GIS / IMS Master Plan Update Project: An Implementation Plan
(FINAL)

Prepared For

Pennington County - City of Rapid City
GIS Division

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Prepared By

GeoAnalytics™

Spatial ● Information ● Systems

WISCONSIN
1716 Fordem Avenue
Madison, Wisconsin 53704
Phone: 608-241-7100
Facsimile: 608-241-7116

SOUTH FLORIDA
330 Clematis Street, Suite 214
West Palm Beach, FL 33401
Phone: 561-655-1216
Facsimile: 561-655-0681

CHICAGO
950 Lee Street, Suite 202
Des Plaines, Illinois 60016
Phone: 847-824-6404
Facsimile: 312-896-5917

URL: www.geoanalytics.com
Email: office@geoanalytics.com

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INTRODUCTION

A. Overview

In the late 1990's, Pennington County and the City of Rapid City embarked on a joint effort to adopt geographic and land information system (GIS/LIS) technology. The purpose behind this decision was to enhance the efficiency and effectiveness of staff handling and integration of map related land information. Initial steps in this direction were taken in 1997 through the development of an *Organizational & User Needs Assessment & Strategic Planning Report.* The study and report was delivered to the Rapid City Area Metropolitan Planning Organization under a contractual agreement with GeoAnalytics. This initiative involved an assessment and planning exercise that defined organizational, department, data and technological needs as well as outlined a multi-year strategic plan for GIS implementation (*Implementation Plan).*

Development and adoption of the initial baseline Implementation Plan represented a long-term commitment by the City and the County to satisfy their respective needs for modernizing land information collection, storage, and use. Since that time, the City and County have taken major strides at GIS implementation. This has included the development of foundational GIS data layers, deployment of key GIS hardware and software, and the establishment of a formal GIS Division to service enterprise and department level needs. The current GIS Division, serving both the County and City, has sought to rejuvenate this commitment to GIS by having GeoAnalytics update the original plan and clarify strategic next steps for further implementation.

This report is the third of three documents to be produced by GeoAnalytics in the development of an updated strategic implementation plan. It outlines a series of discrete activities to be undertaken over the next 3-4 years to further advance implementation of the County and City GIS program. Implementation activity priorities and details are driven by: 1) perceived modernization needs expressed by staff during the situation assessment phase of the project; 2) the future vision for the GIS program outlined in the Conceptual GIS System Design report, and 3) GeoAnalytics' years of experience with local government GIS implementation. In addition, project team voting during the last phase of this project, annual budget constraints, and natural dependencies between different GIS system components also influenced final plan activity recommendations.

It is GeoAnalytics' expectation that the County and City will use this Plan to help guide initial actions taken and investments made as well to formulate future budget decisions. Given technical changes in the GIS industry, coupled with evolving County and City expectations for GIS implementation, the Plan should be treated as a dynamic document that is updated by staff on an annual basis.

B. Background

1. Benefits of an Enterprise GIS

GIS is the cornerstone application for many governmental functions. GIS represents an efficient tool to create engineering maps, map water, sewer and utility infrastructure, track land use and development, study areas of significant natural resources, and analyze future trends and patterns. GIS has evolved from a stand-alone system to an integrated, enterprise information technology. The overall goal is to improve the efficiency, effectiveness, and equity by which land-related information is managed, accessed, and used by government, private industry, and the public. This will be accomplished through the establishment of an enterprise-wide GIS system that will be fully operational for all departments.

This modernization of land information management means rethinking information management procedures, mechanisms for information storage and retrieval, and tools for data analysis to support public decision-making. GIS and Land Information System (LIS) technologies, including integrated computerized mapping and database systems and document imaging, have become necessary tools over the past decade to meet this end. In addition, the adoption of new policies and implementation of more streamlined work procedures related to land information management have also been instituted by many agencies in the pursuit of modernization.

GIS is unique in the realm of information systems in that it has historically been inherently decentralized. Individual land records such as those describing tax parcels, addresses, zoning, and infrastructure have typically been produced and maintained by separate County or City departments or even other agencies, yet access to and use of these same records across the enterprise is essential.

Implementation of an organization-wide, comprehensive GIS strives to maintain and even empower local custodians of data, while at the same time enabling access to, and use of, this same information by clearly defined users. A significant aspect of GIS technology is that it provides the technical means to integrate and analyze the geographic or locational aspects of land records. For example, tax parcel mapping records contain an integrated representation of legal boundary locations and dimensions as well as descriptive information such as property ownership and valuation.

It has become increasingly clear that many of the economic and technical benefits that may be derived from the deployment and use of GIS are best realized from the perspective of a multi-purpose and multi-participant implementation. For example, DOE is the principal custodian for data on property such as ownership and legal description, while other departments such as County and City Planning are regular users of this information. This demonstrates that participation by all County and City departments and even external organizations in an enterprise GIS system is critical since there is an opportunity to streamline operations by careful

coordination and shared investment. Therefore, there is a natural enterprise defined by the closely interrelated agencies that have common data, service, and operational interests.

By way of example, one priority GIS implementation activity contained in this plan that is meant to serve enterprise interests involves the implementation of a web-based GIS data access application. This application, which should be deployed across the County and City Intranet, will provide all department staff with a simple means to access, display, and query common GIS data such as parcels, structure photographs, ownership information and street centerlines. Figure 1 below is representative of the planned application.

Figure 1: Example Enterprise Web GIS Application
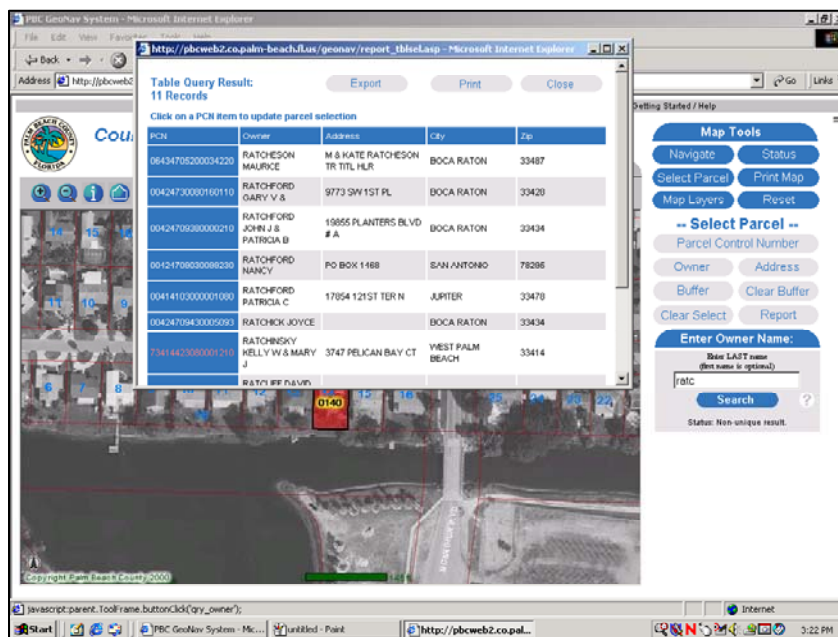
Implementation of this type of application implies that GIS data may be maintained locally but accessed globally using electronic means of communication, such as local and municipal area data communication networks. Using this integrated GIS approach, data may be drawn from a variety of sources, combined, and applied by many users. This characteristic yields several benefits:

- Enterprise relevant data is made accessible throughout the organization;
- Commonly used data is more current because updates are made as part of a business process; and
- Data is more reliable because a designated custodian maintains it.

As a result of these benefits, data is better, less expensive, and more suitable to support governmental operations and decision-making, and thus, benefiting the public. In addition to these benefits, GIS oriented business applications will further

enhance the suitability and value of data by providing it to users in a format that is directly relevant to their unique decision-making needs.

2. GIS at the City and County

The County and City have accomplished much of the foundational implementation of a Geographic Information System (GIS) in the past several years. Significant investments have been made in data, hardware and software, and human resources to sustain the GIS program. As a result of the emphasis placed on GIS by the organization to date, a solid foundation has been established that will facilitate the natural progression into an enterprise system.

The next logical steps will be to sustain and expand on existing investments in core GIS technology, databases, and human resources that serve as a backbone for department business functions. Once achieved, the enterprise GIS program will provide department staff and the public with increased access to spatial and non-spatial related data. Through the use of high-speed network communications and a wide range of user tools, from basic data navigation, query, and reporting to expanded GIS-based business applications, the County and City can further modernize and streamline departmental business functions.

To reach this end, the GIS Division enlisted the professional services of GeoAnalytics to build on earlier planning efforts and develop a strategic plan for the advancement of GIS over the next 3-4 years. This report is that Plan.

3. Design and Planning in this Project

GeoAnalytics' approach to GIS planning for the County and City has been to take a broad perspective. This perspective addresses organizational as well as technical issues in the assessment process and in the formulation of making final recommendations.

A significant finding of this strategic planning effort is that there exists widespread interest and support for expanded use of GIS technology throughout County and City departments. Virtually all land related information that is created, stored, and used by departments has the inherent capability of being displayed and manipulated based on its locational characteristics. Therefore, GIS should be treated as a foundational or core technology within the overall County/City IT infrastructure. It should play a key role in many department business solutions and, at the minimum, be a component of most department databases to ensure that data can be integrated and analyzed in a spatial context.

This implementation plan details specific activities, such as:

➢ The migration of parcel data management to ESRI's new ArcGIS technology environment;
➢ Implementation of a central, uniform GIS data repository;

➢ Adoption of new or amended policies to guide decisions related to data distribution and access; and

➢ Implementation of business-specific GIS applications across County and City departments.

All activities are presented at a strategic level of detail and will require further scoping prior to implementation.

The purpose of this Plan is to help guide initial actions taken and investments made as well to formulate future budget decisions. As stated earlier, given technical changes in the GIS industry coupled with evolving expectations for GIS advancement at the County and City, the plan should be treated as a dynamic document that is updated by staff on an annual basis under the oversight of the LIS Task Force.

GIS MASTER PLAN

GIS Division staff, Task Force Committee members, and GeoAnalytics have determined the business needs of County/City departments and matched them to a set of prioritized GIS implementation activities. The planning exercise has produced a final set of recommended activities to help guide implementation of an enterprise-wide GIS. The LIS Task Force, GIS Steering Committee, and Technical Advisory Committee need to sanction this Plan and be active participants in ensuring completion and annual updates to the Plan.

A staged approach to GIS implementation is recommended in order to break down specific activities including costs and workloads by fiscal year. Each activity described in this Plan contains a series of components; each with estimated costs and the recommended department or division responsible for completing the activity. The Plan outlines all activities identified as important to the GIS Program, regardless of whether they are enterprise or department centric in focus. However, those activities that serve the enterprise or majority of departmental good are identified as higher priority investments.

The first stage activities are recommended for implementation during the remainder of FY2002, while second stage activities represent additional GIS Program investments that should be considered for implementation during FY2003. This is followed by recommended activities in FY2004 and FY2005. The actual work years assigned to implementation activities are subject to change based on shifting work priorities, and funding availability, etc., over the course of the GIS implementation program.

The following are individual GIS implementation activity profiles. The last section contains a summary table of costs associated with each stage of GIS implementation. It is important to note that all costs in this report are only estimates. Costs are based on other local government GIS implementation experiences as well as estimates provided by various private data and technology firms. The GIS Division, prior to undertaking any implementation activity, should develop a more accurate cost estimate for that activity. Furthermore, some of these estimates do not reflect any potential cost sharing that may be possible with external agencies.

It should be noted that estimated costs mostly emphasize up-front capital costs for activity implementation but also try to be inclusive of notable on-going system maintenance costs. These latter costs primarily include recurring technology upgrades and maintenance and on-going maintenance of GIS databases to ensure currency. Also, the notation *SST* is used in individual activity cost tables to denote *Salaried Staff Time*. This is treated as an internal fixed cost rather than additional capital outlay.

Finally, a summary timetable of all implementation activities is provided as well as the summary project team scoring results for the three categories of implementation activities – 1) key program initiatives; 2) data; and 3) applications.

FY2002 GIS IMPLEMENTATION ACTIVITIES

A. Modify GIS Program Governance

1. Description

One area that received strong support during implementation plan activity scoring involved possible changes in current GIS Program Governance. A number of changes were identified and they are described below.

a. Establish GIS/LIS Steering Committee Oversight

It was felt that the current level of communications between the GIS Division and City and County Departments, related to GIS Program priority setting and management decisions-making, needs strengthening through the formal adoption of a committee that includes both City and County Department Head representation. This is not to bring daily or even weekly management decisions up to the Steering Committee level but to more fully vest the Committee in setting and monitoring GIS Program priorities on a regular basis. Likewise, the GIS/LIS Steering Committee, through its Department representation, needs to take an active role in helping ensure conformance with GIS policies and standards across user departments.

The current LIS Task Force Bylaws do not include the provision of a GIS/LIS Steering Committee and will need to be amended to include this committee. The GIS/LIS Steering Committee is currently comprised of six members, the Director of Equalization, Director of the Emergency Services Communication Center, the Public Works Director, the Planning Director, the GIS Coordinator, and the Engineering Division Manager. The LIS Task Force should approve future participation by other City and County departments in the Steering Committee.

b. Re-establish GIS/LIS Technical Advisory Committee

The GIS/LIS Technical Advisory Committee was created by the LIS Task Force on September 16, 1998 and consisted of six members including representation from the City Computer Center, County Computer Center, Public Works Department, Director of Equalization's office, Public Safety and the GIS Coordinator. This committee has not met formally for several years and should be re-established to help research and facilitate the technical decision-making associated with Steering Committee program planning and oversight functions. The Technical Advisory Committee could be supplemented with Ad Hoc working groups to address specific issues. Subject matter experts and technical experts could be brought together as technical teams for specific topics (e.g., addressing) for research; user needs collection, product design, testing, and implementation. These ad hoc working groups would report to the Technical Advisory Committee.

c. Establish LIS/GIS User Group

There currently is some level of a GIS user group function within the County/City GIS Program. However, it appears to be informal in nature. This activity proposes setup and administration of a more formal GIS Users Group with directed participation by existing and potential users of GIS technology. This group will serve as a regular forum for GIS discussions, in-house education and training, and feedback to GIS Program implementation at the tactical level. This group would also serve as a venue for rolling out enterprise-level GIS applications such as the Intranet Web GIS tool described later in this Plan report.

Figure 2 below illustrates a revised GIS Governance structure for the County and City based on the Conceptual Design report that enhances the current GIS governance structure.

Figure 2: Modified GIS Governance Structure

Proposed GIS Governance Model
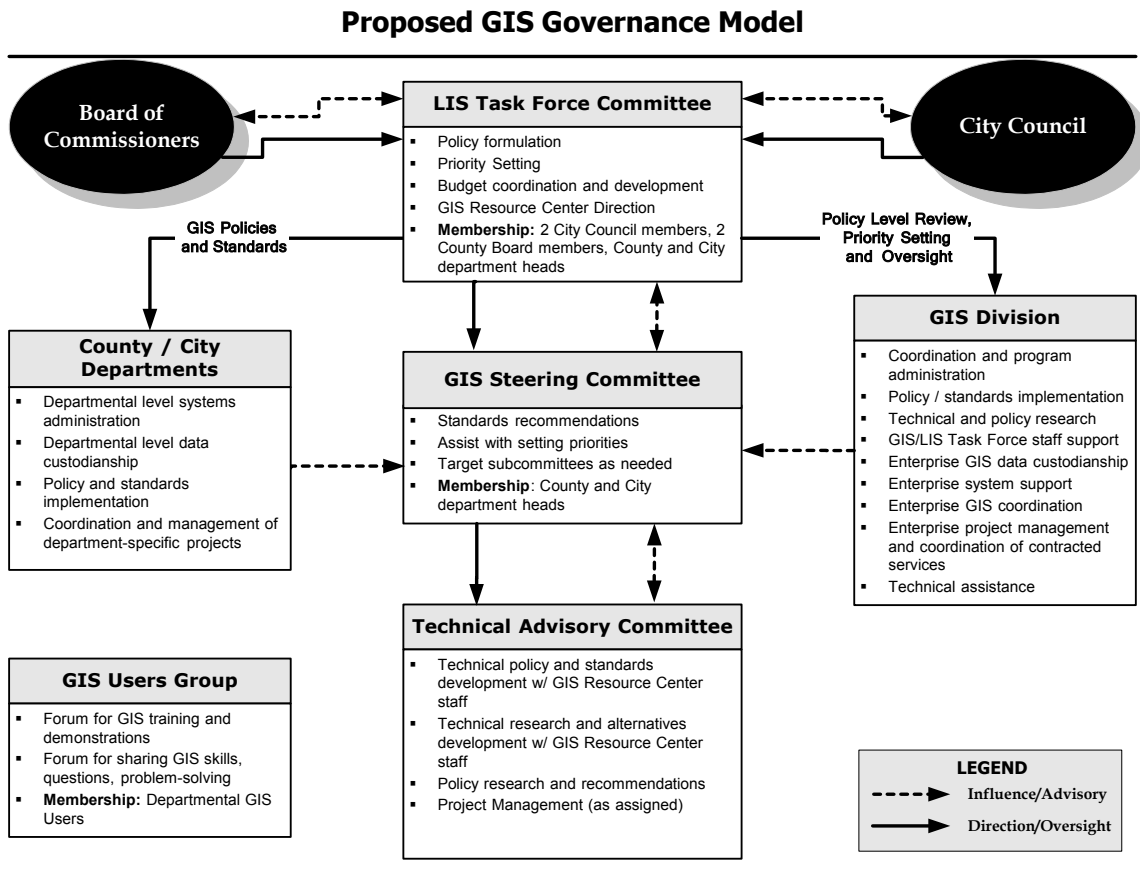
GeoAnalytics recommends that the <mark>LIS Task Force</mark> address these identified implementation plan actions. A more thorough internal discussion needs to take place to build consensus around program governance and County/City stakeholder participation in the process.

2. Timeline

This activity is proposed as a Stage 1 action and should be addressed in FY 2002.

3. Recommended Leadership

The LIS Task Force including elected officials should take on this discussion and approve final decisions related to the enhancement of current GIS Program governance.

4. Estimated Cost

COMPONENT	COST
Internal	*Internal SST*
TOTAL:	**Internal**

* SST – Salaried City/County Staff Time

B. Modify GIS Program Management

1. Description

Another GIS organizational area that received strong support during the project and in implementation activity scoring involved changes in current operational program management. A number of enhancements were identified for future consideration and they are described below.

a. Change in Program Administrative Location

A number of team members felt that the administrative home for the GIS Division should be moved to a non-line department to strengthen its future independence in serving City and County enterprise GIS needs. Changes in the location of the central GIS management function is common with evolving GIS Programs that grow in visibility and stakeholder involvement over time. It is also usually a sensitive topic, and Rapid City is no exception, given current administrative and service delivery arrangements. It needs further discussion at <mark>the Task Force and Steering Committee</mark> levels to reach consensus if any changes are warranted.

b. GIS Division Name Change

As part of a possible administrative re-location, a name change for the Division should also be discussed. A name change would connote the Division's growing, broader, enterprise responsibilities. Names such as the GIS Resource

Center or GIS Service Center were identified in the Conceptual Design report. A name change will also help reinforce the perception of GIS Program enterprise neutrality from any line-department or division affiliation.

c. Formulate and Implement Revised GIS/LIS Service Delivery Model

The primary focus of the GIS Division remains enterprise GIS system development and management. However, Division staff will increasingly find themselves also providing and/or facilitating delivery of non-enterprise GIS services to departments and external entities including the public. This is a common characteristic of a maturing GIS program.

It is expected that the costs associated with an expanding work program will continue to be primarily supported by the current financial model for GIS. This model is an annual, enterprise GIS program budget made up of general fund contributions from both the City and County. To support growing demands for GIS services within the constraints of this annual budget, it will be important for the GIS Division to clearly differentiate enterprise versus department responsibilities. General GIS program funds should target enterprise system development support and department funds should cover department specific needs. This said, general GIS Program funding should also always provide for GIS Division staff time to facilitate department centric GIS initiatives.

GIS products and services requested by organizations/agencies external to City and County government should be paid for in part of whole by those entities. This primarily involves requests for products and services that go beyond typical open record requests. These requests include custom maps or custom GIS data deliveries, etc. Consideration should be given to instituting a chargeback mechanism based on a fee schedule that covers staff time and expenses associated with delivery of such services. This chargeback policy should be consistent with the GIS information policy adopted by the LIS Task Force in 2000.

d. Establish Annual Business Planning Process and Implement Formal Work Management System

The Task Force currently engages in an annual business planning and budgeting process related to the GIS Program. This proposed activity simply reaffirms the need to continue this process based on the new GIS implementation recommendations contained in this report. It is also the intention of this activity, based on GeoAnalytics' recommendation, that a more formal GIS work intake and project management system be implemented.

With the growth of the enterprise part of the GIS program, it will be necessary to prioritize and track the allocation of time and resources of the GIS Division, so that they can be allotted judiciously. As well, for non-enterprise functions, more official lines of communication for requests will need to be established,

thereby enabling better prediction of capabilities, moderation of expectations, and conflict avoidance. Action on both fronts will help improve program expectations management and the quality and timeliness of service delivery. Better project management including implementation of workplan tracking tools, formal status reporting, product quality review, and risk management would provide significant benefits to the quality and efficiency of services.

This overall activity has a number of components that each, on their own, stands as a separate project initiative. GeoAnalytics recommends that the Steering Committee and GIS Division reach consensus on appropriate courses of action for each GIS Program Management enhancement component.

2. Timeline

Attention to these program management enhancement activities is recommended to begin during the remainder of FY2002 and finish before mid-FY2003.

3. Recommended Leadership

Responsibility for discussion and action on these activities should be guided by the GIS Steering Committee working in concert with the GIS Division. LIS Task Force approval will be required for any financial model program changes. Departments will also need to be involved in any operational level changes to service delivery methods and practices.

4. Estimated Cost

COMPONENT	COST
Internal	*Internal SST*
Consulting assistance (*optional*)	$0 - $15,000
TOTAL:	**$0 - $15,000**

C. 911 Dispatch Map Application

1. Description

This implementation activity involves conversion of the current ESCC 911 Dispatch Mapping application from its current MicroStation environment to an ESRI data and technology environment (e.g. MapObjects). Since the ESRI suite of products is the declared GIS software standard for the City and County and because this application supports a crucial City and County business function, its conversion is a priority. It was also identified as a high priority during implementation plan scoring and was listed in the City/County GIS workplan for FY2002.

A contracted professional services firm with solid ESRI MapObjects (MO) development skills should perform the conversion of this application. The

conversion effort will require not only development of a new MO application with linkages to the 911 system, but also conversion of street centerline and address range data from MicroStation design file (DGN) format to ESRI shapefile (SHP) format. Application conversion efforts should be coordinated with separate, though related, efforts toward implementing an enterprise street centerline and address data management system and the creation of an enterprise GIS data repository.

It is expected in the long term that the new MO 911 Dispatch Mapping application will be able to access the County/City GIS data repository as a reliable and up-to-date source of street centerline and address information. In the short-term though, the same data may be replicated locally to ensure 24-hour availability and currency.

2. Timeline

This activity should commence in Q1 FY2003 and be completed by Q3 FY2003.

3. Recommended Leadership

This should effort should be led by the ESCC since it is a Department specific project, though coordinated through the GIS Division since it will involve use of enterprise GIS program funds due to its legacy standing.

4. Estimated Cost

COMPONENT	COST
A. Contracted 911 Dispatch Map Application Conversion	$50,000-$57,000
B. Internal Staff Time	*Internal SST*
TOTAL	**$50,000-$57,000**

D. Deploy Enterprise Web-based (ArcIMS) GIS Data Viewer Application

1. Description

This activity involves the deployment of an Intranet web-based GIS data browse and query application. It was one of the highest scored GIS implementation initiatives. The purpose of this application is to broaden non-technical staff access to existing enterprise GIS data. The application will deliver browse, query, and reporting capabilities that can be utilized by any County or City staff, in order to support most internal business functions and to handle public information requests. Deployment of such an application will provide County and City departments with a more efficient means to access commonly used GIS data.

The GIS Division currently maintains a Web Server computer dedicated for GIS purposes as well as a license to ESRI's ArcIMS web GIS software. Staff has also been working on the development of a basic Intranet application using ArcIMS for

general data display and query. This application is based on a starter template provided with ArcIMS software and should be further extended and customized to meet potential user needs and Task Force Committee expectations. This implementation activity involves completing deployment of such an enterprise web-GIS application.

GeoAnalytics recommends that the County and City acquire a commercial third party solution that is based on ArcIMS technology and can be customized to satisfy Intranet user web-GIS application needs. This is preferable to further in-house development since many third-party commercial solutions are available at a cost that should be less expensive than pursuing extensive internal development.

2. Timeline

A first generation version of this Intranet web-GIS application should be implemented in late-2002.

3. Recommended Leadership

The GIS Division should coordinate acquisition and implementation of the Intranet web-GIS application. Any required customization of the application should be driven by a survey of representative department user needs.

4. Estimated Cost

Component costs below assume use of an existing GIS Division Web Server and existing ArcIMS license.

COMPONENT	COST
A. Intranet Web-GIS Application Site License	$10,000-$15,000
B. Application Customization and Implementation	$10,000
TOTAL	$20,000-$25,000

E. Deploy Web-Based Public GIS Data Access Application

1. Description

This activity involves the deployment of a web-based application for read-only access and browsing of digital GIS data by the general public. The Intranet web-GIS application (previously described) could serve as a base from which to deploy this new Internet application. Once again, this recommends use of a commercial third party solution that works on top of ESRI ArcIMS technology.

Deployment of such an application requires the LIS Task Force and GIS/LIS Steering Committee to make fundamental decisions about what type of access and data they would want to provide to the public. Given recent Homeland Security concerns, the application should be governed by a clear policy on data publication over the Internet. Moreover, different levels of access may be delivered to different types of public users with certain types of more sophisticated access being provided to professional users (e.g. Real Estate Companies) on a paid subscription basis.

It is assumed that this public web-GIS application will be hosted by the GIS Division using the City/County's technology infrastructure. Subsequently, the application will require acquisition of an additional ArcIMS software license (beyond what was acquired for the Intranet access) and likely an additional web server on which to house the application to ensure adequate performance. At present, access to and from the Internet is via a connection to the State network. The relatively slow speed of this connection will restrict the robustness of applications deployed for public access. To compliment this application implementation activity then, an upgrade of the City's Internet connection should also be considered. An alternative that would avoid increasing Internet connection costs involves co-locating the public access web-GIS server at a commercial hosting firm that has a larger bandwidth connection to the Internet. The tradeoff in costs would need to be evaluated.

2. Timeline

This activity is recommended to start in Q4 2002 with completion in early Q1 FY2003.

3. Recommended Leadership

The GIS Division should take a lead role in defining and deploying this type of application with guidance from other departments wishing to publish data for which they are custodians.

4. Estimated Cost

The cost items listed below assume that the GIS Division would acquire a commercial third party ArcIMS application and handle internal hosting of the application. If outsourcing to an applications service provider (ASP) is preferred, will be different.

COMPONENT	COST
A. Purchase of an additional ArcIMS license (optional)	$0 - $7,500
B. Acquisition of a new, dedicated web server (optional)	$0 - $8,000

COMPONENT	COST
C. Acquisition of commercial third party ArcIMS application for publication access web GIS serving	$10,000-$15,000
TOTAL	**$10,000 - $32,500**

F. FY2002 GIS Training

1. Description

Regardless of the skill level of GIS users and Division staff, it is important to maintain and improve skills in a variety of areas. The following are example technical and management skills for which training should be pursued to enhance overall GIS Program effectiveness:

- Technical
    - Introduction and Advanced ESRI ArcGIS
    - ESRI ArcGIS ArcView for Users
    - ESRI Geodatabase Design and Development
    - ESRI ArcSDE
    - MS SQL Server RDBMS
    - Microsoft VB/COM Programming
    - Microsoft ASP/.NET Programming
    - XML Programming
    - Web Application Design and Development
- Management
    - Project Management
    - Communication and Conflict Resolution
    - Technical Writing

2. Timeline

GIS Program related training to be budgeted and completed in FY2002.

3. Recommended Leadership

The GIS Division, Technical Advisory Committee, and Users Group should participate in identifying annual training targets – both outside classes and internal training.

4. Estimated Cost

COMPONENT	COST
A. GIS Training	$13,000
	$13,000

G. FY2002 Technology Upgrade and Maintenance

1. Description

This GIS implementation activity represents annual GIS technology upgrades and maintenance. This includes software maintenance fees to maintain currency and support for all ESRI-licensed technology. Likewise, it covers the cost to upgrade enterprise hardware and related expenses.

2. Timeline

Upgrade and maintenance costs that need to be incurred in FY2002.

3. Recommended Leadership

This represents annual enterprise technology upgrade and maintenance costs that are the responsibility of the GIS Division based on its annual base budget.

4. Estimated Cost

COMPONENT	COST
A. ESRI Maintenance Fees, Hardware Upgrades, Etc.	$20,000
	$20,000

FY2003 GIS IMPLEMENTATION ACTIVITIES

H. Parcel Layer Completion

1. Description

This activity involves completing clean up and quality assurance of the County/City parcel GIS layer. This specifically deals with annotation problems left over from the MicroStation to ArcInfo data migration completed in 2000/2001. Annotation cleanup should be handled through use of either part-time project staff or contract assistance.

As part of this parcel coverage clean-up process, GIS Division staff should investigate the next generation ArcGIS parcel data maintenance environment. Future migration to the new environment may be facilitated by minor structural changes now to the parcel coverage design. These changes could be implemented as part of the coverage annotation cleanup and quality assurance process.

2. Timeline

Parcel annotation cleanup and any other coverage modifications should be started in earnest this year and completed before the end of FY2003 or before migration to the new ArcGIS parcel maintenance environment.

3. Recommended Leadership

The Department of Equalization and GIS Division should take the lead on this activity.

4. Estimated Cost

COMPONENT	COST
A. Consulting assistance to facilitate automated methods for parcel annotation clean-up and identify ArcGIS parcel geodatabase migration needs (optional)	$0 - $5,000
B. Internal GIS data editor staff time (assumes 80%LTE at $9.50/hr for 1 year)	$16,000
TOTAL:	$16,000 - $21,000

I. Master Property Address Database Creation

1. Description

This database is one of the most critical to many of the County and City departments since a large majority of business information used by staff on a daily basis is linked to addresses. In addition to address ranges provided in the street centerline layer, many location-based activities in these departments are dependent upon site addresses and their relationship to property (tax parcels). Many

departments and/or business functions maintain and use their own address databases. Examples include the MSAG, utility billing, permitting and inspection, and other address-based functions.

The GIS Division has created a GIS address database of point locations and address fields. However, this current coverage database has not been structured and published to be a master data source and on-line reference for all City and County business areas and systems that currently require spatial and non-spatial address data. To accomplish this:

1) An assessment of site address data needs in all business areas needs to be completed;
2) Modifications to the current GIS point coverage should be made based on any content or address data structure needs identified in the assessment;
3) Procedures and tools need to be implemented to facilitate staff and business system (e.g. utility billing) access to and use of this master address data source; and
4) A published version of a master site address GIS database needs to be incorporated into the GIS data repository.

This effort should coordinate with another related GIS implementation activity – implementation of a City/County GIS street centerline and address data management application. This application is described separately.

2. Timeline

Finalization of a master address database design should be started in early FY2003, with setup and deployment targeted for mid FY2004.

3. Recommended Leadership

The GIS Division should take the lead on this enterprise data creation initiative with involvement by both address data producer and user departments the minimum, this should include Public Safety, County Planning, and City Building Inspection as official address data producers and various other departments as address data users.

4. Estimated Cost

COMPONENT	COST

A. Assessment and Design
   o Staff Time
   o Technical Consulting
	Internal SST
	$5,000

B. Database Creation/Modification
   o Staff Time
   o Technical Consulting (optional)
	Internal SST
	$0 - $5,000

COMPONENT	COST

C. Access and Interoperability Methods Development
   o   Staff Time
   o   Technical Consulting (optional)
	Internal SST
	$0 - $10,000

TOTAL	$5,000 - $20,000

J. Implement Enterprise Street Centerline and Address Data Management System

1. Description

This activity involves the creation of an enterprise GIS street centerline and address data management system that supports coordinated maintenance of countywide street centerline, address range, and site address GIS databases. The application should be designed to support a workflow driven maintenance process that includes users from the GIS Division (technical coordination and quality assurance), County Planning (unincorporated), the City Building Division (Rapid City), and ESCC (non-RC communities and non-Pennington County jurisdiction). Consideration should be given to implementing this application and associated databases in the ArcGIS environment.

This application will forge a shared data maintenance process and tool environment between City and County departments and the GIS Division. Efforts must be undertaken to coordinate centerline database design and development in order to identify the data structure and content that would meet the needs of the most possible users. In addition, the application must support maintenance of the County/City enterprise site address GIS database developed under a separate GIS implementation. It should be part of an overall centerline and address data management process.

2. Timeline

This activity and establishment of a master site address database were both identified as complementary high priorities. Address maintenance system design efforts should be done in concert with the master site address database development phase.

3. Recommended Leadership

The GIS Division should assume a lead role in the implementation of this application environment with participation by ESCC, County Planning, and City Building. Application development could be completed in-house; however, technical consulting services should be considered depending upon the sophistication of the final application design and project timeline relative to internal programming staff availability.

4. Estimated Cost

COMPONENT	COST

A. System Design
   o   Staff Time
   o   Technical Consulting (optional)
	Internal SST
	$15,000

B. System Development
   o   Internal Development
   o   Technical Consulting (optional)
	Internal SST
	$0 - $20,000

C. Production Roll-out and Training	*Internal SST*
TOTAL	$15,000- $35,000

K. Non-Enterprise FY2003 GIS Database Development

1. Description

This GIS implementation activity represents creation of those non-enterprise GIS data layers identified as priorities in project team scoring. All of these layers are department specific, so coordination and support for their development should come from the responsible custodial department.

2. Timeline

All GIS data layers identified in the table below should be developed and moved into operation maintenance and use during FY2003.

3. Recommended Leadership and Estimated Cost

The following table contains a list of non-enterprise GIS data layers targeted for creation or completion. The table identifies the data layer name, its responsible custodian, and an estimated cost for completion. Estimated costs reflect either the cost to entirely outsource data layer creation or simply acquire technical assistance for data layer design assuming internal staff will handle data creation.

DATA LAYER	LEAD CUSTODIAN	COST
Zoning (parcel referenced) • Internal project staff time	City Planning, County Planning	$0 - $5,000
Flood Zones (Basemap adjusted FIRMs) • Internal project staff time	City PW, Planning	$0 - $10,000

DATA LAYER	LEAD CUSTODIAN	COST
Land Use (parcel referenced) • Internal project staff time	City Planning, County Planning	$0 - $5,000
Water Distribution Facilities • Outsourced	City PW	$0 - $35,000
TOTAL		$0 – 55,000

L. Establish Interdepartmental Data Custodianship Agreements

1. Description

The enterprise GIS will be made up of a defined set of defined GIS databases and custodians, with a central data repository that will store published views of this data on a dedicated GIS database server for enterprise access. For each GIS data layer, details need to be fleshed out with regard to completion schedules, maintenance cycles, and metadata documentation. Custodial responsibilities for data maintenance will reflect not only the needs of the custodian but also the needs of the end users.

Custodial responsibilities should be drafted by the Technical Advisory Committee, under the guidance of the Steering Committee and GIS Division, and agreed to by the departments participating in the GIS program. More technical specifications will need to be established such as schedules and timelines for updates and how data should be quality reviewed by the Division as part of enterprise data repository publication. A table of proposed custodial responsibilities was included in the Conceptual Design report.

2. Timeline

This activity is ongoing as new GIS data layers are created and departments take on responsibility for data layer custodianship. This said, all existing departments that are active in GIS data creation and maintenance should have signed agreements by Q2 FY2003.

3. Recommended Leadership

The GIS Steering Committee supported by GIS Division staff should work together to implement data custodianship agreements where appropriate.

4. Estimated Cost

COMPONENT	COST
Establish Data Custodianship Agreements	*Internal SST*
TOTAL	**Internal**

M. Implement Enterprise GIS Data Repository

1. Description

An enterprise GIS data repository was identified as an important element of a future City/County enterprise GIS system. It provides a formal, stable foundation of published GIS and non-GIS related data that can be reliably accessed across the City/County Intranet for end user purposes. This repository would initially be housed on the existing City/County GIS file server but eventually would be housed on its own dedicated Database Server.

The repository will serve a number of critical long-term purposes. First, it will contain replicated, read only views, of GIS and non-GIS data published from other City and County data systems used for data management. This replication will help segregate network traffic between data maintenance and use functions. Second, data structures to support maintenance are typically different than those used to support analytical use. Subsequently, the repository will store data in a format more suited to custom application uses. Last, many City and County non-map data systems, such as the HP3000, will not be directly accessible by GIS applications or if so, not in a way with acceptable performance. By setting up replication procedures to publish custom views of data needed as GIS map layer attributes from parent systems to the repository, needed non-map data will be readily accessible to GIS users and applications.

A design for the data repository should be developed along with replication methods and procedures to publish data from parent systems and structures in an automated, transparent fashion. Data replication routines and processes should be designed to run on a predetermined schedule that satisfies data currency requirements. The repository should be implemented in stages, incorporating the highest priority datasets first. Strategies need to be developed for the most efficient way of replacing data that has changed.

2. Timeline

This activity should be completed in the fourth quarter of FY2003.

3. Recommended Leadership

The GIS Division should assume responsibility for the design and management of an official GIS data repository with input from the Technical Advisory Committee.

4. Estimated Cost

COMPONENT	COST
A. Consulting assistance for repository design, initial technology installation, replication procedures development, first generation database setup, and technical staff training	$5,000 - $30,000
B. Acquisition of a future GIS Database Server (dependent on DB vendor, Server class)	$0 (completed in FY02)
C. Acquisition of an ArcSDE Server license	$0 (completed in FY020
TOTAL:	**$5,000 - $30,000**

N. Update/Distribute Metadata and Network Access Guide

1. Description

Metadata, or descriptive information about each data layer, should be clearly documented and distributed as part of access to GIS data, either in hardcopy, on-line format, or both. By providing accompanying documentation with GIS data, the GIS Division and user departments will help to promote spatial data usage and prevent inappropriate or misunderstood use of GIS data.

GIS metadata is currently being compiled and published by the GIS Division. This activity involves completion of this activity with metadata being made a formal, on-line part of the central GIS data repository as well as Intranet and Internet web-GIS data access applications.

Standards for metadata should be reviewed by the GIS Technical Advisory Committee, as internal policy to be implemented by each department participating in GIS data development. At a minimum, GIS metadata profiles should include the following information:

- Abstract (a brief narrative summary of the dataset)
- Purpose (a summary of the intentions with which the data set was developed)
- Spatial Domain (the geographic extent of the dataset)
- Data Source
- Original Scale
- Projection Information
- Vintage (time period for which the data set corresponds)
- Accuracy (Positional, Horizontal, Attribute, Completeness)
- Custodian/Contact person

- Maintenance and update frequency
- Attribute fields including definitions and possible values
- Derivative datasets (layers that are affected by changes to this layer)
- Known limitations and use constraints

In addition to metadata, documentation should be published with information on the network location of each data set, including how to access it. This is already being done to some degree. It should be noted that metadata creation using existing templates could be done with ESRI ArcView 8 or ArcInfo 8. Furthermore, under ArcIMS 4, there will be an ArcIMS Metadata Server Extension that will support the enterprise access of metadata created using ArcGIS 8. This ArcIMS extension is part of the estimated budget for this activity and should be made part of the enterprise web GIS data viewer application.

2. Timeline

GIS database documentation/metadata creation is an on-going effort, but integration with the formal GIS data repository and Intranet and Internet web-GIS data access applications should be completed by Q4 of 2003 or Q1 or 2004.

3. Recommended Leadership

It is recommended that GIS Division continue to take a leadership role in this area. Individual departments should also be involved, through the Technical Advisory Committee, in providing metadata for GIS data that will be published to the central GIS data repository.

4. Estimated Cost

COMPONENT	COST

A. Integration with Web-GIS applications and the GIS data repository
   o   Staff Time
   o   Consulting Assistance (optional)
	Internal SST
	$0 - $7,500

B. Acquisition of the ArcIMS Metadata Server Extension	$5,000
TOTAL:	**$5,000 - $12,500**

O. Upgrade Current ArcView 3.x Licenses to ArcGIS ArcView Technology

1. Description

This GIS implementation activity involves converting current workstation ArcView 3.2 software licenses to ArcGIS ArcView 8.x to transition end users to the ESRI

ArcGIS environment. License conversion should happen in a staged fashion based on the need to bring certain County and City GIS user staff over to the new software environment. This needs to be coupled with user training and support.

Priorities for conversion should target those staff that only use ArcView for read only GIS data display, analysis and reporting purposes as well as new staff that should only be trained in the new environment. The County and City own many (70+) standalone ArcView 3.x licenses, so a formal attempt should be made to negotiate with ESRI a cost-effective conversion to floating ArcGIS ArcView seats. This may in the end reduce the total number of ArcView seats licensed by the County/City, but will minimize license conversion costs while still providing a suitable number of floating licenses for daily staff use.

2. Timeline

ArcView license conversion should be negotiated and completed in Q4 FY2003. Transition of staff over to the new ArcView desktop environment including training begin at this time and be completed by Q4 FY2004.

3. Recommended Leadership

The GIS Division and GIS Users Group should lead this software conversion effort.

4. Estimated Cost

COMPONENT	COST

A. Negotiate ArcView license conversion deal with ESRI
    o   Staff Time
    o   Conversion Cost
	Internal SST
	$0-$25,000

B. Perform AV conversion to ArcGIS environment
    o   Training
    o   Software installation and license setup
	Internal SST

TOTAL:	**$0-$25,000**

P. Non-Enterprise GIS Applications Deployment

1. Description

This GIS implementation activity contains non-enterprise GIS applications identified by project team members as important to the overall County and City GIS Program. Since these applications are department specific, coordination and support for their development should come from the responsible user department with coordination assistance provided by the GIS Division. Most applications are only generally defined and may already be operating in some capacity using out of

the box GIS software capabilities. Their inclusion in this plan as future GIS implementation activities implies that a higher level of customization or advancement is warranted.

2. Timeline

All GIS applications identified in the table below should be developed and moved into operation during FY2003 and early FY2004.

3. Recommended Leadership and Estimated Cost

The following table contains a summary description of non-enterprise GIS applications targeted for creation/completion during FY2003. The table identifies the application name, its primary user, and an estimated cost for completion. Estimated costs reflect either the cost to entirely outsource application development or perform development using in-house project staff.

APPLICATION	USER DEPARTMENT	COST
Zoning and Land Use data Maintenance Application (using out of the box ArcInfo capabilities - some further customization may be desirable for non-tech staff) • Internal Staff Time	City Planning County Planning	*Internal SST*
Route Mapping (route mapping for bus and other transp. features – could be department specific app or Internet web app extension) • Internal Staff Time	City PW City Planning	*Internal SST*
Facility GIS Data Maintenance Application with Work Order Mgmt Integration (maintenance application for sanitary, storm, and water system GIS data) • Third Party Solution Purchase	City PW (non-enterprise investment)	$0 - $20,000
TOTAL		$0 - $20,000

Q. FY2003 GIS Training

1. Description

Regardless of the skill level of GIS users and Division staff, it is important to maintain and improve skills in a variety of areas. The following are example

technical and management skills for which training should be pursued to enhance overall GIS Program effectiveness:

- Technical
    - o Introduction and Advanced ESRI ArcGIS
    - o ESRI ArcGIS ArcView for Users
    - o ESRI Geodatabase Design and Development
    - o ESRI ArcSDE
    - o MS SQL Server RDBMS
    - o Microsoft VB/COM Programming
    - o Microsoft ASP/.NET Programming
    - o XML Programming
    - o Web Application Design and Development
- Management
    - o Project Management
    - o Communication and Conflict Resolution
    - o Technical Writing

2. Timeline

GIS Program related training to be budgeted and completed in FY2003.

3. Recommended Leadership

The GIS Division, Technical Advisory Committee, and Users Group should participate in identifying annual training targets – both outside class and internal training.

4. Estimated Cost

COMPONENT	COST
A. GIS Training	$16,000
	$16,000

R. FY2003 Technology Upgrade and Maintenance

1. Description

This GIS implementation activity represents annual GIS technology upgrades and maintenance. This includes software maintenance fees to maintain currency and support for all ESRI licensed technology. Likewise, it covers the cost to upgrade enterprise hardware and related expenses.

2. Timeline

Upgrade and maintenance costs to be incurred in FY2003.

3. Recommended Leadership

This represents annual enterprise technology upgrade and maintenance costs that are the responsibility of the GIS Division based on its annual base budget.

4. Estimated Cost

COMPONENT	COST
A. ESRI Maintenance Fees, Hardware Upgrades, Etc.	$23,000
	$23,000

FY2004 GIS IMPLEMENTATION ACTIVITIES

S. Migrate Parcel GIS Data Management to ArcGIS Technology Environment

1. Description

Maintenance of GIS parcel data to ensure currency, reliability, and availability is a critical component of the County/City enterprise GIS program. Parcel data is currently stored in an ESRI GIS coverage file format and maintained using workstation ArcInfo by the County Department of Equalization (DOE). Late in FY2002, ESRI will be releasing a new version of their ArcGIS environment (Ver. 8.3), which offers the County and City a more powerful and interoperable set of GIS data management tools. This new version, along with a number of third party solutions, will specifically provide support for parcel data maintenance. Given this, it is recommended that the County and City GIS Program migrate its current parcel coverage maintenance environment over to ArcGIS. This GIS implementation activity represents that migration project.

Successful migration of parcel data to ArcGIS is critical to the overall transition of other County and City GIS functions and skill sets to this new environment. It is recommended as part of this migration that integration of other property management workflows activities be considered. The migration may also want to include use of a third party parcel maintenance application built on top of ArcGIS that integrates other related data management workflows such as site address mapping, etc. This implementation activity received the fifth highest score under program initiative voting and thus should be considered a relatively high priority project for the GIS Program.

2. Timeline

It is recommended that the migration of the current parcel data maintenance to ArcGIS be started in Q1 FY2004 and be completed by Q4 FY2004. The migration itself should not take this long and it is assumed that GIS Division staff will explore conversion procedures and ArcGIS 8.3 tools already earlier in FY2003. Also, this migration timeline is selected to coincide with completion of parcel coverage annotation clean up, which is a separate GIS implementation activity.

3. Recommended Leadership

Leadership for this GIS activity should come from a joint team effort involving the GIS Division and County DOE.

4. Estimated Cost

COMPONENT	COST

A. ArcGIS Parcel Data Migration Planning (db design and tool selection)
   o   Staff Time
   o   Technical Consulting Assistance (optional)
	Internal SST
	$0 - $5,000

B. System Migration
   o   Data Conversion and QA/QC
   o   Parcel Maintenance Environment Setup and Customization
   o   User Training
	Internal SST
	$0 - $7,500
	$2,500

C. Acquisition of third party ArcGIS parcel maintenance application (optional)	$0 - $3,500
TOTAL	**$2,500 - $18,500**

T. Department GIS Data Browse, Query, & Mapping

1. Description

This application implementation activity is similar to the enterprise ArcIMS GIS data browse and query tool except that it is meant to provide enhanced capabilities specific to certain department needs. Typical extensions may include specific mapping templates for hardcopy map production and the ability to more custom reports. All maps should have similar layouts and information (disclaimers, source, etc.) in the form of templates.

This activity received a high score in voting, however is less well defined as an outcome than other GIS implementation initiatives. Subsequently, it is still listed as an implementation project with a proposed timeline and estimated budget that reflects its importance to staff. However, the activity needs further clarification before final budget commitment.

2. Timeline

Considering the other priority activities, this activity should run through FY2004.

3. Recommended Leadership

Since this activity is specific to department application development, it is not an enterprise GIS initiative. This said, individual departments should take the lead on the development of their own tailored GIS data browse, query, and reporting applications. However, the GIS Division should be involved to coordinate access to

and use of enterprise GIS software and hardware resources and compliance with any standards.

4. Estimated Cost

COMPONENT	COST

A. Application Design
   o Staff Time
   o Technical Consulting (optional)
	Internal SST
	$0 - $5,000

B. Application Development and Rollout
   o Staff Time
   o Technical Consulting (optional)
	Internal SST
	$0 - $40,000

TOTAL	**$0- $45,000**

U. Ortho Base Map Enhancements

1. Description

This implementation activity involves an update to the existing digital orthophoto basemap GIS layer currently in use by the County and City. Situation Assessment and Conceptual Design findings identified the need for a complete reflight to be performed at least every five years and/or spot updates every year in those areas of the County experiencing significant changes to the landscape. Primary target areas for spot updates include the urban growth fringe of Rapid City as well as other rural development areas.

It is recommended that a formal reflight of the existing orthophoto GIS layer be completed within the timeframe of this new GIS plan. A reflight provides the opportunity to pursue better image resolution and accuracy with new orthophotos since the cost to get more has come down over the past four years. If a reflight is not possible, spot updates to "changed areas" is recommended as a minimum step to keep up with changes in development. Spot orthophoto updates should match the specifications of prior acquisitions to ensure compatibility. Targeted areas for spot acquisition should be identified by GIS Division staff with assistance from user departments.

2. Timeline

This orthophoto update activity is proposed for completion in FY2004. A spring 2004 flight will be required with product delivery before the end of the third quarter that year.

3. Recommended Leadership

The GIS Division should take a leadership role in the acquisition of orthophoto update with technical guidance provided by the Technical Advisory Committee and geographic guidance provided by user departments.

4. Estimated Cost

COMPONENT	COST

A. Orthophoto Acquisition
    o   Staff Time
    o   Product Procurement (range based on spot versus complete reflight procurement)
	Internal SST
	$40,000-$300,000

TOTAL	**$40,000- $300,000**

V. Non-Enterprise FY2004 GIS Database Development

1. Description

This GIS implementation activity represents creation of those non-enterprise GIS data layers identified as priorities in project team scoring. All of these layers are department specific, so coordination and support for their development should come from the responsible custodian department.

2. Timeline

All GIS data layers identified in the table below should be developed and moved into operation maintenance and use during FY2004.

3. Recommended Leadership and Estimated Cost

The following table contains a list of non-enterprise GIS data layers targeted for creation/completion. The table identifies the data layer name, its responsible custodian, and an estimated cost for completion. Estimated costs reflect either the cost to entirely outsource data layer creation or simply acquire technical assistance for data layer design assuming internal staff will handle data creation.

DATA LAYER	LEAD CUSTODIAN	COST
Street Maintenance Routes • Internal project staff time	City PW	$0 - $3,000
Sanitary and Storm Sewers	City PW	$0 - $10,000

DATA LAYER	LEAD CUSTODIAN	COST
• Internal project staff time		
Drainage Basins/Watersheds • Internal project staff time	City PW	$0 - $2,500
Impervious Areas (derived from land use) • Internal project staff time	City PW	$0 - $1,500
TOTAL		$0 - $17,000

W. Permit System GIS Integration and GIS Data Layer Creation

1. Description

The real purpose of this GIS implementation activity is twofold: 1) to create a formal GIS data layer that can reside in the GIS data repository that depicts the location of permits, violations, and other related code enforcement actions; and 2) to integrate GIS map display and reporting capabilities into a future City and County permitting system. Both elements are really dependent upon the implementation of a modernized permitting system, which has been under consideration by the City for the past year or so. Since the timeline associated with this new permitting system implementation is unknown, no firm timeline can be assigned to this GIS activity though it was identified as a priority need. It should be noted that a GIS permit data layer may only involve a non-spatial database table published to the GIS data repository with address and/or parcel number relationships to the GIS parcel or address point layers also residing in the repository.

2. Timeline

Dependent upon migration of existing City permitting system to a new modernized system that is more interoperable with the County and City GIS technology environment. An assumed timeframe for this event recommends that this GIS implementation activity occur sometime in FY2004.

3. Recommended Leadership

Leadership for this GIS activity should come from City Public Works Department and be done in concert with the planned permitting system implementation. The GIS Division should participate in the effort to ensure proper design and setup of a permit GIS data layer in the GIS data repository for general department access.

4. Estimated Cost

COMPONENT	COST

A. Creation of a permit GIS data table/layer
   o   Staff Time
   o   Technical Consulting Assistance (optional)
	Internal SST
	$7,500

B. Integration of GIS functionality into new permitting system (depends upon selected permitting system and out of the box GIS capabilities)	$0,000 - $20,000
TOTAL	**$7,500 - $27,500**

X. Non-Enterprise GIS Applications Deployment

1. Description

This GIS implementation activity contains non-enterprise GIS applications identified by project team members as important to the overall County and City GIS Program. Since these applications are department specific, coordination and support for their development should come from the responsible user department with coordination assistance provided by the GIS Division. Most applications are only generally defined and may already be operating in some capacity using out of the box GIS capabilities. Their inclusion in this plan as future GIS implementation activities implies that a higher level of customization or advancement is warranted.

2. Timeline

All GIS applications identified in the table below should be developed and moved into operation during FY2004.

3. Recommended Leadership and Estimated Cost

The following table contains a summary description of non-enterprise GIS applications targeted for creation/completion during FY2004. The table identifies the application name, its primary user, and an estimated cost for completion. Estimated costs reflect either the cost to entirely outsource application development or perform development using in-house project staff.

APPLICATION	USER DEPARTMENT	COST
Predictive Modeling (Wildfire scenario analysis, flood forecasting, and other tailored spatial modeling functions)	County Fire, Emergency Management	$0 - $10,000

APPLICATION	USER DEPARTMENT	COST
• Third Party Custom Tools • Internal Staff Time		
Planning and Design (specific tools for forecasting and land analysis and planning support, assumes more than out of the box functionality) • Internal Staff Time	City Planning County Planning	Internal SST
Tracking Applications (GPS based GIS tracking tools – e.g. fleet tracking) • GIS integration with GPS based solutions	City PW	$TBD
TOTAL		$0 - $10,000

Y. Evaluate Integration of GIS with Document Imaging Technology

1. Description

There current are a number of document imaging solutions in use across the County and City, though most notable investments have been in the Public Safety area (Police) and the Register of Deeds Office. Integration of GIS with County and City document imaging solutions was identified as an implementation activity of medium priority in both the 1998 GIS Plan as well in the current GIS Plan update process. However, this activity in the context of GIS implementation does not yet have a clear scope of effort and outcome. Subsequently, it is listed here only as a evaluation activity. It is recommended that the Technical Advisory Committee, in concert with the GIS Division, discuss this issue in more detail to identify specific outcomes they wish to achieve.

A further evaluation of the situation, based on GeoAnalytics experience, should include:
o   Clarify the standard or standards for document imaging technology in the City and County.

o   Identify technical integration options between the ESRI suite of products in use at the County and City and standard imaging technology solution(s).

o   Identify specific integration objectives for particular GIS business applications that require real-time access to digital documents. An example might be to integrate the proposed enterprise Intranet web-GIS browse and query application with the ROD document imaging solution to retrieve property related documents based on location.

In summary, achieving GIS integration with document imaging technology in use at the County and City will provide staff the ability to retrieve and display scanned documents, based on the location, address, or other geographic information.

2. Timeline

The recommended evaluation effort should take place in Q1 FY2004.

3. Recommended Leadership

The GIS Division and GIS Technical Advisory Committee working in concert with the City Computer Center and County Information Technology Services department should take the lead on determining integration between existing GIS and Document Imaging system investments.

4. Estimated Cost

COMPONENT	COST

A. Development of system integration strategy
    o   Staff Time
    o   Consulting Assistance (optional)
	Internal SST
	$5,000

TOTAL	**$5,000**

Z. Plan for Migration of Current Legacy Data Systems to a RDBMS Standard Server Environment

1. Description

This activity would involve the long-term migration of key land record data systems (e.g. HP3000 platform or other environments) to a more standards-based RDBMS environment. This would provide for easier integration with core GIS technology, future GIS business applications, as well as publishing of data to the central GIS data repository. This migration will also allow for more interoperability with other City and County business data systems. Since Hewlett Packard has plans to phase out the current HP3000 platform will by end of 2005, migration of business applications on these platforms will need to occur in some fashion.

As it relates to enterprise GIS implementation, this activity simply involves identifying preferred destination platforms and technologies for existing legacy business systems that will assist with easier GIS integration. This should be done by the GIS Division and Technical Advisory Committee working in conjunction with the City Computer Center and County Information Technology Services department. It should be looked at prior to the rush to migrate any legacy systems so options can be properly discussed. Target migration platforms should support

interoperability in the form of open RDBMS access and easy data replication as well as formal Application Programming Interface (API) tools.

2. Timeline

This migration evaluation activity is recommended to take place sometime in FY2004.

3. Recommended Leadership

The GIS Division and Technical Advisory Committee working in conjunction with the City Computer Center and County Information Technology Services department should take the lead on this evaluation project.

4. Estimated Cost

COMPONENT	COST

A. Evaluation of GIS interoperability needs and legacy platform migration options
   o   Staff Time
   o   Consulting Assistance (optional)
	Internal SST
	$0 - $5,000

B. Development of standards for use in future technology procurements and legacy migration projects	*Internal SST*
TOTAL:	**$0 - $5,000**

AA. FY2004 GIS Training

1. Description

Regardless of the skill level of GIS users and Division staff, it is important to maintain and improve skills in a variety of areas. The following are example technical and management skills for which training should be pursued to enhance overall GIS Program effectiveness:

- Technical
  - Introduction and Advanced ESRI ArcGIS
  - ESRI ArcGIS ArcView for Users
  - ESRI Geodatabase Design and Development
  - ESRI ArcSDE
  - MS SQL Server RDBMS
  - Microsoft VB/COM Programming
  - Microsoft ASP/.NET Programming
  - XML Programming
  - Web Application Design and Development
- Management

- o Project Management
- o Communication and Conflict Resolution
- o Technical Writing

2. Timeline

GIS Program related training should be budgeted and completed every year.

3. Recommended Leadership

The GIS Division, Technical Advisory Committee, and Users Group should participate in identifying annual training targets – both outside class and internal training.

4. Estimated Cost

COMPONENT	COST
A. GIS Training	$20,000
	$20,000

BB. Annual Technology Upgrade and Maintenance

1. Description

This GIS implementation activity represents annual GIS technology upgrades and maintenance. This includes software maintenance fees to maintain currency and support for all ESRI licensed technology. Likewise, it covers the cost to upgrade enterprise hardware and related expenses.

2. Timeline

Upgrade and maintenance costs that need to be incurred in FY2004.

3. Recommended Leadership

This represents annual enterprise technology upgrade and maintenance costs that are the responsibility of the GIS Division based on its annual base budget.

4. Estimated Cost

COMPONENT	COST
A. ESRI Maintenance Fees, Hardware Upgrades, Etc.	$25,000
	$25,000

FY2005 GIS IMPLEMENTATION ACTIVITIES

CC. Non-Enterprise FY2005 GIS Database Development

1. Description

This GIS implementation activity represents creation of those GIS data layers identified as highest priorities in project team scoring. Many of these layers are department specific, so coordination and support for their development should come from the responsible custodian department.

2. Timeline

All GIS data layers identified in the table below should be developed and moved into operation maintenance and use during FY2005.

3. Recommended Leadership and Estimated Cost

The following table contains a summary description of non-enterprise GIS data layers targeted for creation/completion during FY2005. The table identifies the data layer name, its responsible custodian, and an estimated cost for completion. Estimated costs reflect either the cost to entirely outsource data layer creation or simply acquire technical assistance for data layer design assuming internal staff will handle data creation.

DATA LAYER	LEAD CUSTODIAN	COST
Accident Locations • Internal project staff time	City Police, County Sheriff	Internal SST
Traffic Counts (Street Centerline referenced)	City PW	Internal SST
Septic Tanks (address and parcel referenced)	City PW, Planning	$0 - $5,000
Street Signage	City PW	$0 - $7,000
TOTAL		$0 - $13,000

DD. Non-Enterprise GIS Applications Deployment

1. Description

This GIS implementation activity contains non-enterprise GIS applications identified by project team members as important to the overall County and City GIS Program. Since these applications are department specific, coordination and support for their development should come from the responsible user department with coordination assistance provided by the GIS Division. Most applications are only generally defined and may already be operating in some capacity using out of the box GIS capabilities. Their inclusion in this plan as future GIS implementation activities implies that a higher level of customization or advancement is warranted.

2. Timeline

All GIS applications identified in the table below should be developed and moved into operation during FY2005.

3. Recommended Leadership and Estimated Cost

The following table contains a summary description of non-enterprise GIS applications targeted for creation/completion during FY2005. The table identifies the application name, its primary user, and an estimated cost for completion. Estimated costs reflect either the cost to entirely outsource application development or perform development using in-house project staff.

APPLICATION	USER DEPARTMENT	COST
Traffic Forecasting (GIS-based traffic forecasting tools) • Third Party Custom Tools • Internal Staff Time	MPO	TBD
Incident/Crime/Accident Analysis (third party GIS tools for crime analysis to support enforcement planning and personnel allocation) • Third Party Custom Tools • Internal Staff Time	City Police County Sheriff	$2,500-$5,000
Resource Assessment (DOE tools to support soils reporting and property assessment) • Internal Staff Time	City PW	Internal SST
TOTAL		**$2,500-$5,000**

EE. Integrate Computer-Aided Mass Appraisal System with GIS

1. Description

The County seeks some level of data interoperability between its future CAMA system and GIS. The desired interoperability will provide staff the ability to retrieve and display GIS views of property based on tax records. Interoperability may be approached from two directions: A GIS viewer can be integrated into the CAMA solution, so that CAMA users may access the GIS views without leaving the CAMA session; and a department specific web-GIS application can be built to support access to and display of CAMA records.

2. Timeline

This implementation activity is recommended for 2005.

3. Recommended Leadership

The Department of Equalization (DOE) will have the primary responsibility for defining requirements for this tool. In addition, the GIS Division would work with DOE to determine the best solution for this system, and to select a consultant for development of the integration tool.

4. Estimated Cost

ACTIVITY	COST
A. GIS Integration Development (depends upon out of the box GIS capabilities that can be afforded by the future DOE CAMA solution)	$10,000 - $30,000
TOTAL	**$10,000 – $30,000**

FF. FY2005 GIS Training

1. Description

Regardless of the skill level of GIS users and Division staff, it is important to maintain and improve skills in a variety of areas. The following are example technical and management skills for which training should be pursued to enhance overall GIS Program effectiveness:

- Technical
    - Introduction and Advanced ESRI ArcGIS
    - ESRI ArcGIS ArcView for Users

- o ESRI Geodatabase Design and Development
- o ESRI ArcSDE
- o MS SQL Server RDBMS
- o Microsoft VB/COM Programming
- o Microsoft ASP/.NET Programming
- o XML Programming
- o Web Application Design and Development
- • Management
  - o Project Management
  - o Communication and Conflict Resolution
  - o Technical Writing

2. Timeline

GIS Program related training should be budgeted and completed every year.

3. Recommended Leadership

The GIS Division, Technical Advisory Committee, and Users Group should participate in identifying annual training targets – both outside class and internal training.

4. Estimated Cost

COMPONENT	COST
A. FY2005 GIS Training	$20,000
	$20,000

GG. Annual Technology Upgrade and Maintenance

1. Description

This GIS implementation activity represents annual GIS technology upgrades and maintenance. This includes software maintenance fees to maintain currency and support for all ESRI licensed technology. Likewise, it covers the cost to upgrade enterprise hardware and related expenses.

2. Timeline

Upgrade and maintenance costs that need to be incurred in FY2005.

3. Recommended Leadership

This represents annual enterprise technology upgrade and maintenance costs that are the responsibility of the GIS Division based on its annual base budget.

4. Estimated Cost

COMPONENT	COST
A. ESRI Maintenance Fees, Hardware Upgrades, Etc.	$28,000
	$28,000

SUMMARY GIS IMPLEMENTATION COSTS AND TIMELINE

The table below presents a summary cost estimate for all GIS implementation activities outlined in this Plan.

Table 1 - GIS Implementation Activity Costs, Years 2002-2005

ACTIVITY	YEAR	COST RANGE	
		LOW	HIGH
FY2002 Implementation Activities:		LOW	HIGH
2002			
A. Modify GIS Program Governance	2002/03	Internal	Internal
B. Modify GIS Program Management	2002/03	$0	$15,000
C. 911 Dispatch Map Application	2002	$50,000	$57,000
D. Deploy Enterprise Web-based (ArcIMS) GIS Data Viewer Application	2002/03	$20,000	$25,000
E. Deploy Web-based Public GIS Data Access Application	2002/03	$10,000	$32,500
F. FY2002 GIS Training	2002	$13,000	$13,000
G. Annual Technology Upgrade and Maintenance	2002	$20,000	$20,000
FY2002 TOTAL:		**$113,000**	**$162,500**
FY2003 Implementation Activities:		LOW	HIGH
H. Parcel GIS Layer Clean-up/Completion	2003	$16,000	$21,000
I. Master Property Address Database Creation	2003	$5,000	$20,000
J. Implement Enterprise Street Centerline and Address Data Management System	2003	$15,000	$35,000
K. Non-Enterprise GIS Database Development	2003	$0	$55,000
L. Establish Interdepartmental Data Custodianship Agreements	2003	Internal	Internal
M. Implement Enterprise GIS Data Repository	2003	$5,000	$30,000
N. Update/Distribute Metadata and Network Access Guide	2003	$5,000	$12,500
O. Upgrade Current ArcView 3.x Licenses to ArcGIS ArcView Technology	2003/04	$0	$25,000
P. Non-Enterprise GIS Applications Development	2003/04	$0	$20,000
Q. FY2003 GIS Training	2003	$13,000	$13,000
R. Annual Technology Upgrade and Maintenance	2003	$23,000	$23,000
FY2003 TOTAL:		**$ 82,000**	**$212,500**
FY2004 Implementation Activities:		LOW	HIGH
S. Migrate Parcel GIS Data Management to ArcGIS Technology Environment	2004	$2,500	$18,500
T. Department GIS Data Browse, Query, & Mapping	2004	$0	$45,000

ACTIVITY	YEAR	COST RANGE	
U. Ortho Base Map Enhancements	2004	$40,000	$300,000
V. Non-Enterprise FY2004 GIS Database Development	2004	$0	$17,000
W. Permit System GIS Integration and GIS Data Layer Creation	2004	$7,500	$27,500
X. Non-Enterprise GIS Applications Deployment	2004	$0	$10,000
Y. Evaluate Integration of GIS with Document Imaging Technology	2004	$5,000	$5,000
Z. Plan for Migration of Current Legacy Data Systems to a RDBMS Standard Server Environment	2004	$0	$5,000
AA. FY2004 GIS Training	2004	$20,000	$20,000
BB. Annual Technology Upgrade and Maintenance	2004	$25,000	$25,000
FY2004 TOTAL:		**$45,000**	**$409,500**
FY2005 Implementation Activities:		LOW	HIGH
CC. Non-Enterprise FY2005 GIS Database Development	2005	$0	$20,000
DD. Non-Enterprise GIS Applications Deployment	2005	$2,500+	$5,000+
EE. Integrate Computer-Aided Mass Appraisal System with GIS	2005	$10,000	$30,000
FF. FY2005 GIS Training	2005	$20,000	$20,000
GG. Annual Technology Upgrade and Maintenance	2005	$28,000	$28,000
FY2005 TOTAL:		**$60,500**	**$103,000**
TOTAL 2002-2005:		**$300,500**	**$887,500**

Table 2: General Implementation Timeline

The table below presents a summary timeline for all GIS implementation activities outlined in this Plan.

Implementation Activity	2002				2003				2004				2005				2006			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
A. Modify GIS Program Governance				█	█															
B. Modify GIS Program Management				█	█	█														
C. 911 Dispatch Map Application				█	█	█	█													
D. Deploy Enterprise Web-based				█	█															
E. Deploy Web-based Public GIS Data				█	█															
F. FY2002 GIS Training Agreement	█	█	█	█																
G. Annual Technology Upgrade and	█	█	█	█																
H. Parcel GIS Layer Clean-		█	█	█	█	█	█													
I. Master Property Address Database					█	█	█	█												
J. Implement Enterprise Street						█	█	█												
K. Non-Enterprise GIS Database					█	█	█	█												
L. Establish Interdepartmental Data						█														
M. Implement Enterprise GIS Data									█	█										
N. Update/Distribute Metadata and									█	█										
O. Upgrade Current ArcView 3.x									█											
P. Non-Enterprise GIS Applications							█	█	█	█										
Q. FY2003 GIS Training					█	█	█	█												
R. Annual Technology Upgrade and					█	█	█	█												
S. Migrate Parcel GIS Data									█	█										
T. Department GIS Data Browse,									█	█	█	█								
U. Ortho Base Map Enhancements									█	█	█	█								
V. Non-Enterprise FY2004 GIS									█	█	█	█								
W. Permit System GIS Integration and										█	█									
X. Non-Enterprise GIS Applications									█	█	█	█								
Y. Evaluate Document GIS Integration									█											
Z. Plan for Migration of Legacy										█										

AA. FY2004 GIS Training								██	██	██	██								
BB. Annual Technology Upgrade and								██	██	██	██								
CC. Non-Enterprise FY2005 GIS												██	██	██	██				
DD. Non-Enterprise GIS Applications												██	██	██	██				
EE. Integrate Computer-Aided Mass													██	██					
FF. FY2005 GIS Training												██	██	██	██				
GG. Annual Technology Upgrade and												██	██	██	██				

Conclusion

This updated Plan for the Pennington County and the City of Rapid City GIS Program represents the next major step towards the implementation of an enterprise GIS – one that is interoperable with other IT systems and one that serves all departments' business needs. The first GIS plan developed 1998, helped launch the County/City GIS program. Since this time, it has evolved beyond a startup to a functioning operational program. In fact, many original implementation goals were achieved in less time than scheduled.

This updated Plan presents a broader vision for the next generation GIS with many organizational as well as technical challenges. Increased demands for GIS related services by a growing number of departments and staff as well as the public requires further formalization of information creation, sharing, and access policies. Moreover, more effective management of staff time and internal projects will become paramount. This will require development of additional technical and management skills, which emphasizes the need for on-going staff training.

Finally, the Conceptual Design report and this updated GIS Plan place significant emphasis on the need to pursue further technical integration between GIS systems and County and City non-GIS business systems. A number of implementation activities support this direction. Likewise, there is a focus in this Plan on the development and rollout of applications that need to serve enterprise as well department specific business needs. Some GIS tools have already been built and deployed by GIS Division staff as well as by certain departments. The future will see significantly more deployment of applications that are tailored to serve specific business functions and that require access to both GIS and non-GIS data systems.

In summary, this Plan provides a solid framework for advancing County and City GIS implementation over the next few years. As with all plans, it should be revisited annually to make priority and budget adjustments based on changing circumstances.

APPENDIX 1: IMPLEMENTATION PLAN VOTING RESULTS

A voting worksheet was distributed to project team members during implementation planning to measure the team's collective perception of priorities associated with proposed implementation activities. The worksheet contained three categories of activities including Key Program Initiatives, Data, and Application actions. Team members were asked to identify the relative importance of each activity by assigning points to each activity with the total for each category not to exceed 100 points.

The following is a set of summary tables of scoring results. It depicts total points assigned to each activity by implementation activity category as well as the number of staff that assigned points to each activity. A sample of the worksheet that was distributed to project team members to be used for scoring is included after the scoring summary tables.

Appendix Table 1: Summary Scores and Rankings for Key GIS Program Activities

Activity#	Initiative	#Points	#Voters	RANKING
P1	Realign the Current GIS Division	148.3	5	1
P8	Design and Deploy an Enterprise GIS/LIS Street Centerline an	88.3	6	2
P3	Establish GIS/LIS User Group	75.3	7	3
P4	Formulate and Implement Revised GIS/LIS Service Delivery Model	72	7	4
P15	Migrate Current GIS/LIS Parcel Data Management to ArcGIS Technology Environment	69	5	5
P2	Establish Formal Technical Advisory Group to the GIS/LIS Task Force	63	7	6
P5	Establish Annual GIS/LIS Business Planning Process and Implement Formal Work Order Management System	56	6	7
P17	Migrate Current Legacy Data Systems to a an RDBMS standard server environment	50	6	8
P7	Establish Interdepartmental Data Custodianship Agreements	46	7	9
P16	Upgrade Current ArcView 3.x Software to ArcGIS ArcView Technology	44	4	10
P10	GIS Training and Education	39	5	11
P6	Design and Deploy Enterprise GIS/LIS Data Repository	39	6	13
P9	Develop and Publish Formal Data Standards / Metadata Guid	32	6	13
P11	Complete Upgrade of City/County Data Communications Network	24	4	14
P13	Acquire Department GIS/LIS Staff to Further Department GIS Capabilities	16	2	15
P12	Acquire Additional GIS Resource Center GIS/LIS Staff to Further Center Capabilities and Services	15	3	16
P19	Integrate CAMA System with GIS	15	1	16
P18	Update/Distribute Metadata and Network Access Guide	10	1	17
P14	Adopt Enterprise Document Imaging Technology Standard and Vendor Contract	8	2	18
P20	Other	0		

Appendix Table 2: Summary Scores and Rankings for Proposed GIS Data Activities

Activity#	Initiative	#Points	#Voters	RANKING
D8	Parcels	240	9	1
D4	Master Property Address Database	215	8	2
D9	Orthophotography Base Map Enhancements	145	8	3
D17	Permit Locations	48	5	4
D6	Flood Zones	33	5	5
D14	Elevation/Topography	28	5	6
D1	Zoning	25	3	7
D10	Street Maintenance Routes	25	3	7
D5	Water Distribution Facilities	20	4	8
D2	Land Use	20	3	8
D3	Census Geography	20	3	8
D7	Sanitary and Storm Sewer Facilities	18	4	9
D15	Drainage Basins/Watersheds	18	4	9
D16	Impervious Areas	16	4	10
D12	Traffic Accidents	12	3	11
D13	Traffic Counts	11	3	12
D11	Septic Tanks	11	3	12
D18	street signs, code violations,zoning mpa, billboard signs,forest service roads, veg types Other			

Appendix Table 3: Summary Scores and Rankings for Proposed GIS Applications

Activity#	Initiative	#Points	#Voters	RANKING
A1	*Internal* ArcIMS Browse & Query Application	227	8	1
A2	*Public*-Access ArcIMS Application	136	8	2
A3	Department GIS Data Browse, Query, and Mapping	130	8	3
A12	911 Dispatch Map Application	96	5	4
A8	Road Centerline Maintenance Application	81	6	5
A4	Document Image Viewing Application (general and department specific)	47	5	6
A10	Zoning and Land Use Maintenance Application	26	4	7
A18	Predictive Modeling	21	4	8
A6	Bus / Snowplow / etc. Route Mapper	17	4	9
A20	Area and Temporal Comparisons	16	3	10
A16	Planning and Design	16	3	10
A13	Other Tracking Applications	16	4	10
A11	County and City Lands Applications	16	3	10
A9	Facility and Work Order Management Application	11	3	11
A19	Dynamic Location Tracking	11	2	11
A17	Traffic Forecasting Model	11	3	11
A15	Incident / Crime Analysis	11	3	11
A7	Public Report and Request Applications	6	2	12
A14	Accident Analysis	6	3	12
A21	Resource Assessment	5	2	13
A5	Mobile GIS Data Access Application	4	2	14
A22	Other			