GIS Tactical Plan

Kalamazoo County Michigan

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Prepared by:

InfoGeographics, Inc.

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Project Overview

Kalamazoo County, like many other similar organizations, faces a variety of challenges. Geographic Information Systems (GIS) technology has been identified by administration and agencies within Kalamazoo County as an area that has the potential to produce gains in service and efficiency both within the County organization and through collaboration with external agencies.

Organizations and communities in and around Kalamazoo County have been using GIS independently for many years. Over the past 20 years, the County has been slow to invest in GIS, which has resulted in an uneven balance of GIS usage and implementation across the region as groups develop independent GIS support structures.

Kalamazoo County has contracted with InfoGeographics, Inc. (IGI) to investigate and assist in targeted planning for expanding the comprehensive and coordinated use of GIS for county-based organizations. The GIS Tactical Planning Project, hereby identified as the GIS Tactical Plan, is to investigate the existing state of GIS in the County government and recommend opportunities for its expanded utilization.

GIS Tactical Plan Project Team & Oversight

IGI and Kalamazoo County have established a Project Team for communication and coordination among the various interested parties. The Project Team is the primary reviewing and dissemination group for all project deliverables to ensure expectations are met as the project progresses. The Project Team is comprised of:

- Lotta Jarnefelt, Director, Kalamazoo County Department of Planning & Community Development (Team Manager)
- Scott Swan, InfoGeographics Project Manager
- James Bennett, InfoGeographics Oversight / Quality Control

GIS Tactical Plan Process

A GIS Tactical Plan is dependent upon good data and the efficient collection of that information. For this project, the major source of the input for the planning process was in-person interviews with key participants and stakeholders regarding GIS. The County provided the following information to IGI as reference material:

- GIS & File Directory Structure and listing
- County WAN Infrastructure Diagram
- County Governmental Organizational Chart
- ESRI Customer Entitlement Summary for County
- HCS GIS Workgroup Goals, Objectives, & Tasks (2007-8)
- 2008 County GIS Expenditure Detail Report
- County Tax Maps website
- Kalamazoo County Online Mapping website

This process is designed to work from a foundation of previously developed knowledge and information; ask key questions and get responses from a selected group of Department Managers and staff at agencies using or wanting to use GIS; develop recommendations in technical, organization, and financial areas; and then work with the group to finalize the plan. The intent of the GIS Tactical Plan is to provide Kalamazoo County the blueprint to build a foundation for long-term GIS management and collaboration.

Kickoff Meeting

The project started with an open Kickoff Meeting at the County Administration Building on August 1, 2008. The meeting presented and explained the project and planning process. Examples and discussion of GIS in general and its usefulness and role in the workplace were presented. The Kickoff Meeting allowed for more efficient gathering of pertinent information without the need for redundant discussion about the project itself. This was particularly useful during the interview process, when time was limited. The meeting was well attended with over 30 participants.

GIS Interviews

The planning process included a series of interviews with stakeholders from throughout the County. The interviews were conducted to gather more in-depth information for the analysis and recommendations. The interviews were conducted on August 14th and 15th, 2008. The following is a list of the agencies interviewed:

- Greater Kalamazoo Assoc. of Realtors
- Southwest Michigan First
- County Airport
- County Clerk / Register of Deeds
- County Emergency Management
- County Department of Health and Community Services
- County Equalization
- County Information Systems
- County Parks Department
- County Road Commission
- County Sherriff / E911

- City of Kalamazoo
- City of Parchment
- City of Portage
- Alamo Township
- Comstock Township
- Kalamazoo Township
- Oshtemo Township
- Texas Township
- Western Michigan University
- Kalamazoo Area Transportation Study
- Prein & Newhof

Information and goals for the planning project process were discussed with interviewees as necessary. The interviews focused primarily on discussion of present GIS utilization, and any opportunities for collaboration, services, and application of a Countywide GIS.

GIS Tactical Plan Analysis & Production

InfoGeographics has performed the work necessary to compile, analyze, recommend, and report on the content, goals, and nature of the discovered information in relation to the project goals and objectives. Existing knowledge gained through similar projects was augmented and refined by the more detailed and specific information gathered through background materials and the interview process. The primary focus of the consolidated analysis and recommendations was to give the County direction to move forward effectively in the short term while keeping medium and long term goals in mind.

InfoGeographics has conducted the analysis, produced, and delivered the document, *Kalamazoo County GIS Tactical Plan-Draft,* outlining the findings and recommendations. It is based upon all of the information discovered and gathered, with feedback from the Project Team.

Following an approximate two-week review period from the date of delivery of the draft, all agreed-upon comments from the Project Team were consolidated and incorporated, and the *Kalamazoo County GIS Tactical Plan-Final* was delivered to the Project Team Manager with all supporting materials.

GIS Tactical Plan Document Organization

As a result of the analysis and recommendation efforts, InfoGeographics has produced this document, the **Kalamazoo County GIS Tactical Plan** outlining findings and recommendations. IGI is delivering the GIS Tactical Plan contents in a series of sections. The major plan sections are:

Project Overview – outlines the overall planning project and progress to date.

Advantages of GIS for Kalamazoo County – summarizes in general terms what GIS can do for Kalamazoo County.

GIS Technical Opportunities – analysis and recommendations to maximize the use of GIS technology within Kalamazoo County government and to interact externally with any participant organizations. Results of the analysis present commonality of data, applications, hardware & software platforms, maintenance functions, and development efforts. Opportunities for consolidated, coordinated, and more efficient utilization of GIS in these areas are highlighted.

GIS Organizational Opportunities – an important look at the existing organizational relationships among the key stakeholders using GIS in Kalamazoo County and a presentation of alternatives to coordinate and share GIS data and applications more effectively from an *operational* standpoint. The focus is on operations and the day-to-day reality of a group of linked departments and organizations sharing and offering GIS data, applications, and services.

GIS Financial Opportunities – summarizes the opportunities that have presented themselves towards developing a consistent, unified financial model to support more consolidated operations. A discussion of financial strategies and methods is included.

Next Steps to Implementation – this final section functions as an action plan, compiling and presenting the set of recommendations described in the previous three sections in a logical sequence.

Advantages of GIS for Kalamazoo County

Introduction

With the advent of computerized mapping systems starting in the 1960's, GIS has become a cultural and technological phenomenon. Spatially enabled information is a part of many of our daily lives (MapQuest, Google Maps/Earth, Virtual Earth, GPS tracking, personal navigation devices, digital weather maps, etc.) and this trend is continuing at an increasing rate. The impact of this *cultural* change in the way spatial information is used and managed is profound for many organizations. It has been stated that over 80% of data held and managed by government bodies includes a spatial component. Organizations and governmental bodies of all shapes and sizes are striving to find the best way to institute and use GIS technology in a manner that will ensure both efficiency and success.

InfoGeographics views the implementation and use of GIS technology as a cyclic, iterative process. The process starts with the identification and prioritization of goals and objectives, followed by specification, development, and deployment. Ongoing maintenance is the final stage, until new goals are developed and the process begins again. Without this direction and flow, stemming from a detailed view of what the system can actually do for the organization, the stage would be set for a host of problems. Utilizing this logic, the following is a list of the GIS Tactical Plan goals for this project:

- Assess the current state of GIS usage throughout Kalamazoo County

- Identify where organizations see themselves going with GIS.

- Identify opportunities for collaboration on GIS development and maintenance.

- Recommend organizational changes to integrate the various GIS efforts.

- Technical recommendations and options to wisely develop and apply GIS technology and human resources to support and grow the system and data.

- Identify financial considerations and appropriate methods that could be instituted for common development, maintenance, and cost recovery.

- Enumerate how the County can be more efficient in its use of GIS and provide better service both internally and to its various constituents, and the general public.

For any GIS applications, the focus must be on how system users interact with the GIS and how it performs services for these users. To make better decisions, to better serve the public, and to better manage the assets, the users of the system must be able to access and use the GIS in a manner which is at their level of expertise and germane to their actual jobs. Hence, most of the specific advantages GIS can bring to Kalamazoo County organizations fall into categories of use and information management. The following is a discussion of the most prominent benefits that can be realized by expanded and integrated use of GIS at Kalamazoo County.

Quality of Information

Expanding and integrating GIS technology in a more comprehensive way at Kalamazoo County will result in better quality of information. As various disparate databases and data sources are converted or linked to their geographic locations, inconsistencies and errors in the information will surface and can be addressed and rectified. An example of this would be merging different existing spreadsheets and databases on Hazardous Materials (HAZMAT) sites and referencing them to features or locations in the GIS, uncovering mistakes and redundant information. This would be a valuable asset to Emergency Management and environmental health efforts, and insure public safety.

Another way GIS can improve quality is by monitoring and enforcing data entry for consistency. This is usually done through *domains* and *rules*. Basically, these methods restrict input of information so they adhere to a standard. A good example would be limiting street name types to only USPS-approved abbreviations, such as "ST" for "Street". In this example, users would not be permitted to enter "STR" as a street type.

Better Access to Information

The core nature of a GIS is to share information and use it in integrated ways. Through the act of implementing a GIS, the channels of access between the selected data sources are opened. Being able to draw on these different data stores through the common, location-based geographic framework can be a powerful and useful tool. By accessing this information directly through digital means, more up-to-date information can be made available to a wider audience, and in an expanded timeframe, essentially 24/7 versus traditional business hours.

Convenience also enters into this accessibility issue. Original documents or historic information may be restricted to specific locations for security. They may be hard to find. Input of selected portions of this paper or manual information, or scanning of the documents themselves would enable GIS to reference and make available these formally location-restricted resources to people who need them without lengthy searches. In this sense, GIS is acting as a spatial indexing system into more traditional forms of information storage. The County's current Tax Mapping website is a perfect example of this. The map consists of hyperlinks to PDF maps for different areas of the County. The maps are available to the public for free 24 hours a day, seven days a week.

Ease of Use

GIS can embed itself in a user's workflow or everyday business practices. The user experience and interface into GIS functions can be simplified to the point where little or no specialized training is needed to take advantage of the capabilities of GIS.

An example of this might be embedding GIS into applying online for a building permit; where either an address is input and shown on a map, or the location is spotted on an interactive map and the GIS application will automatically find and populate the database

with the appropriate jurisdiction, parcel property code, city, zipcode, and so on. The completed application would then be routed to the appropriate agencies in the proper order. Ideally, the applicant and departmental personnel could find out the status of the building application at any time. Importantly, the location is fixed at the beginning of the process and, along with the attached information, becomes a resource for the GIS. The interface for an application like this could be simple and intuitive. Once specific business process-related functionality is defined, these methods to access and use the GIS in-stream can be integrated.

Information Integration

One of the most powerful abilities of GIS is the capability to produce products and applications that combine different data sources from different offices within or external to an organization. An example of this would be to use property mapping data in conjunction with local zoning, taxation, and environmental information to assist in an Economic Development interface for potential businesses to locate in Kalamazoo County. This could provide a clear and accurate way to present Kalamazoo's "best foot forward" to attract business and industry. This would link "islands of information" that have traditionally existed independently, but benefit from a shared environment. The framework holding this together is the geography, or location of these different factors and their relationship to each other in real space. Traditionally, these sorts of information are stored and used separately. GIS provides the common context to bring them together.

Enhanced Return-on-Investment

It is often difficult to quantify return-on-investment (ROI) for GIS for local governments since the measures are typically on services and quality of life, and not financial measures. However, return on investment in this context can have several different measures, some of which are tangible. It is important to note that both of these factors can cut across departmental and organizational boundaries in the right collaborative environment.

Tangible types of measures generally focus around the technology and its products, i.e. it can be implemented to see who is doing what when, and accomplishing certain results. This can increase accountability for key processes and application/data goals, identifying where contribution is being made and vice versa. Another measure of this kind can be product dissemination and sales as a measure of productivity. A third measure, though harder to quantify, is the reduction of redundancy in information management. GIS can have a major impact on redundancy through the leveraging of the common spatial framework. However, it is a straight information technology issue as well. All of these translate into efficiencies and cost savings in staff, time, and resources like staffing, hardware, and software.

Intangible efficiencies and measures generally fall into areas of service and reputation. Better decisions, better products, easier to use services, less load on staff, improved communications, more opportunity for consolidated analysis, happier customers, better

relations with other agencies, and more, are all factors that have great value to the County. Even though they are traditionally difficult to measure, it is important to recognize them when looking at ROI for GIS. In a real sense, they are the most important aspects of any organization, be it governmental or others.

Better Decision-Making

Another extended benefit of integrating information is that powerful and useful new products and analysis can be generated through the GIS to support decision-making. Different sets of information can sometimes be complex and cumbersome and have no direct relationship to each other outside of their spatial relationship. GIS can allow these data to be brought together for advanced uses to answer key questions and needs for an organization that would be very difficult or impossible to address traditionally. For example, integrating the scheduling and location of construction efforts and County events to more efficiently communicate and plan for traffic, field crews, and other operations, so work can be performed with the least amount of disruption. In this way, GIS can be utilized in unique and powerful ways to produce results almost impossible to achieve through traditional means.

Access to the "Digital Universe"

More and more, our world and social systems are being captured in digital format, the "digital universe." There is an immense amount of spatial information that has the potential to be accessed and used with GIS in Kalamazoo County. This includes many sources inside the County government and sources outside the County, including local units of government, the Michigan Center for Geographic Information, USGS, EPA, USDA, private data sources, and many others. Some of this information can now be accessed as services directly through the Internet. Ready-made and available data could immediately enhance the capabilities of the system and allow for use and analysis that would otherwise be expensive and difficult. Care must be taken to select and use the appropriate geographic information that meets the needs and standards of specific applications for accuracy and completeness.

Regulatory Requirement Assistance

Almost every organization is required to report in some fashion to oversight authorities. For Kalamazoo County organizations, this might be at the State and Federal levels. These reports typically follow a set format and schedule. GIS can assist and enhance these regulatory reporting functions by generating better displays, compiling data, and communicating results in a more intuitive way.

In June of 1999, the Government Accounting Standards Board (GASB) issued *Statement #34*, which requires annual reporting of all current and long-term assets, such as infrastructure components, by all government entities. Generating GASB-34 information and submittals is a great example of this type of GIS use. Geographically referenced asset

information can be used to report and summarize based upon specific jurisdictions and types of assets.

Stability, Permanence, and Organization

By storing and utilizing information in digital form, GIS solves the problem of decay of paper records that are both cumbersome to store and sometimes difficult to update. It also allows for the digital data store to be organized and backed up on a regular basis so that in the event of a disaster that would destroy manual records, such as fire or flood, a secure recovery from such an event could be insured. Over time, selected pieces of hard-copy information sources can be converted to digital form to receive these benefits. The GIS can be used in an organizational sense as an indexing mechanism for easy search, retrieval, and correlation of data that may have been scattered across an organization in different formats.

GIS Technical Opportunities

Introduction

Kalamazoo County has several areas to take advantage of technical opportunities with GIS. These opportunities include applications, infrastructure, and data. Identifying existing and potential applications and leveraging the internal network and existing GIS-related staff will provide a solid vehicle for GIS expansion. A central data repository with supporting hardware, software, and connectivity will make up the infrastructure foundation upon which GIS applications and operations will run. Data opportunities exist among County sources, so sharing and accessing these in a more comprehensive fashion will be emphasized.

The opportunities to improve the technical aspects of the GIS program were identified using the interview information and discussions with County staff. The following sections present the findings and recommendations in the technical areas by category.

GIS Applications

In the context of the GIS Tactical Plan, IGI will discuss *GIS Applications* as encompassing more than commercial software programs such as ArcView, Word, Excel, or Internet Explorer. The term *application* is meant to encompass all of the necessary components to perform a given function or task. These components include all of the pieces necessary for GIS: software, hardware, data, and personnel skills. In other words, it is all of the pieces of the puzzle that allow an organization to perform a specific GIS-related operation. This is a good way to characterize how to use GIS to its best advantage for a particular purpose or business process.

The strategy to examine, select, and plan for specific uses for GIS, and then let those uses dictate the form of the GIS or the required components is the philosophy behind this GIS Tactical Plan. This "application oriented" approach generally ensures the best use of available resources to satisfy the most important needs. For any expanded implementation of GIS by Kalamazoo County, priority is assigned to the applications that afford the most commonality and benefit to critical operations.

A good example of a GIS application is an owner mailing notification, where all properties within or crossing 300' from a selected property are identified, and ownership information is produced to provide a mailing list. All of the components of the GIS must be working in harmony: property mapping, tax assessment/ownership information, the GIS hardware and software, and the staff trained to run the notification application. This type of application has widespread commonality and may be useful to many users within the County, at local municipalities, to local businesses, and the general public. Hence, it typically ranks high in priority for implementation and drives the GIS towards useful services and functions.

It is important to consider how GIS is presented to the user community. GIS technology can be seamlessly integrated with users' business processes to streamline solutions and bridge gaps in organizations. GIS applications are often transparent to the end user and become a part of everyday operations instead of treating GIS as a separate program.

This GIS Tactical Plan identifies and arranges priority GIS Applications, and what is necessary to make them operational. The priority GIS Applications can be deployed quickly and staged in a way that enables users of the GIS the maximum functional benefit, ensuring the long-term success of GIS in Kalamazoo County.

The following section presents an overview of applications discovered during the interview phase. This is arranged by organization and may include potential applications and necessary supporting data and software. Once again, the definition of a GIS Application used in this GIS Tactical Plan includes the components needed to perform a useful business function with GIS. This includes spatial data, tabular data, hardware, software, and trained staff. The applications listed along with their characteristics will then be used to identify commonality of purpose, data, and other aspects applicable to GIS planning.

Comprehensive GIS Applications Matrix

This table details the range of potential GIS applications for Kalamazoo County by the department or organization in the order they were interviewed. Subsequent matrices depict the commonality of applications and data to assist in the determination of the priority applications that will be recommended and carried forward in more detail. The "Priority" values are rankings of the importance of GIS data and applications, 1 being the most critical, and so on. Miscellaneous digital base map data are assumed as being needed for all applications and hence are not listed in each one.

Notes: Hardware is not included in this chart as most modern computer workstations are suitable for GIS maintenance and basic user purposes. People skills, from a maintenance standpoint, follow the software designated for that particular application.

Organization & Applications	Software	Data	Priority
Planning & Community Dev. Dept ▪ Intra-County Cooperation ▪ Intergovernmental Cooperation			
Online Community Development/Economic Development Site – public website to help communities, businesses, industry, and people select locations to move or relocate to Kalamazoo County. Also used to communicate information on events and other information.	AI Hosted site ArcGIS Server ArcView GeoC w/EAM	Property Mapping, Zoning, Land use, Vacant Properties, For Sale Properties, Utilities location & condition, Street Condition, Demographics, Traffic Counts, Crime Ratings, Events, Pictometry	1
Economic Development Support – mapping assistance to help prospects identify prime properties or areas for locating business and industry.	ArcView	Property Mapping, Zoning, Land use, Vacant Properties, For Sale Properties, Utilities location & condition, Street Condition, Demographics, Traffic Counts, Crime Ratings, Pictometry	2

Organization & Applications	Software	Data	Priority
Brownfield Project Management – assistance to track and analyze locations, public investments, physical characteristics of Brownfield sites. Provide mapping support for grant development and reporting.	ArcView	Brownfield Sites data, Soils, Contamination Sites	3
Notification tool – public application to notify nearby residents of upcoming and proposed construction projects.	AI Hosted site ArcGIS Server GeoC w/EAM	Parcels and addresses with contact information for all communities in the County.	4
Zoning & Planning Support – support and distribution of zoning and planning mapping including zoning, master plans, and land use.	ArcView	Zoning, Master Plans, Land Use	5
Gr. Kalamazoo Assoc. of Realtors ▪ Provide resources for Realtors			
Real Estate & Developer Support – mapping assistance to help identify prime properties or areas for locating residential, business, and industrial development.	ArcView or Online Service	Property Mapping (w/ attributes), current zoning, land use, vacant properties, For Sale properties, water/sewer districts, cable/high-speed internet districts, street condition, demographics, flood maps, contours, bus routes, school district maps, traffic counts, crime ratings, airport restrictions, upcoming construction projects, Pictometry	1

Organization & Applications	Software	Data	Priority
Southwest Michigan First ■ Attract companies to Kalamazoo area ■ Expand & support SW Mich Businesses			
Economic Development Support – mapping assistance to help prospects identify prime properties or areas for locating business and industry.	ArcView	Property Mapping, Vacant Properties, For Sale Properties, Utilities location & condition, Street classification/condition, Fire station/hydrant locations, Demographics, Traffic Counts, Crime Ratings, Climate data, Air Quality data, wetland maps, Pictometry	1
Business Retention Program Support – assistance to track and prepare for visits and interaction with business owners.	ArcView	Business Retention Program data, Eng/DPW Improvements data & schedule	2
Western Michigan University ■ Campus GIS and mapping (Physical Plant)			
Utility Systems Management – GIS used to maintain a digital model of the underground sewer, gas, water, steam, condensate, and chilled/return systems for modeling, maintenance, and support of field operations and construction efforts.	ArcInfo	Sanitary sewer, storm sewer, water distribution system, gas, steam, condensate, chilled/return, sidewalks, road edges/centerlines/addressing, trees, buildings, surface elevations, and Pictometry.	1
Disseminate Campus Spatial Information – Provide information to the campus community and general public about locations on campus.	ArcView Public Website(s)	Campus buildings, Points of Interest, Streets, Addressing, walkways, paths, trees, structures, Pictometry.	2
Notification tool – application to notify nearby residents of upcoming and proposed construction projects.	AI Hosted site ArcGIS Server GeoC w/EAM	Parcels and addresses with contact information for all neighboring communities.	3

Organization & Applications	Software	Data	Priority
Operational Support – mapping and database information developed and maintained by WMU that is slated for conversion to GIS at some point. Priority and scheduling of migration TBD, possibly based upon available student labor.	ArcView	Construction As-builts Sign Inventory Street Lights & System Easements Catch Basin and Drain Inspection Reports Telecommunications/Wireless	4
Health & Community Services Dept ■ Improve overall community health			
Disease Outbreak Identification & Analysis – discover, identify, mitigate, and contain health-related outbreaks in the County.	ArcInfo GeoStat Analyst Spatial Analyst	Outbreak data, birth/death data, good address geocoder for whole County. Address data. Health Center data. Census data (SF1, SF3, etc.)	1
Notification tool – application to notify nearby residents of upcoming and proposed construction projects, health warnings, and emergency situations.	AI Hosted site ArcGIS Server GeoC w/EAM	Parcels and addresses with contact information for all communities in the County.	2
Development Site Assessment Analysis – assistance to track and analyze locations, projects, physical characteristics of sites proposed for development.	ArcView	Parcels, address information, water quality data, contamination sites data, and utility locations. Proposed development locations. GPS and results of boring samples.	3
Head Start Program Support – districting and bus routing for County Head Start Program.	ArcView Network Analyst	Head Start enrollee residences, classroom locations, bus data (number, sizes, ranges).	4
Restaurant Inspection Analysis – analyze and disseminate results of food service and preparation facility inspections.	ArcView	Restaurant inspection data, quality centerlines with good addressing.	5

Organization & Applications	Software	Data	Priority
Methamphetamine Lab Location Analysis – assistance to track, analyze, and disseminate locations and physical characteristics of known and former illicit methamphetamine facilities. Determine risks, if any, to neighbors.	ArcView	Crime data: illegal methamphetamine manufacture facilities locations, quantities, physical characteristics.	6
City of Parchment			
Assessing & Appraisal Support – assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities, BS&A Permitting System, Roads Condition, Zoning	1
Asset Management Support – Location based tracking and reporting of assets for planning, budgeting, and GASB34 reporting.	ArcView, Asset Management Software (TBD)	Asset Records, Water Distribution System, Property Mapping Data	2
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	3
Online Property Mapping Site – public website to visualize and disseminate property-based mapping information.	AI Hosted site ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping, Pictometry, Utilities, Zoning	4
Parks Department ▪ Provide stewardship of green spaces ▪ Preserve historic County resources			
Recreational Land Assessment – review and evaluate current and available recreational land for improved access and natural/recreational corridor development. Maintain park structures and assets.	ArcView	Parcel data, owner info, real estate data, park land, asset, and structure data, contours, open spaces, schools, trails, bike routes, Pictometry.	1

Organization & Applications	Software	Data	Priority
Alamo Township			
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping data – converted from hardcopy	1
Assessing & Appraisal Support – assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities, BS&A Permitting System, Roads Condition, Zoning	2
Texas Township			
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	1
Assessing & Appraisal Support – assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities, BS&A Permitting System, Roads Condition, Zoning	2
Online Property Mapping Site – public website to visualize and disseminate property-based mapping information.	ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping, Pictometry, Utilities, Zoning	3
Road Commission ▪ Maintain safety of road system ▪ Ensure convenient public travel ▪ Manage roadside environment			
Road System Management – GIS used to maintain a digital model of the street systems for modeling, maintenance, and support of field operations and construction efforts, including permitting.	ArcInfo RoadSoft Custom Apps	Countywide, continuous Roadways, Road Condition, ROW's, Easements, Parcels/Property Mapping, Sanitary Sewer, Storm Sewer, Water Distribution System, other Underground Utilities, Open Drains, and Assets.	1

Organization & Applications	Software	Data	Priority
Asset Management Support – Location based tracking and reporting of assets for lifecycle planning, budgeting, and GASB34 reporting.	ArcView, Asset Management / Custom Apps, Roadsoft	Asset Records, Contiguous, County-wide Data for Transportation and Drainage, Sign Inventory, Property Mapping Data	2
Pothole Reporting/Complaint Tracking – System for tracking and dispatching crews responding to complaints about roadway conditions by telephone or internet.	ArcGIS Server ArcInfo Roadsoft Custom Apps	Improved road centerlines with accurate, easy-to-use addressing/geocoding.	3
Snow Removal Routing – Effectively route snow removal vehicles and teams to roads based upon roadway priority.	ArcView Network Analyst Roadsoft Custom Apps	Road Centerlines with "priority" designation.	4
Sign Reflectivity Assessment/Replacement Plan – replace all low-reflectivity signs with ones of higher reflectivity. Conduct full sign inventory.	ArcView Roadsoft Custom Apps	Signage data. Pictometry.	5
Culvert/Bridge Inventory – Inspect and assess all County bridges and culverts based upon traffic/priority.	ArcView Roadsoft Custom Apps	Road Centerlines, traffic data, Pictometry.	6
Roadsoft Interface for ArcGIS – Integrate MDOT data from Roadsoft into ArcGIS.	ArcInfo GeoC or custom application	Underlying Roadsoft Database.	7
County Airport			
FAA Construction Restriction Enforcement – Identify and cite violations of the FAA airport construction restrictions (FAR Part 77).	ArcView	Digital GIS layer interpreted from FAR 77, which is based upon nearest runway locations using buffers.	1
Asset Management Support – Location based tracking and reporting of assets for planning, budgeting, and GASB34 reporting.	ArcView, Asset Management Software (TBD)	Asset Records, Utility Systems Data – storm systems, electrical, fiber.	2

Organization & Applications	Software	Data	Priority
City of Kalamazoo			
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	1
Assessing & Appraisal Support – assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities, BS&A Permitting System, Roads Condition, Zoning	2
Online Property Mapping Site – public website to visualize and disseminate property-based mapping information.	AI Hosted site ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping, Pictometry, Utilities, Zoning	3
Asset Management Support – Location based tracking and reporting of assets for planning, budgeting, and GASB34 reporting.	ArcView, Asset Management Software (TBD)	Asset Records, Utility Distribution Systems, Property Mapping Data (convert Water, Sanitary Systems from As-builts).	4
City of Portage			
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	1
Assessing & Appraisal Support – assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities, BS&A Permitting System, Roads Condition, Zoning	2
Online Property Mapping Site – public website to visualize and disseminate property-based mapping information.	AI Hosted site ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping, Pictometry, Utilities, Zoning	3
Asset Management Support – Location based tracking and reporting of assets for planning, budgeting, and GASB34 reporting.	ArcView, Asset Management Software (TBD)	Asset Records, Contiguous, County-wide Utility Distribution Systems, Property Mapping Data	4

Organization & Applications	Software	Data	Priority
Comstock Township			
Address Assignment – assign street addresses for structures.	ArcView GeoC w/ EAM	Road Centerlines w/ accurate address ranges. Property Mapping Data with addresses. Quality orthos and/or Pictometry.	1
Permitting Operations Support – Locating and analyzing permitting data, with better access and query capability to Assessing data.	ArcView GeoC w/EAM	BS&A Building System, BS&A Assessing System, Property Mapping, Site Risk, Pictometry	2
Asset Management Support – Location based tracking and reporting of assets for planning, budgeting, and GASB34 reporting.	ArcView, Asset Management Software (TBD)	Asset Records, Inventory data, Property Mapping Data	3
Industrial Development Support – Provide maps of industrial development district to encourage economic development.	ArcView	Zoning, Property Mapping, Utilities, Pictometry.	4
Land Value Map Production – Development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	5
Assessing & Appraisal Support – Assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities, BS&A Permitting System, Roads Condition, Zoning	6
Emergency Management Dept ▪ Mitigate, Prepare for, Respond to, and Recover from Disasters			
Emergency Situation Prevention, Planning, Mitigation and Response – Rapid map production for disaster planning and response. Planning of mitigation procedures and evacuation routes for various emergency scenarios. Reporting of major damage $$ to Governor within 72 hrs.	ArcView	Water System, Sanitary/Storm Sewer System, Property Mapping with structure values, Gas lines, Roadways, Bridges, Accurate Address information, Hospital & EMS stations, Pictometry.	1

Organization & Applications	Software	Data	Priority
Hazardous Materials Tracking – Mapping assistance to locate, track, and spatially access hazmat information.	ArcView CAMEO	IMMEDIATE ACCESS TO: Hazmat Data, Property Mapping with Resident Contact Information, Water System, Storm Networks with Outfalls, Gas lines, Bridges/Culverts, Roadways/Evacuation Routes.	2
Notification tool – application to notify nearby residents of upcoming and proposed construction projects.	AI Hosted site ArcGIS Server GeoC w/EAM	Parcels and addresses with contact information for all communities in the County.	3
Emergency Routing & Re-routing – Direct and redirect emergency and evacuation vehicles on-the-fly based upon constantly changing, unverified information during emergency response.	ArcView Network Analyst	Road Centerlines, Bridges, Trails, Accurate Address Data, Hospital and EMS stations, Pictometry.	4
Structure/Pre-plans Support – mapping assistance to locate, track, and spatially access scanned building/structure internal plans information wherever possible.	ArcView	Structure Pre-plans, System Drawings.	5
Oshtemo Township			
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	1
Property Sales Reporting – Visualize and disseminate property-based mapping information internally, including Recent Sales Maps.	ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Recent Sales data with price and date, Property Mapping, Pictometry, Utilities, Zoning.	2
Assessing & Appraisal Support – assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities (sewer/septic, well), BS&A Permitting System, Roads Condition, Zoning	3

Organization & Applications	Software	Data	Priority
Online Property Mapping Site – public website to visualize and disseminate property-based mapping information.	AI Hosted site ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping, Pictometry, Utilities, Zoning	4
Equalization Department ▪ Ensure equal and uniform assessments by townships and cities			
Assessing & Appraisal Support – Overview and assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry (with Measurements), Utilities, BS&A Permitting System, Roads Condition, Zoning, Accurate Addressing Information, Soils, Drains, FEMA Flood data.	1
Online Property Mapping Site – public website to visualize and disseminate property-based mapping information.	AI Hosted site ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping, Pictometry, Utilities, Zoning	2
Kal. Area Transportation Study ▪ With the Metro Planning Org, provide coordinated transportation planning			
Notification tool – application to notify nearby residents of upcoming and proposed transportation projects.	AI Hosted site ArcGIS Server GeoC w/EAM TransCAD	Parcels and addresses with contact information for all communities in the County. Accurate address data. Traffic count data. Zoning (with definitions). Future Land Use data.	1
Kalamazoo Township			
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	1

Organization & Applications	Software	Data	Priority
Assessing & Appraisal Support – assistance to determine accurate appraisals and assessment data on real properties.	ArcView GeoC w/EAM Pictometry	BS&A Assessing System, Property Mapping, Pictometry, Utilities, BS&A Permitting System, Roads Condition, Zoning	2
Notification tool – application to notify nearby residents of upcoming and proposed projects requiring 300 foot (or selectable) notifications.	AI Hosted site ArcView GeoC w/EAM	Parcels and addresses with contact information for all neighboring communities. Accurate address and centerline data.	3
Online Property Mapping Site – public website to visualize and disseminate property-based mapping information.	AI Hosted site ArcGIS Server ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping, Pictometry, Utilities, Zoning	4
Prein & Newhof ▪ Engineering services			
Provide Mapping Services for Various Communities – Using a variety of data exchange methods, provide mapping services, update parcels, zoning, land use, and other layers for most Kalamazoo County communities. Resulting data and layers may remain in-house, or may be returned to the community, depending on individual contracts. Perform or record parcel splits and combines based upon documentation. Maintain "effective" parcel layer for communities based upon 12/31 snapshot of previous year while performing updates. Provide mapping assistance to communities as needed.	ArcInfo ArcGIS Server	BS&A Assessing System, Property Mapping, Zoning, Land Use, Roadways.	1
Land Value Map Production – development and printing of mandated land value maps.	ArcView GeoC w/EAM	BS&A Assessing System, Property Mapping	2

Organization & Applications	Software	Data	Priority
Sherriff / E911 Dept ■ Protect lives and property ■ Enforce laws and ordinances ■ Investigate crimes ■ Detain County prisoners			
Structure/Pre-plans Support – mapping assistance to locate, track, and spatially access scanned building/structure internal plans information wherever possible.	ArcView	Structure Pre-plans and System Drawings for schools, hospitals, and other large structures.	1
Community Crime Mapping – provide methods for investigators (and public) to visualize and get information about various categories for crimes and incidents throughout the County. Identify "hot spots" based upon crime reports and EMS dispatching.	ArcView ArcInfo	Incidents Database, Accurate Addressing and Centerline information. EMS dispatch data. Pictometry.	2
Operations Support – access to other mapped and database information to assist operations.	ArcView ArcInfo	Property Mapping, Water Billing database, Rental Information, Structure Pre-Plans, Pictometry, including rural areas of County.	3
County Clerk / Register of Deeds ■ Maintain land and vital records ■ Administer elections			
Election Mapping – Prepare election maps, including County Commission Districts (scheduled for redistricting in 2011) with GIS help from Prein & Newhof.	ArcInfo Redistricting Extension	Census data, library districts, school districts.	1
Register of Deeds Database Maintenance – Maintain and update Register of Deeds data.	ACS Application		2

Commonality of GIS Applications

The preceding pages show a range of applications that focus on the specific tasks performed by the organizations participating in the interviews. Whenever possible, cross-over applications that find value in multiple organizations and departments are recommended. Two excellent examples are the Kalamazoo County Online Mapping website and the resident Notification Tool. A complete summary of applications with strong commonality between groups (6 or more total) is shown in the table below. For the purposes of this analysis, Western Michigan University's Plant Department and Prein & Newhof have been grouped into a single "Engineering" category.

Kalamazoo County GIS Applications — Applications vs. Type of Organization (number interviewed)	Public GIS Mapping Website	Assessing & Appraisals	Land Value Mapping	Asset Management	Notification Tool
County Department (9)	2	1	-	2	3
Local Mucipality (8)	6	8	8	4	1
Non-profit Organization (3)	0	-	-	-	1
Engineering/University (2)	1	-	1	1	1
Totals	9	9	9	7	6

Below are descriptions of the recommended applications for the first Stage of the Tactical Plan. Stage 1 is intended for implementation using the County's current infrastructure and resources. Time, effort, and cooperation are the essential ingredients for the successful implementation of Stage 1.

Public GIS Mapping Website

The Kalamazoo County Online Mapping website was under development at the time of the kick-off meeting and interviews for this project. The site contains layers for PLSS (the Public Land Survey System, i.e. Sections, Quarter Sections, etc.), property mapping data (for a handful of townships), transportation, ROW's, soils, schools, hydrology, wetlands, and voter precincts, among others. When it is

launched, this site will provide many users with a wide range of information that will help support many of the requested and suggested applications.

The County Mapping website is currently hosted by an external vendor, alleviating the County of the burden and cost of server and database maintenance and software licensing. Data updates are sent electronically to the vendor where the new layers are queued for posting. The current hosting agreement allows parcel updates to be posted annually to reflect the new tax rolls; other layers may be updated quarterly. If an organization such as the Health & Community Services Department has data it would like to share with the public, the Kalamazoo County Online Mapping website may be a good option, provided the deployment time is not pressing and the information is easy for the public to properly interpret spatially. A more complete view of data sharing and data needs is presented in the following Data section.

It is important to note that data presented on the current mapping website should be limited in quantity. Too many layers, even when grouped or categorized, can be daunting to novice internet users. If layer visibility can be controlled through URL-based parameters, it may be possible to provide shortcuts to versions of the online website that only display some layers. It is not clear if this functionality is available in the current site, or if it is an upgradable option.

The County will be responsible for housing proprietary departmental and local government data. The broad application of storing, maintaining, and making available a wide variety of spatial and related database information to a wider audience of non-public users is of prime importance to the goals of an initial expansion of a GIS Program. At some point, enabling GIS browser-based access and use of the County's enterprise data store would help make GIS more widely used in individual business processes and departmental operations, especially for data of importance to multiple organizations that is not appropriate for public release, or for data that must be released immediately.

If all necessary functionality and data for a particular application can be provided by online mapping, some GIS software may no longer be needed. Some of the individual installations, licensing, and maintenance costs of higher level GIS software, including ArcGIS Desktop, may be reduced to help offset some of the "enterprise" system costs, particularly within County departments. This will be particularly significant when considering ArcGIS Server deployment in future stages of GIS expansion.

Since Kalamazoo County is now employing a web hosting service for presenting their GIS data, many local units have an opportunity to utilize the County's service and avoid contracting their own web service. Through basic data sharing, units can provide data intended for public viewing to the County, and the County could host it on their site. Besides the cost savings to the local units, the residents and businesses of Kalamazoo County would enjoy a single website for spatial data. A unified countywide website would avoid the need to visit multiple map

websites when searching for spatial information and, more importantly, provide seamless data across the various municipal boundaries.

Though local governments may continue providing their own online mapping site, basic data sharing is recommended to provide easy, one-stop access to continuous data for use by the general public, including constituents, corporate developers, and public safety officials.

Assessing & Appraisals / Land Value Mapping

Assessing and Appraisal Support and Land Value Mapping applications are a popular, commonly recommended theme for the local municipalities interviewed. Assessing and Equalization employees devote extensive resources toward these types of activities, which are fundamentally rooted in the maintenance and analysis of property database data. Many of the interviewees are involved in assessing activities with their township.

The County should provide assessors and appraisers with a web-based map that presents recent sales and land values by zoning category. The recent sales maps are an essential step in the analysis of property values. Land value maps are based upon an analysis of recent sales. The maps must be updated annually and are required by the State's 14-point review process. For communities that share assessing data with the County, the Kalamazoo County Online Mapping Website should present recent sales and land values as separate layers with customized labels presenting the information needed to create updated land value maps for each community.

Optionally, the County could provide a complete Land Value Mapping service for all participating units by investing in a map series production application. Since the countywide land value map layer will already be created with appropriate labels or annotations, the County could use the application to produce a professionally formatted map series covering any City, Village, or Township that shares current digital property mapping GIS data with the County.

More than 10 of the communities in Kalamazoo County do not have property mapping data in digital format. As a result, they will receive little of no benefit from any County-based assessing support or land value mapping GIS applications. Digital conversion is strongly recommended for these units, and is discussed in more detail in the Data section of this Plan.

Asset Management

Within the County, the Road Commission and the County Airport requested GIS application support for asset management. Local municipalities that maintain utility systems will also benefit from an application that tracks the location and condition of assets, to aid with replacement schedules, life cycle planning, and GASB34 reporting.

It is recommended that the County work with local communities and their engineer(s) to provide assistance with the coordination of projects for the conversion of plans and as-built drawings to digital GIS format. The County should develop and provide a template schema for common utility GIS layers, to ensure that features can be integrated County-wide.

After data are acquired or converted to GIS, the County GIS Coordinator will be responsible for providing access to the training and support needed to properly maintain the data.

Notification Tool

A strongly recommended application is the Notification Tool. Using property mapping data with contact information, the Notification Tool will enable anyone to select a parcel or set of parcels and a buffer distance. The Tool would identify all contact addresses within the buffer distance of the selected parcel(s) and present the results in a report or mail merge. A County Notification Tool was identified as useful during the interviews with the Planning & Community Development Department, Western Michigan University Physical Plant, the Health & Community Services Department, the Emergency Management Department, Kalamazoo Area Transportation Study, and Kalamazoo Township. The City of Kalamazoo currently has a Notification Tool, but it only works for properties within the City limits. Notifications near the City boundary do not return any results from outside the City.

The most important application of the Notification Tool is its benefit to public safety and emergency response. If an emergency situation occurs, the Notification Tool could be used to quickly identify and contact residents and/or land owners who may be involved or at risk.

The expansion of the Kalamazoo County GIS is a continuous process that will grow and evolve as new technologies are developed. The initial focus here is on priority applications that can be deployed relatively quickly, using existing resources. As the County's GIS infrastructure grows, the applications should be revisited to identify additional potential functionality and new tools that become feasible for improving County-wide efficiency and productivity.

Data

Data are one of the largest investments in any GIS system. Data organization, maintenance, access, and data models should be a source of collaboration among Kalamazoo County agencies to provide the greatest widespread utility and return on investment (ROI). For existing data, such as property mapping data, to be shared and utilized effectively, the consolidated data must be adjusted to ensure that the final product is properly interpreted by the system and the users. This standardization process will ensure that attributes are properly defined in the associated documentation, and assist

with efficient, accurate updating. These steps will be essential to the deployment of an eventual County Enterprise GIS database.

- *Consolidation and Standardization* – It is important to discover and reconcile data traditionally kept in multiple locations into common data models. A good example would be the BS&A data extracted and joined to parcels for mapping within the individual communities throughout Kalamazoo County. Some local assessors may extract or calculate different attributes for their parcels. When the data are presented County-wide, a common data structure and representation will ensure consistency between Cities and Townships.

- *Documentation of Data* – Documentation is primarily accomplished through the use of metadata, or information about a particular class of features or database, stored in a consistent manner. This can be very important both to track the development and history of the data, and who worked on it. Metadata can also be used as an excellent indexing system to the data itself, allowing users to make decisions about the validity of using a particular dataset for a given purpose, reducing the use of inappropriate data. The ESRI data models and software stores basic metadata on features and database items natively, though it may be necessary to augment this with more detailed information.

- *Maintenance of Data* – To ensure continued quality of data, IGI recommends that each data layer is assigned a Subject Matter Expert to maintain it, responsible for the currency, accuracy, and documentation related to that data source. For more information on Subject Matter Experts, see the *Core GIS Staff* section of this document. An example would be designating a specific individual in the Health & Community Services Department as the Subject Matter Expert for restaurant inspection data. He or she would be accountable for updating the GIS Database on a schedule based on the rate of change of that dataset. It is also recommended to require GPS State Plane Coordinate reference data in contract specifications, provided by the construction contractor or developer in as-built drawings and/or CAD data for easy incorporation of data.

Commonality of Data

Given the various aspects of data development and maintenance, it is necessary to identify the data necessary for the recommended GIS Applications and discuss how the data should be stored and maintained. Emphasis is on datasets that span use by multiple organizations. Some datasets may need to be created, acquired, or georeferenced, and data sharing agreements may be necessary to enable regular data transfers between some municipalities and the County. The table below represents the necessary digital GIS layers required for the successful deployment of the recommended applications.

Kalamazoo County GIS Applications Applications vs. Required Datasets	Mapping Website	Assessing & Appraisals	Land Value Mapping	Asset Management	Notification Tool	TOTALS
Parcels / Property Mapping	X	X	X	X	X	5
Roads	X	X	X	X	X	5
Address Data	X	X		X	X	4
Zoning w/ definitions	X	X	X		X	4
BS&A Parcel Data		X	X		X	3
Oblique/Ortho Aerial Photography	X	X		X		3
Utilities Data		X		X		2

Initially, any readily available data layers required for high-priority or multiple applications should be incorporated into the County's collection. The caveat to this recommendation is that each of these data layers should be examined for appropriate content based upon the expected application needs. For example, property mapping with assessing data embedded could contain hundreds of data fields because of the high number of these fields available in the Equalizer Assessing System. Further analysis may be necessary to detail which key fields are of the most widespread use and value, and target those fields for incorporation into the County's database.

Data layers that need conversion or adjustment prior to incorporation may require more detailed examination. Many of these layers will take little effort to get into a GIS-compatible format, and others may require extensive digitization by trained GIS staff. It is therefore recommended that this list be analyzed and arranged into an order that will facilitate the countywide implementation of the applications and the expected usefulness. As mentioned earlier, many applications will be deployed before data are available for all townships. The following is a discussion of what IGI considers the two key foundation datasets.

Address Data

> Though Addressing was only mentioned briefly by the interviewees, County-based addressing is highly recommended to ensure proper EMS and Public Safety response countywide, without the need for multiple data sources as political boundaries are crossed.

> Currently, Kalamazoo County municipalities are responsible for assigning new addresses within their jurisdictions. The addresses are maintained and housed internally, in some cases in hardcopy formats. The County's four Public Safety Answering Points (PSAPs) at the City of Kalamazoo, City of Portage, Western

Michigan University, and the Sherriff's Department all maintain and utilize their own address geocoding services and street centerlines.

A consolidated, core addressing framework and database maintained by the County will provide more effective and accurate data, and continuous, seamless datasets over the entire County. The County should create a template for all PSAPs and municipalities that includes a union of all necessary attributes. The County must work with the local units and PSAPs to integrate the datasets, and provide an automated, preferably web-based method for distribution of the new, countywide data to the units in a format compatible with their existing systems.

Initially, edits to the addressing dataset would be provided to the County host via email or another method convenient to the units. As the County's GIS system grows, it is recommended that the County investigate methods of implementing secure, online editing tools for the units to quickly and directly submit edits. There are many quality control tools currently available that would simplify this process, and ensure proper submissions, as well as validate address data to the County's Master Street Address Guide (MSAG).

Property Mapping Data

Perhaps the most challenging aspect of Kalamazoo County's GIS expansion is attaining the recommended goal of a complete County fabric of parcels. The benefits to the County and the local units are numerous, and many are discussed throughout this Plan. Having complete parcel coverage is one of the most rewarding and essential aspects of a truly functioning countywide GIS. Depending on how the parcel layer is eventually created (possibly with support from the County), it could result in profound changes in the way parcel mapping is maintained in Kalamazoo County. Many of the tools and applications for assessors and appraisers, including the automatic land value maps, will be deployed without the need for full countywide participation. Units that chose not to participate will simply be excluded from the applications due to missing data. Nonetheless, it is important to make all resident location and contact information (in any format) available to the County for, at a minimum, Public Safety and Emergency Management use.

Conversion to GIS

More than 10 units in Kalamazoo County do not currently have property mapping data in digital format. These units must be the primary focus of Stage 1 parcel activities. Some of the general benefits of digital GIS conversion of property mapping data include disaster recovery and more efficient data updating and editing. As the County deploys additional parcel-based applications, the benefits of participation will continue to grow. For example, instead of devoting weeks or months to preparing annual Land Value Maps, participants in the Kalamazoo County GIS program will already have updated land values on a parcel-by-parcel basis.

Improved Efficiency

Currently, the biggest obstacle to conversion for non-GIS units is cost. The units do not need to implement GIS for this program to be successful. The parcel maintenance process may continue as-is for many units. They will submit edit requests such as splits and combines (with legal descriptions, etc.) to their mapping consultants as usual. Instead of requiring an hour or more to perform each edit manually on mylar or paper, the consultants will open their GIS and complete most edits in minutes. Since most contracts of this type are based upon Time & Materials, overall annual costs should be reduced for each local unit.

Automated Transfer/Distribution

Upon completion of the edits, the data maintained by the local units will be integrated into the County's servers, joined with assessing information, and uploaded to the web mapping service. Local units will quickly access the updated data using only a web browser and an internet connection. Other benefits could include automatic distribution of countywide GIS property data to PSAPs, improving the effectiveness and response time of Emergency Management and Public Safety teams.

Future: Online Editing

Optionally, if Kalamazoo County eventually upgrades to ArcGIS Server Enterprise Edition – Advanced Level, parcel maintenance could be deployed with a secure, online editing application. Authenticated users would access property mapping data countywide and perform edits to parcels in their jurisdiction. This option is not recommended unless the County is able to properly upgrade their infrastructure, as described in the next section. As described above, the primary parcel focus must be the digital conversion of property mapping data into GIS to ensure a countywide benefit from the program.

In addition to data needed for the recommended applications, GIS conversion of data and participation in the County GIS program will have additional benefits. Updating and maintaining property data in hardcopy format is a tedious, time-consuming process with many associated risks. Updating data with GIS requires far less effort, saving time and money, particularly for units whose updates are outsourced on a Time & Materials contract basis. GIS-based parcels also offer a much higher value, enabling a wider range of analysis and validation capabilities not available with printed formats. Hardcopy data are susceptible to damage from fire, water, deterioration, theft, and mishandling or misplacement. Digital data, when properly backed up, can easily be recovered after almost any disaster. Parcel conversions, like most large GIS projects, will likely involve a bid process to ensure competitive pricing, though it may vary from community to community.

A summary of GIS applications and data tools by Stage is shown in the following table:

Stage	GIS Application
1	**Public GIS Mapping Website**
	Assessor & Appraisal Support Layers
	Land Value Mapping Layers
	Notification Tool
	Addressing Standardization, Storage
	Parcel Standardization, Conversion, Storage
2	**Enable Addressing Tools**
3	**Hosted Parcel Maintenance (optional)**

Please note that it is not the County's place to require property data conversion. The recommendation here is to build a system that provides and demonstrates a dramatic benefit to digital conversion and data sharing, as well as assistance with the conversion process. Cost sharing can lighten the burden of conversion placed upon individual townships. A brief discussion of cost sharing options is included in the Financial Opportunities section of this Plan. If this Tactical Plan is implemented properly, the local units should not ponder whether to participate in the Kalamazoo County GIS program, they should ask themselves why they are *not* participating.

Infrastructure

The infrastructure of a GIS system provides the main backbone of operations. Hardware, software, connectivity as well as how they are used are important factors to consider for a GIS. Systems are typically high end, as the software requirements demand more memory and processing power. Connectivity between the systems is also important when working with GIS. Technology infrastructure today is built for scalability and flexibility as the demands grow for widespread use and robust applications. In order to help plan and implement a central County GIS Database, it is necessary to analyze the County's hardware and software capabilities and identify additional needs.

Hardware

Although the cost has come down substantially, hardware is still a significant capital improvement cost. Supporting hardware and operating systems can be challenging for the day-to-day activities of GIS. Often the desktop and server systems are viewed as special and may require additional training for the system administrators or on-call support contracts. The first stage of GIS expansion for the County is designed to function with the existing hardware and software infrastructure. The following are the recommended stages and options for this plan.

Stage 1 – File Geodatabase Implementation

Centralized database structures and applications often require larger servers. GIS data uses significantly more resources than a traditional database storing only simple information. The Kalamazoo County Information Systems Department currently has the data servers necessary to support the short-term expansion of the GIS Program. Given the results of the research, application, and data needs, it is initially recommended that the County utilize the existing systems, including the N:\GIS drive, to implement the data repository in ESRI File Geodatabase format. This format will support internal maintenance and will serve as a source for the expanded Kalamazoo County Online Mapping website. This central storage location will provide a core location for the website's data, collecting data integrated from outside agencies and other County departments. Data will be processed as necessary and provided to the hosting vendor when website updates are needed. By enabling appropriate access and permissions, internal County departments will be able to edit and update data directly without the need for duplication that may result in data loss. Non-County units will submit edited data directly to the County via email links on the website.

It is recommended that current systems be leveraged to the maximum possible degree before additional hardware is contemplated. This includes formal utilization of the Kalamazoo County central servers and infrastructure as the primary backbone for any future Enterprise GIS deployment. Initial examination of the existing network architecture has found that it is well designed and sufficient for inclusion of all that is necessary for the central spatial services described in Stage 1. When the County decides to pursue a Stage 2 enterprise implementation, a specific location and connectivity for an Enterprise GIS Database server on the existing network topology should be determined with IS staff for maximum performance, support, and future extensibility.

If the County plans to pursue any upgrades or deployments of ArcGIS Server within the next two years, it is highly recommended that Kalamazoo County renew the ESRI maintenance agreement for ArcGIS Server Workgroup Edition – Standard Level before it expires in November 2008. Preserving this license will enable the County to request a simple maintenance upgrade from ESRI rather than renegotiate a full purchase for the required ArcGIS Server software necessary for Stage 2.

Stage 2a – ArcGIS Server Workgroup Standard (Current)

The County currently has an unused license of ESRI's ArcGIS Server Workgroup Edition – Standard Level software. Though the existing County GIS website is hosted externally, ArcGIS Server Workgroup Standard would permit the deployment of browser-based applications for internal use and the option to add external web applications for the public. This could include many of the applications that are not appropriate for public use. Security-sensitive data may be

utilized and shared with internal agencies and/or protected using permissions restrictions or logins. This central system architecture would continue to support the existing individual workstations and local network server systems that are being used at departments, such as Health & Community Services, currently performing GIS work.

ArcGIS Server Workgroup Standard runs on MS SQL Server Express and limits concurrent connections of ArcGIS desktop users to 10 and a maximum database size to 4 GB. However, it may be worth considering given the current maintenance agreement, the ease of use, and the cost-effective upgrade path to the Enterprise Edition, if the County plans an Enterprise upgrade within two years.

Stage 2b – ArcGIS Server Enterprise Basic (Recommended)

The current recommendations for Kalamazoo County's GIS expansion are focused primarily on the storage and maintenance of data for applications to be used by internal and external units, not the development of mini-applications for internal departments. Many of the functions currently proposed will utilize the existing, externally-hosted mapping website for implementation. Since the County's initial focus is on data hosting, it is recommended that the County upgrade the current ArcGIS Server license to ArcGIS Server Enterprise Basic.

The upgrade will enable the County to employ more secure methods of housing and securing data, and implement version-based editing tools, including multi-user editing (with database roles and permissions), enhanced performance, and better scalability. Quality control of edits performed by users will be greatly enhanced and backups and history will become integral functionality.

Stage 3 – ArcGIS Server Enterprise Standard or Advanced (Future Upgrade)

An optional upgrade to ArcGIS Server Enterprise Standard or Advanced would enable the County to combine the benefits of both Stage 2a and Stage 2b above. Kalamazoo County would have the storage and maintenance benefits of Stage 2b with the ability to deploy web applications using that data, as in Stage 2a. With ArcGIS Server Enterprise Advanced, authenticated web users could be given the ability to edit spatial data via the internet, and the County would have version-based tools for review of the edits. This type of upgrade would remove the need for many ArcGIS Desktop licenses at the County, since version-based editing could be performed using a web browser.

Deciding upon the appropriate hardware system for an ArcGIS Server configuration has many technical factors to consider. These factors include Video, Local CPU or computer processing, Network Communication, Server CPU or server processing, and Data Access I/O (Input/Output). GIS is known for the intensive processing (CPU) and data access (I/O and network) demands as compared to the video requirements of sending output information to the computer screen. Therefore, the specifications of a correctly sized system are focused around the processing and access requirements. Information available at the ESRI website (http://www.ESRI.com) describes minimum and recommended

hardware specifications for a database and/or web server(s). Before implementing ArcGIS Server, more detailed specifications will need to be determined based on further investigation of the necessary size and complexity of the proposed Enterprise GIS Database, and the chosen software platform.

Software

With the exception of the public GIS mapping website, ESRI software has been clearly identified as the primary GIS software to be used at Kalamazoo County. Even within the ESRI product suite there are various types of products that are used for different purposes. The interview results indicated the following current licenses and use of the ArcGIS suite within County Departments:

Number	Existing Software Licenses
2	**ArcEditor Floating**
4	**ArcView Floating**
1	**ArcGIS Publisher/ArcReader**
1	**ArcGIS Server Workgroup Standard (4 cores)**

It is recommended that moving all users to the current version of the base GIS software, ArcGIS Desktop version 9.3, will help in establishing and connecting to any Enterprise GIS Databases and in training, support, and application development.

The mixture and number of licenses of the ArcGIS products should also be re-examined. Many ArcView users may be able to use ArcGIS Server applications or websites to view, query, and analyze their data. Conducting an inventory of who is utilizing the ArcReader method of accessing County data, where they are, and how they are using it will also be important for any future ArcGIS Server application deployments.

By further examining the existing GIS software use, in regards to ArcView and ArcReader in particular, there is a potential to reduce the number of licenses and subsequent total costs, given the implementation of future ArcGIS Server browser-based viewers and applications. There are probably many existing casual users and a great deal more that will benefit from this centrally served and maintained capability to present spatial and database information, as well as functionality.

Stage 1 – Current Software

For the initial GIS Database system, the following is the recommendation for the base software.

- *ArcGIS Server* - ArcGIS Server Workgroup Edition Standard Level. This license should be renewed before it expires *if the County plans to implement any of the Stage 2 or Stage 3 recommendations within two years.*

Stage 2b – Recommended Software

For the Enterprise GIS Database system, the following are the recommendations for the base software. It is assumed all of these will be to the most current version and service pack at the time of implementation.
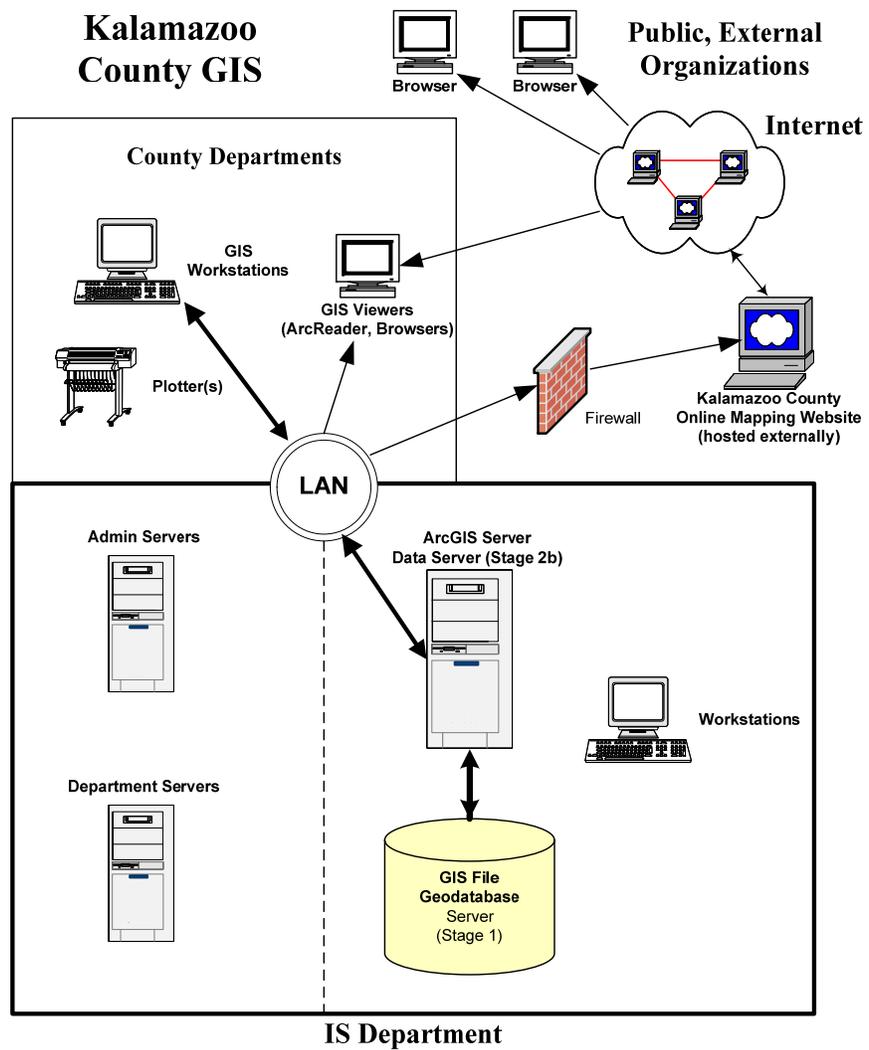
- *Operating System* - Windows 2008 Server Standard Edition is currently the recommended operating system for ArcGIS Server. Windows 2008 Server is an ESRI-approved operating system. The County currently supports many Windows based systems and has the technical knowledge required for support.

- *RDBMS* – Microsoft SQL Server 2008 Standard Edition RDBMS software. The software is on the approved RDBMS solutions listed by ESRI for the Enterprise Edition of ArcGIS Server.

- *ArcGIS Server* - ArcGIS Server Enterprise Edition Basic Level.

- *Backup Software* - Backups are a critical component for managing an enterprise database. The Enterprise GIS Database server should use the standard backup software and methodology currently in place.

Conclusion

The technical opportunities discussed and recommended cover a wide variety of topics, from existing hardware and software, to the resources necessary for future enterprise deployment and expansion. Although there are several approaches to implementing GIS technology, an application-oriented approach focused on business processes and maximum utilization of the system by the widest audience will drive the data and infrastructure needed to support enterprise use, and ensure buy-in from as many users as possible.

The recommended applications are intended to consider the commonly performed tasks that will benefit the most from GIS. The County's Online Mapping Website will fulfill many of the GIS needs of the stakeholders, though the underlying data must be protected, properly maintained, and updated regularly to ensure continued use and value to users.

Although we have presented options for accomplishing many County goals with the existing hardware and software systems, the most efficient option for stable GIS expansion is for the County to utilize the ArcSDE-like functionality of ArcGIS Server Enterprise Basic (or higher) to build a GIS data warehouse. By taking action immediately to extend the County's current ArcGIS Server License agreement with ESRI, the County will be able to avoid purchasing a full-cost new license of ArcGIS Server Enterprise Basic or Standard/Advanced Enterprise in the future.

Kalamazoo County GIS

County Departments

GIS Workstations

Plotter(s)

GIS Viewers (ArcReader, Browsers)

Public, External Organizations

Browser Browser

Internet

Firewall

Kalamazoo County Online Mapping Website (hosted externally)

LAN

Admin Servers

Department Servers

ArcGIS Server Data Server (Stage 2b)

Workstations

GIS File Geodatabase Server (Stage 1)

IS Department

GIS Organizational Opportunities

Introduction

Where GIS technology and management best fits into an organization or set of agencies is important to identify. Highly technical skills are needed to support the infrastructure and applications while subject matter specific knowledge is needed to drive the data maintenance, applications, and analysis tools that can streamline and improve business processes. This mix of skills is challenging when it comes to the organization of a GIS Program.

GIS in Kalamazoo County is no exception. Currently, there are very few departments and organizations with active GIS operations, each with individuals supporting them at different levels. It is apparent to all parties involved that there needs to be better communication and coordination with the various operations, especially if a central GIS resource is to be put in place. The Kalamazoo County Planning Director has taken on the role of County GIS Coordinator, responsible for driving the County-wide GIS initiatives. Currently, these initiatives are done in conjunction with the Director's Planning-related activities. As the Kalamazoo County GIS continues to grow, the responsibilities of the GIS Coordinator may require a fulltime commitment. The chosen organizational structure should support these goals and facilitate better use of data, system, and staff resources across the board.

GIS Program Basic Level of Service

Of fundamental importance to non-County organizations is the need to clarify what GIS users are to receive for their participation and cooperation with the Kalamazoo County GIS. This issue must be resolved for many reasons, not the least of which is being able to estimate and build a realistic operating budget for the GIS Program. The following are a recommended basic set of services that the Kalamazoo County GIS Program could offer all participating organizations.

➢ A minimum five-year commitment to support the GIS Program

➢ Management and availability of the Online Mapping Website

➢ Access to GIS layers and databases stored on the GIS Warehouse (exception: data restricted for security or other agreed upon reasons)

➢ Management and enforcement of data sharing agreements and restrictions

➢ Management and updating of layers maintained by core GIS operations, such as street centerlines

➢ Coordination of digital aerial photography acquisition, including oblique imagery

➢ Mass purchasing opportunities for GIS software and/or data

➢ GIS Technical Support up to 40 hours annually available through Core GIS Staff, to provide general GIS assistance to users

- ➢ Coordination and hosting of quarterly KAGIS User Group meetings (see below)
- ➢ Coordination of the GIS Steering Committee
- ➢ Upkeep for GIS documents and materials for participants
- ➢ Scheduled workshops and training sessions

Regardless of the organizational alternatives selected, it is IGI's recommendation that this concept of offering a Basic Level of Service be instituted. The GIS Coordinator must work closely with Information Systems staff to ensure that resources are available to support planned activities, and that IS staff are properly trained to provide critical internal support. Agreeing to perform these services is a significant responsibility and careful consideration should be given to this offering before formal agreements are put in place.

Recommended Organizational Structure

Review and analysis of the current status of GIS within Kalamazoo County, as well as experience with many other GIS programs has resulted in a recommendation for an organizational structure that IGI believes would function well for the County. The organizational structure is presented preceded by specific recommendations and descriptions of key staff responsibilities and organizational components that comprise this structure.

GIS Steering Committee

The GIS Steering Committee is the main policy/administration body of the GIS Program. The Committee is recommended to initially be made up of the Department Managers interviewed as well as a Deputy County Administrator, though this membership may change in character as the numbers of participating departments grow. The GIS Steering Committee's responsibilities will include:

- Oversight in implementing the selected Organizational Structure
- Input and oversight for the development of an annual GIS Budget
- High-level Prioritization of Applications & Projects
- Oversight and approval for the creation of GIS Project Teams
- Oversight, approval of budgets, and scheduling for GIS Projects & Applications
- Oversight, review, and action regarding the overall direction of the GIS Program

Initially the primary focus of the GIS Steering Committee will be to oversee and assist in the implementation of the selected organizational structure and any necessary financial considerations pertinent to the GIS efforts. After this, the Committee will primarily assist in GIS Program direction, oversight, review, and recommendations to keep the operations on track. It is envisioned that the GIS Steering Committee will meet on a quarterly basis.

Core GIS Staff

The leadership, management, and skill base of a GIS program are perhaps the most important factors for success and maintenance of the GIS Program. Core GIS Staff will provide valuable GIS services, coordination, and education pertinent to all aspects of the GIS operations. Core GIS Staff will initially be only the GIS Coordinator but should grow to include other key members, though initially some of these staffs will occupy multiple roles:

- GIS Coordinator
- GIS Data Specialist
- GIS Programmer – Application & Web
- GIS Interns

The Core GIS staff in Kalamazoo County will be an integral part of all GIS Project Teams. The project manager for each of these teams should be from the Core GIS Staff, usually the GIS Coordinator. The following are short descriptions of each staff position.

The *GIS Coordinator* provides the leadership and accountability for the GIS program as well as the direct contact for participating departments and Cities, Villages, & Townships (CVT's). The GIS Coordinator needs strong leadership, management, education, and budgeting skills and must have a foundation in GIS technology. The GIS Coordinator will provide the primary supervision of all Core GIS Staff.

The *GIS Data Specialist* (strongly recommended) will provide the technical skills needed to manage and advise on the GIS data and databases. This individual would work closely with other Kalamazoo County staff to provide the unique technical knowledge a GIS requires. They would conduct as-needed educational and training services to the participating organizations. The GIS Data Specialist position may be part-time or outsourced if appropriate. This position should be filled as soon as possible, to ensure effective data maintenance.

The *GIS Programmer* (future, as needed) will provide high-level programming skills needed for development of GIS applications, be it general GIS programming or web programming. They will work closely with staff in the Information Systems Department. The GIS Programmer position may be part-time or outsourced if appropriate.

GIS Interns (future, as needed) could be used by the GIS Program for a variety of GIS tasks. The use of Interns provides a way to build skills and provide flexibility to the changing workloads of the program. This strategy allows the Core GIS Staff and participating departments to hire GIS interns as needed. In many cases, the Interns need to work directly with the GIS Liaisons. Close ties with the educational institutions providing these interns are recommended including any local Universities, Colleges, and other career/technical centers. Supervision of all GIS interns should be performed by the GIS Coordinator.

The Core GIS Staff as described would work in a close team to establish a strong central GIS service bureau and resource to the entire County enterprise. It should be noted again that although the Core GIS Staff will possess strong technical skills, the maintenance of data and department-level analysis will typically be done in the participating departments where the subject matter experts and responsibilities reside.

GIS Liaisons & Subject Matter Experts

A significant component for ensuring a smooth functioning GIS Program is the designation of GIS Liaisons and the GIS Subject Matter Experts. Liaisons will support the internal needs of the GIS Program and provide a dedicated, primary point of contact with the GIS Coordinator. In most cases, the Liaison from the department or organization will be the Subject Matter Expert for that agency, though at larger agencies with different operations interacting with the County's GIS Program, the Liaison may be more of an administrative contact. A good example of this might be the Kalamazoo County Department of Health and Community Services.

All GIS Liaisons will have a dedicated Core GIS Staff contact, usually the GIS Coordinator, and a backup (even a general IS staff person), to provide a direct link to the GIS Program and specific GIS Projects and Applications. There must always be point of contact person to enhance communication, consistency, and trust in the GIS Program. The GIS Liaisons and GIS Subject Matter Experts will have some of the responsibilities listed below:

- Information conduit between the County GIS Program
- Maintenance and oversight of organizational GIS data
- Accountable for the departmental GIS information maintained
- Analysis and application support for their organization
- GIS Project Team member for selected projects and applications

GIS Liaisons may also have additional duties within their departments such as coordinating map requests, GIS analysis, and supervision of Interns as needed.

GIS Project Teams

Directly supporting the GIS Program and Core GIS Staff will be short-term GIS Project Teams. The GIS Project Teams primary objective is to implement projects and applications that are beyond the scope of standard operations, typically to build and expand GIS use. A common GIS Project Team will consist of 3 to 7 members including a Core GIS Staff member. Each project and application identified will be processed through a two-staged approach. The stages include the following objectives:

Phase 1
- Develop preliminary Project/Application work scope, budgets, and schedules
- Include Technical, Financial and Organizational (Staff) requirements
- Obtain approval from the GIS Steering Committee

Phase 2
- Implement approved GIS Projects & Applications
- Status Report/Accountable to the GIS Steering Committee
- Identify Training and Maintenance Requirements

This application workflow and process of identification, approval, and implementation is shown in the following figure.
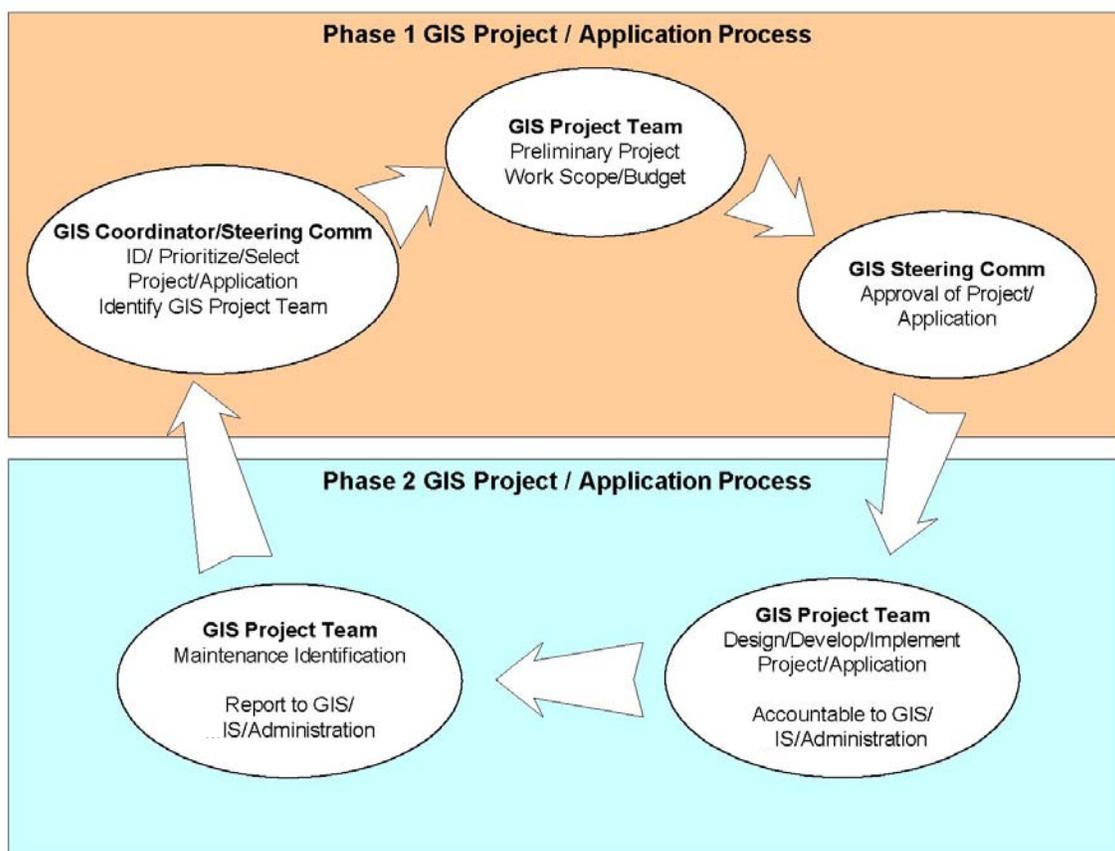
Once the project or application has completed the lifecycle, it is considered complete. However, the GIS Project Team may continue to function in reduced form to monitor the project or application, and address maintenance and improvements.

GIS User Group – KAGIS

The results and tenor of the interviews conducted for this GIS Tactical Plan highlighted the need for more widespread knowledge and involvement in the GIS Program by all existing and potential users of GIS at Kalamazoo County. Building a strong GIS community requires a robust and regular group meeting of stakeholders, managers, and users of the GIS, both internal and external to the County.

Therefore, it is InfoGeographics strong recommendation that a GIS Liaison/User Group be created. In the past, the "Kalamazoo Area Intergovernmental GIS Coordinating Council" (KAGIS) performed a function similar to this, but was dissolved due to lack of interest. As renewed interest has grown in recent years, and with the expansion of the County's GIS program, the need for a KAGIS-like group is once again evident.

This new KAGIS group should meet every two to three months. Initially this will be the forum for direct communication and interaction among the departments and communities through their Liaisons, as facilitated by the GIS Coordinator. As the GIS program progresses, users of all varieties can be invited to participate.

Existing and potential GIS users should be invited to these meeting. In general, all interested parties should be welcome to attend, although specific groups should be strongly encouraged to come, including anyone in any of the roles described above and anyone interested in learning more about GIS activities in Southwest Michigan.

The program for these meetings should be varied and interesting. The following are some basic topics that could be staged and incorporated into KAGIS meetings over a long period of time.

- Short presentations by existing users about their programs, data, applications, lessons learned, etc.
- Discussion of overarching issues and decisions regarding the direction of the GIS Program
- Workshops on specific topics like GPS, building data, etc.
- Breaking into focus groups to discuss topics
- Consultant/Vendor presentations about products or services
- Open discussion for networking and brainstorming

The value of a strong GIS user group and the communication and feedback it can give a GIS Program cannot be underestimated. In addition to the meetings, it is recommended that a specific area on the main Kalamazoo County website is designated for GIS. The KAGIS Group webpage can also become a place for publishing schedules, participant information, and materials to augment the meetings themselves.

The County must take steps to increase the overall value of participation in the Kalamazoo County GIS program. Cost sharing, overall public safety, emergency preparedness, and general GIS project support, such as Sharepoint hosting and KAGIS coordination, are all great benefits the County should provide. In addition, the County can provide the administration and coordination of regular orthophotography flights with oblique views on behalf of the participating organizations.

GIS Organizational Structure

The following graphic depicts the recommended organizational structure for the expanded GIS Program at Kalamazoo County, based upon existing and future (as needed) staffing.
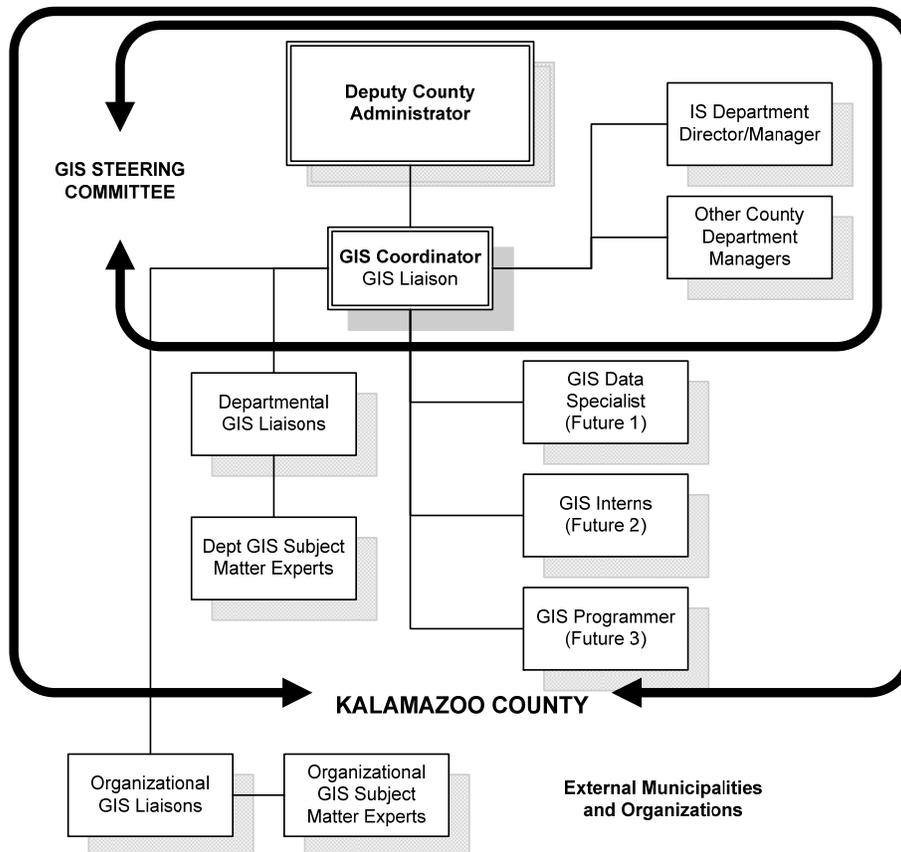
GIS Financial Opportunities

Introduction

When implementing or expanding GIS at an organization, financial considerations are some of the most important and often difficult aspects to reach a state of balance and stability, especially in today's economic climate. The needs of participants and users must be weighed against available resources and the political environment, both of which can be in a constant state of change. Many different factors enter into financial modeling for GIS, and it is important to find a good fit of these factors to the situation at hand, and that this is done from a realistic viewpoint. The following is an outline of these factors to help frame future efforts in this arena, it was not seen as a goal of this plan to fully address these issues, since the focus is on the more short term, tactical viewpoint.

Factors in GIS Financial Modeling

- *Customers*
- *Products*
    - Data
    - Maps
    - Staff Services
    - Application Services
- *Expenses*
    - Staffing
    - Fixed
    - Data
    - Consulting
- *Funding Vehicles*
    - General Fund
    - Basic Level of Service cost sharing agreements
    - Departmental/Organizational Budgets
    - Spatial Enhancement Fee in Existing Fee Structures
    - GIS Product Fees
    - Subscription to Services
    - Grants
    - In-Kind Agreements
- *Marketing*

Each of these factors should be considered during current and future implementations or expansions of the County's GIS program.

Cost Estimates

The following information presents basic cost estimates to assist in the initial decisions necessary to grow the Kalamazoo County GIS Program, including implementing the GIS Database and initial applications previously described.

Immediate steps can be taken to establish Kalamazoo County's GIS without large investment or cost. Initial recommendations for data sharing and expanding the Kalamazoo County Online Mapping website fit into currently budgeted items that are already integrated into the existing departmental budget(s).

Stage 1

Public GIS Mapping Website

Many of the Stage 1 applications have already been included in the existing County GIS budget, including the Public GIS Mapping website and the Notification Tool, currently with limited geographic coverage. If the Kalamazoo Online Mapping Website is deployed as planned, the public will have access to much of the spatial information recommended in this Plan. Currently, many layers are available for only limited areas of the County, since many Cities, Villages and Townships do not have GIS data available, or they are not currently sharing GIS data with the County. As more communities realize the benefits of cooperation and agree to participate in the program, coverage will grow.

Additional Cost: None – already budgeted

Assessor & Appraisal Support Layers / Land Value Mapping Layers

Internal staff time is needed for the creation of additional layers to support assessors and appraisers, such as tax map layers and land value layers. This could be presented on the public website or if a community prefers to keep this data from public view, the County can create and distribute these layers directly to the individual organizations as ESRI Layer files, scripts, COTS software, enhanced PDF documents, or other agreed-upon formats as part of their data sharing agreement with the County. If the County implements the map series production software option, complete Land Value Maps could be provided annually as PDF's to participating units.

Additional Cost: Staff time & Software to be determined

Notification Tool

The Kalamazoo Online Mapping Website will offer users the ability to buffer selected parcels and generate mailing label sheets with the owners' contact information. Currently, the underlying data are only available for some areas of the County. As more communities agree to participate in the program, coverage will grow. It will be important to market this functionality via the entry page to the site, as novice GIS users may not find it easy to use.

Additional Cost: None – already budgeted

Addressing Standardization & Storage

County GIS staff should provide a template for spatial layers related to addressing. These can be based upon models from ESRI, but IGI recommends modeling the addressing data on any existing address datasets already in use within the County. It will be important to accommodate all addressing attributes from throughout the County in this model to ensure necessary data are not lost, and the resulting dataset is compatible with exporting to systems countywide, especially public safety systems. Some or all of this work may be outsourced if necessary.

Additional Cost: $5 – 10k (if outsourced)

Parcel Standardization, Conversion, and Storage

Some property and addressing datasets will require conversion or processing prior to analysis or submission to the hosting vendor for publishing. Property mapping data for some municipalities will require conversion from non-GIS formats (paper, mylar, CAD, etc.) prior to their complete incorporation into the Kalamazoo County Online Mapping website. It is essential to collaborate with the municipalities and their mapping consultants, if appropriate, on these types of projects.

In determining the details of any cost sharing by the County, it is important to recognize the short and long term benefits to be achieved at the local level. At a minimum, the County should work with the community to develop a template for the data to be collected, ensuring data standardization once the information is integrated into the countywide database. The County can also assist with the preparation of a formal RFQ or RFP and offer to review submittals if the municipality is taking bids for the conversion work.

Parcel conversions can be done internally over time, or outsourced to a GIS vendor. If the conversion is performed internally, GIS Interns should be utilized for the project, under the direction and supervision of the GIS Coordinator, to ensure that the resulting data integrates properly and adequate quality control measures are employed.

If an external vendor is used for the parcel conversion(s), there are many variables to consider that will affect the relative cost-per-parcel. The quality and format of the source documents, the amount of text to be converted, and the parcel conversion experience of the vendor can all be factors that result in large fluctuations in total conversion costs. The County can also assist with coordination of conversions of multiple communities, which may be able to reduce per parcel costs further, depending upon the contractor.

Though the County may decide to contribute to the cost of the conversion, the largest benefit of GIS-based parcels is to the operations of the individual municipalities, so much of the cost must ultimately be left to the communities. If local municipalities are unwilling or unable to provide support for digital conversion, the County should continue to develop and enhance its GIS applications and offerings. Though a complete County parcel map has the most value, 100% coverage and participation is not necessary for the

successful expansion of the County's GIS, and should not be a factor in preventing the County from continuing on to Stage 2 and beyond.

Additional Cost: approximately $2 – $7 per parcel total (if outsourced)

ArcGIS Server Workgroup Standard Renewal

The County currently has a $10,000 ArcGIS Server Workgroup Edition Standard Level software package, which is "grandfathered" into a $2k per year maintenance fee. (New customers currently pay $2.5k per year.) As long as maintenance is current, the County may upgrade to equivalently-priced versions of ArcGIS Server at little or no cost. If the license is permitted to lapse in November 2008, the County would have to repurchase the software or back-maintenance at full price in order to implement additional Stages of this Plan. If the County intends to implement *any* ArcGIS Server solution within two years, immediate action should be taken to renew the existing ESRI maintenance agreement for ArcGIS Server Workgroup Standard, to ensure long-term cost savings.

Additional Cost: $2k annual maintenance

Stage 2b (recommended)

GIS Database Implementation

The implementation of ArcGIS Server Enterprise Edition Basic Level (ArcSDE) technology will allow countywide datasets to be assembled, stored, disseminated, and maintained more efficiently. This will permit view, query, and multi-user editing access to all County GIS data for internal ArcGIS users. These estimates are presented based upon the recommendations in the Technical Opportunities section, and are estimates only. Estimated costs are presented pending more detailed specifications and direct quotes from ESRI.

- ESRI ArcGIS Server Enterprise Basic

    o ArcGIS Server Enterprise Basic Software:
    $0 *upgrade* cost (if existing ArcGIS Server maintenance is current)
    $3k in annual maintenance

    o ArcGIS Server Installation and Configuration: $4-6k

    o Architecture & Database Design:
    $4-6k (depending on how many layers, this also includes hardware specification and network architecture research and recommendations)

    o Installation, Configuration, & Initial Loading: $4-6k

    o Training Assistance (Administration, Loading, General Use, and Editing):
    $3-5k or outsource via VPN

    o Miscellaneous Assistance - $2-4k

Stage 3 (future)

ArcGIS Server Enterprise Standard or Advanced Implementation

The enhanced implementation of ArcGIS Server Enterprise will allow datasets and applications to be deployed through interactive browsers, separate from the public website. This will enable secure, browser-based access to the entire Kalamazoo County enterprise, if desired. These estimates assume a central installation for network viewing and editing (Advanced only), and the development of the initial browser. As stated in previous sections, implementation of browser-based GIS applications has the possibility to reduce the necessity of some ArcGIS Desktop licenses. This may help to offset the costs of the migration to this server based system, but a more detailed analysis of ArcView use will be necessary at the time of the upgrade to predict the value of this benefit. Many of the setup costs below will be greatly reduced if Stage 2b is implemented prior to this upgrade, since many of the Stage 2b requirements overlap with Stage 3.

- ESRI ArcGIS Server Enterprise Standard or Advanced

  - ArcGIS Server Enterprise Standard Software:
    $10k *upgrade* cost (from 2b, to be confirmed with ESRI at upgrade time)
    $5k in annual maintenance (to be confirmed by ESRI at upgrade time)

  - ArcGIS Server Enterprise Advanced Software:
    $30k *upgrade* cost (from 2b, to be confirmed with ESRI at upgrade time)
    $10k in annual maintenance (to be confirmed by ESRI at upgrade time)

  - ArcGIS Server Installation and Configuration: $4-6k

  - Architecture Review & Design:
    $3-5k (includes hardware specification and network architecture research and recommendations)

  - Installation, Configuration, & Initial Loading: $4-6k

  - ArcGIS Server Initial Website:
    $4-8k (depending on extent and functionality)

  - ArcGIS Server Training Assistance (Admin, Introductory Programming):
    $4-6k or outsource via VPN

  - Miscellaneous Assistance - $2-4k

Next Steps to Implementation

Introduction

This section builds upon the technical, organizational, and financial opportunities and the recommendations detailed in previous sections. The steps in this process may change as the GIS Coordinator and the GIS Steering Committee reviews, formalizes, and implements the Kalamazoo County GIS Tactical Plan, and as optional Stages are approved. More in-depth information regarding the individual components mentioned in this section is available in previous sections.

Incremental Steps

The intent, design, and performance of these action items are predicated on the strategy that these are incremental steps to improvement and success. However, there may be areas that can proceed as parallel efforts, such as putting the organizational structure in place while a central GIS Database is implemented. One of the most important factors of this action plan is the institution of a process to discover, develop, and integrate GIS data, applications, and address key functional goals on a *project-by-project basis*. This will enhance the foundation and future stability of the County's GIS program, provide mechanisms for accountability, and insure that the refinement and expansion of the GIS program is accomplished in a logical and pragmatic fashion.

The first step in the expansion of the GIS Program will be to get basic agreement and consensus regarding the recommendations in this GIS Tactical Plan from the County Board of Commissioners and the GIS Coordinator. The steps discussed in this section use the recommendations as presented and if they are changed or revised, these steps will need to be adjusted accordingly.

Implement the Organizational Structure

This simple step will formalize the organizational structure. After review by the GIS Coordinator and the presentation of the GIS Tactical Plan to stakeholders, it is recommended that the GIS Steering Committee be formally created and a first meeting conducted to review, comment, and reach consensus regarding the content in this GIS Tactical Plan. The County GIS Coordinator is ultimately responsible for the implementation of the GIS Tactical Plan.

Communications procedures, even in a simple fashion, should be developed and implemented to enhance and formalize communications among the different component groups and individuals, including the GIS Steering Committee, the IS Department, Liaisons/Subject Matter Experts, and GIS Project Teams.

A cornerstone of this communication in the first stages of implementation should be direct and frequent communications between the GIS Coordinator and the GIS Steering

Committee, including the IS Department Manager. The GIS Coordinator should provide a succinct GIS status report at each meeting of the GIS Steering Committee.

Another critical communication link will be to enhance the relationship between the GIS Coordinator, the participating departments (through the Liaisons), and GIS Project Teams as they are created. In addition to regular status reports from the Liaison's and Project Managers to the GIS Coordinator, the GIS Coordinator will need to constantly monitor and assist to ensure the GIS Liaisons, Project Mangers, and team members are clearly communicating their goals and the methods of accomplishment.

Restart the Kalamazoo Area GIS Group (KAGIS)

Good cooperation requires excellent communication. A properly implemented organizational structure provides the communication avenues necessary for a successful GIS program within the County. An open GIS user group involving stakeholders from throughout the County is the next step. KAGIS will enable the County to garner feedback from local communities and organizations, including recommendations for improving County GIS services. Kalamazoo County will monitor KAGIS to determine the direction of other GIS programs in the area, and identify ways to assist and cooperate with these programs.

KAGIS will establish a venue for promoting the County's GIS Basic Level of Service, and add value to the program as a whole. By providing project updates and demonstrating new technologies, the County will help other Kalamazoo area GIS users maintain their skills and knowledge. Formal and informal training coordinated by the County through KAGIS will recruit new GIS users and assist users in need of updated skills.

In any expansion of GIS technology at an organization, educating and providing support for users new or advancing in GIS is imperative. It is recommended that an incremental and repeatable series of GIS Education Sessions be conducted to help spread awareness and uses of the GIS for many different purposes, especially as new or custom applications are made available. Courses may be conducted by the GIS Coordinator, other in-house staffs, or by outside professionals for specialized training.

Develop a GIS Budget

It is imperative in the early stages of the expansion of GIS operations that the financial picture be put on a firm foundation. This is especially true for the core operations and datasets that will play a part in GIS products across the board; such as an Enterprise GIS Database, licensed software, staffing, data development, applications, and so on.

The GIS Financial Opportunities section lays out some of the basic costs associated with the first stages of the program expansion, and this should be formalized into the annual budget for the Planning Department and other applicable departmental budgets.

With the instability in today's economy, it is difficult to rely on fee-based services to gain support from other organizations. If the County can demonstrate the value of the County's GIS Basic Level of Service and other components of the GIS program to other

communities and organizations, it may be feasible to pool funds from other sources to accomplish the same goals with GIS, resulting in an overall reduced cost for all involved parties. For example, for communities that currently pay for independent hosting of their GIS data, the County may be able to offer identical hosting services through the Kalamazoo County Online Mapping website at a greatly reduced rate. Depending upon the situation, the cost of hosting may be further reduced or offset when negotiating the details of data sharing or maintenance agreements with the County.

Once a County decides to charge for GIS services, the next obvious question is: How much? Other Michigan counties have struggled with establishing a fair rate for GIS services provided to local units and organizations. Should fees be based upon size, population, total property or land value, number of parcels, number of addressed structures, or some weighted combination of these?

An MS Excel spreadsheet has been delivered with this Tactical Plan. It can provide assistance with calculating GIS cost sharing for efforts like the Basic Level of Service or individual projects as they are defined. The spreadsheet uses area, parcel count, total taxable value, and population as weighted inputs used to breakdown costs. The GIS Coordinator enters the above information for all units and the total cost of operations, and the spreadsheet will calculate the cost per unit for the County's Basic Level of Service or Projects for the GIS Program.

Implement Agreements

Cost Sharing

Kalamazoo County may be able to offer some GIS services to the public and to local units at no charge. Other services, such as data conversion projects, may not fit into the current County GIS budget and therefore require a funding source. There are many potential funding sources listed in the GIS Financial Opportunities section that should be considered before embarking on a GIS project. It is important to consider the relative benefit and value to each involved organization when establishing the breakdown of costs for GIS services and projects.

The attached spreadsheet is one tool that can assist the County with dividing up costs for countywide services and projects, whether they are paid annually, quarterly, monthly, one-time, etc. Once the services and fees have been agreed upon, it is essential to institute a formal agreement outlining the details and procedures for invoices and payments.

Data Sharing

Many Kalamazoo area communities and organizations have data that is essential to the success deployment of some GIS applications and tools. Data sharing agreements provide a formal arrangement that outlines rules and procedures for the transfer, updating, distribution, and sharing of GIS data between the organizations.

Usage restrictions for any datasets shared with the County must be detailed explicitly in a Data Sharing Agreement. Some data may be necessary for internal public health, public

safety, or emergency response teams within the County, and may be restricted from public release or other internal use. County data sharing agreements typically fall into one or more of the following categories:

- Public: May be freely distributed to anyone.

- Purchase: May be sold to anyone. Some or all of the revenue may be returned to the source organization.

- Internal: May be used by internal County staff only.

- Restricted: May be used by only those departments or individuals specified in the data sharing agreement.

Some local units have already expressed an interest in sharing data with the County for public distribution on the Kalamazoo County Online Mapping website. If the units decide to provide all of their data to the County, but only offer some layers or attributes to the public, this should be detailed in a data sharing agreement.

Implement the Database

This implementation stage will put in place the central GIS data storage and access mechanisms described in Stage 1 (or Stage 2b), the Geodatabase storage system. Once again, the design and implementation of this can proceed in conjunction with some of the more organizational, financial, and staffing efforts detailed above so that it will be ready when the other components are in place.

Identify and Prioritize GIS Projects & Applications

At this stage, the GIS program can begin the iterative process to identify, evaluate, prioritize, and select GIS Projects & Applications. Please refer to the Organizational Opportunities Section for details and illustration of the recommended process. It is recommended that the first GIS Application applied to this process be the Assessing & Appraiser Support tools, but this is ultimately the decision of the GIS Coordinator and the GIS Steering Committee. The Kalamazoo County Online Mapping Website and associated Notification Tools are also recommended; they are already in the development and pre-release stages of the cycle.

A more detailed analysis and organization of the GIS applications discovered and described through these planning efforts should be carried out by the GIS Coordinator. This would consist of verifying, refreshing, and augmenting this known list through the Liaisons and contacts with the principle stakeholders in the departments.

The GIS Coordinator and the GIS Steering Committee would then evaluate the comprehensive listing of projects and applications and prioritize them into basic stages for implementation, ideally projecting the GIS Program out for two to three years. This overall prioritization should be revisited at least annually.

Finding the right mix of projects and applications to complete, in order, and committing to a medium-to-long term plan can have a positive and far reaching effect on the success of the GIS Program. It is the basic decisions regarding how GIS at Kalamazoo County will grow and succeed.

The projects recommended at this time are listed below. Details on each may be found in previous sections of this Plan.

- ✓ Kalamazoo County Online Mapping Website.
- ✓ Develop Assessing & Appraising layers for tax mapping and distributed analysis.
- ✓ Develop Land Value Map layers for distributed analysis.
- ✓ Market the Notification Tools to be available on the Kalamazoo County Online Mapping Website.
- ✓ Develop standard templates for Addressing and Property Mapping data.
- ✓ Renew the ESRI Maintenance agreement for ArcGIS Server Workgroup Standard (if the County intends to upgrade within two years).

Stage 2b involves the following recommended additional components:

- ✓ Upgrade ArcGIS Server Workgroup Standard to ArcGIS Server Enterprise Basic.
- ✓ Update Addressing and Property Mapping templates for the Enterprise Geodatabase.
- ✓ Initiate Property Mapping data conversion projects for non-GIS communities.
- ✓ Initiate a countywide Orthophotography program (Pictometry)

Develop Extended Work Scopes, Budgets, & Schedules for Selected GIS Projects & Applications

Once a GIS Project is selected for implementation, the detailed work scope, financial feasibility, and timing for the development and deployment must be coordinated. Two examples of common GIS projects are a coordinated orthophotography flights and an HCS mobile GIS data collection program. A coordinated orthophotography flight would provide a common data benefit to units Countywide, while the HCS mobile GIS data collection project would provide a system model for others to follow to collect other, non-HCS data.

Extending existing GIS Budgets at various departments to address project needs should be carried out as they are identified and used in the approval process. Any applicable grant funding or revenue sources should be worked into the financial picture at this point. The GIS Steering Committee and GIS Coordinator can then make the decision to proceed on the project. With a formally organized GIS plan in place, the County can provide GIS services to most departments and organizations without major budget outlays, since data requirements and infrastructure needs will often be satisfied by the existing system(s).

Form GIS Project Teams

Upon approval of a GIS Project, with all requisite work scope, financials, and scheduling in place, a GIS Project Team can be formed. This is the group that will be responsible for the specification, development, deployment, and maintenance of a particular GIS application or functional project. A GIS Project Team, given a name that should match its basic goal, should be made up of:

- A County Project Manager, usually the GIS Coordinator
- Departmental Liaison(s), if appropriate
- Technical Support Staff from County Departments & IS, if necessary
- Subject Matter Experts as needed
- Consultants as needed

Per the process delineated above, a GIS Project Team may be convened in a preliminary fashion to supply the GIS Steering Committee with work scopes and budgets as projects/applications are selected to assist in the approval process. Once a project/application is approved, this group will perform the work necessary to complete the project. The Project Manager will report to the GIS Steering Committee regularly through the GIS Coordinator on status and issues related to the project. For smaller projects, the GIS Project team may consist of only the GIS Coordinator.

Perform GIS Projects/Applications

This is where the GIS Project Team proceeds to perform the project tasks within the budget and timeframe allocated to it. In general, the following stages can be followed in any project of this sort:

- Functional Specifications to formalize specific behaviors and requirements

- Development of systems, software, and data

- Testing, refinement, and deployment of the finished product

- Training and support to maintain the application

Results of this stage of the process should be a functional and finished GIS application and/or product, maintenance in place to support it, and training conducted to make users aware of the project results.

Track and Support Maintenance of GIS Applications

There may be an extended role for the Project Team after the completion of the project, or deployment of the application, to track the progress and success of the finished product, make any adjustments necessary, and support continued maintenance. Periodic reports of the status and progress regarding the project throughout its lifecycle should be presented by the GIS Coordinator to the GIS Steering Committee.

ID & Prioritize (again)

This is where the iterative nature of the project/application process kicks in, essentially going back to the "identify, prioritize, select, and approve" stages to expand and deepen GIS operations over time from a firm foundation of planning, logical method, and accountability.

Conclusions

This *Next Steps to Implementation* strategy to implement key projects and applications for GIS at Kalamazoo County will accomplish major goals and objectives envisioned for the expanded use of GIS countywide. It also establishes a path to realize the visions of GIS and its use, as communicated by the stakeholders throughout development of the GIS Tactical Plan. It is also intended that this GIS Tactical Plan be a living document and as the paths branch and change over time, this resource can be used as a basis to assist making decisions and document these evolutionary changes.

These recommendations will enhance the in-house processes and products that Kalamazoo County and local units are mandated to perform and deliver. Opening the business processes, applications, and data to GIS creates vehicles to more fully integrate additional participants and departments in the GIS program. This works both ways, as new participants will reap the benefits of this highly useful functionality and data in their business processes. The positive effects of this interoperability can be profound and long lasting and may evolve in many directions.

InfoGeographics, Inc. has been pleased to assist Kalamazoo County in this GIS Tactical Planning effort and believes the County should be commended for having the foresight to examine in detail the expanded uses of GIS technology in a manner prone to targeted and structured success.

Kickoff Meeting Attendees

August 1, 2008, Kalamazoo County Administration Building

NAME	ORGANIZATION
Sue Hoch	IT/City of Kalamazoo
David Dickason	W.F. Upjohn Center, Western Michigan University
John Faul	Kalamazoo County
W. L. Miller	County Planning
Andrew Falkenberg	Assessing/City of Kalamazoo
Dan List	WMU Physical Plant
Jay Eichstaedt	City of Kalamazoo
Paul Baker	County Emergency Management
Ken Marshall	Kalamazoo Sherriff – e911
Dave Schneider	Kalamazoo County Emergency Management
Dennis Durham	Parchment
Jeff Reicherts	Kalamazoo County HCS-EH
Deb Cardiff	Kalamazoo County HCS-EH
Patrick Krause	Drain Commissioner
Ron Shutler	Kalamazoo/Battle Creek Intl Airport
Annie Wendt	Kalamazoo County Health and Community Services Dept
Zena Santos	Drain / Planning
Kellie Layman	Planning / SESC
Bonnie Payton	Equalization
Matt Hansen	Equalization
Ed Dempsey	Prein & Newhof
Dan Frizzo	Prein & Newhof
Tim Hudson	Comstock Twp
Kelly Metz	Comstock Twp
Dwight Leeks	KCRC
David Artley	Kalamazoo Community Development