State of Mississippi

Geospatial Strategic Plan

December 2010

Fairview industries

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Mississippi Geospatial Strategic Plan

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Executive Summary

The 2010 Mississippi Geospatial Strategic Plan and the associated reports and business plans are sponsored and funded by the Mississippi Coordinating Council for Remote Sensing and GIS (Council) and is an update to Mississippi's 2003 GIS Strategic Plan. All of the documents reflect the findings from a series of interviews and meetings that were conducted between January and November of 2010. Over one hundred people from state, regional, local governments and the private sector were included in the interview process. These reports adhere to the National States Geographic Information Council's (NSGIC) recommended format for state level GIS Strategic Plans and GIS Business Plans, which has become a de facto standard for the nation.

The reports are separated into four documents based on the audience for which they are targeted and the different uses for which they are designed.

Geospatial Plan describes the current status of GIS activities in Mississippi, the strengths, weakness and opportunities of the current Program, identifies strategic actions and summarizes the goals and objectives of each of the framework themes as well as an estimated budget requirement to achieve those ends.

Funding Options *is* a summary of the potential funding sources that were explored and reviewed with the Council's Policy Advisory Committee. It includes findings from other states as well as options developed from current fees and funding streams that could benefit from GIS technology in Mississippi. Identifying sustainable funding sources to support ongoing activities will be critical to Mississippi's long-term GIS success.

Benefits of GIS are short, stand-alone vignettes that provide examples of how a strong GIS infrastructure can reduce cost, help government operate more efficiently, and support better decision-making.

Implementation Plans consist of eleven detailed strategies or business plans that provide a stepwise approach for the development and maintenance of the state's framework data as well as the supporting infrastructure of technology and education that is needed to create a sustainable system. These are draft documents that should be reviewed and finalized by the stakeholder community.

Background

The Mississippi Geospatial Strategic Plan addresses two areas; the coordination and management of the collection and ongoing update of spatial data, and the framework data that provides the foundation or framework to support applications and business operations across the state.

The framework themes are the data for a modern digital Mississippi base map. In the past many agencies and businesses relied on the paper base maps produced by the US Geological Survey (USGS). The 7-½ minute quadrangle map (the quad map) was a commonly used stable base map for decades. With the proliferation of digital data, the ever-widening use of digital maps in consumer products and by agencies and businesses, Mississippi undertook the development of the Mississippi Digital Earth Model (MDEM) to provide a sustainable program for the development and ongoing updates of the framework data to support a modern base map. The data sets are organized into eight data framework themes, are supported by the statewide GIS community, provide statewide coverage and are freely accessible. They include:

- Boundaries (Geopolitical)
- Cadastral (Parcels and Public Land Survey System (PLSS))
- Elevation (onshore and bathymetry)
- Gazetteer (named places – Optional)
- Geodetic Control
- Hydrography
- Orthoimagery
- Transportation

To fully support this effort the Council will also need to focus additional effort on three management themes:

- Coordination
- Education
- Technology and Infrastructure

Strategic Actions

The strategic plan identifies prioritized actions to sustain the Mississippi GIS program and to build out critical data sets. Implementation plans were developed for the framework data and three management themes to address the stated programmatic goals of the Council as written in legislation. Recognizing the financial challenges, the implementation plans provide a stepwise approach that first address the foundational component of each area, building what can be accomplished at minimal cost and then progressing to full implementation.

The nine strategic actions that follow identify what the Council can do to provide institutional support to realize the successful completion of the implementation plans.

Coordination and Management: Mississippi has many of the components for a strong statewide geospatial infrastructure that when harnessed could move the state ahead rapidly. The Council has the legislative authority and responsibility for coordinating GIS activities in the state and there is broad based participation on the Council at the state agency level. At the regional and local level the use of GIS technology and or digital mapping technology is expanding. For those communities that are technically challenged the private sector is providing a de facto infrastructure, making full use of technology to support local government mapping through contracted services. All of these sources provide opportunities for the Council to build the state's GIS infrastructure.

- **The position for a State GIS Coordinator must be created and funded.** The Council relies heavily on volunteer efforts from state agencies and duties as assigned from other projects. Without a fulltime coordinator it will be difficult, if not impossible, to identify, develop and implement strategies to build consensus on statewide cooperative projects and to nurture and develop a statewide constituency for the Council's programs and projects.

- **The Council should expand participation by local governments, federal agencies and GIS consumers.** This could be accomplished in three ways.
  - Fully utilize technology for conferencing and meetings to encourage statewide participation in the Council technical workgroups as well as Council meetings.
  - The Council's Technical User Group should be re-activated with technical workgroups to address each of the data themes involving stakeholders and subject area experts from the GIS user community.
  - Council membership should be increased to include broader representation of local and regional governments as well as including federal agency participation.

- **The Council should establish a Staff Advisory Committee to support the Council members.** The Staff Advisory Committee would consist of one representative for each Council member appointed by that Council member. The purpose of a Staff Advisory Committee is to review technical issues, standards and recommendations coming from the workgroups and to brief their Council members prior to the meetings on these technical issues allowing the Council to focus on policy, coordination and funding issues. The GIS Coordinator should chair the Staff Advisory Committee.

- **The Council should add two committees to address Technology and Infrastructure and Education an Outreach.** These two non-data themes need to have a forum where issues and strategies that bear on these topics can be discussed. Membership should, as in the technical workgroups, consist of stakeholders and subject area experts. The Department of Information

Technology Services should chair the Technology and Infrastructure Committee and the Institutes of Higher Learning should designate a chair for the Education and Outreach Committee.

Technology and infrastructure: Support for the statewide Mississippi GIS Program is well developed. The current portal provides data viewing and distribution functions and is undergoing some updates and enhancements. These changes will expand the capability of the portal and make it easier to keep information current. Consolidating geospatial access from all agencies under a single point of entry will increase access efficiency and increase the visibility of the Council and its partner's efforts.

- **Access to Mississippi's geospatial data and supporting applications needs to be brought under the umbrella of a single portal.** Providing easy access to data and applications at a single recognizable portal is essential for he future success of the program.

- **Support for the underlying technology and data publication needs to be embedded in sustainable funding.** The 2003 strategic plan is focused heavily on technology and infrastructure development but the funding, which has primarily come from federal grants, has been focused on data development. Going forward it will be necessary to adequately fund the back office and technology support for the data initiatives.

Education and Outreach: The program developed by Mississippi State University (MSU) Extension Service is of exceptionally quality. Local governments frequently cited this program as a tangible and highly valued benefit coming from the state. But many people from local governments were unaware of the Council's activities. The Council should continue to support this education effort while expanding the outreach to develop a constituency for the Council's projects and programs.

- **Education and Outreach should be directly supported by Council activities and funding and expanded to include an Annual State GIS Conference.** The Council should continue to support the education effort led by the MSU Extension Service. This is highly valued by the user community and has done much to promote the use of GIS technology in the state. The Council should broaden its strategy to make the GIS community aware of and encourage participation in the Council's programmatic goals. Most successful state GIS programs are associated with regular statewide GIS conferences that bring GIS producers and consumers from all communities and perspectives to a common meeting. The conference environment encourages participation in educational sessions and makes it possible for the GIS community to share experiences and build cross discipline personal networks.

Data Theme Development: Data development has progressed at a remarkable pace in Mississippi since the inception of the Council. Federal funding has been leveraged to create statewide orthoimagery and elevation data. The Floodplain Mapping Program provides base information along with the flood risk area mapping. Additionally engineering level detailed information (Mississippi Digital Earth Model, MDEM) has been produced in five coastal area counties. State agencies and local governments have developed many data sets for other data themes that when combined provide useful statewide GIS coverage.

- **The Council should direct its technical work groups to develop detailed strategies for assembling the best available data for all of the framework data themes for inclusion under the statewide GIS Portal umbrella.** The efforts required to assemble the best available information have been detailed in the implementation plans developed as a part of the current strategic planning effort. This compilation of best available data can be viewed as a path towards the MDEM standard. Having the best available information assembled and updated will provide an excellent base for Mississippi's statewide GIS and a foundation for building applications for decision support.

- **The GIS Inventory should be maintained and used as a tool to support coordination.** An inventory of GIS data assets is essential for planning and coordination. A grant was acquired from the Federal Geographic Data Committee (FGDC) to populate the NSGIC GIS Inventory including both state and local governments data. Keeping this inventory current with both available and future data acquisition will help identify opportunities for collaboration and coordination, the identification of best available data, and existing assets that meet the MDEM standard.

Stakeholder Data Priorities

From the interviews the following data themes were identified as the priorities for the user community. These are the top priority data themes essential for the Mississippi GIS Program.

- Updated statewide orthoimagery
- Compilation and access to all available parcel data
- Development of a the state Gazetteer (named places)
- Consolidation of a commonly agreed to Boundaries (including municipalities and school districts)
- Standardization and compilation of all available transportation and address data sets

Conclusion

Mississippi faces many challenges in building out its spatial data infrastructure including funding, staffing, coordination and engagement and participation of local governments.

But the problems are not as daunting as they may first appear. These challenges are more of a matter of putting the pieces of the puzzle together than they are of finding and creating missing pieces. A review and listing of the state's assets encourages this view of the status of geospatial technology in the state: the Information Technology Services has put together a robust technology infrastructure; the Council has the appropriate authority to coordinate GIS activities in the state and has successfully initiated a number of projects to build MDEM quality data utilizing available federal funds; the state agencies are engaged in the Council's activities; the Institute's of Higher Learning (IHL) are fully engaged, Delta State University, MSU's Geosystems Research Institute (GRI) and the Mississippi Automated Resource Information System (MARIS) have strong working relationships with state and local governments providing technical assistance and support for all types geospatial projects; the ten Planning and Development Districts provide a management infrastructure throughout the state for local government and many of these districts have GIS capabilities to provide technical assistance to local governments; the private sector provides a de facto geospatial infrastructure for many of the local governments; and local and regional governments have established their own GIS user groups, the Mississippi Association for Spatial Technologies (MAST) whose mission is to promote, educate, and provide assistance in professional development for the use and application of spatial technologies in the state of Mississippi; and much more.

The Strategic Plan, the Strategic Actions and the Programmatic Goals with their associated Implementation Plans can be utilized to take advantage of all of Mississippi's geospatial assets, which are many. The investment needed is not overwhelming. By bringing the pieces of the puzzle together to focus on the issues there is much that can be done with available resources to build the case to acquire the needed funding to fully build out Mississippi's geospatial infrastructure.

Introduction

The 2010 Mississippi Geospatial Strategic Plan and the associated reports and business plans is sponsored and funded by the Mississippi Coordinating Council for Remote Sensing and GIS (Council) and is an update to Mississippi's 2003 GIS Strategic Plan. The strategic plan and associated documents reflect the findings from a series of interviews and meetings that were conducted between January and November of 2010. Over one hundred people from state, regional, local governments and the private sector were included in these interviews.

The Mississippi GIS Stakeholders come from local and regional governments, state and federal agencies, Indian tribes and the private sector. They represent a broad cross section of disciplines including land surveying and geodesy, environmental management, law enforcement, homeland security, emergency response, economic development, lease sales and population analysis to name a few. They all expressed a degree of high interest in the enhancement of Mississippi's GIS statewide program. On the consuming side of the stakeholder community there is also a high degree of interest in obtaining statewide spatial data that is updated regularly and easily available. The common thread among the Mississippi stakeholder community is the desire for leadership and coordination.

The Council has the legislative authority and responsibility for coordinating GIS activities in the state. The membership of the Council is broad including representation from state, regional, and local governments that are the principal stakeholders of the framework data layers. The members all have a strong interest in working together to improve products and to reduce the cost of their operations. Some of the Planning and Development Districts and special districts (Yazoo Levee Board) have a sufficient level of GIS expertise to provide technical services to their member counties. There are private sector companies that have a strong working relationship with the counties and are working to improve the GIS capabilities of local governments. The universities are providing strong support to local governments in education; MSU provides an extremely good education and outreach effort through the Geosystems Research Institute. Delta State University and MARIS provide technical services and data resources to state and local governments.

Mississippi's statewide GIS Program is poised for success. The significant efforts in data collection, infrastructure development and data compilation need to be leveraged. Adding a GIS Coordinator in Mississippi would be one of the most effective actions for accomplishing those ends. A fulltime GIS Coordinator would have the ability to build partnerships among the stakeholders to identify opportunities and leverage existing resources. The job at hand is not only working with the stakeholders to build the requirements but to facilitate implementation through outreach and education to state

and local governments. Facilitating acquisition is another role the Coordinator can play. Local governments, who are the source of much framework data including parcels, orthoimagery, jurisdictional boundaries, street centerlines and more, have reported a limited capability of initiating and managing coordination projects for all but the simplest arrangements even thought there can be significant cost savings for entering into partnerships. Multi-county acquisitions of orthoimagery have demonstrated a 20% to 30% cost savings over individual acquisitions. A coordinator working with the Planning and Development Districts and other regional governments would be able to facilitate broader regional projects, such as orthoimagery, centerline files, and improvements to the control network.

Identifying sustainable funding sources to support ongoing activities will be critical to Mississippi's long-term GIS success. There are two documents that were developed to assist the Council's efforts to acquire sustainable funding. The *Funding Options* paper provides a list of a number of funding sources. The suggested strategy is to build a multipronged approach to obtain sustainable funding, tapping potential resources from several sources that will benefit from the availability of the data and the technology and to expand the participation in the state's GIS program to build consensus and buy in across the state. The *GIS Benefits* for Local Governments describes the value that can be realized from the end products of a statewide GIS program. This document may be helpful in building support from supporting funding programs or providers.

Structure of the Strategic Plan

The body of the document is divided into four sections:

1. Strategic Planning Methodology describes the methodology and approach to the strategic planning process.

2. Current Situation provides a review of the current situation as documented in the interviews and through reviews of data collection programs, the GIS Inventory and websites.

3. Vision & Goals lays out the Vision and Goals of the Mississippi GIS Program including a brief description of the implementation plans to achieve programmatic goals.

4. Budget Overview summarizes the budget requirements to achieve the goals.

1. Strategic Planning Methodology

1.1 Project Team

The execution and supervision of this project was conducted by the following team:

Project Oversight: The Council's Policy Advisory Committee (PAC) formed a steering committee consisting of the following persons:

Joel Yelverton, Policy Advisory Committee (PAC) Chair
Keith Harkins, representing the Department of Environmental Quality (DEQ)
Craig Ogeron, representing Information Technology Services (ITS)
Charles Williams, representative of the local government assessors
Warren McKinnon, representing the Department of Revenue (DOR)
Representative Scott Delano, representing the Mississippi Legislature
Melinda McGrath, representing the Department of Transportation (DOT)
Wes Burger, representing the Geosystems Resources Institute (GRI)

Project Management: Direct project management was provided by Keith Harkins, Director of Administrative Services, Mississippi Department of Environmental Quality.

Project Consultant: Following a competitive procurement, Mississippi selected Fairview Industries from South Carolina to update the Council's 2003 Strategic Plan. Nancy von Meyer and David Stage were the principals for this project.

1.2 Project Activities

The project was initiated in the January 2010 and the following activities were conducted over the next ten months.

1. **Kick Off Meeting.**
   January 2010

2. **Stakeholder Presentations.** There were five stakeholder meetings held as a part of Association meetings during the spring of 2010.

Table 1 Number of persons in outreach effort – excluding final review Webinars

County	18
Federal Agency	8
Local Government	21
Non-Profit	4
Private	15
Regional Agency	24
State Agency	19
University (IHL)	9
	118

3. **Stakeholder Interviews.** From February through September state agency personnel and persons identified during the stakeholder meetings were interviewed regarding the business requirements and the use of GIS and digital framework data. A complete list of contacts is found in Appendix A.

4. **Report Authoring.** The Geospatial Strategic Plan was drafted following the user interviews and in consultation with the Council Policy Advisory Committee.

5. **Strategic Plan Presentations**. In addition to Council presentations four webinars were given on October 21, 27 & 28 2010 and November 24, 2010.

2. Current Situation

2.1 Mississippi GIS Stakeholder Community

The Mississippi GIS Stakeholders come from local and regional governments, state and federal agencies, Indian tribes and the private sector. They represent a broad cross section of disciplines including land surveying and geodesy, environmental management, law enforcement, homeland security, emergency response, economic development, lease sales and population analysis to name a few. They all expressed a degree of high interest in the enhancement of Mississippi's GIS statewide program. There were over a hundred persons from all levels of government and the private sector who wanted to provide their input on their needs for geospatial data. Their depth of understanding of the need for GIS is very high. On the consuming side of the stakeholder community there is also a high degree of interest in obtaining statewide spatial data that is updated regularly and easily available. The common thread among the Mississippi stakeholder community is the desire for leadership and coordination.

Developing some relatively simple to use applications that demonstrate the use of GIS will go a long way toward building confidence and expanding the stakeholder community. These applications should focus on end users (consumers) rather than data producers, emphasizing GIS embedded in familiar business needs. The Secretary of State's section sixteen land leasing is an excellent example of how the state's GIS data resources can be applied to a widely used business function. The State Archives program for the historical trails and sites is another good example.

2.2 What is the Mississippi Geospatial Development Status

2.2.1 Relative To NSGIC's "9 Criteria For A Successful Statewide GIS Program"

The National States Geographic Information Council (NSGIC) published a listing of "9 Criteria for a Successful Statewide GIS Program." NSGIC identified fundamental characteristics of effective statewide coordination of geographic information technology (GIT). The end result is a listing of nine critical factors for measuring performance objectives and the criteria needed for an effective statewide GIT coordination program. These critical factors identified in the state model for coordination were intended as guidelines to be considered in the development and administration of any statewide GIT coordination.

The following describes Mississippi's rating against those criteria.

1. **A full-time, paid coordinator position is designated and has the authority to implement the state's business and strategic plans:**

   No. Currently the Council relies on DEQ for voluntary staff for the Council and contracts and grants to implement the Council's projects.

2. **A clearly defined authority exists for statewide coordination of geospatial information technologies and data production:**

   Yes. The 2003 Mississippi Legislature passed House Bill 861, which established the Mississippi Coordinating Council for Remote Sensing and Geographic Information System (Council). HB 861 was aimed at creating statewide coordination and sharing of geographic data. The Council is also responsible for overseeing the development of the Mississippi Digital Earth Model (MDEM).

   MDEM is a digital land base computer model of the entire state of Mississippi. It will be composed of the seven geographic framework data layers identified by the Federal Geographic Data Committee (FGDC) as the essential layers upon which all other geographic data layers should be overlaid.

3. **The statewide coordination office has a formal relationship with the state's Chief Information Officer (CI0):**
   Yes. The Chief Information Officer is a member of the Council and the Mississippi Department of Information Technology Services hosts the Council's Clearinghouse.

4. **A champion (politician, or executive decision maker) is aware and involved in the process of geospatial coordination:**
   Yes. There is an awareness an interest in GIS by senior staff at all levels in state and county government and within the legislature.

5. **Responsibilities for developing the National Spatial Data Infrastructure and a State Clearinghouse are assigned:**
   Partial. The Information Technology Services hosts the Mississippi Geospatial Clearinghouse. Stewardship responsibilities have been identified for the framework layers but the roles still need to be defined and an implementation strategy needs to be developed for each of the framework thematic data layers.

6. **The ability exists to work and coordinate with local governments, academia, and the private sector:**
   Partial. Local governments and academia are represented on the Council but the mechanism for outreach is on an ad hoc basis through Council projects. The lack of the ability of the Council to coordinate with local governments can be attributed

to the absence of a full-time coordinator that is able to dedicate the time to that undertaking.

7. **Sustainable funding sources exist to meet project needs:**
   No. The Council has been very successful at getting project funding for Council strategic initiatives but it does not have sustainable funding for a GIS Coordinator or for data acquisition programs.

8. **GIS Coordinators have the authority to enter into contracts and become capable of receiving and expending funds:**
   No. There is no GIS Coordinator.

9. **The Federal Government works through the statewide coordinating authority:**
   Partially. The Federal Government works with individual agencies on projects but does not work with the Council as a coordinating mechanism.

2.2.2 Data Development Status Relative to Framework Data Layer

The National Spatial Data Infrastructure defines the concept of seven "federal framework" data layers. This definition, found on the Federal Geographic Data Committee's (FGDC) web site, builds on the notion that "GIS applications of many different disciplines have a recurring need for a few themes of data." Thus, framework data sets represent the common needs of the GIS community and are therefore considered "one of the key building blocks and…the data backbone of the NSDI."

The Council is serving up its available framework data on the Mississippi Geospatial Clearinghouse web site http://www.gis.ms.gov/Portal/. The following is a summary of the status of the framework layers in the state.

Table 2 Framework data layers

Framework Layer	Mississippi Status (at the time of this report)
1. Geodetic Control	The Mississippi Height Modernization program provides accurate height information by integrating Global Positioning System (GPS) technology with existing survey techniques. This project establishes and monitors Continuously Operating Reference Stations (CORS) throughout Mississippi and is currently being implemented by MDOT and in conjunction with the Gulf Coast Geospatial Center, USM.
2. Parcels	Parcels in a GIS or computer aided mapping (CAD) format are better than expected. There are sixty-four (64) counties that have maintained data in a digital format, which includes 13 counties, maintained data sets and 51 vendor maintained county data sets. For eleven (11) counties the Lanworth scanned and vectorized data could be purchased as a starting point for some applications. This brings the total to 75 counties with some level of digital parcel data.
3. Transportation and Roads	Street centerlines are being maintained by a number of different organizations but the attribution and currency varies considerably by organization and business need. MDOT keeps information on all of the state and county roads but they have a three plus year update cycle and the local governments need the data more current with the primary driver being the E911 systems. Many counties and local governments have more current road geometry.
4. Hydrography	Updates to the hydrography consist of two components, flood plain mapping through DEQ and updates to the National Hydrographic Database HUC codes through MARIS.
5. Elevation	Through funding provided by the National Oceanic and Atmospheric Administration's (NOAA) Coastal Services Center (CSC), a digital terrain model (DTM) and associated elevation contours are being developed for 34,660 square miles of the state (approximately 72%). The contours are being developed with a horizontal accuracy of approximately +/- 4' and a vertical accuracy of approximately +/- 3' and delivered at a 5' interval. Initial delivery of DTMs began in December 2009, with final deliveries in early 2010. As a part of the response to the

	oil spill in May 2010 the coastal areas of Mississippi were reflown with LiDAR.
6. Orthoimagery	The state acquired two-foot statewide orthoimagery in 2006. The local governments collect either aerial photography or digital imagery on an eight, ten and twelve year cycle depending upon the number of parcels in the county. DOR requires that the counties collect 1 ft aerial photography for urban areas and 2 ft aerial photography for rural areas. The coastal counties have been flown a number of times since hurricane Katrina and during the recent oil spill.
7. Boundaries	Boundaries files are being collected on an as needed basis throughout the state. Many of the counties rely on the Census boundary files unless they have better data. The Floodplain mapping program includes boundaries as one of the base layers.

2.3 Mississippi's Geospatial Strengths, Weaknesses, Challenges & Opportunities

2.3.1 Geospatial Strengths

Mississippi has many of the components of a strong statewide geospatial infrastructure that when harnessed could move the state ahead rapidly.

The Mississippi Coordinating Council for Remote Sensing and GIS (Council) has the legislative authority and responsibility for coordinating GIS activities in the state. The membership of the Council is broad including representation from state, regional, and local governments that are the principal stakeholders of the framework data layers. The members all have a strong interest in working together to improve products and to reduce the cost of their operations. Some of the Planning and Development Districts and special districts (Yazoo Levee Board) have a sufficient level of GIS expertise to provide technical services to their member counties. There are private sector companies that have a strong working relationship with the counties and are working to improve their GIS capabilities. The universities are providing strong support to local governments in education; Mississippi State University provides an extremely good education and outreach effort through the Geosystems Research Institute. Delta State University and Mississippi Automated Resource Information System (MARIS) provide technical services and data resources to state and local governments.

One of the key elements of successful state GIS programs is a portal that supports the statewide GIS Program by providing access to the framework data and application services and supports the State and National Spatial Data Infrastructure. Information Technology Services (ITS) has fulfilled its stated goals from the Council's 2003 Strategic Plan and then some by establishing the Mississippi Geospatial Clearinghouse

that has the capability and capacity to handle all of the framework data for the state including robust backup and disaster recovery. Furthermore they have the technology to provide the infrastructure for Internet applications and have implemented several projects with the Secretary of State and the State Archives.

Mississippi has acquired a number of framework datasets with Federal funding including 2006 statewide orthoimagery, statewide elevation data, improvements to the spatial infrastructure for the coastal counties in the aftermath of Hurricane Katrina and the establishment of a continuously operating reference system (CORS) that will serve as the backbone for the geodetic control network.

There are ten Planning and Development Districts as well as the Yazoo Delta Levee Board and the Gulf Regional Planning Council that provide planning and technical services to local governments. Although the offices have different levels of expertise in geospatial technologies, the resource does exists for coordination and outreach that is essential to engage the eighty-two counties in the state. These regional offices have demonstrated the ability to provide technical services to local governments.

The Institutions of Higher Learning (IHL) through the continuing education program at Mississippi State University have built an excellent GIS curriculum that supports local governments with nearby high quality educational opportunities. IHL also provides project-based support for local governments through the MARIS. One time high end processing such as re-projecting the National Aerial Imagery Program (NAIP) data for local government use, and assembling national data sets into county cut outs are important services used by many of the local governments in Mississippi.

The private sector has played significant role in improving the state's geospatial infrastructure. Most of the smaller counties are unable to implement or maintain GIS technology not only because of the cost of the technology itself but they do not have the resources to maintain GIS expertise in-house. There are a couple of companies in Mississippi that have filled this niche by providing technical services mostly in the areas of tax assessment and parcel data. Because they service a number of small counties in several states they are able to maintain centralized technical services with the expertise to develop digital parcel products for the county. Because of the similarity in applications they are able to provide a standardized GIS product from computer aided mapping (CAD) files or GIS data.

2.3.2 Weaknesses and Challenges

Coordinator: A key component to the success of a GIS Council, and first on the list of NSGIC Criteria for a Successful Statewide GIS Program is a State GIS Coordinator. The Council does not have one and relies on the voluntary efforts from state agencies. The absence of a full-tine coordinator is apparent in the types of projects that the Council has been able to address. It is commendable how much has been accomplished on a project-by-project basis but these have only been able to proceed

with centralized acquisitions such as the statewide orthoimagery, state level centerline data and flood plain mapping. The Council has not been able to address databases that come from local governments such as parcel data, improvements to the Public Land Survey System, addressing or boundary files. Furthermore the business requirements of local governments are often different than those of the state agency stewards of geospatial data. To engage the local governments it is imperative that their voices be heard and their business requirements are taken into account for the Council projects. For example local governments need to maintain more current street centerline data than MDOT, they acquire imagery at a higher degree of accuracy than the state two-foot acquisition and the counties have their own acquisition schedules. Without a coordinator it is difficult if not impossible to identify and develop strategies to address the local government business needs and as a result acquire their cooperation to serve as data stewards of some of the most sought after data sets by state, federal and local governments as well as the private sector.

Funding: The Council has relied on Federal grants to fund its activities and there is no sustainable source of funding to hire a coordinator or funding that is dedicated to the maintenance, improvement, or expansion of the data assets. The Council is tasked in HB 861 with:

> *(e) Oversight of the Mississippi Department of Environmental Quality's development and maintenance of the Mississippi Digital Earth Model, including establishing policies and standards for the procurement of remote sensing and geographic information system data by state and local governmental entities and establishing the order in which the seven (7) core data layers shall be developed;*

Although the MDEQ Office of Geology and Energy Resources is given the responsibility for program management and procurement, development and maintenance of the Mississippi Digital Earth Model, no state level funding has been designated to procure, compile or integrate that data into a statewide coverage.

Gaps in the Geospatial Infrastructure: As with many states, particularly rural states, there is a persistent gap between the geospatial technical and investment capabilities of smaller, poorer counties and the richer, more developed counties. Even acknowledging there are a few promising counter examples of strong small-county GIS operations, there still remains a **gap between "GIS have" and "GIS have-not" counties**. This gap will prove an impediment to completing some statewide framework data initiatives such as parcels.

Counties have found that **it can be challenging to retain trained geospatial technical staff** in light of county government pay scales and the demand for GIS personnel. Counties often begin their GIS programs by hiring less experienced staff, perhaps a recent graduate, at lower pay levels and providing training. Counties have found that

once these personnel gain proficiency their skill-set is marketable and many counties have lost GIS staff when they leave for higher paying jobs in other sectors. This can be particularly challenging to address since a competitive salary for a trained and experienced GIS technician can exceed the salary of a County Assessor. The strategy followed by many of the counties is to outsource their GIS needs.

An educational challenge related to the counties' implementation of GIS is the difference between CAD (typically AutoCAD) and GIS. **Many counties that have automated mapping have started with the CAD environment because it is less expensive for software purchase and maintenance and easier to find train and to retain staff to work with CAD.** The Statewide GIS training is focused on GIS and ESRI training and does not provide a benefit to these counties. It is possible to convert CAD information to GIS shape files for publication and distribution but this does add to the processing effort.

2.3.3 Opportunities

A progressive approach can be taken and has been designed into the implementation plans. There are many things that must be done to lay the foundation for building out MDEM.

Standards, Specifications and Procedures:

These are foundational components of building any infrastructure for the acquisition and sharing of information. Creating universal specifications for data products that can be readily incorporated into contracts is fundamental to coordination. This is particularly true for products such as orthoimagery where acquisition is through contracting services, but it is also applicable to all of the framework layers. This accomplishes two things; first it ensures that if the specifications are followed the recipient will receive a product that meets their business requirements and secondly it levels the playing field for the vendors so they are all bidding on the same product.

Developing standards, specifications and procedures will do much to enhance the broader utility of data framework products in the state and as well as providing a method for acquiring reliable updates in times of disaster.

Creating standards, specifications and procedures is a low cost effort although it would be greatly enhanced with the availability of a GIS Coordinator.

Coordinating Resources:

Coordination activities are designed to bring participants together to realize projects and products in which all parties benefit. A coordinator's primary role is to identify opportunities of mutual benefit and formalize the process for the participating organizations. Once collaboration and coordination are established, those procedures can be institutionalized among the participants. The GIS Coordinator also serves as a

point of contact for outside organizations to field requests and questions and to identify emerging issues or concerns within the organization.

A GIS Coordinator in Mississippi could partner with stakeholders and leverage existing resources. As previously mentioned, standards, specifications and guidelines can relieve many of the technical burdens on local governments and state agencies for data acquisitions. The job at hand is not only working with the stakeholders to build the requirements but to facilitate implementation through outreach and education to state and local governments. Facilitating acquisition is another role the Coordinator can play. Local governments, who are the source of much framework data including parcels, orthoimagery, jurisdictional boundaries, street centerlines and more, have reported a limited capability of initiating and managing coordination projects for all but the simplest arrangements even thought there can be significant cost savings for entering into partnerships. Multi-county acquisitions of orthoimagery have demonstrated a 20% to 30% cost savings over individual acquisitions. A coordinator working with the Planning and Development Districts and other regional governments would be able to facilitate broader regional projects, such as orthoimagery, centerline files, and improving the control network.

Local Government Stewardship:

There are a number of framework layers that are being collected by local and regional governments that can populate or enhance the framework layers. These local data sources can be categorized as either a *primary source* (the authoritative source for the data) or an *enhanced source* (a contributor to an existing statewide data set). Parcels are an example of a primary source of framework data because the local government tax assessor is the authoritative source and steward of parcels. Orthoimagery and street centerlines are examples of enhanced sources. Local governments acquire aerial imagery on an eight, ten or twelve year cycle as defined by DOR. The urban areas are required to collect aerial imagery at a minimum 1ft and some counties collect the data at a six-inch resolution, which is considerably better than the 2006 statewide imagery that was collected at a two-foot resolution. Including this imagery into the best available data sets for the state would improve the accuracy and currency in some counties. As to centerline data, many counties collect their own centerline file and keep it current within months. These files would provide a currency enhancement to the MDOT transportation network that is on a three-year update cycle.

These examples illustrate the benefit that local governments can provide to the state. There are more data themes that local governments maintain including the PLSS, hydrography, boundaries as well as attribution of features that can improve the overall quality of the state's geospatial infrastructure.

Centralizing Resources to Establish Critical Mass in support of GIS:

Regarding the "have" and "have not" communities, the basic issue is the lack of resources because of the small population base. It is a general rule of thumb that it takes a community of 50,000 persons and more to readily support the utilization of GIS technology, although there are notable exceptions. In Mississippi there are only thirteen counties that meet the 50,000-population criterion. However, combining or grouping the counties into Regional Planning Districts they all serve populations of greater than 100,000.

Table 3 Planning and Development Districts with population by jurisdiction

Southern Mississippi Planning and Development District	732,000
Central Mississippi Planning and Development	575,000
Three Rivers Planning and Development District	262,000
East Central Mississippi Planning and Development	241,000
North Delta Planning and Development District	232,000
Southwest Mississippi Planning and Development District	189,000
Golden Triangle Planning and Development	179,000
South Delta Planning and Development District	158,000
Northeast Mississippi Planning and Development	143,000
North Central Planning and Development District	138,000

This is not to say that the regional councils have the resources to fund a GIS infrastructure, but it should be apparent that they provide a central service center that has the potential, with careful planning, to focus the contract management as well as geospatial services to further the goals and objectives of the Council. This would be particularly true for orthoimagery, parcels and boundaries.

3. Vision & Goals

3.1 Problem Statement

The goals of the Mississippi Coordinating Council for Remote Sensing and GIS are to coordinate the state's GIS efforts and to build the state's framework layers. There is not a funded position for statewide GIS coordination and there is not a sustainable funding mechanism to support data acquisition, publishing or maintenance.

3.2 Strategic Goal

The overall strategy is to establish the coordination mechanisms and acquire funding to build, maintain and provide access to the Mississippi geospatial infrastructure.

3.3 Programmatic Goals

In recent years Mississippi has seen its fair share of disasters from Katrina to the recent oil spill. With the economic downturn, the mortgage crisis, tornados and flooding the ability of the state to continually respond has been strained. With this pressure on state resources, the state's geographic information data and systems need to be viewed as an asset that can support the more efficient deployment of resources, provide more accurate reporting and become a first line data set for mitigating, response and management of disasters as well as the day to day operations of the agencies. **Enhancement to the state's GIS program should not be an added financial burden but recognized as an essential tool supporting response and recovery operations and supporting future growth and economic development in the state.**

To address economic development, respond to disaster events, to ensure fair and equitable taxation, to support education and to address the daily business operations of state and local governments, the state should invest in the following:

1. State GIS Coordination: **$140,000 annually**
2. Recurring orthoimagery acquisition on a three-year cycle: **$1.3 million annually**
3. Completion and standardization of statewide parcels over three years: **$ 1.66 million**
4. Reconciling and digitizing political and administrative boundaries: **$75,000 per year for three years.**
5. Gazetteer update: **$35,000 per year for three years.**

A next tier of activities should be addressed as funding becomes available. This level of activity will build a data set to support a statewide geocoding service. This data will also support enhanced 911 activities, emergency response and provide essential transportation base data for floodplain mapping, parcel mapping and many other business activities across the state.

1. Street centerlines: **$50,000 for pilot project**
2. Address Points: **$15,000 for initial data collection**
3. State geocoding application: **$100,000**

Funding requirements are described within each of the programmatic goals along with a generalized discussion of options for acquiring that funding.

3.3.1 Coordination

Background:

Coordination activities are designed to bring participants together to realize projects and products in which all parties benefit. Active coordination results in the acquisition, standardized data products, maintenance and publication of geospatial data themes.

Mississippi has many data stewards with GIS data being created and managed at every level of government. It also has places with no GIS presence, areas that are "underserved" in the sense that they do not have local resources to support GIS development locally.

Implementing a grassroots coordination style will enable the GIS Council to develop a statewide program with community-based support and a high degree of active participation**. A grassroots coordination effort provides a broad based support for the Council's goals and objectives.** The participants drive program goals and are also the data stewards.

Coordination and the Coordinator: Coordination is the process of creating a collaborative environment that is a mutual benefit to all parties.

A coordinator's primary role is to identify opportunities of mutual benefit and formalize the process for the participating organizations. Once collaboration and coordination are established, they should be institutionalized among the participants. The GIS Coordinator also serves as a point of contact for outside organizations to field requests and questions and to identify emerging issues or concerns within the organization. The GIS Coordinator typically works with a council or representative body assisting with policy development, setting direction and goals, managing the development of needed standards and procedures as well as project management. Successful state GIS organizations have a continuing need for an identified coordinator. In some states the GIS coordinator is a single person, such as in South Carolina, while in other states the GIS Coordinator is an office with multiple staff such as in Montana and Arkansas. Mississippi should start with a single person that has access to technical support.

Build a constituency - Develop an environment of engagement
To bring the broad based participation to the program, Mississippi should initiate a statewide GIS conference. This will bring disciplines from assessors, chancery clerks, address coordinators, 911 managers, emergency management staff, land surveyors, the private sector, state agencies and federal agencies together on common ground to discuss the state's spatial data infrastructure, strategic goals, technical issues, data acquisition projects and partnership opportunities.

***Technical Support Facilities*:** States with the most successful GIS coordination programs have access to technical support facilities. This is often termed a "GIS Shop" that is able to take on specific GIS tasks such as the compilation and integration of data into statewide data sets, extract, transform and load (ETL) activities and provide technical expertise on GIS operations. The technical facilities also support data publishing, web based services or application services, and data security.

What needs to be done:
The Council should develop the description of the responsibilities for the GIS Coordinator and create a full time position specifically for the coordinator. The Coordinator should be associated with a technology group that is able to provide assistance for technology projects and the position should be shielded from being subsumed into the agency projects.

The GIS Coordinator should work with the Council to sponsor a conference to bring the stakeholders in GIS together.

The current data portal and data publishing services need to be more fully supported. The resources for the current Technical Support Facilities and the operation of the Clearinghouse have come out of the funding from related activities and have not been specifically supported through the state's GIS.

How to get there:
This is a straightforward funding issue. The Council's state agencies should pool their resources to provide the funding. South Carolina provides a model for how this can be accomplished.

What it will cost:

Table 4 Cost of Coordinator

Item	Amount	Description
Full Time GIS Coordinator	$ 140,000 per year	Includes one Full Time Position with benefits and desktop support.
Technology and Infrastructure	$ 200,000 per year	Includes hardware, software, data backup, staff support and GIS licensing for application development and application users. (Does not include GIS licenses for data producers).
Travel and Small project support	$ 50,000 per year	Travel for the GIS Coordinator, small project funding support.
Education and Outreach	$ 75,000 per year	Base education and outreach support to maintain access to basic GIS workshops and base level technical support. The first year this could be used to establish an annual conference for GIS producers and consumers.
Total	$ 465,000 per year	

Expected Benefits:

The GIS Coordinator will work with the Council members to build processes and procedures for the state's geospatial infrastructure. But most importantly the GIS Coordinator's responsibilities will be to leverage the state's existing resources to build the framework data layers in the state, to establish a clear point of contact for GIS activities and to build consensus among the many stakeholder communities at all levels of government and the private sector.

Support for the technical services has been lagging behind services provided. Eventually each data acquisition project should include a set-aside between eight and twelve percent to support publishing the data and the technical architecture. Having a coordinated point of entry for data sets and application services will increase the visibility of the state's GIS activities and increase its use. A robust backup capability for critical data themes is essential in times of emergency.

The current education and outreach provided by Mississippi State University is one of the benefits identified by every county interviewed. The quality of this program and the depth of the training are second to none. This program has not been sustained through the GIS Council in the past yet it is essential for long term success of GIS in Mississippi. Providing some support for this high quality program will help build and sustain the state's most important asset of the geospatial infrastructure, is people.

3.3.2 Orthophotography

Background:

Orthoimagery is one of the more valuable information sets for the GIS community. It can provide a clear picture of ground conditions and is a commonly used backdrop for many themes. When current imagery is combined with parcel maps or address information it can reduce the need for site visits, accomplishing in minutes what would otherwise take hours. Property appraisers will use the orthoimagery to verify the number of buildings on a property, which reduces the number of site visits they need to make.

Utilizing federal funding Mississippi was able to collect statewide orthoimagery in 2006 at 2 foot resolution and acquire 1 foot and 6 inch imagery for six coastal counties in 2007 (George, Hancock, Harrison, Jackson, Pearl River and Stone}.

Counties and local governments also collect large-scale imagery as do state agencies, generally on a project-by-project basis. The Department of Revenue requires the County Tax Assessors to collect aerial photography, but not orthoimagery, on either a twelve, ten or eight year cycle depending upon the number or parcels in the county. DOR's requirements are for at least one-foot imagery in the urban and 2 foot imagery in the rural areas. The tax assessor is required by DOR to update their soils survey each time they acquire orthoimagery.

What Needs To Be Done:

Mississippi should establish an aerial photography program that acquires orthoimagery on a regularly scheduled basis, either three years or five years. Allowances need to be made for the soils update and counties should be assisted with a migration to digital parcels files. To ensure that the state gets the highest quality data, available uniform specifications for orthoimagery should be developed for imagery acquisition. Imagery should be acquired at a 1-foot resolution to meet the minimum requirements for urban areas. It is more cost effective to fly at a single resolution than trying to break the county into rural and urban areas. Counties should be allowed to buy-up to a higher resolution. Until the counties have an opportunity to acquire digital parcels, DOR should make adjustments to its rules for soil updates to allow counties to utilize new photography but retain the existing soils update cycle that was coincident with the current aerial photography acquisition requirements.

How To Get There:

The Council should request the Legislature for funding that directly supports a state aerial photography program.

Once the funding is acquired, the office in which the GIS coordinator resides, will issue a formal procurement for the photogrammetric services that will cover a recurring statewide orthophotography cycle while providing a local buy-up provision.

It is recommended that the cycle should cover at least one complete, statewide cycle, while providing an option for a second cycle should there be exemplary performance on the first cycle. Awards should be allowed for more than one provider during a cycle, allowing small firms to compete with the larger firms.

What It Will Cost:

A statewide one-foot imagery cost is estimated to be $4,679,700. Because the imagery would be acquired on a three-year cycle it will be approximately $1.55 million per year. If a five-year cycle were chosen it would be $935,940 per year.

Benefits:

1. Orthophotography serves as the **core base map** for most GIS installations. Orthophotography represents the "visible geography" and thus most other data layers must be designed to properly overlay and not conflict with the imagery. It is apparent, even to a non-professional, that "something is wrong" when a road line does not match how the road is depicted in an orthophoto that shows the pavement and sidewalk. Beyond roads, other data sets that should "match" the orthophotography include parcels, hydrography and political/administrative boundaries. Given its role as a core **base layer**, it is all the more vital that this layer be of high quality and reliable currency.

2. Orthophotography has been an important asset in the state's economic development and business recruitment efforts. When a businesses site selection consultant is looking for properties, it is critical that they are able to view those properties in the context of current conditions on the ground. Older or less detailed imagery may not be able to provide sufficient information for their planning or decision-making.

3. GIS has proven an invaluable tool for helping local assessors identify new development that may impact the assessed value. This process of "real property discovery" helps put new development onto the tax roles, and this will increase the revenues that are available to the county and school systems. Critically, many of these changes can be efficiently uncovered from the assessor's office and with a reduced need for fieldwork. The more current and detailed the orthophotography, the more effective the assessor can be in identifying and tracking changes, and validating that these changes result in fair reappraisals.

3.3.3 Parcels

Background:

Parcel data are some of the most sought after data sets in the seven framework themes. The parcels provide a granularity of geography that serves many local and state applications such as land leasing at the Secretary of State, environmental planning and monitoring in the Department of Environmental Quality, right of way

management at the Department of Transportation, emergency response, and many other applications.

With a large portion of Mississippi being rural many of the smaller counties do not find it cost effective to maintain GIS technology in-house. Many of those that do maintain their digital maps in a CAD environment because of their familiarity with software but more significant is the cost of software licenses and the inability to train and retain GIS technical staff. GIS maps means that the parcels are being maintained in a GIS environment whereas digital maps means they are at least being maintained in a CAD environment, and can possibly be converted into a GIS format.

Staff Retention: With the transaction rate of approximately 10% for rural communities (meaning fewer than 2000 changes in the database and of that 10% may require changes in the parcel maps or about 200 map changes per year for counties with populations less than of less than 10,000), many counties find it cost effective to outsource the maintenance of their digital maps. It is beyond the means of many rural counties to attract and keep the skilled staff necessary to support an active GIS program in the county.

Current Situation:

2008 Department of Revenue County Inventory of Assessor Technical Capability: This inventory identified the technical capability of each of the counties including the format in which the counties are able to provide their digital parcel maps. Thirteen counties indicated that they had the ability to provide parcel data in a GIS format, representing about 36% of the parcels in the state.

Vendor maintained parcel maps: Hidden from view are fifty-one (51) counties that rely on vendors to maintain their parcel maps in a digital format. This represents about 50% of the parcels in the state. Although many of them are in CAD format they can be converted into a GIS format.

DOT purchased 52 counties worth of parcel data, most of which are from 2007, from a Lanworth that had compiled data from existing sources or scanned and vectorized tax assessor maps. For eleven counties this Lanworth data available as a best source, i.e. they do not have county or vendor maintained data sets but have digital data sets available. This represents 9% of the total parcel data in the state.

In summary the thirteen counties in the state that are managing their parcels in a GIS account for approximately 36% of the parcels in the state. The private sector vendors that are managing local government parcel maps in a CAD or GIS format that can be converted into a GIS format account for another 50% of the parcels in the state. The scanned and vectorized parcel data from Lanworth accounts for another 9% of the parcels for total of 95% of the parcels in a digital format, representing 75 counties.

Figure 1 Status of digital parcel maps in Mississippi

The quality of the digital parcels varies from county to county and will have to be assessed for appropriateness of use, but by and large Mississippi is very close to having statewide digital parcel information and the remaining cost required to complete the parcels will be a valuable investment.

What Needs To Be Done:

First, parcel maps and associated attributes should be acquired annually from sources that are maintaining their data as a part of regular business operations. The process for submitting this data needs to be formalized and the data needs to be compiled and published in a standard format. This approach is a combination of acquiring parcels from local governments that are using GIS technology and converting the parcels into a GIS format for counties that are using CAD software.

Secondly, the state should establish a program to complete the automation of the parcels in the counties that maintain their maps manually.

Third, the parcel map data should be linked to the annually provided tax roll information provided to the Department of Revenue (DOR). This will require processing the attributes into a standardized structure and linking the files to the map data if the county has not already completed the linking.

How To Get There:

The Council will need to adopt a standard publication format that accommodates the needs of the state and county agencies, but most importantly the reporting requirements for DOR.

There is a considerable amount of parcel data that already exists either in a GIS format or in a digital format that can be exported into a GIS. It is important that the Council approach any data acquisition effort from the counties with a package where the county receives some benefits by participating.

The GIS Coordinator will need to work closely with the counties and determine their requirements for providing data to the state. Counties with GIS capabilities will be able to provide a file and that can be standardized and compiled by the state. The vendors that do mapping with the counties in a CAD environment are able to export the data into a GIS format along with the standardized files.

Where counties do not have digital parcels the Lanworth data may be able to be used as a starting point for updating the parcel data. For those counties with no digital data available the parcel data will need to be automated from deed and plat records.

What It Will Cost:

To complete the parcel data statewide it is estimated it will take $1,660,000 over a three-year period. The initial year will be used to collect and standardize data from counties that maintain parcel data in a GIS and to convert and standardize the counties with data in CAD. The remaining parcels will be automated in the second and third years.

Benefits:

Parcel data are some of the most sought after data sets in the framework themes. The parcels provide a granularity of geography that serves many local and state applications such as land leasing at the Secretary of State, environmental planning and monitoring in the Department of Environmental Quality, right of way management at the Department of Transportation, emergency response and many other applications. As identified in the Benefits Vignettes, Webster County recovered $116,400 annually by using their parcels and addressing files for an audit of their waste management services. This is the tip of the iceberg in terms of benefits that can be derived from digital parcel data.

3.3.4 Political and Administrative Boundaries

Background:

The digital boundary files of interest are those for state, regional, local and federal government jurisdictions as well as administrative areas such as school, fire, emergency response, voting, parks, Census, etc. Boundaries are described by legal descriptions from which the GIS community creates digital files whose quality and accuracy is dependent upon the competency of the interpretation by the creator who may or may not have a relationship with the jurisdiction or administrative area being described. Accurate digital boundaries are important to governments because they are used to describe the geography of jurisdictions and by using other digital files they can be used to quickly and accurately define the inclusion or exclusions of persons and properties within that jurisdiction.

The challenge for the geospatial community is that there are often multiple sources of digital boundary files and there are often discrepancies between adjoining jurisdictions and administrative areas. This is further complicated when source data are not digital. The State School District boundaries are an example of an important data set that needs to be automated and maintained in a GIS environment. The multiplicity of boundary files causes a great deal of confusion among users, resulting in project delays and errors in the collection and distribution of public services and funds.

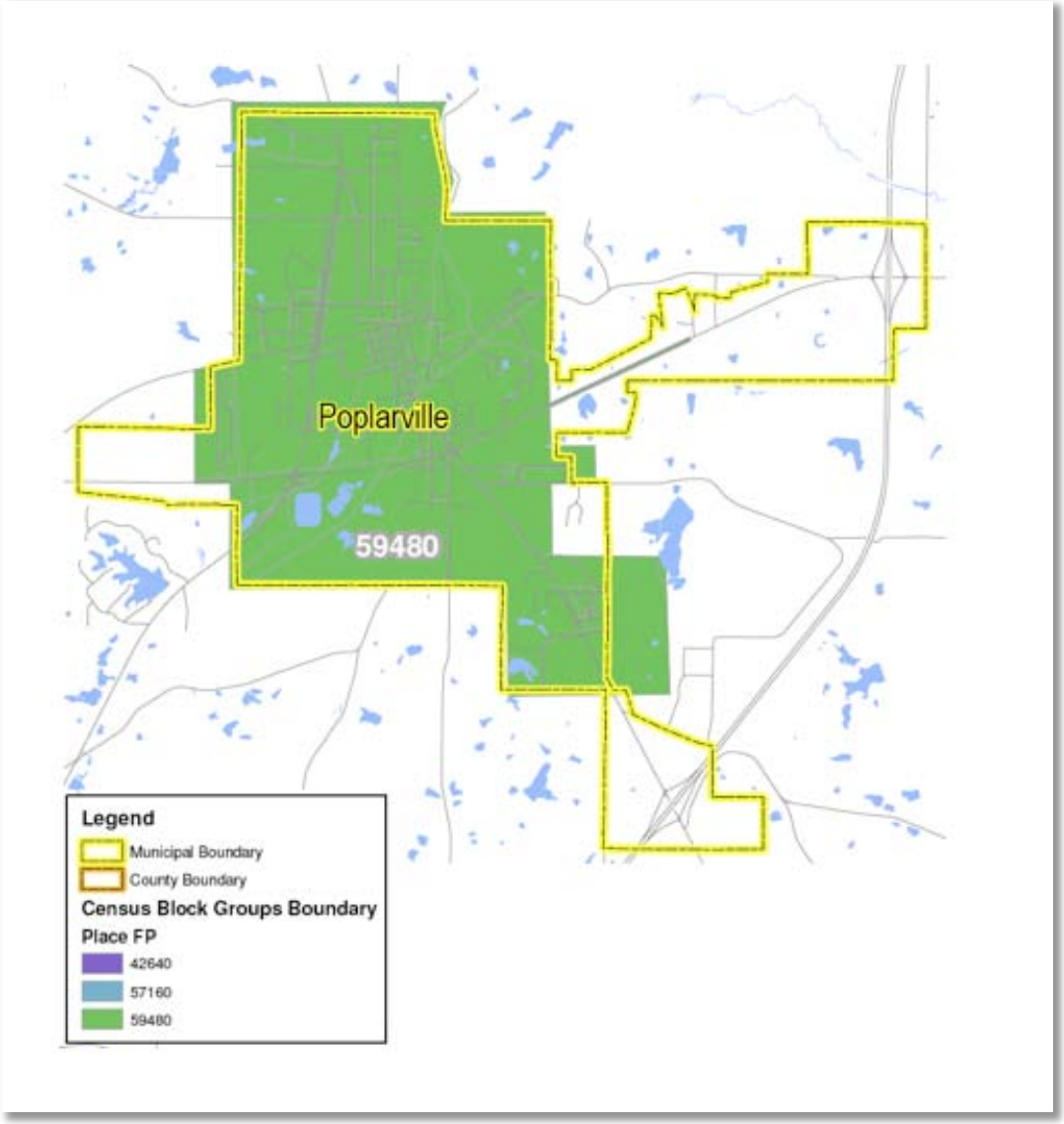

Figure 2 Two boundary files for Poplarville. Which one is right?

What Needs to be Done:

- The annexation process needs to be further examined to develop a consistent and uniform approach for reporting changes in municipal boundaries to the state and for incorporation into a statewide GIS layer.
- Establish a complete and authoritative data set for administrative boundaries starting with the state, county and municipal boundaries. School districts, election districts and judicial districts should follow.
- Establish a service to assist with automating and updating boundary files.
- Coordination between local governments and the Census Bureau to provide a single authoritative source of digital boundary files for state and local governments.

How to Get There:

The current annexation process did not envision GIS and use of municipal boundaries to determine lease share on hunting lands and tax liability and distribution. A key step in improving the current boundaries would be legislative clarification of the process that involves recognition of a single trusted source or official repository for completed and approved boundaries.

The process for reporting annexations needs to be improved. Changes in municipal boundaries are not well known within the counties much less by the state. There were several instances where the Census Boundary and Annexation data set had more current information than the county GIS person down the hall. This process needs to be improved. All communities should follow the same process and report annexations to the state for a data review prior to annexations being completed.

The legal descriptions of the state, counties and municipal areas need to be compiled and verified for currency and correctness. These legal descriptions use the parcels, the Public Land Survey System, hydrography and measurements (metes and bounds) to describe the boundary. As these base layers are improved there may be adjustments to the administrative boundaries over time but it is important to tie the boundary to its reference layer.

There are several existing sources for administrative boundaries that need to be reconciled and resolved to the legal descriptions including Census Boundary and Annexation files, administrative areas used on the floodplain maps, and existing digital data sets in the counties and in state agencies.

The school district boundaries for Mississippi are relatively stable and do not change frequently. The official record for this data is kept by the Department of Education. These source records should be automated and reconciled with the Census School District boundary data sets.

What Will It Cost:

The legislative actions required to improve the annexation reporting processes will be lengthy and require support and buy in from local governments. Until the annexation process is formalized keeping the records of municipal boundaries current will be difficult. The administrative boundaries are also closely tied to the parcel data and in many cases require the parcel data to be accurately mapped.

In the interim an individual working under the direction of the GIS Coordinator should be designated to compile the existing sources and information on the boundaries and resolve discrepancies with authoritative sources. The cost estimate is based on one GIS Specialist for three years.

Benefits

Boundaries are used by state, regional and local governments to determine legal administrative areas and the recipients of corresponding services such as E11, school districts, permitting, police, fire, transportation management, etc. These boundaries are in turn used by the US Census Bureau to determine how more than $400 billion per year in federal and state funding is allocated to communities for neighborhood improvements, public health, education, transportation and much more.

3.3.5 Gazetteer

Background:

The US Board on Geographic Names (BGN) maintains a database of official place names that is managed by the USGS in its Geographic Names Information System (GNIS). This is the official names database that is used by all Federal agencies. GNIS is designed to provide a unique name for a feature with its variants and historical names for sixty-seven feature types). There are coordinates associated with each name making this a spatial database. GNIS has a robust infrastructure to support maintenance by the states and the public. The USGS works closely with DHS, the Census Bureau, EPA and other federal agencies to include the unique GNIS feature ID in their database, providing a primary key to integrate these databases together.

The Geographic Names Information System (GNIS) implemented as a Gazetteer improves the quality of address geocoding and expands the functionality, but beyond that the Gazetteer data set provides location for named places such as schools and libraries and airports. Many state agencies and local governments need these point locations with the correct names for these places. This data is important for emergency planning to identify potential shelters or staging areas, it is helpful for navigation, and it is an important part of the critical infrastructure management.

- Mississippi Geographic Names Board is in the Mississippi Department of Environmental Quality.
- The Mississippi GNIS database is not being actively maintained by Mississippi, as is the case in many states.
- The potential of using the Gazetteer should be evaluated as a mechanism for integrating a diverse number of databases maintained by state, federal and local governments.
- GNIS currently has 39,706 Mississippi entries in 51 Feature Classes.

What Needs To Be Done:

US Gazetteer format and procedures are well established by the US Geographic Names Board Secretariat in the USGS. Subcategories for Feature Class Names are needed. The fifty-one Mississippi feature classes would benefit by having subcategories established. For example schools could be broken into pre-

kindergarten, kindergarten, elementary, middle school, high school, Jr. College, University, public and private, etc.

How To Get There:

A person or organization needs to be tasked with reviewing the existing Mississippi GNIS information, learning the national format and procedures, and then establishing the subclasses or any new classes for Mississippi.

The existing place names and locations that have been assembled for other projects need to be compiled and reviewed for entry into the Mississippi GNIS. After that it is a process of continuing to build the database.

What It Will Cost:

The estimated cost based on a half time position for three years is $35,000 per year.

Benefits

Critical Facilities: Critical facilities (buildings, facilities and public attractions) can be captured as a part of the update to GNIS.

Coordination with Federal agencies: Over the past five years the USGS has been integrating their names database with the Department of Homeland Security, the US Census Bureau and the Environmental Protection Agency's National Hydrographic Database and others making these database GNIS enabled and integrated with other GNIS enabled databases.

Feature Inventory: Maintaining the Gazetteer for Mississippi allows for the use of names in spatial analysis but more importantly it provides a standardized and integrated spatial inventory of most spatial features in the state including state buildings, schools, parks, natural features, hydrography, etc.

Database Integration: Databases that include names can be spatially integrated by the inclusion of the GNIS feature ID in the source database. There are numerous inventories maintained by state and federal agencies that can be readily brought into the system (schools, airports, ponds, streams, trails, ports, transit stops, churches, parks, administrative and jurisdictional boundaries, etc.). Such a system would allow the use of names queries that could otherwise only be accomplished with more complicated GIS applications. These names queries can then be combined with spatial queries using names as the basis of query.

- Provide me a list of the category (pond) in school district named X.
- Provide me a list of the fire stations in X jurisdiction named X.
- Give me all of the variant and historical names of the streams in park named X.
- Provide me a list and location of the current and historical names of the middle schools in a jurisdiction named X.

3.3.6 Second Tier of Activities

Background:

The transportation network (street centerlines) provides an important base set of information. The transportation is one of the critical cartographic elements in any base map and it also provides location context for many other themes. It can be coupled with site address points to provide the basis of a statewide geocoding service. The address points are included with the street centerlines in the strategic plan because both are essential geography for E911 and other emergency service response, road maintenance, permitting and transportation planning.

Table 5 Current Status of Street Centerlines

Description	Miles	Attribution
Miles of road mapped by DOT	83,000	DOT roads include the mandate attributes
Functionally classified road	29,500	
DOT Maintained Roads	12,000	There is a hierarchy of maintenance with local governments. There is no overlap.
Municipal Planning Organization (MPO) Street centerlines	TBD	Street centerlines, names, no address ranges
Local Government street centerlines	TBD	Street centerlines, names, address ranges, E911 zones or districts
Address Points		Three counties were identified as having address point feature classes for site addresses

The Mississippi Department of Transportation (MDOT) recently completed a GIS needs assessment and an implementation plan. One of the long-term goals is to maintain a complete linear reference system of all state maintained roads and to eventually include local roads.

One of the important applications associated with the street centerlines is a statewide geocoding service. The address points provide a more exact location than distance proportioning of address ranges. The address points should be considered in the development of the street centerline data.

Challenge for a Common Geography:

The challenge to coordinating "transportation data" is that so many versions of the transportation data exist. Roads are easily visible in most aerial photography and it is a relatively easy task to "re-digitize" visible road lines from aerial imagery. The road

network is so important everyone needs it, but they often need one more attribute than is in readily available data sets. As a result there are multiple centerline files being created to address different business needs of state, regional and local governments. These road networks are difficult to reconcile because of currency, attribution and cartography requirements of the different organizations. A single source of centerline geometry used with uniform business applications has the potential of coordinating many of the transportation network efforts between state, regional and local government efforts. Furthermore standardizing the products attached to this geography such as address ranges and site point addressing would greatly facilitate the integration of these systems.

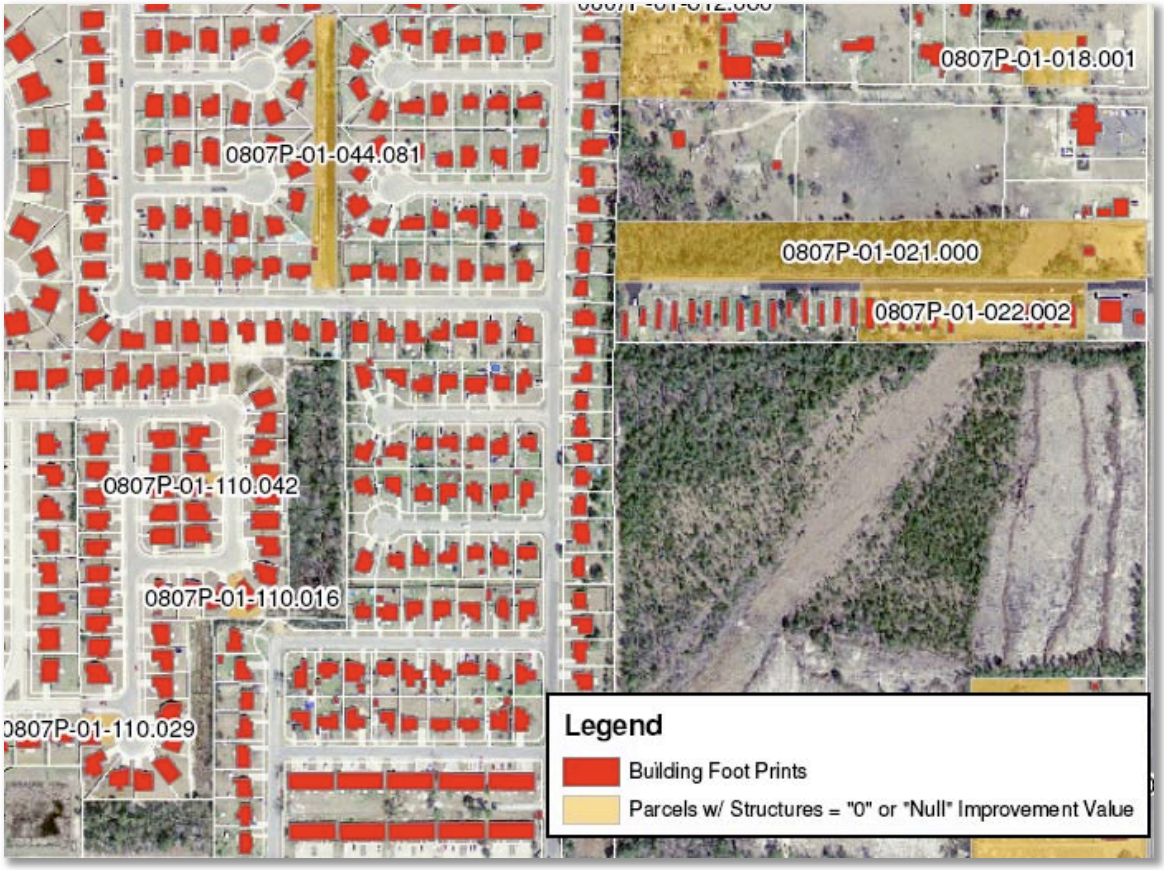

Figure 3 Building footprints are a source for address points.

Addressing and Geocoding Services

- Address Points and street data have interdependent attributes. The road name in the site address record should correspond to the street name on the road centerline file and the site address numbers need to fit within the address ranges on the street segments. Using these two data sets together improves the quality of both.

- E911 uses the street geography and distance from the beginning of a range to estimate the location of an address on the street when the site address point is not available.
- Using parcels to acquire an address point is a reasonable starting data set for address points. The site address information improves the quality of the parcel data.
- GNIS provides another level of addressing that can be used to identify named features and their location such a school buildings, government buildings, place names and critical infrastructure. Adding GNIS to a geocoding service improves the functionality and accuracy.

Improvements Required:

- Currency of MDOT Centerline File and street names.
- Common street centerline geography
- Inventory of available address point data sets
- Addressing and Locations
  - Address Standards
  - Address ranges included in centerline file

What Needs To Be Done:

A pilot project needs to be established with MDOT, a regional agency and several local governments (counties and cities) to test the feasibility of a shared data editing environment, to document the attributes and the stewards for the attributes and to determine how a commonly shared database populates operational systems such as DOT's operational roads system, regional metropolitan planning organizations (MPOs), highway patrol, and local government systems. This shared data set should also service a statewide geocoding service.

> **Shared editing is the future for data sets with so many interested parties and so many potential stewards and developers**.

3.4 Implementation

3.4.1 Implementation Strategy

The implementation plans provide a set of progressive steps that can be taken, by subject area, to build out the spatial data infrastructure in Mississippi. There are two components of the infrastructure, data themes and management themes. Both types of implementation plans should be considered draft and reviewed, modified as needed and submitted to the Council for adoption.

Data Themes

Boundaries

Cadastral (Parcels and PLSS)

Elevation (onshore and bathymetry)

Gazetteer (named places – Optional)
Geodetic Control
Hydrography
Orthoimagery
Transportation

Management Themes
Coordination
Education
Technology and Infrastructure

The **Technical User Group** should establish ***Technical Workgroups*** consisting of stakeholders and subject area experts for each of the data theme implementation plans. These workgroups are responsible for finalizing the implementation plans and developing or compiling standards, guidelines and product specifications. The products are presented to a Council Staff Advisory Committee for review and placement on the Council agenda.

It is recommended that the Council establish a ***Staff Advisory Committee***, one member for each Council member and appointed by that member. The Staff Advisory Committee members should be persons with an understanding of GIS technology and able to assess and advise their Council members on technical issues that come from the different workgroups as well as other sources that bring technical issues to the Council. The objective is to have these technical issues resolved by the Technical Workgroups and the Staff Advisory Committee before they are presented to the Council so that the Council members can focus their efforts on policy, coordination and funding issues.

The GIS Coordinator's responsibility is to work with the Technical User Group to coordinate and prioritize tasks, following the strategic plan, and to chair the Staff Advisory Committee.

3.4.2 Implementation Plans

The implementation plan for each theme has three options progressing from option one, which is the least resource intensive, to option three, which is a complete theme build out. In this way the Council can establish theme priorities and then target available resources to progressively complete each theme.

4. Budget Overview

The budget required for the Mississippi Statewide GIS Program has three primary components Base Program, Ongoing Data Support and Data Development.

Base Program

This is the proposed base budget to sustain the current level of GIS activities and to support the base level activities for the data themes. The source for funding for the base program budget needs to be sustainable and continuing.

Sustained Program Support

Table 6 Budget for sustained support.

Item	Amount	Description
Full Time GIS Coordinator	$ 140,000 per year	Includes one Full Time Position with benefits and desktop support.
Technology and Infrastructure	$ 200,000 per year	Includes hardware, software, data backup, staff support and GIS licensing for application development and application users. (This does not include GIS licenses for data producers.)
Travel and Small project support	$ 50,000 per year	Travel for the GIS Coordinator, small project funding support.
Education and Outreach	$ 75,000 per year	Base education and outreach support to maintain access to basic GIS workshops and base level technical support
Total	$ 465,000 per year	

Ongoing Data Support

This is proposed budget to support keeping the statewide GIS data current. This does not include new data set development. The source for funding for the ongoing data support needs to be sustainable and continuing.

Table 7 Cost of ongoing data support

Item	Amount	Description
Orthoimagery	$1.55 million per year	This is based on a three-year cycle for continuously updating 1-foot orthoimagery across the state.
Data Set Standardization	$ 75,000 per year*	Includes extracting and transforming data sets from local, regional, state and federal agencies into a standardized data set, updating metadata and staging for publication and distribution.
Total	$ 1,625,000 per year	
* The ongoing costs will be reduced as the process for data standardization becomes routine.		

Data Development

This is a proposed budget to support the data development of the recommended core data themes. This can be one time funding because the data development is not a continuing recurring cost. The data development has been proposed as a three-year timeframe to reach the completion for the recommended core or essential data elements.

Table 8 Data development budget

Data Set	Year 1	Year 2	Year 3	Description
Parcel Data	$ 500,000	$580,000	$ 580,000	Core parcel data for all counties
Gazetteer	$35,000	$35,000	$35,000	Named places and updated GNIS
Administrative Boundaries	$ 75,000	$75,000	$ 75,000	State, county and municipal boundaries
Total	$ 610,000	$ 690,000	$ 690,000	

Appendix A Contacts for Strategic Plan

Table 9 Persons interviewed or contacted to provide input to the strategic plan

	Organization Type	First Name	Last Name	Organization
1.	County	Tara	Coggins	Lamar County
2.	County	Jonathan	Dancy	Quitman Co.
3.	County	Garett	Dendy	Prentiss County
4.	County	Tony	Fleming	Clarke County
5.	County	Hannah	Hamm	Tishomingo County
6.	County	Matt	Hanks	DeSoto County
7.	County	Bob	Jackson	Harrison County Appraiser
8.	County	Kevin	Ladner	Hancock County
9.	County	Jimmie	Lewis	Hinds County
10.	County	Jim	McDougal	DeSoto County
11.	County	Chad	Meek	Panola County
12.	County	Solomon	Moody	Pearl River County
13.	County	Michael	Purdy	Panola County
14.	County	Dwayne	Raphael	Hancock County
15.	County	David	Shaw	Lafayette Co. EMA
16.	County	Terence	Snell	Hancock
17.	County	Scott	Trapolina	DeSoto County
18.	County	Paul	Tristani	Pascagoula
19.	County	Charles	Williams	Stone County
20.	Federal	Dan	Allen	FEMA
21.	Federal	Dan	Beavers	
22.	Federal	Katy	Breaux	Corps of Engineers
23.	Federal	Jason O	Hunter	FEMA Region 4
24.	Federal	George	O'connor	FEMA
25.	Federal	Denis	Riordan	NOAA
26.	Federal	Jason	Trzaska	FEMA
27.	Federal	Sam	Walsh	AMTE County FEMA
28.	Legislature	Scott	DeLano	Legislature
29.	Municipal	Mike	Armstrong	City of New Albany
30.	Municipal	Randy	Barber	City of Oxford
31.	Municipal	Patrick	Bonck	Harrison County Zoning
32.	Municipal	Bill	Breeden	City of Pascagoula
33.	Municipal	Steve	Collum	City of Fulton
34.	Municipal	Kristin	Greger	City of Biloxi
35.	Municipal	Brian	Grissom	City of Saltillo
36.	Municipal	Justin	Hesken	City of Hattiesburg
37.	Municipal	Will	Hooke	Boliver County
38.	Municipal	Greg	Korb	City of Cleveland
39.	Municipal	Robert	Lee	City of Jackson

	Organization Type	First Name	Last Name	Organization
40.	Municipal	Mike	Miller	Gulfport
41.	Municipal	Eric	Nolan	City of Biloxi
42.	Municipal	Gene	Peralta	Pass Christian City
43.	Municipal	Mike	Prestage	City of Flowood
44.	Municipal	Leland	Reed	Town of Byhalia
45.	Municipal	Lisa	Reid	City of Hattiesburg
46.	Municipal	Paula	Rushing	Town of Tishomingo
47.	Municipal	Larry	Sibley	Town of Inverness
48.	Municipal	Hugh	Summers	Town of Monticello
49.	Municipal	Michael	Watkins	Ocean Springs
50.	Municipal	Mark	Savasta	City of Pascagoula
51.	Non-profit	Jerry	Beaugez	AFMM
52.	Non-profit	Jill	Butler	River Science LLC
53.	Non-profit	Jamie	Hughes	CDM
54.	Non-profit	Quincy	Mukoro	Mississippi Municipal League
55.	Non-profit	Jay	Santinelli	CEPA
56.	Private	Rob	Blackman	Compton Engineering
57.	Private	Jeff	Cooke	Tristate
58.	Private	Jimmy	Bradley	Waggoner Engineering
59.	Private	Chan	Burns	Burns Engineering
60.	Private	Charles	Curcio	Baker Engineering
61.	State	Bud	Douglas	Information & Quality Healthcare
62.	Private	Michael	Hawkins	Waggoner Engineering
63.	Private	Gary	Hennington	The Geospatial Group
64.	Private	David	Huff	Huffland Surveying
65.	Private	Cheryl	Jordan	Laurel Board of Realtors
66.	Private	Valerie	Kare	LaSalle Group Inc.
67.	Private	Cragin	Knox	Waggoner Engineering
68.	Private	Lei	Li	Baker Engineering
69.	Private	Paul	Pitts Jr.	Compton Engineering
70.	Private	Richard	Tolbert	MAPS
71.	Private	Lei	Wang	Michael Baker Jr. Inc.
72.	Private	Melody	White	Coast Electric Power
73.	Private	Joel	Yelverton	Yelverton Consulting
74.	Regional	J.C.	Aaron St.	TRPDD
75.	Regional	David	Alexander	GTPDD
76.	Regional	Paul	Barnes	SMPDD
77.	Regional	Kurt	Brummett	Three Rivers Planning and Development District
78.	Regional	Leslie	Callender	CMPDD
79.	Regional	Chuck	Carr	CMPDD
80.	Regional	Damien	Franklin	ECPDD
81.	Regional	David	Hansen	SMPDD
82.	Regional	Michael	Howse	East Central PDD

	Organization Type	First Name	Last Name	Organization
83.	Regional	Rudy	Johnson	GTPDD
84.	Regional	Jay	Lloyd	NPDD
85.	Regional	Regina	Melton	SMPDD
86.	Regional	Michael	Monk	CMPDD
87.	Regional	Beth	Ousley	SMPDD
88.	Regional	William	Peacock	CMPDD
89.	Regional	Dean	Pennington	Yazoo Mississippi Delta Levee District
90.	Regional	George	Pollitz	SMPDD
91.	Regional	Toby	Sanford	GTPDD
92.	Regional	Thomas	Sanford	Golden Triangle PDD
93.	Regional	Bill	Sheppard	Yazoo MS Delta Levee Board
94.	Regional	Larry	Smith	CMPDD
95.	Regional	Scott	Stewart	GTPDD
96.	Regional	Mark	Stiles	Yazoo Mississippi Delta Levee District
97.	Regional	David	Wade	CMPDD
98.	Regional	Chris	Weathers	NCPDD
99.	State	Julian (Ray)	Barksdale III	Department of Transportation
100.	State	Michael	Bograd	MDEQ Office of Geology
101.	State	Mitchell	Bounds	MS Dept of Information Services
102.	State	Debra	Brown	MS Dept of Information Services
103.	State	James	Buchanan	MS Forestry Commission
104.	State	Stephen	Champlin	DEQ
105.	State	Keith	Harkins	DEQ
106.	State	Mike	Hatch	ITS
107.	State	John	Helms	Mississippi Development Authority
108.	State	Sylvia	Knight	Secretary of State
109.	State	David	Litchliter	MS Dept of Information Services
110.	State	Brian	Mason	MS Dept of Information Services
111.	State	Frank	McCain	Mississippi Department of Revenue
112.	State	Warren	McKinnon	Mississippi Department of Revenue
113.	State	Gerald	McWhorter	Secretary of State
114.	State	Jack	Moody	MDA
115.	State	Craig	Orgeron	MS Dept of Information Services
116.	State	Laura	Pentecost	MS Dept of Information Services
117.	State	Jeff	Pierce	MDOT
118.	State	Heath	Prejean	MS Dept of Information Services
119.	State	Mark	Sanders	MEMA
120.	State	John	Simpson	Department of Transportation
121.	State	Zan	Walker	Department of Transportation
122.	State	Barbara	Yassin	DEQ
123.	University	Talbot	Brooks	MSCCRSGIS
124.	University	Wes	Burger	Mississippi State University
125.	University	Jerry	Coleman	USM
126.	University	Reed	Davis	USM

	Organization Type	First Name	Last Name	Organization
127.	University	Wendy	Griffioen	USM
128.	University	David	Holt	USM
129.	University	David	Mooneyhan	The University of Southern Mississippi
130.	University	Nel	Ruffin	MSU Geo-Project
131.	University	Scott	Sampson	Geosystems Research Institute
132.	University	David	Shaw	Mississippi State University
133.	University	Jim	Steil	MS Automated Resource Information System

Appendix B Webinar Attendees

Webinar Content

October 21 – Strategic Plan Review and Recommendations
October 27 – Funding Options
October 28 – Implementation Plans
November 18 – Strategic Plan

Table 10 Persons attending and or registered for Webinars. Number of persons per line not assessed.

First	Last	Organization	October 21	October 27	October 28	November 18
Julian	Barksdale	MDOT	A	A	A	A
Paul	Barnes	SMPDD			A	A
Michael	Bograd	MDEQ Office of Geology	A	A	A	A
Talbot	Brooks	MSCCRSGIS	A			R
Debra	Brown	ITS	A	A	A	A
James	Buchanan	MS Forestry Commission	A			
Wes	Burger	Mississippi State University		A	R	
Chuck	Carr	CMPDD		A	A	A
Steve	Champlin	MDEQ	A			A
Scott	DeLano	Legislature	A	A	R	A
Bud	Douglas	DGE	A	A		
Tony	Fleming	Clarke County			R	R
John	Helms	Mississippi Development Authority				A
Michael	Howse	East Central PDD			A	A
Cragin	Knox	Waggoner Engineering	A	A	A	R
Brian	Mason	MS Dept. of ITS	A	A	A	
Warren	McKinnon	Department of Revenue	A	A	A	A
Gerald	McWhorter	Mississippi Secretary of State	A			
Mike	Miller	City of Gulfport / TUG / MAST				A
Jack	Moody	MDA	A		A	A
Quincy	Mukoro	Mississippi municipal League	R			
Craig	Orgeron	ITS	A			
Jeff	Pierce	MDOT	A			
Dwayne	Raphael	Hancock County				R
Mark	Sanders	MEMA	A		A	A
Thomas	Sanford	Golden Triangle PDD				A
Mark	Savasta	City of Pascagoula				A
David	Shaw	Lafayette Co. EMA				R
John	Simpson	MDOT	R			
Jim	Steil	IHL-MARIS	A	A	A	R
Richard	Tolbert	MAPS	A	A		R
Joel	Yelverton	Yelverton Consulting	R			A

A = Attended; R = Registered but did not login

Appendix C Acronyms and Abbreviations

Council - Mississippi Coordinating Council for Remote Sensing and GIS

CAD – Computer Aided Mapping
CORS - continuously operating reference stations
DEQ – Department of Environmental Quality
DFIRM – Digital Flood Insurance Risk Map
EPA – Environmental Protection Agency
FEMA - Federal Emergency Management Agency
FGDC – Federal Geographic Data Committee
GIS – geographic information system
GPS – global positioning system
GRI - Geosystems Research Institute
IHL – Institutes of Higher Learning
MARIS – Mississippi Automated Resource Information System
MAST - Mississippi Association for Spatial Technologies
MDEM – Mississippi Digital Earth Model
MDOT – Mississippi Department of Transportation
MEMA – Mississippi Emergency Management Agency
MFMMI - The Mississippi Flood Map Modernization Initiative
MPO - Metropolitan Planning Organizations
MSU – Mississippi State University
NGS – National Geodetic Survey
NFHL - National Flood Hazard Layer
NFIP - National Flood Insurance Program
NHD – National Hydrologic Dataset
NSGIC – National States Geographic Information Council
NWI – National Wetlands Inventory
PLSS – Public Land Survey System
URISA - Urban and Regional Information Systems Association
USGS – US Geological Survey

Appendix D Table of Tables

Appendix E Table of Figures