made. Key element to this include

- good data to work with
- a list of helpful applications ranked by most important
- timetable for application implementation

Suggested course of ACTION:

⇒ *Evaluate status of data needed for regional applications*

⇒ *Create timetable for application implementation*

⇒ *Set up support for applications*

GOAL

Access to other jurisdictional data

One of the main needs of all of the jurisdictions and especially F-M COG is to be able to access data from other jurisdictions. This entails several things:

- Data in same format
- Facilitative body to keep oversee and maintain data access and standards
- Standards that are enforced so that all data within the metropolitan region is reliable and has meta data
- Data available to download over the web
- Buy in from all the jurisdictions that have critical data sets

ATTAINMENT

Format

Although increasingly becoming a smaller issue than in the past, data, that is GIS and tabular data should be in the same format. It is more critical that the GIS data be in exactly the same format because even though there are many translators available, it is very rare that the data will be exactly the same once it is translated. New technologies such as spatial databases which store spatial information in relational databases are increasingly being used so that geographic data can be accessed from multiple types of software such as CAD and GIS.

COMMONLY SHARED REGIONAL GIS GOALS

Later in this document and documents created for Fargo and Cass County suggest the use of ESRI products for several reasons. The use of these products will make the transfer of data between jurisdictions the easiest. However, there will be CAD data that is best kept in CAD. As stated before, there are advances in technology that will allow the use of CAD without data loss.

Tabular data is not as critical to have in exactly the same format. Most of the newer databases can read each others formats. GIS software can also read these newer formats without any manipulation. The problem is with the older database formats that do not easily transfer to other database packages. These will need to be addressed metropolitan-wide if this tabular data is to be shared successfully.

Suggested course of ACTION:

⇒ *Databases that are in old formats should be evaluated to see if it is economical to transfer*

⇒ *Create routines that will extract critical data from old formats*

⇒ *Interview consultant who can help with conversions*

Data Sharing Standards

The GEODEC document lays out standards for the land based sharing, layering schema and naming conventions. This document should be the source for all standards. However, it should be updated due to new technologies and ways to get data. It should also take into consideration metadata standards. The facilitation body must stay abreast of the information provided by the jurisdictions on data quality and cooperation between the jurisdictions. This way, they can enforce the standards laid out, creating a much more functional and user friendly sharing agreement. Standard naming conventions and file structure become increasingly important as custom applications are developed to be shared throughout the region. By adopting and adhering to GEODEC and other standards, custom applications can be developed and shared with much more ease.

Suggested course of ACTION:

⇒ *Review GEODEC*

⇒ *Update and make changes where needed*

⇒ *Get participants to agree to standards*

Web Download

The web is becoming the primary source for sharing and dissemination of not only GIS data but the use of GIS to analyze and map geographic data. A web browser driven GIS Data Warehouse concept is an ideal way to organize and distribute large amounts of GIS data. Web browsers provide a simple point and click format for exploring GIS documents, data, maps, etc. Any person familiar with the concept of using the Internet can easily access the GIS data warehouses via the Internet or a local area network. The Metropolitan Area should implement a web site that will house a GIS data warehouse where the participants of GEODEC can get data. This web site should also include ways to comment on data as well as access metadata.

If it is deemed desirable, this web site could also house applications dealing with metropolitan wide GIS data that would allow each jurisdiction and the public to access helpful information in a simple and easy way. These applications may even lessen the need for jurisdictions to download datasets because the information they need can be gathered from the online applications.

Other uses of the web site would be to facilitate partnerships and information about GIS to the entire Metropolitan Area. Training could be provided via this web site as well as technical support. This would help greatly in the effort to elevate all jurisdictions to the same level of GIS expertise while allowing them to interact and actually make GIS enjoyable. While different from entity to entity, data warehouses usually contain the following information:

- GIS Overview/background page
- Data page - for reviewing and accessing GIS data
- MetaData/Data Dictionary - complete descriptions of data
- Prepared Maps - maps already prepared and ready for download and printing
- General GIS info - links to other related sites, contacts,

COMMONLY SHARED REGIONAL GIS GOALS

- Help Page - frequently asked questions, how-to section
- User/Administrators Handbooks

Planning and development of the GIS data warehouse should occur early during the regional GIS implementation process. It will become the central repository for all things GIS. Starting it early ensures that it can be tested, revised or improved before it becomes much more complex later on in the process.

Suggested course of ACTION:

⇒ *begin development of web-browser driven GIS data warehouse*

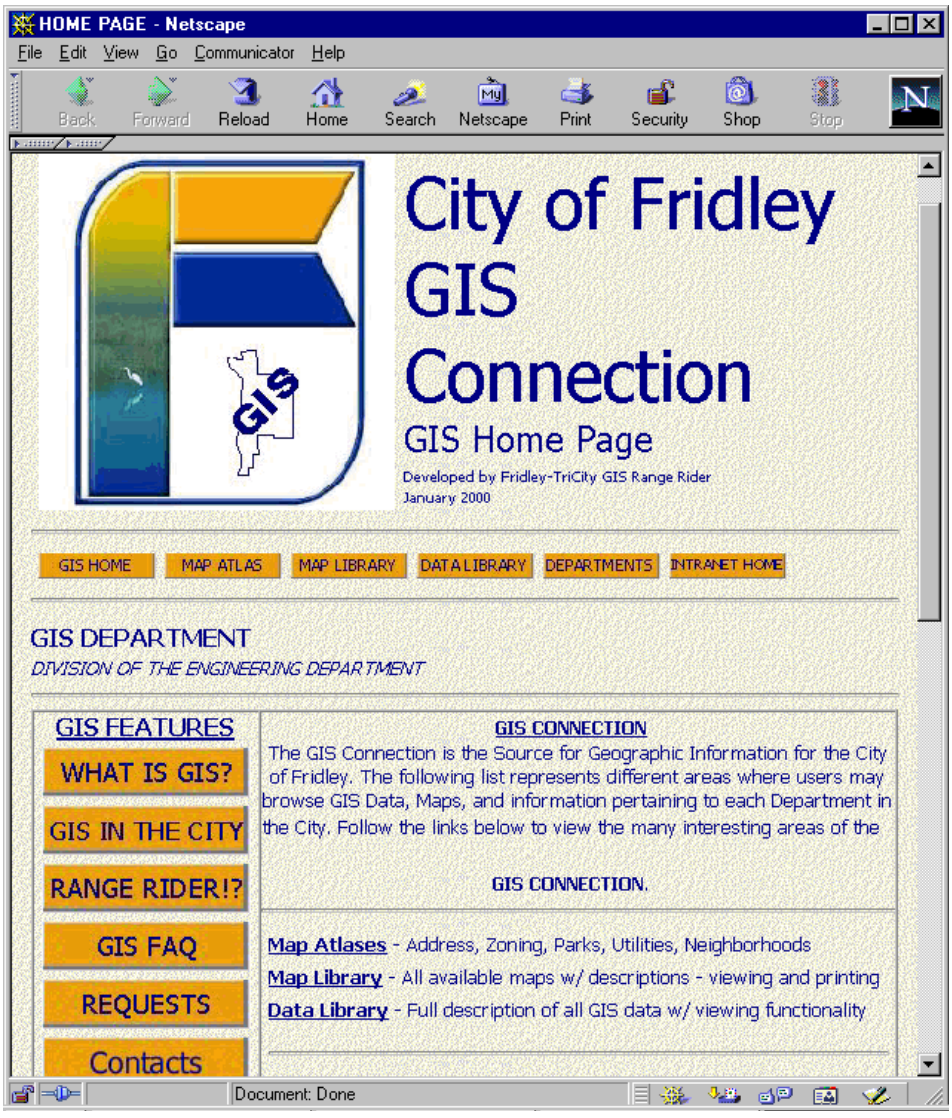
⇒ *post data, metadata, data dictionary, GIS administrator's handbook, etc*

⇒ *conduct how-to seminars on data access via warehouse*

⇒ *Create routines for updating and uploading current info from jurisdictions*

⇒ *Create custom applications*

⇒ *Identify consultants to help as needed*



The City of Fridley GIS Connection is an example of a simple-user friendly interface to GIS data and other information.

COMMONLY SHARED REGIONAL GIS GOALS

Buy In

In order to make the Metropolitan-wide GIS successful, there must be buy in from the critical jurisdictional bodies. This seems to be coming together already with the GIS Committee meeting regularly. However, other things than just participating in discussions need to happen.

The metropolitan goals outline many different aspects of creating a metropolitan-wide GIS. One of them is creating critical datasets that everyone needs. The buy in here would be agreeing on standards for land use codes, addressing, accuracy of flood data, sharing databases, sharing applications, .etc.

Public access to data will entail people buying into what kind of data will be accessible to the public. The participants must agree on what warrants special protection from the general public. There are many differing ideas not only on data access but recouping costs of creating the data. The GIS Committee must address this before the public will be allowed to access web based applications.

A key to making the Metropolitan-wide GIS successful is implementing in a timely fashion so that people do not get bored with the idea, or that policy makers can see the benefits. The buy in here is to get all of the participants on one page and commit to taking an aggressive stance on getting the GIS data available in a way that is simple for each other and the public to access.

Suggested course of ACTION:

- ⇒ *Create an environment of communication by having a web page, user group, training, .etc*
- ⇒ *Create an environment of sharing by having everyone participate in standards*
- ⇒ *Have data available via the web on a very user friendly page*
- ⇒ *Promote sharing and partnerships between the jurisdictions and other entities such as school districts, SWCD's, Utility Companies, .etc*

REGIONAL GIS GOALS SUMMARY

The goals documented here only represent those general goals that were most commonly document by a majority of jurisdictions. These are the areas in which any regional GIS initiative should focus its efforts. Attaining these goals will provide the foundation for future collaborative GIS efforts.

In addition to these primary regional GIS goals, the following section outlines a number of important GIS related tasks that should be undertaken to ensure the development of a strong, well founded, and coordinated regional GIS.

REGIONAL GIS MANAGEMENT

With an organizational structure in place and a list of goals set, its time to turn our attention to the somewhat less exciting, but equally vital issues surrounding the management of a regional GIS. From the selection of GIS hardware and software, to the development and documentation of data, the day-to-day details of shrewd GIS management can make the difference between a successful and unsuccessful regional GIS program. A large regional GIS program like the one being proposed for the Fargo-Moorhead region will have a large number of users and become very complex as it matures. Starting the management process off right by carefully considering how to best manage the project will bay big dividends in the long run. Simple things like clearly documenting all data or creating simple, user friendly procedural guidelines for end users can make all the difference in the years to come as staff, data, users, and technology changes.

The following section outlines some approaches to GIS management that can be used to build a sound, coordinated approach to developing a successful regional GIS. It also discusses practical matters that should be addressed as the GIS program begins to grow and evolve.

HARDWARE

GIS computer hardware costs have become a much smaller issue over the past few years. The dramatic drop in computer costs coupled with remarkably improved performance has made GIS hardware needs an almost non-issue for most entities. All of the major GIS software packages can now run in a windows operating system on a desktop personal computer. There are only a few instances when more expensive UNIX workstations would be a required solution.

The only hardware recommendation being made is that the computers running GIS software should be as robust a possible. Geographic Information Systems software combine large databases with large graphics files. As a result, the computer processing power required to efficiently run a GIS is much higher than for most other operations. While most newer computers meet the minimum requirements to operate a GIS, long redraw time, long processing time, etc will reduce staff efficiency. Therefore, the faster and more robust a computer, the better.

Another hardware issue that may need to be addressed is the local area network (commonly referred to as a LAN or Intranet). As GIS becomes more widely used and more and larger amounts of data is transferred over the Intranet, performance may suffer. It is difficult to gauge how much of an issue it will be or when (if at all) it will need to be addressed. Much of it will depend on how quickly GIS is integrated in the day to day activities of a significant number of staff and how big a role the network will play as a data repository vs. storing data on local hard drives. High-speed Intranet connections are important for accessing and moving large GIS datasets efficiently.

Below are some computer hardware specifications which pertain to the specific GIS software they are running.
Each specification has the lowest recommended specification followed by the recommended specifications to be productive.

Arc/Info NT workstations
ESRI SOFTWARE SPECS
Pentium or Higher
128 MB RAM
Windows NT 4.0 SP4
2.5 GB of Free Hard Drive Space

SUGGESTED WORKING SPECS
Pentium 400 or better
128 MB RAM
Windows NT 4.0
Depending on where data is stored.
6 GB Hard Drive if data stored somewhere else
10 - 15 GB Hard Drive if data is stored on computer

ArcView Workstation
ESRI SOFTWARE SPECS
Pentium or Higher
32 MB RAM
Windows 95 or Windows NT 4.0
90 MB of Free Hard Drive Space

SUGGESTED WORKING SPECS
Pentium 300 or Better
128 MB RAM
Window NT 4.0
Depending on where data is stored.
6 GB Hard Drive if data stored somewhere else
10 - 15 GB Hard Drive if data is stored on computer

MapObjects Applications Computer
Pentium 200 or Better
32 MB RAM or more
Windows 98, 2000, NT 4.0

GIS SOFTWARE

Many factors should be explored when making a choice of which geographic information system software to use. Cost, product support, user-base, capabilities, user friendliness, customization, training opportunities, and compatibility with other software. The following are the software requirements for most GIS activities:

Functionality
- Pin mapping
- Vehicle tracking
- Census data specifics
- Links to other graphical images
- "polygon analysis"- merging areas (polygons) or creating new polygons from overlapping areas. (i.e. best area suited for site development a compilation of soil polygon, slope polygon, land use, zoning etc.)
- Ability to overlay multiple layers
- "point + click" drawings
- laptop map/data displaying
- Routing Map display

Compatibility
- Ability to interface with other external organizations
- Linkage to developed databases
- "generic" hardware platform
- networked (centralized) data storage
- integration with Internet data/web pages

Usability
- Levels of usability: (casual, moderate, heavy)
  - Management
  - Technical
- Ability to automate functions (e.g. scripts)
- PC usability
- various output methods - files, reports, printed, electronic
- PC printable output

Data
- "Top quality" aerial photos
- Topographical view
- Fire: building/occupancy characteristics
  - database linkage to mapped buildings

GIS Software Recommendations:

Based on these requirements, we have identified a handful of software vendors that offer a family of GIS products that would meet the needs of the COG and participating jurisdictions. These companies are the top four GIS vendors in the world and represent the bulk of all GIS usage. It is recommended that the all jurisdictions in the region choose between the leading, established GIS software vendors. Of the top four GIS software companies, our experience suggest that the best choices are either the ESRI or Intergraph line of GIS products. Why? Both companies offer a number of GIS software solu-

(Continued on page 51)

(Continued from page 50)

tions ranging from their full-feature, flag-ship GIS software to their more user friendly, yet capable Desktop GIS software. Both companies' software options can be used as stand alone solutions or integrated into enterprise-wide solutions. They are scalable and customizable to meet user needs.

Guide to leading GIS vendors, products

VENDOR	PRODUCT	DESCRIPTION	STARTING PRICE
Autodesk www.autodesk.com	Autodesk World	Desktop GIS	$1,995
	Autodesk MapGuide	Web-based GIS	$9,990
	AutoCAD Map	CAD map creation, editing	$4,250
ESRI www.esri.com	ArcView	Desktop GIS	$1,195
	Arc/Info	Full-feature, flagship GIS	$10,000
	ArcView Business Analyst	Business-oriented GIS, analysis	$11,995
	ArcView Internet Map Server	Web-based GIS	$10,500
	BusinessMap Pro	Entry-level business mapping	$149
Intergraph www.intergraph.com	GeoMedia	Desktop GIS	$1,500
	GeoMedia Pro	Full-feature, flagship GIS	$7,500
	GeoMedia Web Map	Web-based GIS	$10,000
	GeoMedia Network	Networking modules	$2,000
MapInfo www.mapinfo.com	MapInfo Professional	Desktop GIS	$1,295
	MapInfo MapXtreme	GIS application server	$24,495
	MapXtreme Java Edition	Web-based GIS	$24,495
	MapInfoData Target Pro	GIS for marketing apps	$695

Major GIS Vendors

User base….
One important factor that should not be overlooked when choosing a GIS software is user-base. The number of other organizations using the same type of GIS software can help to answer many of the questions facing the COG, including: Can we easily share data with our neighbors, the state, the region? Is there a local software vendor branch to support your needs? What about user groups? Are there good training or workshop opportunities? Is there a skilled workforce pool to draw from? The Minnesota GIS/LIS Consortium sponsored a research project to examine what is occurring in the GIS community. An overwhelming number of respondents indicated that they were using ESRI products (see actual survey responses at http://www.mngislis.org/salary.html). This conforms to an older survey conducted by the Minnesota Governor's Council on Geographic Information that also shows a heavy concentration of ESRI products in Minnesota (http://www.lmic.state.mn.us/gc/gisdir.htm). While it is not suggested the COG choose its GIS software solely on what other organizations are using, it is important to understand that the choice of vendors could either make the COG a GIS software island or part of a very large regional user-base.

Based on all these factors, it's hard to choose against the ESRI line of software. While other software vendors may provide better solutions to specific needs, few can match the overall capability of ESRI's products. Their desktop GIS software, ArcView, is the cheapest and most widely used of all the top four vendors' desktop solutions. In addition, ESRI has a line of products called MapObjects that can be used to develop very user specific and user friendly desktop GIS applications at a very low cost. If ESRI products did not dominate the region, another vendor choice might be preferred; but when considering all the factors surrounding software options for the COG, it just makes sense to choose ESRI.

> NOTE: Since ESRI products are being recommended, all cost analysis relating to software in the GIS Needs Assessment will be based on ESRI software. However, these costs would also be relatively reflective of the cost of choosing another software vendor (see Table 7.1).

An important and often hidden cost of most GIS software are licensing, technical support and training, and upgrade costs.
Licensing: Most of the major GIS software programs require some sort of ongoing license agreement for each software seat. These costs can range from hundreds to thousands of dollars per year per license, adding significantly to the overall software cost. Some license agreements include the cost of technical support, future upgrades, user groups or other educational forums, training, etc. Other license agreements are simply a yearly fee for use of the software. Identifying the cost/benefits of license agreements is key in evaluating their worth and comparing different GIS software options.
Support Technical support is critical. Make sure the software you choose is well supported. How much does support cost?

(Continued on page 52)

(Continued from page 51)

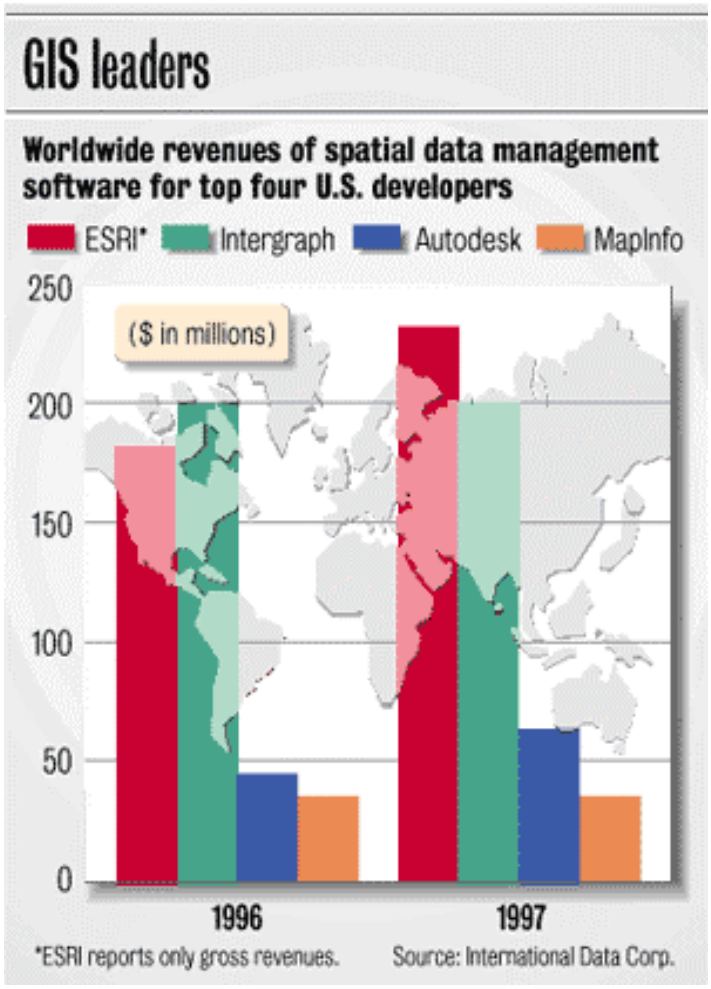


Table 7.2 Worldwide GIS Revenues by Developer

What type of support is available (some companies only offer support via fax or email, so you can't talk to a real person)? How much support do you get (some support is limited to a small number of hours month, etc.)? How good is the support? Is the support local or can you only get support from someplace far away? Is training available locally? Is "on-line" training available? Is in-house training available? Is there a discount for large group training? Is one-on-one training and option? These are some of the questions that should be considered when reviewing support and training issues.

Upgrades GIS software usually undergoes significant revisions every couple of years. As new versions are introduced, the COG may need to budget for upgrades. Again, these costs can run from hundreds to thousands of dollars per license. When deciding to upgrade or not, consider not only the cost/benefit of upgrading now, but also the cost of future upgrades. For example, the upgrade cost from version 1.0 to version 2.0 of a GIS desktop software may be $300 if you have a copy of version 1.0. After reviewing the new capability of the software, you choose not to upgrade (saving $300). However, in the future, when version 3.0 of the software is released with new capabilities you need, it may be offered to version 2.0 users for $300, but version 1.0 users may be required to pay the full cost of the software (which is almost always much more than twice the cost of upgrading - say $1000 in this example). So even though the upgrading from one version to the next may not seem a good investment at the time, it could save significant dollars in the long run.

Yet another equally important aspect to consider when choosing a software are the number of third party applications developed for use with the software. Many companies or individuals create modules that are designed to run with a certain GIS software platform. These modules typically add capabilities to the GIS that focus on one area of application. For example a third party might develop a GIS module that simplifies or automates the generation of mailing lists. This would add greatly to the functionality of the original GIS software. Some GIS software suites have literally hundreds of add-on modules available (many of them free).

Regional Choice

The ESRI suite of GIS software is currently the GIS of choice for all jurisdictions and most participating organizations within the region. Currently, FMCOG has one copy of ESRI's ArcView software and a new computer adequate to handle most processing tasks. It may be necessary in the future for other staff to have ArcView or, better yet, custom, stand alone GIS applications that could be shared with the jurisdictions. By coordinating GIS processing needs with other jurisdictions that have the enhanced capabilities of more robust GIS software such as ArcInfo, and by acquiring additional (relatively inexpensive) ArcView extensions that add more capabilities to the software, FMCOG should be able to continue to meet its internal GIS needs without large expenditures on GIS software.

A few ArcView extensions that should be added to meet mission critical GIS processing needs within FMCOG include:

(Continued on page 53)

(Continued from page 52)

- Xtools extension No Cost
- Data Automation Kit

Some additional GIS tools or ArcView extensions that would be useful to FMCOG, but not necessarily mission critical would include:

- Zoning Analyst $ 2,495.00
- Network Analyst $ 2,495.00

Other considerations for software are customization of off-the-shelf products and free standing, shared custom applications. Unless there is expertise in-house most of these will need a consultant to create them. It will be cost effective if applications that will help others in the metro area and do basically the same tasks, are shared.

Suggested course of ACTION:

⇒ *review available software in detail*

⇒ *identify actual costs and incentives*

⇒ *identify any hidden or ongoing costs*

⇒ *review non-vendor third party application support*

⇒ *Purchase software needed to complete critical tasks*

⇒ *Research custom applications and consultants who provide them*

⇒ *Partner with other jurisdictions on shared applications*

DATA CONVERSION

Any spatial data that is in a non-GIS compatible format should be converted. Databases in old, difficult to read formats should be converted into a format that will be easily read or translated into formats that the jurisdictions will be able to read.

Much of the data conversion may not be in-house data but data that is gotten from the jurisdictions. Though others are trying to make their data as accessible as possible, there will always be data that needs massaging. It would be wise to automate routines that extract and format the data for regional needs.

Suggested course of ACTION:

⇒ *Create a list of data that is not in a compatible format with GIS*

⇒ *Rank datasets in importance*

⇒ *Ascertain whether current staff can handle conversions*

⇒ *Talk to vendors of current software about routines already created for conversion*

⇒ *Interview consultants who could help with data conversion*

GIS DATA CREATION AND MAINTENANCE

Regional GIS Data Creation and Maintenance in the region revolves primarily around obtaining and compiling data from various data providers. FMCOG does create some data on its own, but these are generally limited in scope and pertain mostly to FMCOG activities and have limited use in other jurisdictions or organizations. There may be an opportunity to develop mission critical GIS data for FMCOG that would have substantial value to all of the jurisdictions, allowing FMCOG to participate in regional GIS activities as both a data provider and a data user. As a data user of information from a number of different jurisdictions and organizations, FMCOG routinely is forced to overcome a number of data compilation issues that arise due to inconsistencies in similar datasets provided by each jurisdiction. The development of the GEODEC standards was an excellent starting point in overcoming many of these obstacles, but this document needs to be updated and expanded to keep pace with today's requirements. Likewise, the timing of GIS data delivery from the jurisdictions to FMCOG (and to a lesser extent, from FMCOG to the jurisdictions) needs to be reviewed in light of new data availability. Finally, FMCOG also needs to find ways to make GIS data compilation and quality control much more efficient by automating much of the process.

In many ways, FMCOG as a data user that has many needs of the jurisdictions' data, but provides little in the way of useful GIS data or GIS services in return. While this is inherently true, and in fact FMCOG as a whole performs a large number of critical services for all of the jurisdiction in the region, the GIS function within FMCOG is perceived as being primarily a data user, not a data creator. After reviewing all the needs of the jurisdictions, participating organizations, and FMCOG, there may be an opportunity for FMCOG to work with the jurisdictions to develop an accurate centerline database that would be important not only to FMCOG, but also to each of the jurisdictions. Developing this GIS data layer would provide FMCOG with a much needed piece of data, and would also cement FMCOGs role as an important data provider within the region.

One of the major problems currently facing FMCOG are the dissimilarities in the same types of information provide by each of the jurisdictions. Parcels, for example, are a critical dataset for FMCOG to be able to perform its needed GIS activities. Yet parcels are provided to FMCOG by each of the jurisdictions in several different coordinate systems with different levels of accuracy and completeness, and even in different file types. These dissimilarities in otherwise similar data require that much of the time spent by FMCOG staff on GIS has to be spent on getting these datasets to work together.

The first step in resolving this problem was the creation of the GEODEC standards, which layout a good framework for how to standardize GIS data. However, these standards need to be reviewed, updated and enhanced to take into account new databases, technologies, file types, distribution requirements, etc. In addition, the GEODEC standards need to be expanded to encompass areas like coordinate systems, addresses and parcel identification numbers, data accuracy and precision, and more.

As part of the GEODEC enhancement process, translation tables should be developed in cases where jurisdictions are unable to adhere to GEODEC standards. Translations tables will provide both jurisdictions and FMCOG with a blueprint for how to convert data from its original format to GEODEC format and back as needed.

Schedules for data delivery to FMCOG need to be reviewed, restablished and adhered to by the provider jurisdictions and organizations. The diverse schedules in which data is actually updated by each jurisdiction can, and has, influenced the overall frequency in which a regional database is truly updated, but in general, FMCOG would benefit by having the most up to date data possible. In return, regional maps and analysis performed by FMCOG GIS staff that have any relevance or importance to local jurisdictions should be updated and distributed to coincide with data distribution. As should any datasets created by FMCOG.

An important goal for FMCOG that should be seriously considered is automating routine GIS data compilation processes. This would involve using Avenue or Visual Basic programming languages to write routines that would combine a number of the GIS processing functions into a single, streamlined activity. In essence, most of the "hoops" that FMCOGs GIS staff have to jump through to combine data from all of the separate jurisdictions could be combined and simplified. The resulting

(Continued on page 56)

applications can save literally days of staff time each time the data is updated. In addition, error checking and other quality control procedures can be written into these automation programs to indicate where potential errors or anomalies occur. Identifying these areas of concern early on is key to maintaining a high level of integrity in the data and, more importantly, any subsequent analysis and decision making based on the data.

Suggested course of ACTION:

⇒ *Communicate with jurisdictions on how data will be transferred*

⇒ *Review, update, enhance, expand GEODEC*

⇒ *Develop translation tables and procedures for converting existing data to GEODEC standards.*

⇒ *Create standards and time tables for data updates and maintenance*

⇒ *Automate routine task such as maintenance and standard mapping*

METADATA/DATA DICTIONARY

Put simply, **metadata** is detailed information describing the technical aspects of GIS databases. A **data dictionary** is a user-friendly document describing the information contained in the GIS database and appropriate use or limitations of that data. The Minnesota Governor's Council on Geographic Information has been working to develop metadata standards for Geographic Information. The importance of clear and complete metadata should not be overlooked. Following is a brief extract from the Governor's Council report on Metadata:

> *Proper documentation is often overlooked when developing new databases to be used for geographic information system processing. When essential information about data is missing, its value is severely reduced. Where did the data come from? When were they collected? How accurate are they and how are they to be appropriately used? Without clear and complete documentation, no easy resolution to these fundamental questions exists. Confusion created by such uncertainty leads to a lack of confidence in the data that blemishes the outcome of any analysis in which it is used.* -from Minnesota Geographic Metadata Guidelines, Version 1.2, October 7, 1998. Find out more at:
> http://www.mnplan.state.mn.us/press/accurate.html

Metadata and data dictionary creation software tools are available from a variety of sources and should be obtained and utilized to simplify the metadata creation process. The Minnesota Governors Council of Geographic Information also publishes a number of helpful reports on how to properly create metadata. Their site can be visited at:
http://www.lmic.state.mn.us/gc/committe/stand/index.htm

The GIS Data Dictionary initiated through the Advance Metropolitan GIS Planning process should be expanded to all data, both GIS and non GIS available from all departments in all participating jurisdictions and organizations. The GIS Data Worm provided by PlanSight^{LLC} is a good starting point for collecting the critical GIS data for integration into a data dictionary. Data Dictionaries should be in both HTML and text format. Ideally, the GIS Data Dictionary should include the following:

- File name
- File type
- File format (shape, coverage, dxf, image, etc.)
- Content type
- Coverage area
- Date developed
- Date last updated
- Provider organization
- Field names
- Image sample
- Data access options
- Complete metadata

Other data sources for information about the FMCOG region exist at the state and national level. These databases can be identified and explored by accessing a number of GIS data clearinghouses such as the Minnesota DNR Data Deli and the North Dakota GIS Data Clearinghouse.

As with any entity that creates and manipulates data, there must also be accurate metadata. Since F-M COG straddles two states it may be advantageous to use the federal metadata guidelines. Minnesota has an extensive list of items which is essentially a sub-set of the federal. However, North Dakota does not have this standard yet. When it does, it will undoubtedly be a sub-set of the federal standards as well. North Dakota may use a different set of items. Therefore, the COG would be

best served with the federal standards.

There are tools that help in the collection of metadata. The Federal Geographic Data Committee (FGDC) has a page devoted to metadata and collection tools. (http://www.fgdc.gov/metadata/toollist/metatool.html) There are also extensions for Arc-View that allow the user to create metadata.

Suggested course of ACTION:

⇒ *Regional data information from jurisdictions and organizations*

⇒ *Create standards for tracking data change and metadata completion*

⇒ *Research tools to help make this process easy*

GIS COORDINATOR'S HANDBOOK

A GIS Coordinator's handbook goes beyond information maintained in metadata. It contains information necessary to accomplish GIS administrative tasks. Items such as hardware and software license numbers, technical support contacts, yearly task schedule, etc. should all be found in the Handbook. Essentially, if the primary GIS staff were to leave the chosen regional GIS facilitating agency, all of the information required to help the new GIS Coordinator get up and running should be included in the GIS Coordinators Handbook. A new Coordinator should be able to find the answers to any question regarding hardware, software, data, passwords, contacts, or procedures in the GIS Coordinators handbook. The Handbook should be updated annually. It could be integrated with an on-line data Warehouse or similar format.

Suggested course of ACTION:

⇒ *document all mission critical information related to GIS*

⇒ *develop handbook maintenance routine*

⇒ *prep information for posting on internet/local area network*

GIS COMMUNICATION & AWARENESS PROGRAM

Often GIS departments make the mistake of not actively promoting GIS. One of the most successful ways to raise GIS awareness in organization is to start a staff relation/communication program composed of several different strategies to make people more aware of GIS and its potential benefits. Some of the strategies used by other cities include:

- GIS FLYERS - periodic (biweekly or monthly) email newsletters sent directly to all regional staff describing recent GIS activities and highlighting GIS uses. This is one of the simplest and most informative methods for keeping people aware and involved with GIS.
- MAP OF THE MONTH - Developing and promoting useful GIS maps to administration and staff on a regular basis certainly raises awareness. Every month a different department map should be highlighted and displayed, either in a central location, or by providing small copies to staff, administration, councils, etc. This promotes GIS and demonstrates its usefulness to non GIS users.
- GIS USER GROUP - Regular users groups (different than the more policy oriented meetings) should be scheduled as a way to demonstrate and discuss GIS use. These meetings should target regular staff as well as existing GIS users.
- GIS SEMINARS - Occasional seminars which include software demonstrations, presentations, etc are also helpful.
- MONTHLY STATUS REPORTS - A monthly report prepared by GIS staff documenting recent activities, successes & setbacks which can be reviewed by administration will raise awareness and often result in improving support from administrators These reports may include a cost/benefit section.

Suggested course of ACTION:

⇒ *publish regular GIS "flyer"*

⇒ *document monthly activities*

⇒ *estimate and disseminate cost/benefit of GIS activities*

⇒ *regularly identify useful, high profile maps to complete and disseminate*

TRAINING

Current GIS staff at FMCOG need continuing education and training to acquire and retain the GIS skills necessary to meet FMCOG needs now and in the future. Emphasis should be placed on programming and data management skills. A number of local and regional sources for training exist. Discounts are often available for group training. See appendix C for details.

Suggested course of ACTION:

⇒ *Research partnering with other jurisdictions to save costs on training*

⇒ *Research one-on-one training for specific GIS problems and questions*

⇒ *Have software in place before training begins*

⇒ *Procure training from consultant on custom applications*

GIS VENDOR EVALUATION PROCEDURES

GIS vendors and consultants can help the region meet many of its needs by:

- providing specific GIS expertise not available from your current staff
- helping to give you a fresh look at GIS issues
- leveraging the City's internal staff by providing additional GIS resources
- helping to meet tight deadlines
- teaching new techniques and technologies
- controlling long term permanent staffing costs.

Following are a few steps to help the FMCOG evaluate and choose a GIS vendor or consultant. They focus on larger projects, but the general principals apply as well to smaller ones.

1. Clearly define the GIS objectives that you hope to achieve.

- Describe the job you want done and specify the things you expect from the GIS vendor/consultant.
- Understand precisely how you expect the FMCOG will benefit from the work.
- Decide on the project timeframe, scope and any constraints on the vendor/consultant.
- Clarify your own role, which key staff will be involved, and how their time will be made available.

2. Consult with others in the jurisdictions to agree to those objectives.

- Consult with divisions/departments, the GIS Steering Committee, the GIS Division and others on the nature of the project.
- Jointly define the specific needs for the expertise desired. Is it a hardware, software, training, data, application, or a GIS management problem?
- Possibly regular "hand holding" discussions or counseling sessions with the GIS consultant rather than a defined GIS project is more appropriate. Many cities obtain considerable value from scheduling assistance in this way - but make sure you still have a written contract including hourly costs.

3. Short-list no more than three GIS vendors/consultants, and ask them to provide written proposals

- Make sure you ask only such GIS vendor/consultant to quote for the work as are qualified to carry it out.
- If you do not know a suitable GIS vendor/consultant, ask around. Potential consultants will be happy to send you basic information about themselves and talk with you about your needs, without charge. Begin by contacting and talking with other cities who have used GIS consultants for tasks similar to your own.
- Invite the GIS vendors/consultants identified to submit written proposals, which should include:
    - Their understanding of the problem
    - Names and credentials of the consultant(s) who will actually do the work
    - Experience of the firm
    - References
    - Other support provided by the firm (is GIS their main focus, or do they provide other services)
    - Fees, expenses and schedules of payment
    - The inputs required from the city

4. Brief the GIS vendor/consultant properly.

- Prepare a concise project description which clearly defines the objectives, scope, timeframe, reporting procedure and constraints of the project and agree to it with others in the area who will have an influence on the outcome of the project.
- Remember that the cheapest quote will not necessarily give the best value for money and the fees of your preferred GIS vendor/consultant may be negotiable.

(Continued on page 63)

(Continued from page 62)

5. Be sure to meet the individual GIS consultant who will actually do the job.

- What is the vendor/consultant's reputation for completing GIS projects on time and within budget?.
- Talk through your chosen proposal with the consultant before making a final decision to ensure that you have any concerns answered. If you are not happy with any aspects of the proposal do not feel pressured into accepting them. Continue discussions with the consultant until full agreement on the proposal can be reached.
- Make sure you have the appropriate staff available to answer any additional questions the consultant may have about the project. Allow sufficient time to get to know the GIS consultant and clearly understand the overall approach they plan to use in meeting your requirements. Also allow adequate time immediately after the meeting for you and your GIS staff to review and document the consultants' presentations.
- Have they taken the time and made the effort to truly understand both the client and its needs?
- Do they have the appropriate GIS experience necessary to work on the project?
- Have they proposed the proper level of GIS management and/or technical skills needed to successfully complete their part of the project?
- Have they exhibited a sensitivity to, and concern for, your budget constraints?
- If they are also a GIS software or data vendor, does your need seem "shoe-horned" into their solution?
- Select the firm or individual that you feel has the best qualifications and experience and who you feel you can work with comfortably.

6. Ask for references from the chosen consultant(s) and follow them up.

- Ask the company or individual chosen for names or written references from former clients in order to verify the consultants' suitability for the project.

7. Review and agree a written contract before the project starts.

8. Be involved and in touch during the project.

- Using GIS consultants effectively demands a commitment of time as well as money by the clients staff.
- Remember that you must keep in touch with the progress of the project if you are to get the most from it. GIS vendor/consultants are likely to be most cost-effective when working to an agreed program and timeframe. Make sure there are regular progress meetings and that the consultant keeps you fully briefed on progress.
- If you and your staff need to provide input, make sure that you do it within the agreed timeframe.
- Extra costs may be incurred if you hold up the progress of the project.
- Some GIS projects can be more effective when the work is done at the clients. Make sure the client can provide suitable office space and administrative support for the GIS vendor/consultant.
- You should aim to involve your staff in the assignment as early as possible so that they partly "own" the project and have an interest in the results.
- Projects are often most effective when run by a joint team of consultants and staff.

9. Ensure that the consultant does not save surprises for the final product.

- The GIS vendor/consultant's final product is often his or her most tangible 'deliverable'; but it must be in a format which is beneficial to you. If necessary, ask the consultant to produce a draft or prototype deliverable so that you can review it before the final product is completed.
- The final report should contain no surprises.
- Ask the vendor/consultant to make a presentation to you and your colleagues, if this will help discussion on its conclusions.
- Make sure you understand what the GIS deliverable will be before the project starts.
- Ensure that metadata or other documentation is provided (as necessary)

10. Adopt or implement the final deliverables.

You may need to make arrangements for the GIS consultant to help with the implementation. This can be done cost-effectively by involving the consultant in regular progress meetings. Get a written quote and proposal for any GIS implementation work, even if it follows directly from a project

AUTOMATE DATA MAINTENANCE

Developing macros and scripts to automate data maintenance, updating, and other routine tasks will save many, many hours. Documenting task procedures, following standard file structure and naming conventions will further ease the tasks of automation.

Suggested course of ACTION:

⇒ *automate as many routine tasks as possible*

GIS USER HANDBOOK

A GIS User Handbook should be developed and distributed to all users (possibly on-line via city network). A user handbook is a collection of information that helps users working with GIS. How-to sections describing step-by-step procedures for simple applications, a data dictionary defining all data and its proper use, key contacts, troubleshooting, frequently asked questions, etc. are useful tools for novice and advanced users.

Suggested course of Action:

- ⇒ *develop GIS User Handbook*
- ⇒ *distribute hardcopy*
- ⇒ *integrate into GIS Warehouse*

REGIONAL GIS ESTIMATED COSTS

Based on estimates provided by F-M COG staff, the time to process local data into a single regional GIS database that meets the internal needs of F-M COG takes, on average approximately 650 hours/year. Assuming additional databases need to be developed to meet the remaining regional GIS data needs, database development and maintenance for a regional GIS could easily top 1000 hours per year (.5 FTE). Combine this with the time to develop, test, and deploy custom regional GIS applications, coordinate regional GIS activities, develop GIS policies and procedures, and document data and tasks; the total time estimated to develop and maintain a regional GIS could easily be in excess of 2000-3000 hours/year (1 - 1.5 FTE). More or less time may be required depending on the aggressiveness of the timeline and scope of GIS activities. Following is an estimated cost comparison between hiring new staff to perform all regional GIS tasks as opposed to hiring a consultant:

Annual Costs	Hours	Dollars
Employee	3000/year	$75,000+/-
Circuit Rider Consultant	3000/year	$90,000+/-
Traditional Consultant	3000/year	$150,000-$225,000+/-

In addition to project costs, items such as hardware, software, training, etc. should be taken into account during the budgeting process and estimates are outlined in the table below.

Table 66-1: The following costs estimates are based on hiring staff to undertake most GIS activities with some minor support from GIS consultants. They should be altered if consultants are used in lieu of new staff. These costs estimates are for regional GIS activities only.

Estimated Costs	2001	2002	2003	2004	2005
Staff					
Train Current Staff	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 2,000.00
Additional Staffing (3000 hours +/-)	$ 75,000.00	$78,750.00	$82,687.50	$86,821.88	$ 91,162.97
Staff Total	**$ 77,000.00**	**$80,750.00**	**$84,687.50**	**$88,821.88**	**$ 93,162.97**
Hardware/Software/Data					
ArcView Desktop GIS	$ 2,390.00	$ -	$ -	$ -	$ -
IMS Software	$ 7,000.00	$ -	$ -	$ -	$ -
Hardware	$ 10,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00
Custom Shared Applications (ArcView/ArcIMS/MapObjects)	$ 5,000.00	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 2,000.00
Maintenance Fees/Technical Support/Upgrades/additional software	$ -	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 5,000.00
Data Integration/Conversion					
Hardware/Software/Data Total	**$ 24,390.00**	**$ 8,000.00**	**$ 8,000.00**	**$ 8,000.00**	**$ 8,000.00**
Estimated Total Regional GIS Costs	**$101,390.00**	**$88,750.00**	**$92,687.50**	**$96,821.88**	**$101,162.97**

The following table breaks down the cost estimates according to the structural options outlined earlier in this report. Costs figures are base upon those found in table 66-1 and are spread among the major participating organizations as describe in each organizational option for regional GIS.

Cost by Participant - County Centric Approach to Regional GIS					
F-M COG	$ -	$ -	$ -	$ -	$ -
Clay County	$ 50,695.00	$44,375.00	$46,343.75	$48,410.94	$ 50,581.48
Cass County	$ 50,695.00	$44,375.00	$46,343.75	$48,410.94	$ 50,581.48
Fargo	$ -	$ -	$ -	$ -	$ -
Moorhead	$ -	$ -	$ -	$ -	$ -
West Fargo	$ -	$ -	$ -	$ -	$ -
Dilworth	$ -	$ -	$ -	$ -	$ -
Other	$ -	$ -	$ -	$ -	$ -

Cost by Participant - F-M COG Centric Approach to Regional GIS					
F-M COG	$101,390.00	$88,750.00	$92,687.50	$96,821.88	$101,162.97
Clay County	$ -	$ -	$ -	$ -	$ -
Cass County	$ -	$ -	$ -	$ -	$ -
Fargo	$ -	$ -	$ -	$ -	$ -
Moorhead	$ -	$ -	$ -	$ -	$ -
West Fargo	$ -	$ -	$ -	$ -	$ -
Dilworth	$ -	$ -	$ -	$ -	$ -
Other	$ -	$ -	$ -	$ -	$ -

Cost by Participant - F-M COG-County Partnership Approach to Regional GIS					
F-M COG	$ 33,796.67	$29,583.33	$30,895.83	$32,273.96	$ 33,720.99
Clay County	$ 33,796.67	$29,583.33	$30,895.83	$32,273.96	$ 33,720.99
Cass County	$ 33,796.67	$29,583.33	$30,895.83	$32,273.96	$ 33,720.99
Fargo	$ -	$ -	$ -	$ -	$ -
Moorhead	$ -	$ -	$ -	$ -	$ -
West Fargo	$ -	$ -	$ -	$ -	$ -
Dilworth	$ -	$ -	$ -	$ -	$ -
Other	$ -	$ -	$ -	$ -	$ -

SUMMARY

This Advanced Metropolitan GIS Plan attempts to lay the framework for the development of a coordinated, collaborative regional GIS. By reviewing the existing GIS activities and level of involvement in all of the local jurisdictions, determining how the jurisdictions want to use GIS in the future, identifying those commonalities in GIS goals that could be applied to the region as a whole, and by examining other, similar GIS collaboratives throughout the country; a number of options have been developed that could each provide a blueprint for developing a regional GIS. In addition, this plan identifies specific tasks that need to be accomplished to implement a regional GIS and estimates the costs involved. To further aid in the development of a regional GIS, several important topics, such as legal issues, training options, and third party software choices have been reviewed. By continuing a history of working together to jointly address regional GIS issues, all of the participating jurisdictions in the Fargo-Moorhead Metropolitan region will be able to use this plan as a tool for finding the common ground in which everyone can benefit from collaboratively developing a strong regional GIS.

APPENDICES

APPENDIX A: SAMPLE THIRD PARTY CUSTOM APPLICATIONS

Following are a few samples of third party custom application GIS add-ons available for ESRI GIS software products. This is just a few of the add-ons available for purchase. The product numbers correspond to the numbers supplied in the GIS Needs Assessment section for each Division. Contact the vendor company website provided for more information.

1. SDS, Inc. pARCel mAPPer ä $5,000.00

HTTP://www.sds-inc.com/

http://www.sds-inc.com/taims.htm

pARCel mAPPertm provides the mapping tools required to maintain and edit property maps using a simple step-by-step approach to perform such functions as splits, joins and subdivision imports. Data must be set up in librarian ArcInfo 7.1.2 and ArcCOGO must be installed. Database and symbol sets must be defined

2. Urban Information Systems TAS Basic ä, TAS Advanced ä, TAS Professonal ä & TAS CAD ä $1,180.00

http://www.u-i-s.com/

http://www.u-i-s.com/software.htm

TAS is a suite of ArcView extensions for image georeferencing, image rectification, CAD georeferencing, and much much more.. The TAS suite gives ArcView users sophisticated GIS tools for raster image and CAD theme handling power. They are, however, designed for desktop ease of use. TAS makes it possible to incorporate virtually any image or CAD file as a theme in your ArcView GIS project. TAS now comes in multiple levels to meet every user's needs. Every TAS product includes comprehensive User's Manuals and on-line Help (Windows users only).

TAS Basic

TAS Basic is the powerful yet easy to use entry level product for raster image manipulation within ArcView GIS. TAS Basic includes everything you need to control image theme scaling, moving, rotation calculation, georeferencing and World file creation. With TAS' tools you can easily move and shape images within a View according to your specifications. TAS Basic, like all TAS tools, is an ArcView GIS extension. If you know how to use ArcView, you know how to use TAS. TAS Basic works on all ArcView platforms.

TAS Advanced

TAS Advanced adds enhanced image manipulation and automation tools to the TAS suite. TAS Basic's functionality can be dramatically extended using TAS Advanced. This level of TAS adds many new functions including: advanced image georeferencing techniques, image georeferencing batch processing, mosaic creation, image cropping, creation and editing of image catalogs and more. And, for Windows users, the first time ever in ArcView -- true image rotation!

TAS Professional

Rectify images inside of ArcView. TAS Professional includes true image transformation tools for image rectification in an incredibly easy to use and powerful interface. TAS Professional brings a whole new level of image handling to the desktop by giving the user true image correction capabilities within a vector based GIS environment. Do not be fooled by the name, though, this tool is as easy to use as the other TAS products. TAS Professional is a major breakthrough in image handling for desktop users. TAS Professional is a Windows only product.

TAS CAD

TAS CAD is the ArcView extension designed for those who have access to CAD files and want to migrate them to GIS. TAS CAD includes everything you need to control CAD theme scaling, moving, rotating, georeferencing and

(Continued on page 71)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 70)

CAD World file creation. With TAS' CAD tools you can easily manipulate the geographic aspects of CAD themes within a View according to your specifications. There is no need for file conversions. Every drawing made in the last ten years can become a feature-rich GIS theme in as few as five mouse clicks. This is an essential tool for the migration of CAD files to GIS themes. TAS CAD works on all ArcView platforms.

3. The CEDRA Corporation Avparcel $1,495.00

http://www.cedra.com/
http://www.cedra.com/AVparcel.html

CEDRA-AVparcelTM is an ArcView® extension which includes and expands upon CEDRA AVcadTM to provide tax (cadastral) mapping, parcel maintenance and general Polygon Editing. Join the many Assessor's, Planners, State Archives, Oil Companies and Utility Authorities that use CEDRA AVparcel to manage their parcels, leases and land boundary information within an ArcView environment. Have the ability to snap between and within themes, handle unlimited number of parcels, utilize state plane or UTM, special PIN formats,Buffering capabilities and a host of other features listed below.

CEDRA-AVparcelTM

CEDRA-AVparcelTM is an ArcView® extension which expands upon AVcadTM to provide the user the ability to create, edit and manage three dimensional topologic polygons of land parcels for tax (cadastral) mapping, parcel maintenance and other applications that involve the manipulation of polygons and/or boundary information. CEDRA-AVparcelTM is fully compatible with Versions 3.0 and 3.1 of ArcView®. AVparcelTM provides the following functionality:

Building the database from within AVparcelTM

Geometric layout of parcel corner and curvature points, boundary sides and polygons, multi-course tie-lines, and centroids in an interactive graphic environment. Topological data structure enabling CEDRA-AVparcelTM to recognize shared sides. Ability to "clean" all parcels or a selected set of parcels, thereby eliminating duplicate and dangling parcel corners. Databases created may represent:

- Parcel ownership,
- School districts,
- Fire safety districts,
- Drainage districts,
- Political boundaries,
- or any other special district delineation.
- Support of associate tables for Ownership, Taxation, Land use, Water use, etc.
    - Support of a variety of coordinate systems such as State Plane, UTM, etc.

Geometric functionality

Includes and expands AVcadTM.

- Direct deed transcription with or without tie-lines, and optional forced parcel closure.
- Automatic determination of centroids and areas.
- Three dimensional database for application to high rise condominium type of ownership.
- Computational and deed record attributes of boundary key elements, areas, record books, and survey information.
- Automatic polygon creation using auto-search (tracing) functionality.
- Ability to mass convert polygons into topological parcels.
- Individual point, line, circular arc and spiral definition.
- Point and line traversing.
- Tangent line and curve generation.
- Ability to insert, delete and relocate vertices of a polyline or polygon.
- Specification of angles in decimal or degrees/minutes/seconds form.

(Continued on page 72)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 71)

- Specification of angles as an Azimuth, Bearing or Cartesian direction.
    - Point Snapping across themes.

Database query and editing

- Precise geometric location.
- Parcel location by number and area range.
- Parcel corner relocation and side modification.
- Parcel translation, rotation, biaxial scaling and deletion.
- Non-graphic attribute editing.
- Polygon splitting, joining and editing of vertices.
    - Ability to store geometric and deed data with deed data being independent of the geometric data.

Parcel Closure Adjustment

- Crandall, Compass, Transit and Least Squares adjustments with formal report generation.

Parcel Identification Numbers (PIN)

- Single alphanumeric string of user-defined length.
- Support of New York State Office of Real Property Services (ORPS) format.
- Ability to create a user-defined PIN format comprised of up to eight individual components.

Importing functionality

- dBase, Info and ASCII files.
- Import of Arc/Info coverages and libraries.
- DXF, DWG, DGN CAD drawings.
- Ability to mass import polygons from an ASCII file.
- Ability to mass import points in a variety of formats from an ASCII file.
- Ability to display the following raster file formats
  TIFF (.tif files).
  ERDAS (Rev 7.3 and 7.4 .lan and .gis files).
  IMAGINE (.img files).
  BSQ, BIL and BIP.
  Sun Rasterfiles (.rs, .ras, and .sun files).
  BMP.
  JPEG (.jpg files).
  IMAGINE (.img files).
  Arc/Info GRID.
  RLC (Run-Length Compressed format).

Graphic display manipulation

- Preparation of parcel maps with the ability to customize map templates.
- Mass Annotation of parcel identification numbers, area and centroids.
- Advance or return to previous views.
- Individual and global text scaling.
- Individual and global text editing.
- View of ASCII based files.

4. The Omega Group CrimeView ä $4,995.00

http://www.theomegagroup.com/

CrimeView is a suite of integrated crime analysis tools designed for use with ArcView GIS 3.0. CrimeView facilitates

(Continued on page 73)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 72)

the accomplishment of both simpler and more complex crime analysis tasks. CrimeView walks you through the individual tasks, letting you guide the analyses with minimal input. Automated tasks include incident and suspect reporting by various standard and user-defined geographies, crime density and repeat call investigations, and custom report and map creation. CrimeView includes a full-featured Windows report writer

Key Features:

- online Windows style help on all reporting, mapping and
- analysis routines
- includes versatile R&R Report Writer® for report
- generation and custom report design
- produces maps, reports and analyses with ease from your
- data in a format that is most useful to you

5. novaLIS Technologies â Cadastral Editor $ 5,000.00
http://www.novalistech.com/

NovaLIS Cadastral Office is the first truly complete product of its kind, developed specifically for the cadastral mapping and land records market. It combines the proven capabilities of NovaLIS' Cadastral Editor and GATE to provide a comprehensive transactional editing and updating solution for cadastral databases. Cadastral Editor offers a user-friendly toolkit for inputting, editing and merging spatial data, and GATE allows for the intelligent extraction and locking of "working areas" from a cadastral database.

Features

- A complete transaction management environment provided by GATE for both spatial and attribute data with temporal and history tracking capabilities.
- New, innovative COGO spreadsheet data entry and adjustment supported by an intuitive spreadsheet environment.
- Extremely easy to use "Wizards" to lead users through a series of workflows to perform tasks such as spatial data adjustment, merging and topology clean up.
- Efficient tools for automated raster-to-vector conversion of scanned source plans.
- Powerful tools for both table and "heads up" digitizing of data from paper source documents.
- A complete line of products (Personal, Workgroup, Enterprise) that allows users to acquire low-cost entry software and grow into complete enterprise-wide systems if needed.

6. HJW & Associates Aerotopia ä PhotoMap ä (digital ortho photos) $ 5,000.00
http://www.hjw.com/
http://www.aerotopia.com/

Aerotopia's PhotoMap is the first comprehensive collection of aerial orthophotography available on CD-ROM. Covering 24 metropolitan areas in the U.S., PhotoMap is affordable, accurate, up-to-date aerial imagery ready to view in most graphic and desktop mapping programs. PhotoMap tiles are ortho rectified aerial images that have had photographic and terrain distortion removed. Features one foot or larger typically can be seen on a PhotoMap tile, allowing display of details essential to mapping and GIS professionals.

7. Enabling Technology, Inc. SMMS-Spatial Metadata Management System ä $495.00
http://www.enabletech.com/

Good people are hard to keep, but critical information shouldn't go with them when they leave. With the Spatial Metadata Man-

(Continued on page 74)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 73)

agement System (SMMS) version 2.0 from Enabling Technology, you can rest assured that information critical to your GIS will always remain at your fingertips. By a dynamic database, SMMS maintains metadata as your central reference for spatial data.

- Easily create, manage and distribute FGDC-compliant geospatial metadata
- Maintain a multi-user SQL Server 6.5 or MS Access metadata database
- Minimize data entry with metadata templates
- Rapidly search and retrieve records from your growing metadata database
- Publish internet-ready reports with links to spatial data
- Keep your metadata current with Metadata Management functionality
- Import and export metadata files in ASCII text and SGML
- Share Contacts, Citations and Distribution Methods among metadata sets
- Customize the view to better suit your organization's level of compliance
- Receive extensive online help and technical support
- Convert your entire SMMS 1.0 database with a single command

8. Eden Systems InForum Parcel Manager (3 seats) $ 6,000.00

http://www.edeninc.com/
http://www.edeninc.com/parcel.html

PARCEL MANAGEMENT
InForum Gold Parcel Manager provides the foundation for an enterprise-wide GIS that supports the daily business tasks for cities, counties, and utilites. The Parcel Manager maintains base information on all parcels and related buildings, businesses, assessments, owners, owner history, and zoning. The information stored in the Parcel Manager provides the crucial link to nearly all geographically referenced business transactions within a municipality. Parcel Manager, with embedded Map Objects for ESRI, is the only 32-bit (Windows '95, Windows '98, Windows NT) comprehensive parcel management software in the governmental market.

Key features:

- Extensive, configurable parcel information
- Link buildings and businesses to parcels.
- Track parent-child relationships.
- Attach notes, alerts, and files to a parcel.
- Full owner, zoning, and assessment history
- View parcels, buildings, and businesses on your parcel map.
- Choose several types of address validation to maintain tight control over your parcel database.

9. CRW Associates Builders Square, Project Trak & Code Trak (2 seats) $ 8,500.00

http://crwassoc.com/
(software description web page under construction 3/9/99)

"Builder's Square"
The "Builder's Square" application is a direct GIS interface to their Permit Management, Code Enforcement and Damage Assessment applications.

10. Eagle Information Mapping, Inc. ViewPoint Document Manager ä $ 495.00

http://www.eaglemap.com/

(Continued on page 75)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 74)

http://www.eaglemap.com/products/documentmanager/documentmanager.htm

VIEWPOINT DOCUMENT MANAGER

ViewPoint Document ManagerTM is Eagle Information Mapping's core software product. To put it simply, ViewPoint Document Manager is the BEST WAY to manage ArcView GIS® Projects. ViewPoint Document Manager lets you store ArcView documents outside of ArcView project files. ViewPoint Document Manager handles standard ArcView documents (views, themes, tables, charts, layouts, etc.), plus new ViewPoint documents, such as areas of interest (AOIs) and workbooks (collections of documents). ViewPoint Document Manager lets you preview ArcView documents outside of ArcView; to retrieve a document you simply drag-and-drop it from ViewPoint Document Manager into ArcView. Documents can also be displayed in list or description mode.

ViewPoint Document Manager lets you share ArcView documents with other users. The workgroup friendly environment of ViewPoint Document Manager lets GIS administrators easily support large and diverse groups of users and enables new or occasional users to become productive with minimal training effort. With ViewPoint Document Manager, you can realize the power of GIS throughout your organization.

The core concept of ViewPoint Document Manager is the use of multiple repositories for saved documents. Each ViewPoint Document Manager user has a personal directory to store documents by default. In addition, ViewPoint Document Manager provides a system directory where documents shared by many users are stored. Documents stored at the system level give new or casual users the ability to access the functionality of ArcView without having to understand where to find and how to load and symbolize data in ArcView. ViewPoint system documents, which can be used to set a standard for map symbols, can serve as defaults or templates from which any user can create customized documents. A single knowledgeable ArcView user can support an unlimited number of casual users by populating the ViewPoint system directory with themes, views, AOIs, tables, etc.

In addition to the system and personal directories for ViewPoint documents, you can also take advantage of ViewPoint Document Manager bookmarks. A bookmark is simply a shortcut to some location on the network where ViewPoint documents are stored. Bookmarks provide unlimited flexibility to the ViewPoint document storage hierarchy. By sharing bookmarks, small groups of users can create their own special repositories for ViewPoint documents.

ViewPoint document sharing is simple and safe. Although ViewPoint Document Manager allows multiple users to have access to a single document, only one user can have write access to a ViewPoint document at a time. Once you begin working with a ViewPoint document, other users can only open copies of the document.

The following are some of the key tasks you can accomplish with ViewPoint Document Manager:

- Save views, themes, Areas of Interest (AOIs), layouts, tables, charts, and scripts
- Drag-and-drop views, themes, AOIs, layouts tables, charts, and scripts into ArcView
- Share views, themes, AOIs, layouts, tables, charts, and scripts
- Create, save, restore, and share a collection of documents (called a workbook)
- Preview views, themes, layouts, and workbooks before importing them into ArcView
- Create bookmarks as shortcuts to local or network directories
- Set a working directory for saving documents by choosing from personal, system, or bookmarks.
- Define, restore, and remove AOIs
- Save textual comments with a layout (as you would with other ArcView document types)

11. A.C.T. GIS DigView (Call-Before-You-Dig) $ 1,495.00

http://www.actgis.com/

http://www.actgis.com/products.htm

(Continued on page 76)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 75)

DigView - A facility locator with automatic cover letter/faxing capabilities that facilitates public agency/private developer regulatory interface (supports Blue Stake/Call- Before-You-Dig) (MapObjects™) The DigView Application offers search by parcel number, parcel address, or 'point and click' with user identified 'buffer' distances for proximity maps. It allows 'prefixed' and user entry pan/zoom capabilities, provides on-the-fly graphic annotation, and utilizes 100% dynamic attribute, map layer, and symbol selections, with subsequent hard copy and/or FAX capabilities.

12. Davis Demographics & Planning, Inc. SchoolSite ä Redistricting Extension for ArcView $ 2,995.00

http://www.davisdemographics.com/
http://www.davisdemographics.com/redistex.htm

Functions:
The SchoolSite Redistricting Extension provides a user friendly wizard-based method to modify or create new school attendance boundaries. Using a Study/Planning map layer of the District, alternative school boundary plans can initially be developed using one of three methods:1.Based upon closest school, 2.Existing attendance boundaries, 3.Manually assign each area to a school. Study Areas can then be individually reassigned to other school locations to balance enrollment and site capacities. Additional sites can be added simulating the opening of a new school or surplus sites can be deleted simulating closing a school. As boundaries are modified, classroom requirements by grade level to house enrollment at each site is reported so that the user can immediately see the effects on facility needs with each plan. Classroom loading standards for each grade level can be modified. The effect of class size reduction at various grade levels has never been easier!

Key Functions Added to ArcView:

- Develop attendance boundary plans through assignment of Study Areas.
- Save an unlimited number of plans.
- Comprehensive reporting capabilities including statistics, such as counts of students by grade level, ethnicity, school of enrollment or other data fields (complete flexibility in loading and using student data).
- Classroom needs at each site are automatically updated with each change in boundary plan based upon facility/classroom counts at sites along with user-defined classroom loading standards.
- Create a variety of maps for presentation use.
- Street address/school assignment reports.

The SchoolSite Redistricting Extension is an add-on to the industry-leading ArcView GIS software which provides a complete set of flexible and easy-to-use mapping, analysis and reporting tools. Other optional extensions, (such as the Network Analyst for school service area/walk distances) can be added to meet your particular planning needs...

The SchoolSite Redistricting Extension for ArcView operates with ArcView 3.0a or higher on Windows95, 98 or NT.

13. 3DI, LLC HydroVue (either Sanitary or Stormwater Module) $ 2,995.00

http://www.3diterralogic.com/

14. CarteGraph Systems Ò SIGNview Ò, SIGNALview Ò, BRIDGEview Ò, PAVEMENTview Ò WATERview Ò, SEWERview Ò, WORKdirector ä & CARTEmaster ä $17,555.00

http://www.cartegraph.com/

SIGNview

(Continued on page 77)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 76)

http://www.cartegraph.com/signview.htm

SIGNview® delivers the most practical and efficient approach available for the collection, inventory, maintenance and management of all your sign assets. In the field and in the office, SIGNview dramatically reduces the effort required to create and maintain an accurate, up-to-date sign management database. On-line libraries are one of the features you'll find in SIGNview to help reduce the tedious task of data entry. SIGNview is equipped with an on-line Federal MUTCD library that contains predefined data for all standard signs. Simply select a sign from the library and SIGNview automatically records the attribute information for you! In addition to the standard Federal MUTCD library, several other libraries are available, including:

- CALTRANS
- New York
- Canada
- U.S. Forest Service
- Wisconsin

All SIGNview libraries can be completely customized to reflect any unique signs your organization may have.

SIGNALview

http://www.cartegraph.com/signalview.htm

SIGNALview® provides traffic engineers and technicians with a powerful tool dedicated to the collection, inventory, maintenance and management of all components in a signal system. Its easy-to-use interface is set up so that a simple click of a tab on the side of your screen allows you to quickly switch between the five main areas of the program:

- supports
- faces
- detectors
- controllers
- auxiliary equipment

On-line reference libraries speed the recording and classification of every component and intersection in your system! Whether your duties place you in the office or in the field, SIGNALview is loaded with features to make your signal management efforts comprehensive, fast and easy.

complete signal inventory

- Record a detailed inventory of all integrated signal components:
  - Faces
  - Supports
  - Detectors
  - Controllers
  - Auxiliary equipment
- Attach multiple images, videos, CAD files, documents, OLE objects, etc.
- Identify signal system connectivity
- Use Fast-Capture™ data entry optimization

reference libraries

- Access on-line signal libraries (300+components)
- Automatically associate sign library graphic symbols and data
- Easily create custom signal component library entries

location identification

- Identify signal locations by:
  - Vicinity reference
  - Intersection reference
  - Coordinate reference

signal history

- Record origin/change dates
- Identify signal component condition

(Continued on page 78)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 77)

- Maintenance history log
- Maintain scheduled activities log

field forms

- Create user-defined data entry forms
- Set carryover toggles for repeat entries
- Set default values for standard entries

queries and reports

- Develop queries and reports using all database fields
- Generate standard reports:
  - Signal inventory
  - Scheduled and completed maintenance
  - Signal libraries
- Generate history rollback reports
- Create custom reports

map presentation

- Graphically display all SIGNALview data in a CARTEmaster application using a variety of symbols, sizes and colors
- Create a "dynamic link" between your signal data and a map

BRIDGEview

http://www.cartegraph.com/bridgeview.htm

BRIDGEviewTM is a revolutionary new tool designed specifically for bridge and culvert management. You will quickly appreciate the ease with which bridge and culvert information can be recorded, queried, displayed and reported. Use BRIDGEview to optimize your inspection process, improve your record accuracy, streamline your SI&A reporting and decrease your maintenance costs. For all of your structures, you can easily maintain inventory, inspection, appraisal, maintenance and even state-specific Structure Inventory and Appraisal (SI&A) information. Based on FHWA guidelines and National Bridge Inventory Standards, BRIDGEview is ideally suited for both field and office use. From structure inventory through final generation of SI&A forms, BRIDGEview provides a comprehensive and powerful NBI-compliant asset management tool

complete bridge inventory

- Record a detailed inventory of bridge and culvert structure information
- Reference the FHWA *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges* item codes and classifications
- Attach multiple images, videos, CAD files, documents, OLE-linked objects, etc.
- Record element/material/geometric structure details
- Record structure clearance data
- Record structure load rating and posting data

inspection records

- Conduct FHWA and/or PONTIS style structure inspections
- Conduct multi-year routine/critical structure inspections
- Calculate individual structure Sufficiency Ratings
- Calculate individual structure Replacement Priority Ratings
- Model historical and future structure performance
- Estimate remaining life of structures

location identification

- Identify bridge and culvert locations by vicinity, road network or coordinate reference
- Record easement data

structure history

- Record key construction/reconstruction dates
- Identify original contractors, design data, plan sets, etc.
- Record ADT history
- Maintain maintenance history

(Continued on page 79)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 78)

- Maintain scheduled activities log

queries and reports

- Generate standard reports: inventory, scheduled and completed maintenance, SI&A forms
- Create custom reports
- Import/export FHWA and/or PONTIS data

map presentation

- Graphically display all BRIDGEview data in the CARTEmaster applications using a variety of symbols, sizes and colors
- Create a "dynamic link" between structure data and a map

PAVEMENTview

http://www.cartegraph.com/paveview.htm

PAVEMENTview® raises the standard for pavement management system features and functionality! This comprehensive product allows you to easily maintain accurate and up-to-the-minute pavement inventory, inspection and maintenance information. Whether you are responsible for high-volume paved roads or low-volume unpaved roads, PAVEMENTview provides a valuable management tool! PAVEMENTview is based on concepts introduced by the Federal Highway Administration and the U.S. Army Corps of Engineers and is ideally suited for both field and office use. With PAVEMENTview, you'll quickly benefit from optimized data collection, improved records accuracy, departmental efficiency, simplified analysis and decision making, streamlined workplan development, and most importantly — decreased maintenance costs. As you strive to optimize the impact of available budgets, the capital improvement planning power of PAVEMENTview Plus makes it easy to analyze maintenance priorities, alternatives, costs and benefits. By analyzing several "what if" scenarios, you can develop a multiple-year workplan that optimizes each maintenance dollar that is spent.

complete road segment inventory

- Record a detailed inventory of paved and unpaved road segment information
- Identify road segment classifications
- Attach multiple images, videos, CAD files, documents, OLE-linked objects, etc.
- Record road segment type/dimension/materials details
- Record road segment structure and geometry details

segment location identification

- Identify road segment locations by vicinity, coordinate, road network or inventory route

asset history

- Record key construction/reconstruction dates
- Identify original contractors, design data, plan sets, etc.
- Record ADT history
- Maintain maintenance history and scheduled activities log

inspection records

- Conduct multi-year road segment inspections
- Perform windshield or detailed condition inspections
- Inspect unlimited sample units in each road segment
- Reference on-line FHWA (SHRP) and USACE distress libraries and deduct curves
- Establish segment Overall Condition Index
- Model historical and future road segment performance
- Estimate remaining life of road segments

queries and reports

- Develop queries and reports using all database fields
- Generate standard reports including inventory and scheduled and completed maintenance
- Create custom reports

map presentation

- Graphically display all PAVEMENTview data in the CARTEmaster applications using a variety of lines, symbols, sizes and colors
- Create a "dynamic link" between your road segment data and a map

(Continued on page 80)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 79)

WATERview

http://www.cartegraph.com/waterview.htm

WATERview® is an indispensable tool for anyone responsible for managing water systems, large or small. You have the power to record detailed inventory, inspection and testing data for all of the components within your water system — hydrants, valves, mains, services, meters, pumps and blowoffs. See your water system in a whole new way with the comprehensive query, display and reporting features of WATERview. Join water system managers across the country who are benefiting from optimized data collection, improved records accuracy, simplified analysis, increased departmental efficiency and decreased maintenance costs!

complete asset inventory
- Record a detailed inventory of hydrants, valves, meters, pumps, blowoffs and mains
- Attach multiple images, videos, CAD files, documents, OLE-linked objects, etc.
- Identify network connectivity and conduct network tracing
- Instantly isolate main breaks
- Record hydraulic data
- Interface with standard hydraulic modeling programs

reference libraries
- Access on-line libraries of water system components
- Associate standard component graphic symbols and data
- Easily add or customizelibrary entries

location identification
- Identify water system component locations by vicinity, road network, water network or coordinate reference
- Record easement data

inspection records
- Conduct multi-year inspections of components
- Record a wide range of testing data
- Establish component Overall Condition Index
- Model historical and future component performance
- Estimate remaining life of components

asset history
- Record key construction/reconstruction dates
- Identify original contractors, design data, plan sets, etc.
- Maintain a maintenance history log
- Maintain a scheduled activities log

queries and reports
- Develop queries and reports using all database fields
- Generate standard reports: scheduled and completed maintenance, component libraries, connectivity, valve isolation, billing statements, testing data
- Create custom reports

map presentation
- Graphically display all WATERview data in our CARTEmaster products using a variety of symbols, sizes and colors
- Create a "dynamic link" between your asset data and a map

SEWERview

http://www.cartegraph.com/sewerview.htm

SEWERview® delivers twice the power — manage both storm sewer and sanitary sewer assets in one comprehensive software application! Use this centrally-accessible management tool to inventory, inspect, test, manage and map all information related to your sewer networks. With just a few clicks of your mouse, you'll discover why managers across the country are turning to SEWERview to help manage their sewer networks. Tabs on the side of your SEWERview screen allow you to easily access detailed information about the main components in your sewer network:
- pipes

(Continued on page 81)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 80)

- junctions (manholes)
- intakes
- channels
- pump stations

For each of these components you may record a wide range of identification, feature, location, inspection and history information. You may also associate photos, documents, plans and other pertinent information. You truly have one container in which to record all known asset information! As with all CartéGraph applications, you are able to record as much or as little detail as you wish — SEWERview has the flexibility to fit your needs.

complete asset history
- Record a detailed inventory of pipes, culverts, channels, manholes/junctions, intakes and pump stations
- Attach multiple images, videos, CAD files, documents, OLE-linked objects, etc.
- Identify network connectivity and conduct network tracing
- Record hydraulic data and display graphical component profiles
- Interface with standard hydraulic modeling programs

reference libraries
- Access on-line libraries of sanitary and storm sewer components
- Associate standard component graphic symbols and data
- Easily add/customize library entries

location identification
- Identify sanitary and storm sewer component locations by vicinity, road network, sewer network or coordinate reference
- Record easement data

inspection records
- Conduct multi-year inspections of components
- Record a wide range of testing data: flow tests, infiltration/exfiltration tests, air and water pressure tests, illegal connections tests
- Associate video distress logs
- Establish component Overall Condition Index
- Model historical and future component performance
- Estimate remaining life of components

asset history
- Record key construction/reconstruction dates
- Identify original contractors, design data, plan sets, etc.
- Maintain scheduled activities and maintenance history logs

queries and reports
- Develop queries and reports using all database fields
- Generate standard reports: scheduled/completed maintenance, component libraries, connectivity, billing statements, testing data
- Generate custom reports

map presentation
- Graphically display all SEWERview data in the CARTEmaster applications
- Create a "dynamic link" between your sewer system data and a map

WORKdirector

http://www.cartegraph.com/workmast.htm

When you need quick, accurate and detailed answers, you'll find that paper records and spreadsheet programs just can't compete with the power, efficiency, versatility and user-friendliness of WORKdirectorTM! This unique program is a comprehensive tool for the management of all work activities that occur within a public works department. The interactive and virtually limitless databases of WORKdirector make it a powerful "container" for vital organization information:

- work orders and projects
- work requests
- public complaints
- labor records
- equipment libraries

(Continued on page 82)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 81)

- material inventory

These databases work together to help you accurately record labor, equipment and material costs, relate work activities to specific work orders or projects, track maintenance schedules, develop customized queries and reports and much, much more. One of the real advantages of implementing WORKdirector within your organization is that although many individuals from various departments may be accessing WORKdirector to accomplish their specific tasks on a day-to-day basis, all of this critical data remains in one, easily-accessible location. Because WORKdirector centralizes many of the distributed information recordings and management efforts that go on within public works organizations, it becomes the clearinghouse for such diverse information as inventory levels, employee compensation histories, equipment maintenance schedules, vendor price quotes public complaints, work requests, work orders and standard operating procedures. That means managers know where to turn for the comprehensive information they need t establish budgets, set minimum service response times, track maintenance schedules, make purchasing decisions, etc.

work request management

- Handle departmental work requests and public complaints
- Monitor work request, work order and complaint status
- Track response time
- Generate work completion letters
- Create work request and complaint status reports

work order management

- Generate work orders
- Assign labor, equipment and materials resources
- Track work order progress
- Create a "dynamic link" to all CartéGraph asset management applications
- Display variations between estimated and actual costs and resources for work order completion
- Plot work locations on maps with the CARTEmaster applications

resource utilization

- Enter daily/weekly/monthly work activity
- Match work activities and resources with work orders
- Compile work histories and costs
- Create customized work reports

labor records and tracking

- Record employee information and images
- Maintain compensation histories
- Assign work crew associations
- Compile employee work histories

equipment inventory and tracking

- Record equipment information and images
- Track maintenance schedules
- Record depreciation and salvage values
- Maintain up-to-date operating log books

materials inventory and tracking

- Generate and track purchase orders
- Track materials inventory
- Use barcodes to speed inventory and tracking
- Automatic inventory reduction and reordering
- Maintain a vendor database

images

- Attach multiple images
- Include digital photos, video, OLE-linked objects, etc.

queries and reports

- Develop queries and reports using all database fields
- Generate standard and custom reports

(Continued on page 83)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 82)

CARTEmaster for ArcView
http://www.cartegraph.com/cartemas.htm#CARTEmasterArcView
CARTEmasterTM for ArcView is an application that enhances your ability to use ESRI's ArcView® with CartéGraph's asset management applications. CARTEmaster for ArcView adds easy-to-use menu items and icons to ArcView that allow you to create and view your assets as themes. Creating CartéGraph asset themes provides you with many options to view and query your data in a GIS. CARTEmaster for ArcView automatically creates shapefiles from the database and keeps them up to date. Changes you make in any of the asset management programs automatically update ArcView's display. CARTEmaster for ArcView commands allow you to manipulate the database in viewSERIES applications as well. This two-way connection can best be described as a live link between ArcView and a CartéGraph asset management application. With CARTEmaster for ArcView you can geographically manipulate your database. By using any of ArcView's commands to create a selection set, your database of assets will reflect this geographic selection. This is an excellent tool to analyze a subset of your database. Other CartéGraph applications are GPS-enabled, and CARTEmaster for ArcView is no exception. If you have a GPS receiver and CartéGraph's XYZlink™ utility, CARTEmaster for ArcView's GPS Tracker will pinpoint your position on a map.

15. Geographic Information Services, Inc. Zoning AnalystÓ $ 2,495.00
http://www.gis-services.com/
http://www.gis-services.com/zoningan.html

Zoning Analyst© is an ArcView extension providing comprehensive tools for land use analysis and case management. It supports a wide variety of data sources and can be customized or configured bymost ESRI system administrators. In addition to zoning, it tracks any planning area such as flood plains, redevelopment districts, historical zones, etc.

Zoning Analyst© provides links to both Word and WordPerfect for Windows which can be used to generate public notification letters. Notification areas can be defined using buffers, adjacency or areas such as neighborhoods. The letters are populated from Assessment and Zoning Case files including; parcel ID, legal description, site location, estimated acreage, present zoning, proposed zoning, and proposed use.

The system also provides historical case tracking functions that display all other cases which have occurred in the area. Case information may be drawn from an existing SQL compliant system or created within Zoning Analyst. The parcel tool allows query of case history for any property.

Zoning Analyst® supports an electronic zoning ordinance built using hypertext help. This supports hot links from any parcel directly to the applicable code. Files may be constructed by the client using Word and a help generator.

Property may be selected by address, parcel ID, Deed book and page, Plat book and Page, subdivision lot , block or graphically. Detailed case files can be accessed for any case simply by selecting the case number on the map. Case history can include project plans, previous correspondence, deeds, covenants and other legal documents. Zoning Analyst saves all previous maps and mail merge files created for a case.

A variety of case documents supported: Word, WordPerfect, scanned images, DXF files AutoCAD Drawings, Microstation Drawings, ARC/INFO coverages and ArcView shapefiles.

16. VESTRA Quicktionary for ArcView $ 99.00
http://www.vestra.com/
http://www.vestra.com/documents/VQuick.htm

VESTRA Quicktionary is an ArcView extension that provides an automated way to document datasets in ArcView Views. It

(Continued on page 84)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 83)
describes your "as built" data and pays for itself the first time you use it! With VESTRA Quicktionary, you can view the contents of your data files in a glance, making it easy to spot spelling errors and missing data.

VESTRA Quicktionary appears as a button on the ArcView View Button Bar. It becomes available for active themes with attribute tables. Find out more about VESTRA Quicktionary by reading the frequently asked questions and the user documentation.

How you use it
- Load the VESTRA Quicktionary extension
- Open an ArcView project
- Click on a View
- Activate a theme or themes in the View
- Click on the VESTRA Quicktionary button
- Answer the simple questions in the dialog box
- View your metadata file

17. Digital Engineering Corp. A/VNotify & A/Vreports , autoBound & A/Vreports $ 8,170.00
http://www.digitalcorp.com/

AVReports
http://www.digitalcorp.com/avreports.htm
Put a Report Writer Extension into your Arcview 3.0 Project.
- Create Professional reports directly from inside Arcview.
- Create reports from one table or use data from multiple tables in a single report.
- Incorporate Arcview Layouts and Views in your reports.
- Use report wizards to create over 80 report formats.
- Export reports to 18 file formats including: Word, Excel, Lotus etc.
- Use included Active X objects to incorporate reports into MapObjects Applications.
- Create HTML files from reports.
- Access reports through Avenue calls.
- Share reports with others using distribution facility.

A/VReports Pro is a professional report writer extension for use with the ArcView 3.0 desktop GIS package. Since A/VReports Pro works as an ArcView extension product, it is available to all existing and future ArcView projects. A/VReports works by creating a new entry in the ArcView project window called A/VReports. From this interface, users can create new reports, run existing reports or add previously created report templates to the project.

A/VReports can be used to generate reports from any data source accessible by ArcView including: Attributes from Arc/Info Coverages, Shape files, INFO tables, DBASE files, Text files, ODBC databases, and SQL databases such as Oracle.

Database records selected in ArcView are immediately available to A/VReports for printer output, screen display or export to any of 18 formats including MS Word, Excel, HTML, TXT, CVF, Lotus 123, RTF etc.

Users can also incorporate reporting functionality into Avenue applications using A/VReports Avenue calls. Additionally, A/VReports includes Active X, VCL and OCX components which provide the ability to share reports created by A/VReports with MapObjects applications.

A/VReports Pro is based on the Crystal Reports 5.0 report engine, the number one voted report writer for the Windows environment with over 3 Million copies in use. Each A/VReports license includes one fully licensed copy of the Crystal Reports version 5.0. Users with existing copies of Crystal Reports can choose to purchase A/VReports Pro without Crystal Reports at a reduced cost.

(Continued on page 85)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 84)

The combination of A/VReports Pro and Crystal Reports provide users with the ability to combine data from ArcView with other sources such as MS Access. Excel, ODBC etc. and using one of over 15 report experts create professional reports quickly and efficiently.

A sample HTML output from AVReports Pro is available for review. This sample was created by saving the report output to HTML format. A/VReports automatically creates the required HTML and graphic .jpg files.

autoBound

http://www.digitalcorp.com/ab3gen.htm

Autobound is a GIS-based system for redistricting, reapportionment, and resource allocation. The system is designed to create balanced regions using input either from point data, such as incidents or calls for service, or from polygons depicting census blocks, planning areas, or other user-specific boundaries. autoBound is built on top of Arcview desktop GIS from Environmental Systems Research Institute (ESRI). Arcview GIS is the leading desktop GIS for the Windows 95/98/NT and Unix environments.

The system provides the ability for both an automated and a manual redistricting process. The automated redistricting process creates balanced districts, which take into account physical features as well as political boundaries. For example, a police department creating new beats can avoid beat configurations with potential accessibility problems by identifying a major river as a physical barrier. Likewise, a school district interested in balancing students to available school resources would avoid splitting communities between schools by identifying each community as a political boundary. The redistricting engine adheres to user-defined parameters when boundaries are established.

The manual editing facilities provide multiple selection modes with dynamically updated bar graphs depicting the total values for each district. Using the system, districts can be generated using the automated engine then refined using the manual edit process.

Finally, autoBound allows an organization to evaluate multiple boundary configurations in less time than it normally would take to formulate one plan.

AVNotify

http://www.digitalcorp.com/avnotify.htm

Location based notification system for ArcView. AVNotify is a location based notification system designed to work with the ArcView desktop GIS software. The system is designed to provide users with an easy to understand interface for creation of mailing lists by means of geographic selection and proximity analysis. The system also provides full facilities for the use of the mailing list in creation of form letters, labels, mail-merge documents and user defined envelopes. The system provides the following capabilities:

Multiple selection tools including:

- Point buffers,
- Polyline buffers
- Randomly defined polygons
- Circles and Rectangles
- Tracking facilities for multiple selected sets.
- Automatic selection of adjacent features.
- Selection of features using pre-defined. zones.
- Selection by name, address, phone number or other user defined attributes.
- Creation of form letters, mailing labels mail-merges and user defined envelopes.
- Use bar coded addresses for reduced mailing costs.

The system is designed to provide the user maximum flexibility by maintaining a none session based mailing list. Using geographic or ad-hoc selection tools names can be added or subtracted from this mailing list. This process may depending on the users requirements take multiple days and several AVNotify sessions. Once the mailing list has been finalized, the user can create hard copy form letters and labels directly using the AVReports extension which is included with the product or transfer the list to the mailing subsystem for further processing.

(Continued on page 86)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 85)

The AVNotify product uses Crystal Reports version 5.0 software as its core reporting software and AVNotify includes a fully licensed copy of the Crystal Reports software. The Crystal Report software provides over 15 report experts including form letters, mail merges and numerous AVERY label formats.

In addition to facilities for printing notifications, the AVNotify software provides the ability to use data from multiple sources including external ORACLE SQL databases and to export mailing lists to multiple database, spread sheet and other file formats including HTML 3.0.

18. GeocodeÒ, Inc. GeoCAVÓ (Computer Assisted Valuation) $ 2,995.00

http://www.discover-net.net/~geocode/
http://discover-net.net/~geocode/geocav.html

GeoCAV is loaded with new features:

- For Windows95® / 98 & NT® with Access® databases
- Usable for assessors, appraisers, the real estate industry, and lending institutions
- Cost approach to value, sales comparison approach to value, and Income approach to value
- Residential, commercial, agricultural, manufacturing, or special purpose
- Designed with MapObjects® so it links to your parcel map
- Automatic area calculations from floor plan designer
- View digital photos and scanned documents
- User customizable
- Building Permits
- Sales History
- Customized printing and exporting to text file
- Full Help System
- "Viewer" Module for the Public

NEW FEATURES ADDED - WINTER 98/99

- Sales ratio analysis
- User selected variables & weights for comparable sales
- Thematic mapping function
- Parcel locator / Find procedure
- Selected set printing of report templates
- Full screen image viewer
- Edit PIN on parcel map
- Five different parcel summaries with printing & exporting
- Extended matching of drop-down lists
- Additional floor plan drawing features

19. DES LAURIERS & ASSOCIATES, INC. GEOTMS (Geographic Town Management Systems) $ 3,995.00

http://www.geotms.com/
http://www.geotms.com/products.html

Introducing GEOTMS - Geographic Town Management Systems
As the information age becomes more and more pervasive, residents are demanding the same efficiency from government as

(Continued on page 87)

APPENDIX A: SAMPLE CUSTOM APPLICATIONS (cont)

(Continued from page 86)
from the private sector. And why shouldn't they? The technology is not only available, but more affordable then ever. Nonetheless, government agencies continue to lag. Antiquated processes - legacies of a bygone era - remain in place, despite the enormous benefits of automation. Speedy, automated processes would make towns more attractive. Better yet, funds previously used to support lumbering paper trails could be channeled into revitalization. All that is needed is a way to make it happen. On the brink of the millenium, GEOTMS presents just that.

How? GEOTMS is a complete municipal land management software package that enables local governments to electronically process and track a wealth of information such as applications, permits, and licenses. By automating virtually all administrative processes, GEOTMS transforms the lengthy and complex into the fast and simple.

Inside-Out Development
By designing GEOTMS from the user's point of view, we've taken care to make the transition as painless as possible. Rather than imposing new processes, GEOTMS actually mimics existing ones, improving upon them with built-in shortcuts, integrity checking, security, and an array of other conveniences. That means training is a breeze.

Embedded GIS Technology
Being a developer in the ESRI Business Partner Program, Des Lauriers & Associates, Inc. is in a unique position to fortify GEOTMS with GIS technology, giving municipal management a whole new dimension. With GEOTMS, GIS is actually embedded into everyday processes, so that everyone can benefit from GIS - without having to master it.

Information Sharing
Information can now be readily shared and acted upon by all departments. As a product of the information age, GEOTMS transforms the means by which information is shared. Taking advantage of the networked environment, we replace the timeworn interoffice memo, for example, with display screens that pop up at the click of a mouse.

GEOTMS Modules
The individual modules, each of which functions as a stand-alone program, currently include: Board of Health; Building Code Enforcement; Building, Electrical & Mechanical Permits; Conservation Commission; Historic Commission; Licensing; Planning Board; Reference Library (a read-only viewer); and Zoning Board of Appeals. Board of Assessors and Fire Permits modules are in the works.

System Requirements
GEOTMS is designed to be operated in a networked environment using Pentium 133 processors with 32 MB of memory and 2 MB video cards, running on Windows 95 or Windows NT.

APPENDIX B: DATA STANDARDS

Following is an expert describing the information available from the Minnesota Governor's Council on Geographic Information. The web site is dedicated to providing GIS Administrators with an approach for developing data standards..

> Implementing the National Standard for Spatial Data Accuracy explains how to put a new federal standard - FGDC-STD-007.3-1998 - to use in Minnesota. This draft handbook describes how positional accuracy can be measured and reported for databases that contain geographic features like roads, rivers and property lines. Five practical examples walk you through the process using databases developed at Minnesota Departments of Transportation and Natural Resources, the City of Minneapolis, Washington County and Lawrence Mapping. All the mathematics needed to calculate accuracy statistics are made easy with spreadsheets available to be downloaded from this site.
>
> For more information, visit:
> http://www.mnplan.state.mn.us/press/accurate.html

APPENDIX C: TRAINING OPTIONS

Following are typical training options, course descriptions, and costs. These courses are design for ESRI products, but would be similar for other software with different training providers.

Several training options have been identified that would benefit GIS users within City of Duluth. The training courses offered through Rowekamp Associates, Inc. and the ESRI regional office would be extremely beneficial for those individuals who have an understanding of ArcView GIS, but lack some of the base ArcView knowledge. The ArcView courses for both companies are very popular, so scheduled classes tend to fill up quickly.

Rowekamp and ESRI offer on-site training consisting two or three day sessions. All training courses provided by these companies utilize ESRI training data sets which may be fine for basic ArcView training, but lacks in specificity concerning city data sets.

Course Descriptions:
Rowekamp Associates, Inc.
ESRI - Minneapolis Regional Office

Contact information for the companies mentioned above are located in the course description areas.

ROWEKAMP ASSOCIATES, INC.
3800 West Old Shakopee Road
Bloomington, Minnesota 55431-3549
1-888-356-4315
phone (612) 884-4014 / fax (612) 948-1846
rowekamp@rowekamp.com

Introduction to GIS
Please call for details, or email rowekamp@rowekamp.com**.**
Introduction to ArcView(r) 3.1
Cost: $600.00 / Student
Purpose of the Course Introduction to ArcView provides a foundation for becoming a successful ArcView software user. This two-day course gives the hands-on experience and conceptual overview you need to take full advantage of ArcView's advanced display, analysis, and presentation mapping functions.

The course teaches basic ArcView functionality. You'll become familiar with the components of the ArcView graphical user interface (GUI) and use ArcView to create, edit, display, query and analyze geographic and tabular data and create presentation maps and charts. In addition to valuable information and experience, you'll come away from the course with a manual containing the lecture notes and exercises.

We recommend that you also attend the half-day Introduction to GIS seminar (scheduled the day before Introducing ArcView) if you have no prior knowledge of Geographic Information Systems.

Topics Covered
ArcView integration, capabilities, and applications
ArcView Graphical User Interface (GUI)
Interacting with the application window and its components
ArcView Projects and other Documents
How projects organize, manage, and store ArcView documents: views, tables, charts, and layouts

ArcView's Online Help Systemusing ArcView's help system; hypertext jumps; context-sensitive help; on-line tutorial
ArcView Views and Themescreating views and themes to display geographic data; manipulating the table of contents to create the symbology and classification scheme for each theme

Creating and Editing Themesusing ArcView shape files to create and edit shape themes; adding and editing features; creating themes from a file of x,y coordinate locations

Spatial Query and Analysisselecting features based on relationships between multiple themes; merging theme features and attributes for analysis
ArcView Tablescreating an ArcView table from a variety of tabular data sources; selecting from a table, joining multiple tables; modifying the structure of a table; editing values in a table

ArcView Chartscreating a chart for presenting tabular data; techniques for changing the look of a chart
ArcView Layoutscreating a final map for presentation and printing; combining views, tables, charts and images, as well as north arrows, logos and scale bars to create a final map

Geocodinglocating a file of addresses on a map; setting address formats; address matching and editing techniques

(Continued on page 90)

APPENDIX C: TRAINING OPTIONS (cont)

(Continued from page 89)
Images
using ARC/INFO grids and other image formats to create themes

Route Systemsusing ARC/INFO route systems with ArcView**Power ArcView(r)**
Cost: $600.00 / Student
Purpose of the Course Power ArcView introduces the concept of customizing ArcView using sample extensions and scripts which are readily available, as well as covers some of the lesser known display, analysis and mapping features of the software. It is a good follow up course to Introduction to ArcView. This two-day course uses hands-on computer time in conjunction with written materials to teach concepts. The afternoon of the second day includes time to discuss questions/issues pertinent to your specific ArcView applications. You are invited to bring sample projects and data to facilitate discussion. Prerequisite: Introduction to ArcView class, or three to six months experience using ArcView.

Topics Covered
ArcView Extensions
ESRI Complimentary Extensions (Cad Reader, Dialog Designer, GeoProcessing, etc); Other Extension Products from ESRI; ESRI Sample Extensions; 3rd-Party Extensions; Other Extensions

New Features in ArcView 3.1 ArcView Application Changes, View Changes, Theme Changes, Layout Changes

Customizing ArcView GUIs Parts of an ArcView GUI; Customize Window; ArcView Controls; Changing the GUI;

ESRI Sample scripts, including our favorite sample scripts (you will not learn how to write your own scripts in this class)

Saving Customized Projects Project-Specific; User-Level; System-Level
Making Projects Portable What is a Portable Project?; Methods of Making Projects Portable
Calculator Tricks Expression Syntax; Requests; Expression Syntax Including a Request; Shape Field Requests; Field Properties Script; Field Calculator Examples

Working with Digital Orthophoto Quads (DOQs) ArcView and Image Files; What are DOQs?; Using Uncompressed DOQs; Using Compressed DOQs; DOQ Reader Extension

Working with CAD files Adding a CAD Theme; CadTools Extension; CAD Theme Properties; CAD Text in ArcView; Editing CAD Files from ArcView; Making Text Resizable
ODBC Connections What is ODBC and Why Would I Use It?; Requirements for ODBC Connections; Steps to Connect to a Table; Notes on Using ODBC Tables in ArcView

Geocoding/Address Matching Requirements for Geocoding; Address Styles; Geocoding Process; Geocoding Editor; Geocoding Preferences; Point Location in Output Theme
Using Map Templates
What is a Map Template?; Default Map Templates; Examples of Using Map Templates; Notes About Default Map Templates; Creating Your Own Map Template; Where Are Map Templates Stored?; Map Templates and Avenue

Tips & Tricks Using Shapefiles; Indexing Theme Tables; Creating Point Symbols from a Font; Transparent Symbols; Creating a Separate Label Theme

Additional Resources Rowekamp Associates Resources; ESRI Web Site; Publications

Introduction to AvenueTM
Cost: $600.00 / Student
Purpose of the Course Introduction to Avenue provides the skills and knowledge needed to use Avenue software to create a customized graphical user interface (GUI) to ArcView(r).

This two-day course uses a task-oriented approach to give you the tools to get up and running quickly.

You'll learn how to use the Customize dialog box and ArcView scripts to create a new, customized interface, and write your own scripts to create, display, and query information to perform different tasks for all areas of GIS implementation.

Introduction to Avenue is ideal for students who are new to GIS, have little or no programming background, or prefer a task-oriented (rather than function- or programming-oriented) approach. Completion of Introduction to ArcView or equivalent knowledge is required. Experienced programmers may prefer to take the three-day Programming with Avenue course offered by ESRI.

Topics Covered
Product Overview
what Avenue is and how to use it to customize ArcView

(Continued on page 91)

APPENDIX C: TRAINING OPTIONS (cont)

(Continued from page 90)
Customizing the User Interfacechanging menus, buttons, and tools to create a custom GUI
Writing and Running Avenue Scriptscreating your own script and running it from a custom GUI
Using ArcView System Scripts
using existing ArcView system scripts to get going quickly

Avenue Statementsconstructing Avenue statements from objects and requests; Avenue online help
Displaying Documentsopening document windows, zooming in on a view, and changing the themes shown in a view

Querying Data Attribute and spatial query techniques for themes and tables; building expressions; how to allow the user to draw a selection area
Creating New Databringing data into ArcView themes and tables; adding new features to an existing theme

Making Mapsusing the layout document to build a template and construct a final map
On-site classes
Rowekamp Associates offers on-site training as well. Please call for details, or email rowekamp@rowekamp.com.

Cost:

1-4 Students	**$600.00 / Student**
5-8 Students	**$400.00 / Student**
9+ Students	**$4,400.00 Group**

Host of the On-Site Training is responsible for Classroom setup and Training Data Installation.

ESRI Regional Office
Judy Laudenbach
Phone: (651) 454-0600
Schedule of Classes
January-June 1999
andes.esri.com/training/allschedule1.cfm

Introduction to ArcView GIS
5/24/99 - 5/25/99
Cost: $700 / Student

This two-day course gives the hands-on experience and conceptual overview needed to take full advantage of ArcView GIS software's display, editing, analysis, and presentation mapping functions. The course teaches basic ArcView GIS functionality. Class participants become familiar with the components of the ArcView GIS interface and learn how documents called views, tables, charts, and layouts are used to display and work with different kinds of information. They use ArcView GIS software to display, edit, query, and analyze geographic and tabular data and create presentation charts and maps.

Prerequisites: Previous experience with desktop mapping or GIS technology is not required; however, registrants should know how to work with windowing software.

Advanced ArcView GIS
5/26/99 - 5/28/99
Cost: $1,050 / Student

This new three-day course takes you beyond the basics to the next level of ArcView GIS productivity. Dynamic lectures, instructor-led demonstrations, challenging exercises, and realistic class projects help you integrate your ArcView GIS skills. You begin by learning how to acquire data and make it useful for your applications. You then practice making projects portable and enhancing the capabilities of ArcView GIS software through sample scripts and extensions. This advanced course also teaches powerful functionality, new to ArcView GIS Version 3.1, such as enhancements to creating layouts, creating reports, and performing spatial analysis with the Geoprocessing extension.

Prerequisites: Completion of Introduction to ArcView GIS or equivalent experience.

Programming with Avenue
5/17/99 - 5/19/99
Cost: $1,050 / Student

This three-day course gives the hands-on experience needed to take full advantage of the Avenue programming language's powerful features. Class participants learn how to customize the ArcView GIS graphical user interface and to write and execute Avenue scripts (i.e., programs) using the Avenue Script Editor. The course introduces participants to object-oriented programming and basic Avenue programming structure.

Prerequisites: Completion of Introduction to ArcView GIS or equivalent experience, or experience with a structured programming language (e.g., ARC

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

Similar regional Collaborative Efforts
To The Fargo-Moorhead Advanced GIS Plan

Introduction

To begin a project without using all of the resources available is short-sighted. Large amounts of money are wasted each year due to duplication of effort. The FMCOG and PlanSight[LLC] are aware of other projects, similar to the Advanced GIS Plan. Through researching these projects, PlanSight[LLC] seeks to glean information that will help in the successful completion of this plan.

Although there is no project exactly like the Advance Metropolitan GIS Plan, there are many that are similar. This document outlines five projects which are considered successes. This information is a combination of information from literature from each project and personal interviews with key individuals working on these projects.

Case Studies

METROGIS

OVERVIEW
MetroGIS covers the Twin Cities, Seven County, Metro Area. This area is 3000 sq mi encompassing 250 plus local units of government with a population of 2.5 million.

MetroGIS is a coordinated effort of several county and local jurisdictions in the Twin Cities Metro Area spearheaded by the Metropolitan Council. The mission statement of the MetroGIS: "To provide an ongoing, stakeholder-governed, metro-wide mechanism through which participants easily and equitably share geographically referenced graphic and associated attribute data that are accurate, current, secure, of common benefit and readily usable" is a testament to their continued belief in the need for good, timely GIS data across jurisdictions. "Five strategic initiatives have framed the decision making to move MetroGIS from concept to maturity:

- Key Stakeholder Endorsement
- Commonly Needed Information
- Data and Cost Sharing Agreements
- Internet Data Search and Retrieval Tool
- Sustainable Financing and Organizational Structure" (Johnson, Randall. " The MetroGIS Initiative: A Model for GIS Collaboration

." June 2000 http://www.metrogis.org/publications/publ-index.htm)

-

HISTORY

MetroGIS is very structured, outlining in detail its goals, action items, sub-structure, meeting structure, .etc. In 1995 the Metropolitan Council suggested that a regional GIS to serve the seven-county Twin City Metropolitan Area should be established. (*METROGIS.* March 2000. http://www.metrogis.org/organization/m-descrp.htm 7 June 2000). In 1996 Stakeholder categories were created "to provide a rational basis to decide which organizations should be represented on the initial policy board". (*METROGIS.* March 2000. http://www.metrogis.org/organization/m-stakeholders.htm 7 June 2000) Also in 1996 an organization structure was implemented to facilitate
discussion and action.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

In 1998 MetroGIS adopted official operating guidelines comprised of six articles: Definitions, Policy Board, Coordinating Committee, Advisory Teams, Amendments and Meeting Procedures. (*METROGIS.* March 2000. http://www.metrogis.org/organization/m-guidelines.htm 7 June 2000)
In 1999 MetroGIS adopted a business plan and a "fair share financial model". Both of these extensive documents can be viewed at http://www.metrogis.org/publications/publ-index.htm. In the business plan, categories were created in order, ranking which project would be "Mission Critical".

Mission Critical: MetroGIS' mission cannot be achieved without supporting these functions.

- Promote and endorse voluntary policies, which foster coordination of GIS among the region's organizations.
- Facilitate data sharing agreements and licensing among MetroGIS stakeholders
- Provide a directory of regional data within region and a mechanism for search and retrieval of GIS data (i.e. maintain and enhance Data Finder). The goal is to provide a single point with information on how search for sources of data.
- Identify unmet GIS needs with regional significance and act on these needs
- Develop and endorse standards for GIS data content, data documentation, and data management for regional data sets.

Also in 1999, a MetroGIS Benefits Study was completed by the Center for Urban and Regional Studies at the University of Minnesota. Between September 9 and October 25, 120 questionaires were given to the stakeholders. At the end of that time 82% of the stakeholders responded. This was another important step for MetroGIS because an independent entity studied how it was working and effecting people. The results were very positive.

The majority of the respondents said that MetroGIS was very helpful in obtaining data for free or at a reduced rate. Only 1% said that the system did not help them.

In response to the question about MetroGIS being an effective use of time and overwhelming majority had a positive response.

Feedback is always helpful in gauging whether a project is worthwhile. Positive feedback from a source such as a formalized survey is an excellent way to show critics and legislative bodies that the money put into the project is being well spent.

Luckily, the Twin Cities has a large, top rated University which is heavily involved in public projects. They have the expertise to study and decipher what is working and what is not working

COSTS

Over the past five years MetroGIS has spent $2.8 million. These costs encompass staffing, hardware, software and data. The current budget is $440,000 down from $560,000 average from 1996-2000. The estimated budget for the next three years hover close to $400,000. Most of the money is budgeted through the Metropolitan Council. This organization has key business needs which foster the support for MetroGIS.(Johnson, Randall. " The MetroGIS Initiative: A Model for GIS Collaboration
." June 2000 http://www.metrogis.org/publications/publ-index.htm)

MILESTONES

The rewards of this five-year effort is finally being realized in collaborative efforts such as street centerlines and address ranges, MCD/county jurisdictional boundaries, census geography
, land use and orthophotography.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

Street Centerlines
The Lawrence Group LLC is a local Minneapolis company that keeps the most timely and accurate address range centerline data of the Twin Cities Metro. The Metropolitan Council along with the Minnesota Department of Transportation entered into an agreement with the The Lawrence Group to procure the data and have it available at no charge to government and educational institutions. This dataset was key to the early success of the MetroGIS project. It catapulted the organization into the forefront of GIS players in the Twin Cities.

Datafinder

The D*atafinder* web page is an excellent source for downloading and learning about what GIS data is available. The page allows the user to search by theme, contributor or metadata. The data under the theme search is organized into 15 categories. The contributor section breaks the categories out by jurisdiction. The user can also do a search of Metadata which returns the data matching the search query.

Ortho-photography
Digital aerial photography is a piece of information that is valuable to everyone. However, it is very expensive to produce. MetroGIS felt that the need outweighed the expense and produced a metro-wide ortho-photo base at .6 meter resolution. Since the last good ortho-base was created by the USGS in 1991-1992 this 1997 flight filled a huge need for timely aerial photography.

Land Use
The Metropolitan Council used the aerial photography to create a generalized land use basemap. They also used county parcel information and local government review as additional sources. The result is a more precise picture of current land uses and where to accommodate future development in a way that gets the most efficient use out of existing infrastructure.

Interactive Mapping
Recently, MetroGIS has unveiled a MapObjects IMS application on its web page. This web application uses the newly finished seven county landuse data. It also allows users to query other pertinent layer which help in the locating the spatial extent the user wants to see.

Rick Gelbman - Metro GIS

Rick Gelbman of MetroGIS talked about help from the jurisdictions in MetroGIS being essential to its success. He sighted the parcel level metro-wide basemap as one of the examples. It did not cost MetroGIS very much because the counties took it upon themselves to create the layer.

Rick also said the "framing model" was critical to the success of MetroGIS.

Randy Johnson said that when creating a multi-jurisdictional partnership, one of the first questions to ask is what do we want it to do? He used the phrase "form follows function". He believes that it is very important to figure out where the coordinating entity wants to go and then figure out the organizational structure.

He also said that there should not only be public partners but private and non-profit partners as well. He points to the relationship with Twin Cities companies as an example of a private partner that worked out very well. He further said that public sector organizations such as school districts, watershed districts and similar organizations should be brought into the fold.

Another thing to consider is what level of collaboration there will be. Will the coordinating body create regional data sets or just help coordinate putting them together? Should the coordinating body create and maintain a place where the GIS data will be kept or only how to can get in touch with people who create the data? Will the coordinating body create and maintain a web application for the metro region that will allow everyone to access regional data?

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

Will the coordinating body be just an area integrator? One of the pitfalls that Randy mentioned was that some coordinating bodies will massage the data if it does not fit well with other jurisdictional datasets. He believes this is a liability and that the organization who needs to match their data with others data should fix what they need to be fixed.

Randy recommends that this be about more than just data and that they be part of an NSDI node.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

SANGIS

OVERVIEW

The project area for SanGIS covers 4,200 sq miles. It encompases the 6th largest city in the US, San Diego, with a population of 2.5 million people. The mission of the SanGIS JPA is "to maintain and promote the use of a regional geographic data warehouse for the San Diego area and to facilitate the development of shared geographic data and automated systems which use that data." (*SanGIS.* 2 November 1999. http://www.sangis.org/about.html 7 June 2000)

HISTORY

SanGIS began as a project called the Regional Urban Information System (RUIS), which was a collaborative effort by the City of San Diego and the County of San Diego. This project was started in 1984 "to improve productivity; reduce costs; provide access to accurate, timely information for decision making; and to improve service to citizens." (*SanGIS.* 2 November 1999. http://www.sangis.org/about.html 7 June 2000) In 1997 the jurisdictions decided to formalize their partnership. SanGIS was entered into as a Joint Powers Agreement (JPA).

SanGIS outlined several goals

- To ensure geographic data currency and integrity.
- To provide cost effective access to geographic data to member agencies, subscribers and the public.
- To generate revenue from the sale of geographic data products to reduce the cost of map maintenance to member agencies.

Over 200 layers of geographic data were created through RUIS. Some of these layers are county-wide while others cover only the City of San Diego. These databases are maintained by various County and City departments and are made available to all participating departments through a distributed network. Several GIS applications have been implemented for use in critical day-to-day operations within the City and County. The RUIS project helped improve decision making and efficiency in local government by providing more timely information, eliminating redundant activities and by re-engineering and automating manual processes.

REAL PEOPLE

Lisa Stapleton is the Administrator of SanGIS. She explained that SanGIS is a Join Powers Agency which formalizes the relationship between the City and County. Before SanGIS when the relationship was called RUIS, the loose organizational structure hindered the progress of GIS. Departments would volunteer to keep up data but then they would begin to slip on the maintenance.

The mission of SanGIS is data. SanGIS maintains the land base for the city and county with seven full-time GIS people. They maintain a data warehouse called the data-gatherer. They also have a cost recovery partnership with the private sector to get a percent from the value added data they sell.

Both the city and county have GIS Mangers. Each department has their own GIS people. A coordination group made up of people from the city, county and SanGIS oversee all GIS for the area.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

Louisville and Jefferson County Information Consortium (LOJIC)

LOJIC has had a long and successful history. The concept began in 1985 when the Jefferson County Municipal Sewer District (MSD) hired a consultant to do a feasibility study on creating a comprehensive GIS for Jefferson County. "The feasibility study
focused on mapping and related data needs of various organizations; a conceptual computer system design; system cost/ benefits; and methods of financing and cost allocation."(*LOJIC.* http://www.lojic.org/aboutus/index.htm 8 June 2000)

Once this study was complete, the decision was made to implement the plan. MSD took the lead and began immediately forming partnerships with other agencies. The MSD formalized the lease/purchase agreements with these organizations to facilitate data sharing.

FULL GIS CAPABILITIES
The MSD has taken it upon itself to be the GIS "consultant" for the rest of the partners. They have 12 fulltime people to support GIS application, networks, training, database development and products/services. They have trained 250 people in 30 agencies in the use of Arc/Info and ArcView.

The MSD maintains state of the art software (Arc/Info, ArcView and ORACLE) and hardware (82 Sun Workstations). They also have a high speed, fiber optic backbone with T1 lines linking other agencies.

One of the benefits to the community is the placement of interns. Several schools in the area send their students to learn first hand how GIS works within a municipal framework. The students are essential on many high level projects.

COST RECOVERY
LOJIC was very interested in recovering the costs they incurred by this GIS undertaking. They found a unique way to navigate the open records laws. They had them changed.

LOJIC played a huge role in amending the Kentucky Open Records Laws. In 1990 the first step to cost recovery was implemented when the law was amended to allow the sale of GIS products and data produced by public entities. In 1994, the law was revised to "eliminate special considerations of GIS data and required that all data produced by public agencies be considered as records in the same way." (*LOJIC.* http://www.lojic.org/aboutus/indepth3.htm 8 June 2000)

Over the life of the project, LOJIC has recovered over $700,000 through sales of electronic data and hard copy maps. Other forms of cost recovery include distribution of data on CD-ROM, custom atlases, land use maps and direct access licenses for other entities interested in using LOJIC data.

COST SAVINGS
Although the cost recovery was a big step for LOJIC, reducing the data redundancy was a major goal in order to save money.

The biggest accomplishment was creating a master address file. LOJIC began by standardizing the largest address databases available: GIS property database, Real Estate Master File (REMF) database and Land Management Information System (LMIS) database. Through verifying address, tax block and lot numbers this database has become the master file for all other agencies updating their internal address databases. The master database is kept standard through local ordinances for assigning and maintaining official addresses both site address and street block ranges.

DATA
A major focus of LOJIC is creating accurate data. Since their inception in 1987, the entities within LOJIC have produced a

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

staggering number of GIS datasets.

The major datasets are planimetric bas map, site address and street centerlines. However, others have been developed that are used everyday by many different departments. Some of these include sewer facilities, aerial photography, parks, watersheds, zoning, .etc.

The benefits of these datasets were realized when the region was flooded in 1997. Using this data and the resources created by LOJIC, evacuation maps, damage assessment, rainfall and flood modeling and a host of other tasks were created quickly and easily.

APPLICATIONS

In the majority of the GIS coordinated efforts, data is the main and sometimes only goal of the project. LOJIC is proud of the many applications that have been created due to their partnerships.

These applications are used for a variety of tasks. The Property Valuation Administrators office uses four of these applications ranging from editing, plotting, analysis and public information. The Metropolitan Sewer District has applications for tracking complaints, property/floodplain proximity and a unique application which helps measure impervious surfaces.

The number of applications are almost too many to discuss. LOJIC has been very aggressive in its creation of custom applications to get the GIS in the hands of untrained GIS people.

KNOWLEDGE SHARING

The people involved with LOJIC are very knowledgeable and experience. Their expertise goes far beyond GIS. They have had first hand experience in building a cooperative GIS from the ground up. They are often asked to share their what they know with others.

Among the people they have helped are the cities of Philadelphia, Montgomery, and Indianapolis. They have also welcomed several delegations from abroad. These include Belorussia, Argentina, Saudi Arabia and Bolivia.

They are often asked to present at the premier GIS get together, ESRI's User Conference in San Diego. They have presented papers ranging from basic GIS projects to GIS legislation. LOJIC has become one of the most envied GIS partnerships in the world.

COMMUNICATION

Through partnerships and sharing LOJIC has fostered a healthy communication of departments throughout Jefferson County. It has forged many good relationships that allow the users to have the power of GIS at their fingertips.

These partnerships go beyond GIS. At this time LOJIC is partnering with several other departments to create a fiber-optic connection to let the huge amounts of data on their computers be accessed at a much greater speed.
http://www.lojic.org/aboutus/publish.htm

REAL PEOPLE

Jane Poole of the Jefferson County Municipal Sewer District (MSD) said one of the big misconceptions when LOJIC started was that all departments would become proficient in creating their own applications. They found that even ArcView was not getting used heavily unless it was customized. However, some of the departments that have people who are technically savvy, took it upon themselves to learn programming and create their own custom applications. MSD still remains as the core GIS trainer and applications designer.

LOJIC has over 300 users. The use range is from casual to heavy. Support from MSD is imperative in order to keep users up to date and provide them with tools so that the GIS will actually be used.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

Several key elements were present which made LOJIC a success. There were people in key positions at the city and county government who realized that GIS technology would be an integral part of what they did. They decided that this technology must be implemented at any price and gave the go ahead at any cost.

Another key element was the lack of territorialism. LOJIC is successful because there is unfettered sharing of data. Jane believes that this is one of the most important elements for success.

Members of the LOJIC all use the same coordinate system. This allows any department accessing any data across the county to use it without the task of re-projecting or transforming it. The precedent has been set and even large utilities are joining LOJIC and converting their data to adhere to the specs of LOJIC data.

She also pointed to cost recuperation as an added boost. They are allowed under Kentucky law to charge for maps used for commercial purpose. This has offset the budget needs allowing them to create and maintain the state of the art GIS now in place.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

New York State (NYS) GIS

OVERVIEW

The New York State GIS covers the entire state of New York and all of its jurisdictions within the state boundary. All are encouraged to join this cooperative to allow the sharing of GIS data.

More than one hundred individuals have volunteered their time, effort, and knowledge to this initiative. The Data Sharing Cooperative currently comprises more than 100 members. New York State's program in GIS Data Sharing has been widely recognized as successful and innovative. http://www.nysl.nysed.gov/gis/collabor.htm

The New York State GIS Coordinating Body's Mission Statement is "operating under the auspices of the NYS Office for Technology, coordinates, promotes and facilitates the development, effective use, and sharing of geographic information. It also removes barriers to implementation of GIS technology to improve the delivery of public services, protect natural resources and enhance the business climate for the benefit of the State, its municipalities, businesses and citizens." http://www.nysl.nysed.gov/gis/gis_nys.htm#mission

HISTORY

In 1993 and 1994 the Legislative Commission on Rural Resources and the Senate Local Government Committee held meetings and hearings on the need to resolve GIS issues. These hearings led to the establishment of the Temporary GIS Council to report to the Governor and the Legislature recommendations for improved coordination of GIS.

Do to recommendations by the Temporary GIS Council in March of 1996, The New York State GIS was created when the Governor created the Task Force on Information Resource Management. In September of that year, the Governor released the first Technical Policy on Geographic Information Systems.

This policy called for the formation of a State Coordinating Body. The 15 person Coordinating Body had its first meeting in November 1996. They were "charged with providing policy recommendations to the Task Force and establishing temporary work groups utilizing Statewide GIS resources to investigate or resolve specific GIS issues" and to "develop a statewide policy that will allow the transfer of digital data between State and Local Governments easily at little or no cost". http://www.oft.state.ny.us/policy/tp_9618.htm

In 1997 the Task Force was renamed the Office for Technology. In the fall of 1997 the first phase of the GIS Cooperative concept was enacted.

In January of 1998 the second phase of the GIS Cooperative concept was enacted. In October of 1998 the Center for Technology in Government put out a report titled "New Models of Collaboration: GIS Coordination in New York State." http://www.nysl.nysed.gov/gis/collabor.htm

OBSTACLES

The Center for Technology in Government in New York State studied obstacles for sharing data and came up with this list. http://www.nysl.nysed.gov/gis/collabor.htm

- Lack of awareness of existing data sets
- Lack of or inadequate metadata (information about data)
- Lack of uniform policies on access, cost recovery, revenue generation, and pricing
- Lack of uniform policies regarding data ownership, maintenance, and liability
- Lack of incentives for sharing
- Absence of tools and guidelines for sharing
- Absence of state-level leadership

"The Council's highest priority recommendations included these:

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

- create a permanent GIS coordinating body with specific goals, duties and structure
- establish a clearinghouse for spatial information; enact license agreement authority for local and state government
- amend the Freedom of Information Law (FOIL) to authorize local and State agencies to set fees for commercial use of GIS data and to use those fees to defray GIS costs and expand public access to GIS information
- limit liability for spatial data providers"

http://www.nysl.nysed.gov/gis/collabor.htm

GIS DATA SHARING COOPERATIVE

The NYS GIS Data Sharing was implemented to have other entities sign an agreement to share and maintain data. State agencies are required to sign this agreement while local agencies are encouraged to sign it.

A standard license agreement was created and sent through the proper political channels to be approved. By signing the agreement, members must designate a GIS contact person and, if they have GIS data sets, submit an inventory of them. http://www.nysl.nysed.gov/gis/datacoop.htm#about

There are many participating agencies. The Coordinating Body has set up a web site which lists all of the pertinent information about the participants. http://www.nysl.nysed.gov/gis/cooplist.htm

They have also set up a web page that allows participants to log any problems they see with the data. Currently, more than 900 data sets, 500 of which are on-line, are readily available through the Cooperative. Through this web site the department maintaining the data is kept abreast of any problems with their data by having this form sent directly to them. http://www.nysl.nysed.gov/gis/forms/discform.htm

Some Key points of the Data Sharing Cooperative are:

Connection to Amended Freedom of Information Law (FOIL) Legislation

- Enable licensing of GIS records
- Primary/secondary custodians
- Basic access rights unchanged
- Avoids reliance on copyright
-

Broad Participation

- Potential for more participants than Federal Model
- Gain access to some of the "best" data (bypass problem of public domain release)
- Combine aspects of Federal Model with marketplace mechanisms
- Scalable to multiple levels; local or regional cooperatives with links to statewide cooperative

Shared Maintenance

- No new effort mandated
- Channel ongoing efforts, data maintenance that would happen anyway
- Lower total cost & effort of data maintenance
- Improved data quality
- Primary Custodians maintain control of datasets, decide how to incorporate improved data

Simplified Sharing

- Within the Cooperative, all members use same agreement, sign it only once
- No "up front" data contribution needed to join, simply agree to terms of Data Sharing
- Agreement (license)
- Low or no cost data transfers, especially if performed over the Internet or NYT

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

Fees

- Not a revenue-generating business model
- Cost of duplication (or less) within the Cooperative
- Option to charge commercial users up to "fair market value"
- Encourage partnerships w/private sector for joint benefits
- Levels the playing field for better bargaining power by data owners

Empowered Custodians

- Retain ownership and maintenance autonomy of datasets; decide how best to maintain
- Sole source for obtaining a particular dataset; eliminates confusion, ambiguity, & orphaned datasets
- Option to put data into public domain
- Ability to negotiate outside of Cooperative for value-added improvements
- Decision on whether to charge fees to commercial users rests with Primary Custodians

COST/BENEFIT

A Cost-Benefit Analysis for Geographic Information System by the NYS GIS Coordinating Body in March, 1998 outlined justification for GIS.

The Kansas GIS Policy revealed a total of $2.2 million was spent to develop a shared database of geographically-related information and to coordinate the use of that information among State, Federal, and local agencies. They further revealed that this data set would have cost the state $11,3 million considering the usage of the shared geographic information by individual state agencies. That results in a net savings of State tax dollars was $9 million over four fiscal years (Benefit/ Cost ratio of 4:1).

The Coordinating Bodies research led them to the Joint Nordic Project Report. This report outlined a system to calculate GIS B/C ratios. These are the project findings:

- If a system is used only for computer-aided mapping and updating, it gives a full return on investment (B/C 1:1).
- If the system also is used for planning and engineering purposes, the investment will be doubled (B/C 2:1).The ratio would rise to 4:1 where all commonly used data sets have been automated.
- Research reports publish in Norway and Sweden show that the B/C ratio for automating conventional maps is greater than 3:1.
- If a common system is created in which information can be shared among different relevant organizations, the investment will come back four times (B/C 4:1).
- For organizations with a poor system for manual map production, the automated system has given B/C ratios up to 7:1. (49)

http://www.nysl.nysed.gov/gis/costanal.htm

"HOLD THE CENTER"

Since the inception of this project, it has relied on volunteers to keep the cooperative effort going. Since many of the data sets in demand are now available, it has been difficult to sustain the volunteers.

"It needs continuing leadership and enough staff to 'hold the center' of the collaboration among many players whose primary objective is not collaboration itself, but the work of their own organizations that the collaboration facilitates." http://www.nysl.nysed.gov/gis/collabor.htm There must be a more formal place for the organization, staff and resources.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

REAL PEOPLE

Bruce is the Coordinator of the NYSGIS. He says that in order to make a regional GIS work, people must know what it is. The NYSGIS held a GIS awareness seminar where the gave demonstrations of GIS applications to stimulate peoples interest. He said that you must get to the business managers. The GIS people already know that it's a needed technology. They also send GIS people with a business perspective to state and local governments. One way they created demand was buy creating reports using GIS products. This stimulated interest by showing people what they can do with this technology.

One of the biggest obstacles was getting people to understand that by sharing, they were not losing some preciouse co-modity. Many of the departments were suspicious of other departments requests for data. The NYSGIS had to sit them down and make them see that sharing was a benefit. All state departments were required to join the data sharing agreement. This meant they had to provide a contact, phone number and a one page report of what data they had.

The data sharing agreement is free to join. However, a member must agree to share their data with other members. Bruce says that the GIS data clearing house made the data sharing much easier and showed people how much there is do gain from this technique.

They NYSGIS is in the process of creating a GIS Center which will be responsible for shared datasets and training. It will consist of 25 to 30 GIS technicians and professionals mostly from state government offices. These will be paid full time positions so that there is support for GIS at all time for all levels of government in the state of New York.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

CONCLUSIONS

The case studies researched for this document are all successes of GIS collaborative efforts. They all have their unique elements. However, there are common threads throughout these projects that have direct impacts on the Advanced GIS Plan.

ORGANIZATION

It is clear that each of these projects used a considerable amount of time to set up an organizational structure that would perform well over time. Some used government intervention to get started while others used the forward thinking of individuals within the organization to implement the collaborative effort.

Whichever method they chose, it is clear that certain things must be present in order to begin a project like the Advanced GIS Plan.

- A central focal point for initial organization and guidance
- A team made up of participants from the groups involved in the project
- A mission statement
- A list of goals for the project
- A list of major issues

Once these are created, the process can move on to more quantifiable tasks.

GOALS

Although it is up to the project team to identify goals, certain goals are evident in each of the projects.

First, a major goal of each of these projects is to create good, accurate data that participants will be able to share. Simply put, to reduce redundancy of effort and save money.

Second, almost every project looked to get some type of GIS data which could be address matched accurately.

Third, the data must be made available so that participants could access and download it easily.

These goals must be a top priority of a GIS collaborative effort. They are the very foundation of what it means to share data.

COST RECOVERY

Cost recovery varies by project. Some of the projects are actually creating revenue. The coordinators have gone so far as to help change legislation to make money off their GIS.

Others, are not looking for this type of return and are only concerned with recovering the cost to create the data. These projects look to stay within the bound of the open records laws implemented by their state.

Still others do not see the need to get any money back at all. They argue that the data was created with taxpayers money. Therefore, selling the data would be a double payment of sorts.

DATA vs Applications Approach

There are different purposes for many of the collaborative efforts studied. Some are only concerned with creating partnerships to share data, others are concerned with pooling data to create region wide datasets, while others are concerned with both data and applications.

Each of these approaches have their own merit. Data must be the first and foremost concern because without good, accurate data, the GIS is worthless. However, the learning curve to GIS is difficult and sometimes insurmountable in the time individuals are given to learn it. This makes a strong argument for the data and applications approach. If the participants are concerned about the data going unused because of the lack of expertise, it may be in the best interest of the centralized

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

GIS department to take this approach.

Depending on the cost and the structure put in place by the coordinating body, there may not be enough resources to create both data and applications. The participants must have an active role in deciding what will be the best for them.

CENTRALIZED GIS OR DISTRIBUTED

There has long been a debate in organization after organization whether to have GIS centralized or distributed. A centralized GIS can offer a pool of experts working together. However, these experts must have in depth knowledge of all the partners data in order to sufficiently meet the users needs. A decentralized GIS has the advantage of on site staff already having knowledge of their departments needs. However, these people do not have the time to become experts in two disciplines.

Most places have been using a hybrid structure, which uses a centralized GIS group to do high-end GIS analysis and applications. Each department then uses a local GIS person who is trained but is not considered and expert in GIS.

Other ways to facilitate use of GIS data without using experts is to buy off-the-shelf products or use consultants to create custom applications that are user friendly. A combination of the hybrid GIS structure, off-the-shelf products, and custom applications from consultants could be a very strong approach.

STANDARDIZATION

Without standards, it would be virtually impossible to collaborate. However, the depth in which the GIS collaborators go into on these standards very greatly.

Some of the collaborative efforts involved legal documents while others are not particularly interested in setting a standard for all participants. It also depend on what type of standardization. There are many different aspects of a GIS plan that can be standardized. Coordinate systems, addresses, and file formats are just a few in a very long list.

No matter what approach is taken, there will be some amount of standardization. The whole point of projects like this is to get people on the same page.

The case studies have brought to light many obstacles. However, they have also shown that a collaborative GIS effort can be a success if it is planned correctly. The Advanced GIS Plan can take valuable information already documented from these success stories. It will be in the best interest of this project to use the case studies for learning what works and what does not.

APPENDIX D: REVIEW OF SIMILAR REGIONAL GIS EFFORTS

References

http://www.lojic.org

http://www.nysl.nysed.gov/gis

http://www.sangis.org/about.html

http://www.metrogis.org/

APPENDIX E: LAW REVIEW

Review and Summary of North Dakota Laws Potentially Pertaining to GIS & GIS Data.

The Century Code for the State of North Dakota is much less complex than State Laws governing the use of GIS and public data in the State of Minnesota. Very few laws on the books in North Dakota have much relevance to the relatively new technologies of GIS and the Internet In fact, GIS and the Internet are not mentioned specifically in the Century Code at all.

There is very little information maintained by local government that is not considered public information. This includes items such as property ownership and valuation which can become political issues if easy, widespread dissemination of this information to the public is available. Some personal information of Public Employees is subject to data privacy issues, while similar information maintained of the general public is not. For example; a public employees personal information, such as home address; home telephone number, etc., is considered confidential, while similar information on the general public is not and can be freely accessed by the public. It is recommended that FMCOG and jurisdictions in North Dakota introduce legislation to the state that would clarify issues surrounding liability from misused GIS data.

Following are excerpts from the North Dakota Century Code that seem to be applicable in whole or part to GIS activities in the metropolitan area.

CHAPTER 11-24
MAPS AND PLATS

11-24-01. Board of county commissioners may provide for copies of plats and plans.
If the board of county commissioners deems it necessary, in order to preserve from mutilation and impairment the plats and plans on file in the office of the register of deeds, it may cause copies of the originals on file to be made by a competent engineer on sheets of tracing cloth. The board may require a bond of the engineer covering a period of five years.

11-24-02. Requirements for copies of plats and plans.
The sheets of tracing cloth on which copies of the original plats and plans are made shall be not less than thirty by twenty inches [762.00 by 508.00 millimeters] nor more than thirty-one by twenty-one inches [787.40 by 533.40 millimeters] and shall be lettered in a workmanlike manner with suitable titles transcribed on them, numbered, lettered, and made up in one or more books which are bound in suitable covers so that they may be readily removed for the purpose of making prints. These copies shall serve as negatives for prints and shall be certified by the engineer in charge of the work to be correct copies of the original.

11-24-03. Written and printed matter on plat to be typewritten and bound.
All descriptions, dedications, and written and printed matter that may be found on the original plats and plans shall be typewritten, properly paged, indexed, and bound in books to correspond with the copies of the plats and plans which serve as negatives. They shall be certified by the engineer who has charge of the work to be correct copies.

11-24-04. Copies of plats and typewritten copies of descriptions not used by public.
The negatives for the prints and the typewritten copies of the descriptions and dedications shall be filed and not used by the public except by persons authorized by the board of county commissioners to make additional copies.

11-24-05. Copies of plats and descriptions made for general use.
The engineer who shall make copies of the original plats and plans on file in any county shall furnish for general use one set of the prints, from the negatives, either on paper or cloth. Such prints shall be placed in substantial covers and bound in one or more books. Each book shall be furnished with an index, and one set of descriptions and dedications shall be bound into each such book and indexed to correspond with the prints. The board of county commissioners may replace from time to

time any of the prints and typewritten sheets which have become mutilated or worn out and may cause to be made prints and typewritten descriptions of all new plats and plans that are filed with the register of deeds
.

11-24-06. Board may replace copies of plats and descriptions - Copies of new plats made.
The board of county commissioners may replace from time to time any of the prints and typewritten sheets which have become mutilated or worn out and may cause to be made prints and typewritten descriptions of all new plats and plans that are filed with the register of deeds.

11-24-07. Rate of pay for making copies of plats. The board of county commissioners shall not pay more than twenty dollars per sheet for copies of original plats and plans. This sum shall include the work necessary for making the negatives, one set of prints, the necessary covers, and two typewritten copies of descriptions and dedications.

(Page No. 140)

TITLE 44
OFFICES AND OFFICERS

CHAPTER 44-04
DUTIES, RECORDS, AND MEETINGS

Following are excerpts of North Dakota State Law related to the use and dissemination of public data that may impact GIS. This is not a complete copy of all sections and subsections, rather, only those areas considered applicable to GIS. For a complete copy of the law, please refer to the Century Code.

44-04-18. Access to public records - Electronically stored information.

1. Except as otherwise specifically provided by law***, all records of a public entity are public records, open and accessible for inspection*** during reasonable office hours. As used in this subsection, "reasonable office hours" includes all regular office hours of a public entity. If a public entity does not have regular office hours, the name and telephone number of a contact person authorized to provide access to the public entity's records must be posted on the door of the office of the public entity, if any. Otherwise, the information regarding the contact person must be filed with the secretary of state for state-level entities, for public entities defined in subdivision c of subsection 12 of section 44-04-17.1, the city auditor or designee of the city for city-level entities, or the county auditor or designee of the county for other entities.

2. ***Upon request for a copy of specific public records, any entity subject to subsection 1 shall furnish the requester one copy of the public records requested. A request need not be made in person or in writing, and the copy must be mailed upon request***. The entity may charge a reasonable fee for making or mailing the copy, or both. An entity may require payment before making or mailing the copy, or both. If the entity is not authorized to use the fees to cover the cost of providing or mailing the copy, or both, or if a copy machine is not readily available, the entity may make arrangements for the copy to be provided or mailed, or both, by another entity, public or private, and the requester shall pay the fee to that other entity. As used in this subsection, "reasonable fee" means the actual cost to the public entity of making or mailing a copy of a record, or both, including labor, materials, postage, and equipment, but excluding any cost associated with excising confidential or closed material under section 44-04-18.8. An entity may impose a fee not exceeding twenty-five dollars per hour per request, excluding the initial hour, for locating records if locating the records requires more than one hour. This subsection does not apply to copies of public records for which a different fee is specifically provided by law.

3. Except as provided in this subsection, nothing in this section requires a public entity to create or compile a record that does not exist**.** ***Access to an electronically stored record under this section, or a copy thereof, must be provided at the requester's option in either a printed document or through any other available medium*****.** A computer file is not an available medium if no means exist to separate or prevent the disclosure of any closed or confidential information contained in that file. Except as rea-

sonably necessary to reveal the organization of data contained in an electronically stored record, a public entity is not required to provide an electronically stored record in a different structure, format, or organization. This section does not require a public entity to provide a requester with access to a computer terminal.

4. A state-level public entity as defined in subdivision a of subsection 12 of section 44-04-17.1 may establish procedures for providing access from an outside location to any computer data base or electronically filed or stored information maintained by that entity. The procedures must address the measures that are necessary to maintain the confidentiality of information protected by federal or state law. Except for access provided to another state-level public entity, the entity may charge a reasonable fee for providing that outside access. If the original information is keyed, entered, provided, compiled, or submitted by any political subdivision, the fees must be shared by the state and the political subdivision based on their proportional costs to make the data available.

5. Any request under this section for records in the possession of a public entity by a party to a criminal or civil action or adverse administrative proceeding involving that entity, or by an agent of the party, must comply with applicable discovery rules and be made to the attorney representing that entity in the criminal or civil action or adverse administrative proceeding.

6. A denial of a request for records made under this section must describe the legal authority for the denial and must be in writing if requested.

7. This section is violated when a person's right to review or receive a copy of a record that is not exempt or confidential is denied or unreasonably delayed.

8. It is not an unreasonable delay or a denial of access under this section to withhold from the public a record that is prepared at the express direction of, and for presentation to, a governing body until the record is mailed or otherwise provided to a member of the body or until the next meeting of the body, whichever occurs first. It also is not unreasonable delay or a denial of access to withhold from the public a working paper or preliminary draft until a final draft is completed, the record is distributed to a member of a governing body or discussed by the body at an open meeting, or work is discontinued on the draft but no final version has been prepared, whichever occurs first.

44-04-18.1. Public employee personal, medical, and employee assistance records Confidentiality - Personal information maintained by professional boards.

1. Any record of a ***public employee's medical treatment or use of an employee assistance program*** is not to become part of that employee's personnel record and ***is confidential*** and may not be released without the written consent of the employee. As used in this section, the term "public employee" includes any person employed by a public entity.

2. Except as otherwise specifically provided by law***, personal information regarding a public employee contained in an employee's personnel record or given to the state or a political subdivision by the employee in the course of employment is exempt. As used in this section, "personal information" means a person's home address;*** home telephone number; photograph; medical information; motor vehicle operator's identification number; social security number; payroll deduction information; the name, address, phone number, date of birth, and social security number of any dependent or emergency contact; any credit, debit, or electronic fund transfer card number; and any account number at a bank or other financial institution.

3. Nonconfidential information contained in a personnel record of an employee of a public entity as defined in subdivision c of subsection 12 of section 44-04-17.1 is exempt.

4. Except as otherwise specifically provided by law, personal information regarding a licensee maintained by an occupational or professional board, association, or commission created by law is exempt. As used in this section, "licensee" means an individual who has applied for, holds, or has held in the past an occupational or professional license, certificate, permit, or registration is-

sued by a state occupational or professional board, association, or commission.

44-04-18.3. Records of law enforcement and correctional employees - Confidential informants.

1. Any telephone number and the home address of an employee of a law enforcement agency, employee of a state or local correctional facility, and an employee of the department of corrections and rehabilitation are confidential. A record containing information relating to an employee of the department of corrections and rehabilitation may be disclosed to an appropriate authority under policy established by the department of corrections and rehabilitation.

2. Records or other information that would reveal the identity, or endanger the life or physical well-being, of an undercover law enforcement officer is confidential. For purposes of this subsection, an "undercover law enforcement officer" means a full-time, salaried employee of a local or state law enforcement agency who acts surreptitiously or poses as someone other than a law enforcement officer while engaging in the investigation of a violation of law.

44-04-18.7. Criminal intelligence information and criminal investigative information - Nondisclosure - Record of information maintained.

1. Active criminal intelligence information and active criminal investigative information are not subject to section 44-04-18 and section 6 of article XI of the Constitution of North Dakota. A criminal justice agency shall maintain a list of all files containing active criminal intelligence and investigative information which have been in existence for more than one year. With respect to each file, the list must contain the file's number or other identifying characteristic and the date the file was established. The list required under this subsection is subject to section 44-04-18. Criminal intelligence and investigative information that is not considered "active" is not subject to section 44-04-18 and section 6 of article XI of the Constitution of North Dakota to the extent that the information is personal information.

2. "Criminal intelligence information" means information with respect to an identifiable person or group of persons collected by a criminal justice agency in an effort to anticipate, prevent, or monitor possible criminal activity. Criminal intelligence information must be considered "active" as long as it is related to intelligence gathering conducted with a reasonable good faith belief that it will lead to detection of ongoing or reasonably anticipated criminal activities.

3. "Criminal investigative information" means information with respect to an identifiable person or group of persons compiled by a criminal justice agency in the course of conducting a criminal investigation of a specific act or omission, including information derived from laboratory tests, reports of investigators or informants, or any type of surveillance. Criminal investigative information must be considered "active" as long as it is related to an ongoing investigation that is continuing with a reasonable good faith anticipation of securing an arrest or prosecution in the foreseeable future.

4. "Criminal justice agency" means any law enforcement agency or prosecutor. The term also includes any other unit of government charged by law with criminal law enforcement duties or having custody of criminal intelligence or investigative information for the purpose of assisting law enforcement agencies in the conduct of active criminal investigations or prosecutions.

5. "Criminal intelligence and investigative information" does not include:

A. Arrestee description, including name, date of birth, address, race, sex, physical description, and occupation of arrestee.
B. Facts concerning the arrest, including the cause of arrest and the name of the arresting officer.
C. Conviction information, including the name of any person convicted of a criminal offense
D. Disposition of all warrants, including orders signed by a judge of any court commanding a law enforcement officer to arrest a particular person.
E. A chronological list of incidents, including initial offense report information showing the offense, date, time, general location, officer, and a brief summary of what occurred.
F. A crime summary, including a departmental summary of crimes reported and public calls for service by classifi-

cation, nature, and number.

G. Radio log, including a chronological listing of the calls dispatched.
H. General registers, including jail booking information.
I. Arrestee photograph, if release will not adversely affect a criminal investigation.

6. "Personal information" means a person's medical information; motor vehicle operator's identification number; social security number; and any credit, debit, or electronic fund transfer card number.

44-04-18.10. Disclosure of public records.
1. A public entity may not deny a request for an open record on the ground that the record also contains confidential or closed information.

2. Subject to subsection 3 of section 44-04-18, if confidential or closed information is contained in an open record, a public entity shall permit inspection and receipt of copies of the information contained in the record that is not confidential or closed, but shall delete, excise, or otherwise withhold the confidential or closed information.

3. An officer or employee of a public entity may disclose or comment on the substance of an open record. Any agreement prohibiting the disclosure or comment is void and against public policy.

4. Unless otherwise prohibited by federal law, records of a public entity which are otherwise closed or confidential may be disclosed to any public entity for the purpose of law enforcement or collection of debts owed to a public entity, provided that the records are not used for other purposes and the closed or confidential nature of the records is otherwise maintained. For the purpose of this subsection, "public entity" is limited to those entities defined in subdivision a or b of subsection 12 of section 44-04-17.1.

44-04-18.13. Lists of children.
Any record of a public entity that is a compilation of children's names, addresses, phone numbers, or any combination thereof, is exempt.