WEST VIRGINIA

STATEWIDE GIS STRATEGIC PLAN

Prepared by the

Office of GIS Coordination

and the

GIS Steering Committee

with assistance from:
Croswell-Schulte IT Consultants

November 1, 2010

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West Virginia Geographical Information System Policy Council

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1.1 BACKGROUND AND PLANNING APPROACH

Geographical Information Systems (GIS) development and use has been ongoing in West Virginia for more than 20 years. A GIS Development Plan completed in early 1993 lead to the proclamation of Executive Order number EO 4-93. The order established the Geographical Information System Policy Council (GIS Policy Council) and charged the Council with implementing the statewide GIS Development Plan, establishing standards and procedures for digital map data, and providing direction to the Geographic Information Systems Program created by Order 4-93. The order also called for the appointment of a State GIS Coordinator, the formation of the GIS Steering Committee, and the creation of the West Virginia GIS Technical Center. In 1995, House Bill 2222 provided for the funding for the State GIS Coordinator and a pilot GIS Development Program, with the West Virginia Geological and Economic Survey (GES), the West Virginia Property Tax Division (PTD) and the West Virginia GIS Technical Center (GISTC) as participants. This partnership, still in existence today, has not been the only GIS effort in state government, since EO 4-93's enactment, GIS use has expanded significantly among state, federal and local governments, and the demand for GIS data, applications and technology continues to increase. In recent years, leaders of the State's GIS community, the State GIS Coordinator and the GIS Steering Committee have recognized a need for a new and updated Statewide GIS Strategic Plan.

This Strategic Planning process was initiated because of this need for and a consensus among GIS practitioners, that improved statewide coordination of GIS will deliver benefits to all segments of the GIS user community, and will ensure a consistent vision for geographic information activities within the state and between state, local and federal governments for the benefit of all West Virginians. The Strategic Planning process also responds to recommendations of the National States Geographic Information Council (NSGIC) and the Federal Geographic Data Council's (FGDC) 50 States Initiative which strongly encourages states to undertake this planning process to strengthen statewide GIS programs and also to contribute to the building of the National Spatial Data Infrastructure (NSDI).

Strategic Plan preparation began in August of 2009 and was led by the State's GIS Coordinator with active participation of the GIS Steering Committee. Croswell-Schulte IT Consultants was hired to provide support in information gathering and plan preparation. The intent has been to reflect the needs of the entire GIS community in the state. To achieve this objective, input has been gathered through meetings and a survey distributed to a wide spectrum of public sector and private organizations throughout the state. The consulting firm, Croswell-Schulte IT Consultants was hired to provide support in information gathering and plan preparation. The major steps in the process included:

- Review of background materials (previous plans, 2008 agency roll call, database and GIS Clearinghouse documentation, description of agency missions, agency development GIS plans etc.)

- Preparation of an initial plan outline

- Initial Strategic Planning brainstorm sessions with GIS Steering Committee and other interested participants

- Survey form preparation and distribution (survey to gather information on GIS status and needs)

- Completion of first draft of plan

- Overview presentation to the GIS Policy Council

- Review of draft plan by GIS Steering Committee members

- Draft Plan review meeting with Steering Committee

- Completion of final draft plan.

- Review of final draft by Steering Committee members

- Completion of final Strategic Plan

- Preparation of Executive Summary and presentation materials

- Submittal, for acceptance and approval, to GIS Policy Council

- General distribution to statewide GIS community

1.2 OVERVIEW OF THE PLAN

This Strategic Plan establishes a foundation for continued expansion and operation of GIS in West Virginia over the next five years, providing direction for future GIS initiatives that impact the entire GIS user community in the state. It serves as a "compass" which guides overall GIS development and coordination and supports a unified Statewide GIS Program development policy. This plan includes a summary of past GIS milestones in the state and a review of the current status of GIS use, with the idea that future development should build on past success and major investments in GIS technology, data, and applications.

This Strategic Plan includes the major sections summarized below:

- Section 1: Strategic Planning Approach and Overview, explains the approach and steps followed in the planning project and gives a summary of the sections of the Plan.

- Section 2: Summary of GIS History, Status, and the GIS User Community, gives background about the history and status of statewide GIS coordination and use and summarizes current GIS use by different stakeholder groups in West Virginia.

- Section 3: Strategic Foundation, presents business drivers for GIS, vision and mission statements, and high-level goals which together establish a target and foundation for Strategic initiatives.

- Section 4: High-Level GIS Architecture and Requirements, summarizes technical and organizational requirements and provides a high-level technical architecture and improved governance structure for statewide GIS

- Section 5: Implementation Initiatives, Timing, and Resource Estimates Strategy, addresses implementation initiatives associated with high-level goals stated in Section 3, and includes suggested timing and projections on costs and resources.

- Section 6: Implementation Management and Monitoring, describes the controls and tools for managing and monitoring implementation work and related outreach and communications.

- Appendices contain more detailed information elaborating on topics presented in the body of the plan and historical documents.

1.3 RELATIONSHIP BETWEEN STRATEGIC PLAN AND IMPLEMENTATION ACTIVITY

The Strategic Plan has been prepared to encourage and provide a strategic context for specific projects and work in areas that benefit the statewide GIS user community. The strategic goals (See Section 3) and specific implementation initiatives (See Section 5) provide a framework for a coordinated response to GIS needs and help to achieve the overall vision for the statewide GIS program as described in this plan, and fosters the development of GIS business plans for data acquisition and application development projects.

SECTION 2:
SUMMARY OF GIS HISTORY, STATUS, AND
THE GIS USER COMMUNITY IN WEST VIRGINIA

2.1 BRIEF HISTORY OF GIS USE AND COORDINATION

Use of GIS technology in West Virginia in the mid-1980s began when a number of state agencies started using early versions of GIS and image analysis software for land inventory and natural resource assessment applications. In the 1980s, adoption of GIS technology and development of GIS databases continued in state government, selected West Virginia local governments, and public utility organizations. The early success and interest in GIS use in the 1980s led to the formation of an ad hoc user group known as the West Virginia GIS Coordinating Committee with participation from a number of federal, state, and local government agencies and private companies with a need to manage geographic information.

The growing interest and use of GIS in West Virginia and nationally provided a basis for launching a study and planning effort for development of a coordinated state GIS program. In 1992, the West Virginia Development Office contracted with PlanGraphics, Inc. to produce a GIS development plan for West Virginia. This project included a needs assessment, conceptual design, cost benefit evaluation, and a GIS development plan. (See www.wvagp.org/strategicplan.asp to view or download these documents). The recommendations in the plan were used by the Governor's Office to issue Executive Order EO 4-93 in 1993 to establish West Virginia's statewide GIS program. The program was funded in 1995 through provisions of House Bill 2222, which created a pilot GIS development program, the Mineral Lands Mapping Project, with the Geological and Economic Survey (WVGES), the Property Tax Division (PTD) and the West Virginia GIS Technical Center (GISTC) created by this order as participants.

The Executive Order established a State GIS Coordinator position within the WV Geological and Economic Survey, and created the WV GIS Technical Center and State GIS Data Clearinghouse, and three coordinating bodies: a GIS Policy Council consisting of cabinet secretaries and members of the Board of Public Works to implement the State's GIS plan; a State GIS Steering Committee comprised mostly of geospatial leaders from state government; and GIS Users Group to serve as the vehicle for education, training, and information exchange among GIS users. Of these three coordinating entities, the State GIS Steering Committee, chaired by the WV State GIS Coordinator, was the first GIS coordinating body to organize in 1996 and meet regularly to advance spatial data infrastructure (SDI) and GIS use in West Virginia.

GIS development in West Virginia received a considerable boost in 2001 with the formation of the West Virginia Statewide Mapping and Addressing Board (SAMB). SAMB was created to oversee the development of statewide GIS data to support E911 emergency response. With funding through Verizon, Inc., statewide orthoimagery, road centerlines, address data and other GIS data layers were developed in coordination with local emergency management organizations. Over the last 10 years, other GIS programs have contributed greatly to the availability of GIS data. Among these are:

- The Mineral Lands Mapping Project (MLMP), with its Coal Bed Mapping, Mineral Parcels Mapping, and the Reserve Coal Valuation programs, providing statewide detailed information on mineral land parcels, coal, oil and gas resource ownership. (GISTC, PTD, GES, OGC)

- National Hydrographic Database (NHD) program delivering surface hydrographic features statewide. (GISTC, NRAC, OGC)

- Completion of digital soil survey map data (SSURGO) by the U.S. Natural Resources Conservation Service (NRCS).

- Statewide transportation database development by the state Department of Transportation (DOT), in cooperation with GISTC, providing a rich road centerline database supporting a range of mapping, asset management, and transportation planning applications.

- Digital Flood Insurance Rate Map (DFIRM) database development by the GISTC.

- West Virginia's Water Development Authority (WDA) Comprehensive Planning Study for Water and Wastewater providing invaluable information about the State's infrastructure.

- Broadband Mapping Program delivering information about broadband coverage in the state

- Transportation & Economic Development Information System (TEDIS) by Nick J. Rahall, II Appalachian Transportation Institute (RTI), providing transportation and economic development information

- Technical Applications & Geographic Information Systems Unit (TAGIS) engaged in developing a comprehensive, state-wide spatial database to support environmental monitoring, analysis, and decision making for the Department of Environmental Protection (DEP)

- Geospatial Transportation Information Section (GTIS) integrating and developing comprehensive strategies for an enterprise GIS to support and track projects from design stage to completion within DOT

- Mine Information Database System (MIDS) containing records of every mine map available online at the WVGES website

- Interactive online applications featuring both West Virginia and regional (WV with contiguous states) oil and gas maps developed by WVGES. The public application includes a document viewer for access to scanned or digitized logs, core photos, and references for these reservoirs; and an interactive mapping component consisting of both a well data portal and an interactive spatial tool integrating maps and cross-sections.

- MapWV, a public gateway to online West Virginia mapping resources offering mapping professionals and/or the casual user access to a wealth of high-quality maps and geographic data via the Internet designed and maintained by the GISTC.

In March 2007, a GIS users group, the WV Association of Geospatial Professionals (WVAGP), formed with the adoption of bylaws and the election of a board of directors from the government and private sectors. The non-profit association was formed to provide broad-level coordination for GIS advocacy issues, information exchange, and sponsorship of educational and training activities. In the fall of 2007, the GIS Policy Council was reconvened to provide high-level GIS coordination for the State. The GIS Policy Council, chaired by the Secretary of Commerce or designee, was organized to include executive leaders from state agencies, including the Chief Technology Officer position created during the 1997 Legislative Session. In July 2008, the GIS Policy Council formally recognized WVAGP as a GIS User Group and re-activated the State GIS Steering Committee.

The need for better statewide coordination in the development and use of geographic data and technology to support diverse stakeholders across the State was articulated in Executive Order EO 4-93 and reaffirmed by Executive Order EO 10-10, issued by Governor Joe Manchin III on August 24, 2010. A synopsis of the current situation was articulated in EO 10-10, including the following highlights:

- GIS has proven to be an effective tool in policy development, decision making, management, engineering and research in almost all state, local, and federal government agencies and private industry

- GIS use greatly benefits from a statewide coordinated effort to streamline government use of geospatial data, expand agency cooperation, and take advantage of grant opportunities and cooperative leveraged funds

- GIS demand has outgrown current efforts to coordinate and there is a need to plan and prioritize the development of publicly funded geospatial data and to define the roles and responsibilities for geospatial data stewardship

2.2 STATUS OF GIS USE IN WEST VIRGINIA

GIS technology and data is now used routinely by a wide spectrum of organizations in West Virginia as depicted in Figure 1.

Figure 1: West Virginia's GIS User Community
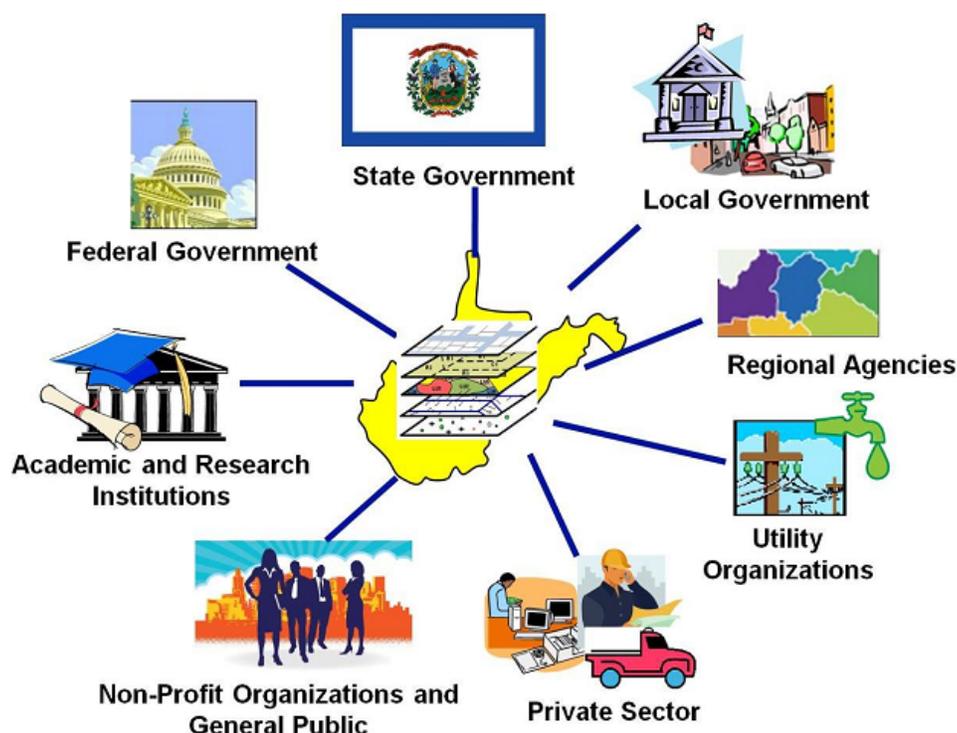
Since the Statewide GIS Program was established in 1995, the number of GIS professionals and programs among organizations in the State has expanded greatly. Federal agencies such as the U.S. Forest Service, U.S. Fish and Wildlife Service, Federal Emergency Management Agency, U.S. Fish and Wildlife Service, and others have increased their adoption and application geospatial technologies in West Virginia. The U.S. Geological Survey has hired a geospatial liaison for West Virginia. Many state government agencies most notably the Department of Environmental Protection (DEP), Department of Transportation (DOT), Geological and Economic Survey, Division of Homeland Security and Emergency Management (DHSEM), the Department of Health and Human Resources (DHHR), and the Department of Tax and Revenue have greatly expanded their geospatial capabilities and use of GIS technology. There are future opportunities for expanding GIS applications to support the programmatic needs of these and other state agencies.

Regional agencies and local governments are major users of GIS technology and represent stakeholder groups for which there are substantial opportunities for expansion in GIS use and delivery of significant benefits in such program areas as: public safety, parcel mapping and real property management, utility and transportation asset

management, land use and transportation planning, plan and permit review, and others. GIS technology is used, to some extent, in most of West Virginia's 55 county governments and in many large and medium size municipalities. Currently, about 34 of the counties have active, multi-department GIS programs and others are interested in or planning for GIS program expansion. Two counties have created and three are in the process of creating regional GIS Councils aimed to share data and funding resources between several agencies and governmental units such as the Assessor's Office, E911 Centers, sanitary boards, and city or town governments. Certain regional agencies and public service districts are making effective use of GIS technology. This includes active GIS programs in the state's Planning and Development Councils, and other transportation and development planning organizations.

Since its creation GISTC has disseminated geospatial data and developed web-map services and online mapping applications; it has built new spatial data layers in cooperation with federal, state and local agencies. The center has assisted with strategic planning, development and implementation of GIS and mapping guidelines and has provided technical support to the Office of GIS Coordination. The GISTC (See http://wvgis.wvu.edu) continues to maintain the GIS data clearinghouse providing access to the data sources listed above a wide range of other GIS data sources. GISTC also maintains a mapping application, "Map West Virginia" (www.mapwv.org) providing web-based viewing of GIS data.

Educational and research institutions such as Concord University, Glenville State College, Marshall University, Shepherdstown University and West Virginia University provide geospatial technologies in research, education, and outreach programs. Lastly, more private sector companies have integrated GIS into their business practices and services. GIS technology is currently used by a broad range of organizations in the state as shown in Figure 1 and there is growing interest in greater adoption and expansion of GIS.

In addition to ongoing GIS development projects and operations cited above, there are a number of recently initiated GIS projects that will result in additional GIS data, applications, and an expanded set of applications for multiple public and private organizations:

- Broadband inventory and mapping
- Water Development Authority mapping and access to water and wastewater utility systems
- GIS database and applications for flood hazard risk analysis (Division of Homeland Security and Emergency Management)
- Miss Utility (a.k.a. "Call before You Dig" program) mapping application
- Statewide cadastral mapping (WVGES, Department of Tax and Revenue & RTI)
- New program coordinated by the state Department of Education in cooperation with ESRI to provide statewide GIS access and instruction in K-12 schools.
- Completion of NAIP 2009 statewide orthoimagery (1-meter resolution, leaf on)
- Completion of statewide 3-meter digital elevation dataset
- NSDI Metadata training & outreach (RTI)
- Updated Census geography (TIGER) data and initiation of Census 2010 which will provide updated demographic data
- Upgraded GPS base stations and access to CORS network (WVDOT & RTI)
- Continuation of the STATEMAP component of the NCGMP to establish the geologic framework of areas determined to be vital to the economic, social, or scientific welfare of the state by the WV Geological and Economic Survey
- WV trails inventory & mapping (WVDOT & RTI)

- Department of Agriculture Gypsy Moth Slow the Spread (STS) Program integrating GIS to pest management strategies in order to reduce the rate of gypsy moth spread into un-infested areas.

- Acquisition of statewide oblique imagery by the West Virginia Sheriff's Association

- WVDOT GIS training (DOT and RTI)

More details about GIS activities and plans of government agencies, non-profit groups, and educational/research organizations are available in the "2008 Agency Roll Call" conducted by the West Virginia Association of Geospatial Professionals, the state GIS Technical Center, and the Office of GIS Coordination (See www.wvagp.org/upload/RollCall/WVGIS2008_agency_reports_jul08.pdf).

2.3 OVERVIEW GIS USER NEEDS

Two recent surveys of the GIS user community in the state (a survey conducted at the June, 2008 state GIS Conference and a 2009 Web-based survey managed by the GIS Technical Center) have provided insights into the needs of various stakeholder groups about access and use of GIS technology and data. These surveys along with input from the GIS Steering Committee have provided valuable information for Strategic Plan preparation. The two surveys confirm a number of key concerns and needs of state GIS users that should be addressed through this plan:

- Insufficient opportunities for training and education
- Lack of or insufficient use of data and system standards
- Difficulty in integration of data from different sources
- Problems with data quality and currency (timeliness of updates)
- Staffing limitations (number of available staff and staff skill levels)
- Funding limitations and need for increased cost sharing
- Unclear protocol and documented best practices for GIS program implementation and operation
- Poor inter-agency, inter-organizational coordination in GIS development and operation
- Insufficient awareness or support from senior management

In addition to the issues cited above, survey respondents identified additional needs and concerns relating to technical issues impacting GIS database and application development. The surveys also revealed that there is not a full understanding of the current GIS statewide management and governance structure and the roles and interrelationships of key bodies including the Office of GIS Coordination, GIS Steering Committee, GIS Policy Council, GIS Technical Center, and the WV Association of Geospatial Professionals. This underscores the fact that the existing governance structure is not well communicated that roles need to be clarified and policies need to be established to position statewide GIS management and governance to better serve all stakeholders in West Virginia.

2.4 NSGIC "SCORE CARD" RESULTS

The National States Geographic Information Council (NSGIC) has prepared a set of critical success factors (CSF) for statewide GIS programs and a simple scorecard allowing states to evaluate their own status and identify areas that need additional work. West Virginia's scorecard results (as assessed by the State GIS Coordinator and the GIS Steering Committee) are provided in Table 1.

Table 1: NSGIC Scorecard for Measuring Success of State GIS Programs

NSGIC "50 States" Success Factors	West Virginia Score*	Comments on Status
1. A full-time, paid coordinator position is designated to implement the state's business and Strategic Plans	5	WV State GIS Coordinator position housed within the WV Geological and Economic Survey
2. A clearly defined authority exists for statewide coordination of geospatial information technologies and data production	3	Executive Order 4-93 designated the GIS Policy Council to oversee the state's GIS Program under the management of the State GIS Coordinator. Additionally there is a GIS Steering Committee chaired by the State GIS Coordinator. The Steering Committee is set up for the coordination of technical aspects of the WV GIS Strategic Plan (originally called WV GIS Development Plan). The committee provides advice to the Policy Council and the GIS Coordinator on technical issues and serves as an interagency coordination body.
3. The statewide coordination office has a formal relationship with the state's Chief Technology Officer (CTO)	3	There is an informal relationship between the Office of the State GIS Coordinator and the CTO in which the CTO is advised by the Coordinator about GIS related issues. The Coordinator reports to the GIS Policy Council and the Director of the WV Geological Survey
4. A champion (political, or executive decision-maker) is aware and involved in the process of geospatial coordination	3	The GIS Policy Council, composed by Cabinet Secretaries, members of the Board of Public Work or their designees, the CTO, and the Coordinator as nonvoting member of the Council, has been involved in initiating and approving the GIS Strategic plan. There is interest in geospatial applications among state agency leaders, individual members of the legislature, and County and local governments. The CTO is supportive of a geospatial program development.
5. Responsibilities for developing the National Spatial Data Infrastructure (NSDI) and a State Clearinghouse are assigned	3	The GIS Technical Center has been designated as a state data clearinghouse for the NSDI. The Coordinator has generally taken the lead role in coordinating data development initiatives in collaboration with several entities; however there are very few formal data stewardship arrangements and funding opportunities.
6. The ability exists to work with local governments, academia, and the private sector	4	The Office of GIS Coordination is working, with local governments, academia, and the private sector in development and implementations of GIS technology.
7. Sustainable funding sources exist to meet project needs	3	The Office of GIS Coordination, the GIS Technical Center, together with the Coal bed Mapping Program, and Mineral Parcel Mapping Project receive funding through the WV Geological and Economic Survey (WVGES); however data and applications development and implementation is dependent on funds availability from non-permanent external sources.
8. GIS Coordinators have the authority to enter into contracts and become capable of receiving and expending funds.	3	The Office of GIS Coordination may only enter contracts, agreements and or receive/expend funds through the Geological Survey. The Coordinator's Office does not have the authority to directly apply for grants with the federal government.
9. The federal government works through the statewide coordinating authority	3	Some federal agencies work through the Office of GIS Coordination others through individual agencies and/or organizations.

* The NSGIC calls for an assignment of scores from 0 to 5 for each of the Success Factors, where "0" means that no progress has been made and "5" indicating that the factor has been fully accomplished. NSGIC maintains a State Summary accessible via the web at http://gisinventory.net/summaries/

2.5 STRENGTHS, WEAKNESSES, OPPORTUNITIES, CHALLENGES (SWOC)

An evaluation of Strengths, Weaknesses, Opportunities, and Challenges (SWOC) is a Strategic Planning tool that creates a picture of status, shortcomings, future direction. This SWOC evaluation provides a starting point for defining strategic goals and for crafting an implementation strategy. Information from the two user community surveys identified above and input from the GIS Steering Committee, the SWOC evaluation is presented in

Table 2. This table gives is a summary of a more detailed evaluation presented in Appendix A which identifies SWOC information organized by the main components of West Virginia's GIS program (geographic data, infrastructure, governance, resources, training/education).

**Table 2: Summary of Strengths, Weaknesses, Opportunities,
and Challenges Impacting GIS Program Development**

Positive Factors	Negative Factors
<u>Strengths</u>: • State GIS governance structure and funding base established through Executive order and state legislation. Includes State GIS Coordinator, Steering Committee, and Policy Council • National support for state GIS coordination and existing USGS liaison in place • Active and interested GIS user community at federal, state, regional and local level with user communication and support provided through WVAGP • Considerable statewide GIS data resources available through state GIS Data Clearinghouse (GIS Technical Center) • Current state and local programs, in planning stage or recently initiated, will deliver additional, detailed geographic data • Active academic and research community supporting GIS users, special projects, and professional training • Advances in GIS software providing more effective Web-based applications for geographic data viewing, analysis, and integration • Recently initiated GIS projects at state level will be providing enhanced data resources and expanded applications • Good fiscal health of WV state government compared to most other states	<u>Weaknesses</u>: • Existing deficiencies in the clarity and effectiveness of state GIS governance elements and policies • Current wording of HB 2222 references legacy GIS environment and does not reflect current organizational environment and funding needs • Insufficient awareness and support of GIS programs by senior officials • Low funding for GIS programs and personnel and hiring limitations impact GIS program quality and expansion opportunities in state and local agencies • General lack of data and technical standards limits effectiveness of database development and GIS implementation • Insufficient GIS data stewardship programs • Organizational and technical barriers still limit joint projects and interagency coordination • Many local governments without GIS programs and, in some cases, no or limited broadband communication access
<u>Opportunities</u>: • Great interest in GIS at all levels of government and the private sector and potential for greatly expanded applications meeting organizations' business needs • Passage of HB 4003 updating and clarifying state GIS governance structure • Advances in GIS software and computing infrastructure providing platforms for more flexible, powerful, and easy-to-use GIS applications • Decreases in cost for GIS data capture and expanded sources of geographic data • GIS special events support expanded awareness and engagement of GIS users and managers (GIS Day, GIS-T conference, state GIS conference) • Public-private partnerships present new opportunities for joint funding • Possibilities for regional hosting of GIS services for low-resourced local governments • New programs and sources supporting additional GIS data compilation (high-res orthoimagery, LIDAR, transportation data, accelerated MLMP parcel conversion, Water Development Authority utility data) • Better leveraging of available GIS training and professional development sources and programs including Web-based training, mentoring • Elevate and formalize role of GIS Policy Council to increase awareness and garner support for GIS • Cost-benefit ROI could provide business case for expansion of GIS • A variety of innovative funding mechanisms can be leveraged to support GIS programs • Tighter relationship with State IT to position GIS as part of enterprise IT • GIS server and license consolidation might decrease maintenance costs and system administration complexity • Use of Web-based GIS services to improve availability and use of existing GIS data	<u>Challenges</u>: • Requirement to further define and clarify roles and relationships of elements of state GIS governance structure • Maintaining awareness and support of senior officials • Geographic variability in GIS resources in local governments around the state—low population/low resourced local governments unable to fund and support GIS programs • Need for documented best practices and standards for GIS projects and program implementation (management, plans, technical specifications, and operational practices • Breakdown of technical and organizational barriers that inhibit integration and coordination which reinforce data and application silos • Maintaining well-trained and experienced GIS workforce • Getting funding and support for high-priority database development (digital elevation data, and statewide high-resolution imagery) and maintaining existing databases • Enlisting work by volunteers from all stakeholder groups for GIS projects and governance support • Possible decrease in Federal funding for GIS programs could place more burden on state and local governments • Setting up effective stewardship practices for update of Framework Data • Rugged terrain complicates compilation and update of GIS data (digital elevation, orthoimagery, and cadastral, governmental/administrative boundaries) • Staying up-to-date with changes and upgrades to software, hardware, and network services

SECTION 3:
STRATEGIC FOUNDATION

The strategic foundation defines the basis for the plan and lays out the long-term direction and issues governing future GIS Development. It defines the basis for the plan and lays out the long-term direction and issues governing future GIS development. It includes a discussion of the main business reasons for GIS and for taking action on the plan. The foundation includes a concise, clear vision and/or mission statement. Mission and vision statements are complementary—the vision paints a picture of the future and the mission gives a concise statement on how to get there. It is not necessarily essential to have both a vision and mission statement but it is recommended. See goals from existing plan drafts (documents: WV GIS State Coordinator Strategic Plan.docx, GIS General Plan.doc). The high level goals are the "handles" on which more specific implementation initiatives are based.

3.1 BUSINESS DRIVERS FOR STATEWIDE GIS

A business driver is a major need, program, service area, or challenge faced by organizations that may be impacted or supported by GIS technology and data. Business drivers may reflect strategic or operational goals of the organization, user or customer service needs, legal or regulatory requirements, external conditions (economic, social, political) or other business factors. Business drivers that are impacted or supported by GIS technology and data establish a very strong, strategic foundation for the GIS program. Some business drivers for GIS are high-level and overarching in nature, reflecting overall goals or advantages for the organization as a whole and impacting multiple departments and user groups. Other business drivers are more specific to an individual department or organization, business area, or program. The main GIS business drivers in West Virginia are identified in Table 3 below.

Table 3: West Virginia GIS Business Drivers

Business Driver	Elaboration and Role for GIS
Overarching Business Drivers:	
Improved collaboration among state agencies	Organizational and programmatic barriers continue to inhibit effective cross-agency collaboration and project partnerships in state government. GIS technology provides a basis and a catalyst for such collaboration—based on common needs for geographic information.
Enhancement/increase in inter-organizational partnerships and cooperation—to encourage resource sharing and cost reductions	The same factors that inhibit effective collaboration among state agencies operate on a broader scale—agencies in all levels of government, the private sector, and academia. GIS technology does provide a foundation for collaboration and inter-organization partnerships (including public-private partnerships).
Improvement in the quality, consistency, timeliness, and efficiency of geographic data stewardship and update	Geographic data is an asset with great business value as demonstrated through practical GIS applications within and outside of West Virginia. Establishment of sound policies for GIS data stewardship helps maintain the value and usefulness of the data.
Improved access to geographic data for decision making	GIS technology with accessible, high-quality data provides a range of tools to support decision-making at local, regional, and statewide levels. From basic query and mapping to sophisticated geographic analysis tools, GIS technology provides input for planning (e.g., land use decisions, transportation, public health, and emergency management) and for allocation of resources for operational purposes.
Response to public demand for information and services	The increase of digital information and services available to private citizens and businesses (through Web-based applications and improved networks) has helped fuel demand for enhanced services and quicker response. GIS technology supports e-government, geographic information needs of private companies, and consumer demand.

Table 3: West Virginia GIS Business Drivers (cont.)

Business Driver	Elaboration and Role for GIS
Overarching Business Drivers:	
Cost containment for public agencies	When properly used, GIS applications can support creation of efficiencies in operational programs (e.g., field operations, social services, permit/plan review, etc.) to help realize cost savings. Opportunities for program and data integration through GIS help reduce redundancy and promote cost sharing.
Enhancement of health and quality of life for West Virginia citizens	GIS applications support planning and operations relating to multiple factors that contribute to enhanced health and well-being of people in West Virginia. Geographically-based decisions in such areas as regulatory program management, public health services, comprehensive planning, environmental quality, and utility infrastructure planning can all be supported by GIS technology and data.
Better leveraging of innovative funding and resourcing mechanisms	While funding of GIS programs, particularly in the private sector, has traditionally relied upon general fund budget allocations, fiscal constraints place demands to examine additional funding sources (grants, fee-based sources, cost-sharing partnerships, and innovative staffing approaches) to continue to sustain and enhance GIS programs. There are a range of "non-traditional" sources which can be pursued.
Program-Specific Business Drivers:	
Increased economic development and tourism	Tourism and recreation are a significant source of revenue for public and private organizations in the state and there are opportunities for expansion.
Efficient emergency planning and response	GIS tools directly support all aspects of emergency management: planning, response to emergency events, recovery, and mitigation. GIS is a primary tool that provides map display and access to supplemental law enforcement and fire dispatch, response, and incident analysis. GIS has a proven place in support of multi-organizational coordination of event response, large-scale emergency planning, and recovery work (e.g., for natural disasters). GIS has been used to support these business needs in West Virginia but considerable opportunities exist for expanded application of GIS.
Tracking public land transactions (acquisition, sale, lease)	Federal, state, and local governments manage a large amount of real property—land, buildings, and other infrastructure for which public agencies have ownership, lease arrangements, or have a role in management. Considerable amounts of money are involved in sales, acquisitions, and leasing. GIS is the most effective tool supporting identification and mapping of these valuable assets and for providing detailed information to support tracking of real property transactions.
Access to current information on land development and development restrictions	Sound land development, small-scale and large-scale, requires government entities and private companies to plan, design, and approve projects taking into account economic benefits and short-term and longer term impacts. GIS is a powerful tool to support project planning and review and to keep track of the status of development. Monitoring of activity that results in major landscape modification (e.g., mining, forest harvesting, and transportation projects) using GIS tools has a major benefit for decision-making.
Identification or orphan, unused land to new productive uses	Mining and timber operations in the state (going back many decades) have resulted in large tracks of land which in their current state have little economic use. GIS can be used to evaluate the productive potential of these lands and include them in land use planning and economic development efforts. GIS also plays a strong role in all aspects of real property management (e.g., appraisal, sales/acquisition/lease management).
Response to more stringent environmental, health, and safety regulations	State and local governments are faced with legal and programmatic requirements to put in place operational programs responding to new or more stringent regulations (e.g., enforcing environmental programs, safety regulations, public health programs, etc.). Such regulatory programs have a strong geographic aspect. GIS technology can help deliver information for efficiently responding to these regulations.

Table 3: West Virginia GIS Business Drivers (cont.)

Business Driver	Elaboration and Role for GIS
Program-Specific Business Drivers:	
Effective energy policy and development of energy resources	West Virginia's economy is largely based on energy resources. GIS technology is currently used and has the opportunity for enhanced application in the management of fossil fuel resources—permitting for coal, gas, and oil extraction; mineral land resource appraisal; management of extraction operations; land reclamation. GIS tools can play a major role in planning and implementation of alternative energy sources (principally wind)
Efficient transportation and utility planning, development and maintenance	Sound management of transportation and utility systems relies on GIS technology for infrastructure, mapping, planning, project design and monitoring, and all aspects of asset and maintenance management. GIS addresses the business needs of a wide range of organizations responsible for infrastructure management: state DOT and WDA, local government public works and municipal utilities, independent public utility districts, and private utility companies.
Inventorying of and improving access to broadband communications assessment and mapping	There is currently a national and statewide focus on inventorying and enhancing broadband digital access in all areas—specifically for underserved areas. The Office of GIS Coordination is managing a major broadband assessment and mapping effort under the auspices of the National Telecommunications and Information Administration (NTIA). GIS is a tool that will be used to support this work and access to GIS will be improved from network enhancements in the future.
Demographic analysis and electoral redistricting and redefinition of apportionments in a way that reflects local needs and improves opportunities for federal funding	Mandated redistricting following the 2010 Decennial Census is largely a geographic problem for which GIS technology can play a major role—providing maps and geographic information for evaluation of factors and different redistricting scenarios and reaching a consensus on electoral district boundaries—in a legally defensible manner and in a way that maximizes opportunities for federal funding allocations. In a broader context, Census 2010 demographic data will provide a foundation for planning of government services based on population distribution.
Positioning and implementation of active and passive sensor networks for the public good	New information technology tools and wide area network communications, supported by GIS technology, provides opportunities to use remote monitoring devices (CORS stations, integrated flood monitoring, weather monitoring, stream gauges, intelligent transportation monitoring and control systems, SCADA systems and smart grid devices for utility networks) promise to lower costs and increase the availability of data to support planning, decision making, and public safety.

3.2. VISION AND MISSION STATEMENTS FOR STATEWIDE GIS

The vision and mission statements establish the conceptual objectives for the Strategic Plan. The vision statement paints a picture of the future. The mission statement articulates what will be done to reach that vision. These brief statements encapsulate the Strategic Plan by providing a clear description of the intended results and a summary on how the results will be achieved. The vision and mission statements serve as the basis for defining strategic goals and a work program (See Section 5) for statewide GIS program enhancement. West Virginia's GIS vision and mission statements presented below have been prepared with input from representatives of the statewide user community.

Statewide GIS Vision:

Build a robust and efficient GIS infrastructure that encourages collaboration and delivers cost-effective geographic data and services to West Virginia organizations and its citizens.

> **Statewide GIS Mission:**
>
> *To enhance GIS assets and services for the benefit of all West Virginians, building on past achievements and incorporating sound leadership, effective management, and active participation from the statewide GIS community.*

3.3 HIGH-LEVEL STATEWIDE GIS GOALS

A critical element of the strategic foundation is a set of high-level goals (sometimes referred to as "strategies") which identify key areas for action to accomplish the stated mission. These goals address important development or operational areas that are critical for long-term GIS development, coordination, and operation in West Virginia. The goals frame the overall intent of the plan and give a high-level basis for implementation initiatives (See Section 5) that address more specific work areas over the 5-year period of this plan.

The goals, of West Virginia's Statewide GIS program are:

1. Enhance and strengthen the governance structure and improve management practices of the statewide GIS program.

2. Increase outreach efforts and awareness of the benefits of GIS technology and data and expand GIS access and use for all parts of the statewide GIS community.

3. Identify and secure new funding sources and establish improved financing strategies for GIS development and operation.

4. Encourage and improve collaboration and coordination through increased sharing of geographic data, technology transfer, and project partnerships.

5. Enhance the quality of geographic data and create effective stewardship practices and standards to efficiently develop and maintain statewide coverage of Framework geographic data.

6. Support the development and maintenance of important, non-Framework geographic data.

7. Encourage and enhance programs and opportunities for training, education, and professional development for GIS staff, management, and users.

8. Maintain and upgrade computing and network infrastructure to provide adequate capacity to support current GIS applications and to adopt new information technology tools and environments.

9. Establish core capability for developing in-house geospatial applications and services in state government to provide greatest benefit for State agencies and other GIS stakeholder groups.

SECTION 4:
HIGH-LEVEL GIS ARCHITECTURE REQUIREMENTS

4.1 ENTERPRISE APPROACH

The strategic goals and initiatives presented in this plan call for a robust statewide GIS architecture which is characterized by the following themes:

- Multi-organizational, statewide scope

- Focus on the business needs of stakeholder organizations

- Long-term vision and focus

- Coordination and collaboration in GIS data and application access among all GIS stakeholders in all levels of government, the private sector, academia, utility organizations, and the general public

- Full development of Framework Data and other important geographic data themes with sound data maintenance practices

- Geographic data and applications that are easy-to-access by users employing effective Web-based services and robust networks

- Practical, well managed adoption of new and proven GIS and IT software and methods that will support users' business needs

- Integration of GIS with overall information technology architectures and IT standards

- Shared data, applications, and support

The high-level statewide GIS architecture presented in this section builds on system components, geographic data resources, and the organizational/management environment already in place in West Virginia—within and outside state government. This includes substantial statewide GIS data, Web-based on-line access to data and applications, considerable investments in GIS software and system/network infrastructure, and statewide GIS program governance. This high-level architecture describes a target environment for a statewide GIS program called for by this Strategic Plan. It is not a "technical blueprint" but a general picture of the main system configuration, database components, and organizational elements needed to support for a robust statewide GIS program.

4.2 TECHNOLOGY TRENDS IMPACTING GIS DEVELOPMENT AND USE

Strategic planning implies a long-term view with an ability to channel GIS enhancements and expansion in a way that anticipates and takes advantage of changes in technology and the GIS industry. The pace of technology change and the dynamic nature of IT and GIS make it challenging to predict specific developments. One can examine trends and prepare a multi-year plan that takes likely changes into account and creates an environment for effective technology monitoring and response to new techniques, practices, and products. Five main technological trends are impacting information technology and GIS.

Trend 1: Pervasive, High-Performance Computing: Continued dramatic increases in the performance of computers, decreases in their size, and greater options in their physical format and adaptability to different user environments. This drives the wide availability of computers of different types and forms (traditional and nontraditional) any place and any time.

Trend 2: Digital Connectivity: Increasing capabilities and infrastructure to transmit digital information over large areas at increasingly higher speeds in wired and wireless modes, including advances in Web-based environments (including private GIS service platforms like Google Earth and Bing Maps) for discovery and access to geographic information. Advances in computing and broadband digital access supports new advances in mobile GIS and "cloud computing" giving flexible options for GIS user organizations.

Trend 3: Geographic Data Capture and Compilation: More efficient and less expensive methods of spatial information capture and processing and an increasing array of sources for geographic information provide GIS users with a larger number of options in building GIS databases. Increases in the number of sources and resolution of earth imagery (satellite and aircraft scanners), GPS data collection tools, orthoimage production, LiDAR capture for DEM generation, and map conversion.

Trend 4: Geographic Data Processing, Management and Visualization: More sophisticated and powerful tools and systems to manage geographic data and to convey meaning through maps, charts, pictures, models, and other visualization forms, with an increase in the tools for management of 3D and time-series spatial data.

Trend 5: Standards and Open Systems: Technical standards (formal or de facto) impacting operating systems, network technology, application software, and data format that promote interoperability, consistency, and common interfaces. As these standards drive the industry, they become the basis for products and practices that support and enable interoperability and make it easier for people and applications to access and use information from multiple sources. Emerging open source GIS software products provide users with additional, low cost options for GIS applications.

4.3 SUMMARY OF GEOGRAPHIC DATA REQUIREMENTS

The evaluation of GIS status, business drivers, and limitations presented above provides context for a summary of key technical requirements for future statewide GIS development and operations presented in this section.

We realize that West Virginia's statewide GIS goals are dependent on the development and ongoing maintenance of high-quality geographic data. There is a focus on "Framework" geographic data that include data themes for which there is a significant, common need by a large portion of the state's user community. West Virginia's Framework Data themes are based on the concept development by the Federal Geographic Data Committee (FGDC) which identifies 7 key data themes: geodetic control, orthoimagery, elevation, transportation, hydrography, governmental units, and cadastral. As shown in Table 4, several additional themes (beyond the 7 FGDC themes) have been included in the West Virginia Framework. In addition to these Framework Data themes, there are other geographic data themes that are important for multiple user groups in the state. Table 4 presents the Framework and Secondary-Framework Data themes on which the Strategic Plan is focused. NOTE: It is recognized that there are other geographic data themes not included in Table 4 which are important for specific organizations and GIS applications. Although these additional data themes are not specifically addressed in this Strategic Plan, the Plan encourages the development of business plans to address them.

West Virginia Framework Data Theme	Description	Summary of Status
Framework Data Themes:		
Geodetic Control	Horizontal and/or vertical control points established with accurate field survey techniques with permanent marker and documentation. Can be referenced with high precision to geographic coordinates (lat/long), horizontal and vertical datum, and appropriate plane coordinate systems.	CORS densification project spearheaded by WV DOT HARN densification 2003. Need to move from CORS to VRS
High-Resolution Orthoimagery	Orthorectified raster data derived from scanned aerial photography, digital aerial cameras, or commercial satellites. Pixel size of 1 foot or less in B&W, color, or four bands.	The most recent leaf-off statewide imagery dates back to 2003, leaf-on are the NAIP 2009. Individual counties are acquiring imagery.
Moderate Resolution Orthoimagery	Orthorectified raster data derived from scanned aerial photography, digital aircraft scanners or satellite imagery with a pixel size normally in the 1 to 5 meter range.	CIR 1996-98 Statewide leaf-off
Elevation	Elevation points or a digital elevation model in a grid or TIN format complied photogrammetrically from stereo aerial photography, from LiDAR, or derived from digitized contour maps.	Statewide 3 meter NED derived from SAMB points and break lines. LiDAR coverage on 40% of state but not statewide LiDAR business plan
Surface Hydrography	Surface water courses, water bodies, and hydrographic basin boundaries (e.g., NHD data).	MOU for NHD stewardship in place
Transportation-Road Network and Addresses	Road network including all highway and road classifications, local streets, and selected private roads. Includes address ranges applied to street/road centerline segments	Stewardship for statewide road centerlines performed by WVDOT and it is expanding its transportation mapping programs
Transportation-Other Transportation Modes	Other, non-road, transportation modes including trails, aviation facilities, railroads, and water navigation routes and facilities	WVDOT, Div. of Tourism, WVDHSEM, Division of Forestry and others are developing and updating various datasets
Cadastral	Boundaries of real property parcels, public rights-of-way, and legally defined easements. Also includes taxing district boundaries which establish the basis for property appraisal.	There is no statewide cadastral dataset, 38 counties have been or are in the process of converting surface tax maps to Shapefiles. Using data from the Property Tax Division the Division of Forestry created a managed timber cadastral dataset. MLMP has mapped over half of the state's mineral (coal) parcels. DOT working on a in-house DOH Land information System
Secondary Framework Data Themes:		
Administrative Boundaries	Boundaries that encompass areas for programs and services administered by a federal, state, regional, or local authority (e.g., election districts, regional planning agencies, health districts, local government service districts, emergency service zones, etc.)	Counties need resources to update the boundaries. Public Service District boundaries undertaken by WDA.

West Virginia Framework Data Theme	Description	Summary of Status
Framework Data Themes:		
Public Safety Critical Facilities	Location of facilities important for emergency planning and response (law enforcement and fire/EMS stations, shelters, schools, hospitals and medical clinics, etc.).	Community anchor institutions updated in 2010 utilizing NTIA's broadband grant. SAMB now administered by DHSEM, counties continue to work on address updates.
Land Cover/Vegetation	A characterization of the vegetative or non-vegetative cover at the surface.	There is a need for a business plan to regularly update and/or publish land cover data.
Water Utility	Water supply facilities (reservoirs, tanks, and treatment plants), water transmission lines, and the distribution network that delivers water to consumers. Including boundaries of utility service areas and other sub-service area boundaries used by a utility organization for management of the utility system.	WDA statewide water and wastewater utility mapping project in progress. Web based interactive tools part of the project
Wastewater Utility	Treatment facilities and the collection network that moves wastewater from generation points (homes and businesses) to treatment sites. Including boundaries of utility service areas and other sub-service area boundaries used by a utility organization for management of the utility system.	WDA statewide water and wastewater utility mapping project in progress. Web based interactive tools part of the project
Telecommunications	Utility infrastructure supporting telephone, cell phone, and radio transmission. Includes towers, land lines, and facilities for voice and data transmission.	NTIA $4.7 Million grant funding current broadband mapping program administered by WVGES and Managed by the Office of GIS Coordination. SAMB Tower location map is continuously updated
Governmental Units	Boundaries of state, county, municipal jurisdictions and public service districts (school districts) used in for allocation of real property taxes.	1:24 State and county boundaries digitized by DEP. 1:24 Tax district boundaries digitized by Property Tax. Corporation boundaries not updated by PSC or any other state agency. WDA will digitize as many PSD boundaries as feasible.
Geology and Mineral Resources	Surficial bedrock geology and selected subsurface geological strata including coal and other minable mineral resources.	WVGES administers, shares, updates and publishes a coaled mapping program and several gas well datasets for GIS applications. DEP maintains gas well and mining permit datasets which are made available to other agencies and the public.

Table 4:
Framework Data Requirements and Status (cont.)

West Virginia Framework Data Theme	Description	Summary of Status
Framework Data Themes:		
Flood Zones	Boundaries of predicted flood zone areas based on FEMA flood rate insurance maps	FEMA and DHSEM working on updates. DHSEM currently working on 11 digit watersheds hazards for 20, 50, 100 and 500 year flood models utilizing HAZUS
Soils	Detailed soil unit boundaries (SSURGO) mapped by the National Resource Conservation Service.	WV SSURGO completed. Need to enhance awareness of the availability of these datasets
Demography	Includes boundaries of geographic units for which demographic data is compiled as well as aggregated demographic data for these geographic units (population, income levels, ethnic background, etc.). Includes data from Census Bureau Decennial Census statistics as well as demographic statistics from other sources.	State data center at the Department of Commerce and Vital Statistics beginning a GIS program

Geographic data requirements that support West Virginia's GIS community, and which deliver benefits to organizations and the general public, focus on building and maintaining statewide coverage of important data themes and putting in place more robust mechanisms for maintaining that data and making it accessible to all users. These data requirements addressed in this Strategic Plan are summarized as follows:

- An accelerated, standards-based, statewide Framework Data compilation with clear procedures, tools, and responsibilities for stewardship (regular maintenance, quality assurance, tracking of updates, and provision of access to a broad user community).

- An environment that supports the development and maintenance of critical non-Framework Data themes with an acceptable level of standards that drive consistency and integration with other data themes.

- Clear, useful metadata standards with effective tools and procedures for capturing, maintaining, and accessing metadata regardless of software environment

- Continued update and enhancement of a geographic data catalog and clearinghouse (now managed by the state GIS Technical Center) to support user searches for and access to GIS data.

- A well-designed Stewardship Program that includes a process, tools, and assigned stewardship roles for specific organizations.

- Access to and integration of non-map geographically referenced data sources (databases, text documents, forms, site photos, drawings, and external Web sources) to support numerous geographic information management applications.

4.4 SYSTEM INFRASTRUCTURE REQUIREMENTS

System infrastructure refers to the technical components of the GIS including computer hardware, networks, and the software used to manage and provide and provide access to GIS data and applications. This Strategic Plan focuses on improvements to the statewide GIS infrastructure that builds on systems currently in place to improve and enhance geographic data management and access in the following areas:

- Storage and management of different forms of spatial data in a way that permit transparent access and integration (vector map data, image layers, CAD data, etc.) regardless of format or coordinate system.

- Tools and easy-to-use applications for capture and update of GIS data, including field data collection and processing, capture of data from aerial images, GIS data conversion from hard copy sources, and efficient data update procedures.

- Availability of tools and applications that enable map display and visualization, geographic query, and spatial analysis.

- Flexible integration between GIS and non-GIS data, software, and applications.

- Web-based GIS interfaces and tools with the ability to combine locally managed data with any external Web-based service.

- Increasing accessibility to high-speed wired and wireless networks and services that expand the availability and flexibility of access to GIS data and applications.

The overall system architecture for support of statewide GIS called for in this Strategic Plan consists of the main components illustrated in Figure 2. This figure represents a conceptual technical configuration

for full deployment by the end of the five-year timeframe of this plan. It shows, at a high level, the main system, database, and network connections that would be needed to support GIS users throughout the state. Its purpose is to provide a general concept to guide long-term GIS enhancement and development.

The architecture in Figure 2 below shows a number of key components that convey a range of roles and services. In practice, the architecture follows a system model with a mix of distributed and centralized services for data management and GIS application services for users throughout the state. This configuration supports the SOA concept through its focus on Web-based services and access to data and applications on multiple platforms.

Figure 2:
Proposed High-Level System Architecture for Statewide GIS in West Virginia
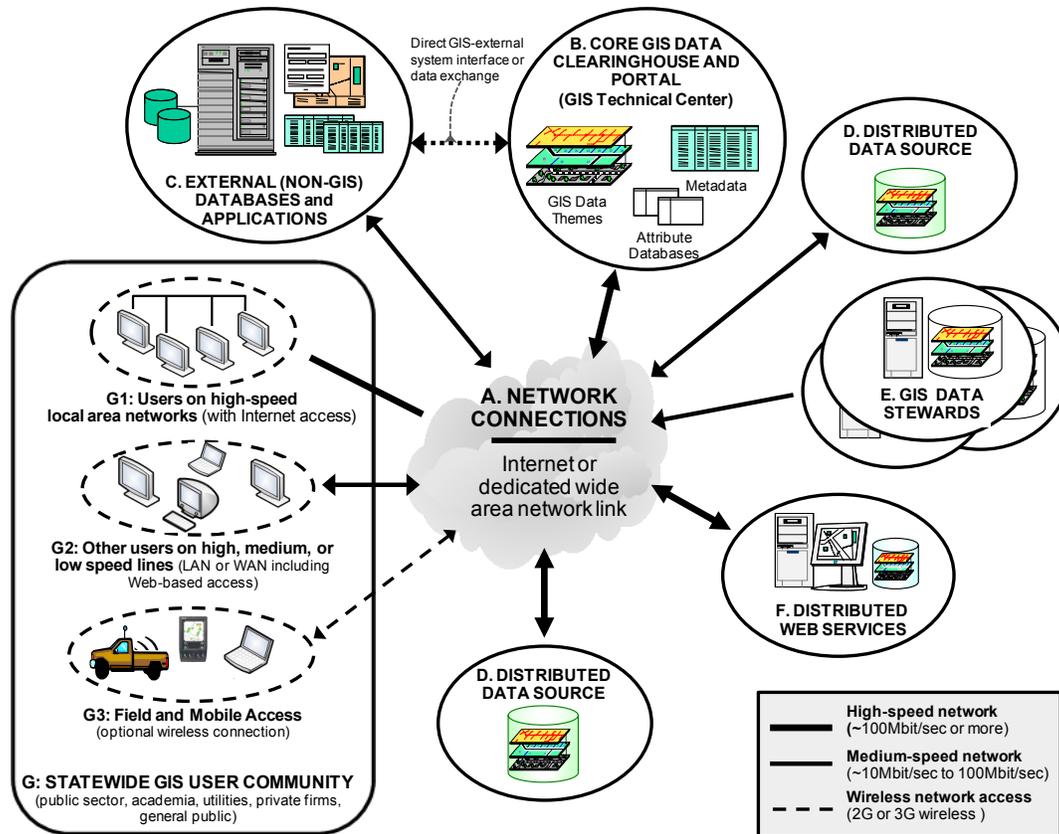
The main components of the high-level system architecture are described in Table 5. These components should be thought of as "roles" that specific sites may play as part of an overall statewide GIS architecture. A specific site may provide more than one role. For instance, a state agency or a county government with an active GIS program may fulfill roles as a Distributed Data Source (D), a GIS Data Steward (E), or a Distributed Web Service (F), as well as being part of the GIS user community (G).

Table 5:
High-level Technical Architecture for Statewide GIS—Main Components

A: Network Connections	This "virtual component" conveys the idea that the statewide GIS will make use of all available network links available to users. This includes access by existing dedicated local and wide area communications (e.g., state government and local government networks) and all other services allowing Internet communications and Web-based access and services for users inside and outside the state.
B. Core GIS Data Clearinghouse and Portal	The Core GIS Data Clearinghouse will build on capabilities now in place and managed by the GIS Technical Center. This will include enhanced services to support GIS data searches (based on a metadata catalog) and easy-to-use tools to access and download data. This core site will operate as a "virtual clearinghouse"—some data will be stored at the Core site but there will also be Web-based links directly to other agency sites where geographic data is stored and Web services are hosted. Core data will focus on Framework Data themes but will also support searches and access to non-Framework geographic data. Gradually, enhanced Web-based GIS services (as is now provided with the MapWV application) for data query, map visualization, and spatial analysis will be developed and deployed.
C. External Databases and Applications	Access will be provided to and from non-GIS databases and applications that require geographically referenced data or specific services to geographically enable those external systems. The nature of the access may range from data download to more interactive data and application integration.
D. Distributed Data Sources	These will be sites at different locations around the state (and perhaps outside of the state) with the system resources and mission to manage GIS data and provide access to it. These sites include selected GIS clearinghouses that are already in place or may be created in the future to support management and access of data for specific geographic areas (e.g., county jurisdiction) or a particular subject area or discipline. Some of these sites could serve a back-up role for the Core GIS Data Clearinghouse and Portal (B) to establish some fault tolerance for continuity of GIS services. These sites may also play a Data Steward (E) role. There are several sites in existence today, TAGIS, GTIS, RTI, MapWV, and WVGES to name a few.
E. GIS Data Steward Sites	Designated stewards, those organizations that have a lead responsibility for collecting, creating, and updating data, will perform the majority of Framework and non-Framework Data update and maintenance. This includes multiple federal and state agencies, local governments, utility organizations, University-based programs, and other participants. The main point is that these sites are formally designated as stewards supporting the statewide GIS program and have agreed to provide GIS data for general access. Some data sets maintained by these sites may be uploaded to the Core GIS Data Clearinghouse (B) for convenience in access but these sites may host data for direct access and therefore play the role of a Distributed Data Source (D) and/or provide Distributed Web Services (F). An example of this is to have RTI designated as a Distributed Data Source (D) also serving as a back-up for the GIS Data Clearinghouse (D), Data Steward (E) and as a Regional GIS Support Center.
F. Distributed Web-based GIS Services	These Web sites provide a range of geographic query, analysis, and display with geographic data. These may be supported by government agencies (federal, state, or local), the private sector (e.g., Google Earth), or academic institutions. In West Virginia, the MapWV site maintained by the GIS Technical Center which operates as part of the state GIS Clearinghouse is one example. The MapWV Web site, like other Web-services, also maintains GIS data and therefore plays a dual role as a "Distributed Data Source" (D). The popular Google Earth is a private sector example of a distributed Web-based services site. Other examples include the upcoming services offered by DEP, DOT and WDA. There are opportunities in West Virginia to expand and enhance Web-based services and applications to provide a richer set of tools supporting business requirements of the state's GIS user community.
G. Statewide GIS User Community	The broad user community throughout West Virginia and even outside the state which includes any GIS stakeholder group of GIS data users and applications from a variety of computing platforms and that access these data and applications from any available network.
G1. Users on High-speed Network	This group of users includes office-based personnel who connect to a local server and to the Internet through a high-speed local area network.
G2. Other LAN or WAN Users	Includes all participating, public sector organizations (federal, tribal, regional agencies, special districts, local governments, and public universities, private companies, general public). These users will access statewide GIS data and services using available wired communication services, including dial-up in some cases.
G3. Wireless Access	As the technology matures, expanded support will be developed for field and mobile data access through wireless data communications from vehicle-based computers or portable/hand-held devices. Field and mobile access may include "disconnected" GIS use or wireless communications as wireless data services are made available to specific geographic areas.

4.5 GIS ORGANIZATIONAL AND GOVERNANCE REQUIREMENTS

Use of the term, "governance" has become frequent in GIS and IT management circles. In the context of this plan, it refers to the following components which help to identify roles, delegate authority, establish lines of communication, and define management practices that support a statewide GIS program:

- Enabling Action: A documented, officially recognized, legal or administrative action that enables, establishes, and sanctions statewide GIS activities. This typically includes legislative active (ratified House or Senate bills or resolutions) or Executive Orders. In West Virginia the primary examples are House Bill 2222 and Executive Order 4-93. Other enabling actions have had a significant impact on the state GIS program (e.g., Senate Bill 460 that established the Statewide Addressing and Mapping Board).

- GIS Governance Authority: The formally designated roles and bodies that are granted governance responsibility for the statewide GIS program. Currently in West Virginia, governance roles are shared by the Office of the GIS Coordinator, GIS Steering Committee, GIS Policy Council, and individual organizations and agencies that support GIS activities.

- Statewide GIS Program Management: This includes the organizational entities and people with assigned responsibility for routine management of GIS operations. Currently, this includes the coordination and support provided by the Office of the GIS Coordinator, the GIS Technical Center, and GIS offices inside user organizations.

- Coordination Bodies: Includes any groups (with multi-agency or multi-organizational participation) established as part of an overall statewide GIS program that provides organizational support and facilitate management, communication, and collaboration among elements of the GIS user community. Currently, the GIS Steering Committee and the West Virginia Association of Geographic Professionals (WVAGP) provide a coordination role but there is a consensus that improvements are needed to support a greater level of resource sharing and collaboration.

- Policies and Rules of Operation: Written rules, policies, bylaws, formal agreements, etc., which provide the structure for clear, consistent operations, communications, allocation of resources, and performance of GIS work and statewide coordination. Currently there is an inadequate level of formally adopted policies and rules for entities that are part of the statewide GIS program—a concern that will be addressed through actions identified in this Strategic Plan.

As explained in Section 2.2 and Appendix A, the current organizational structure and governance of statewide GIS in West Virginia includes many of the elements stated above but improvements are needed to meet the goals of this Strategic Plan. The proposed statewide GIS governance structure adapts the current structure to strengthen and facilitate GIS management and coordination roles by the following means:

- Clarifying and augmenting the role and authority to the State GIS Coordinator in decisions and programs that impact state GIS resources and projects by implementation of Executive Order 10-10.

- Revision of legislation and implementation of Executive Order language to better reflect current GIS program circumstances and to help accomplish strategic goals.

- Formalizing the structure and role of the GIS Steering Committee and enhancing its involvement in statewide GIS decisions and coordination.

- Clarifying the role and authority of the GIS Policy Council and strengthening its involvement and oversight role in statewide GIS program planning and management.

- Positioning the GIS program as a significant part of the state's overall information technology architecture through increased coordination with the State Office of Technology (WVOT) and connection with the information technology planning, guidelines, and standards managed by the WVOT and the state Information Technology Council (ITC).

- Establishing an organizational structure that includes the creation of standing committees and temporary task forces or work groups that can engage multiple components of the statewide GIS user community in activities that support the goals of this Strategic Plan.

- Organizational enhancements and policies that enable and promote a higher degree of resource sharing and collaboration among state agencies.

- Formalizing the role of the WVAGP to better contribute to the statewide GIS goals and serve as a user group and advisory body for the Office of the State GIS Coordinator and GIS Steering Committee. WVAGP's role, relative to the overall governance structure, needs to be clarified. There will benefits in doing so, but it may mean some changes to the structure and membership of WVAGP.

- Formulating and communicating written policies, practices, and standards that support smooth operations and provide a foundation for statewide GIS development and operation.

- Taking specific steps to engage elements of the GIS user community in West Virginia which currently are not actively involved in statewide GIS initiatives through formal partnerships and joint projects.

- Making GIS data and applications more available statewide—particularly for lower population and lower resourced counties and cities which are not in a position to implement GIS programs. Regional user groups and the proposed Regional GIS Support Centers are organization entities that support this effort.

- Enhancing and formalizing the role of the state GIS Technical Center and regional organizations with GIS expertise, to provide GIS services and support to users around the state that currently have limited access to GIS data and applications.

- Leveraging the existing resources of the state's educational sector to promote GIS instruction and the training of professionals with an understanding of GIS technology and applications.

A proposed organizational and governance structure to accomplish the strategic goals is described in Section 4.6.

4.6 PROPOSED STATEWIDE GIS GOVERNANCE STRUCTURE AND MANAGEMENT

A revised organizational structure is proposed to address the governance and management requirements stated in Section 4.5. This structure, depicted in Figure 3, should be seen as a clarification, formalization, and enhancement of the organizational elements and relationships that are currently place. This recognizes that the current governance structure has been reasonably effective but improvements are needed. The recommended governance structure depicted in Figure 3 and explained in more detail in Table 6, builds in the strong points of the existing structure.

Figure 3: Proposed High-Level System Architecture for Statewide GIS in West Virginia
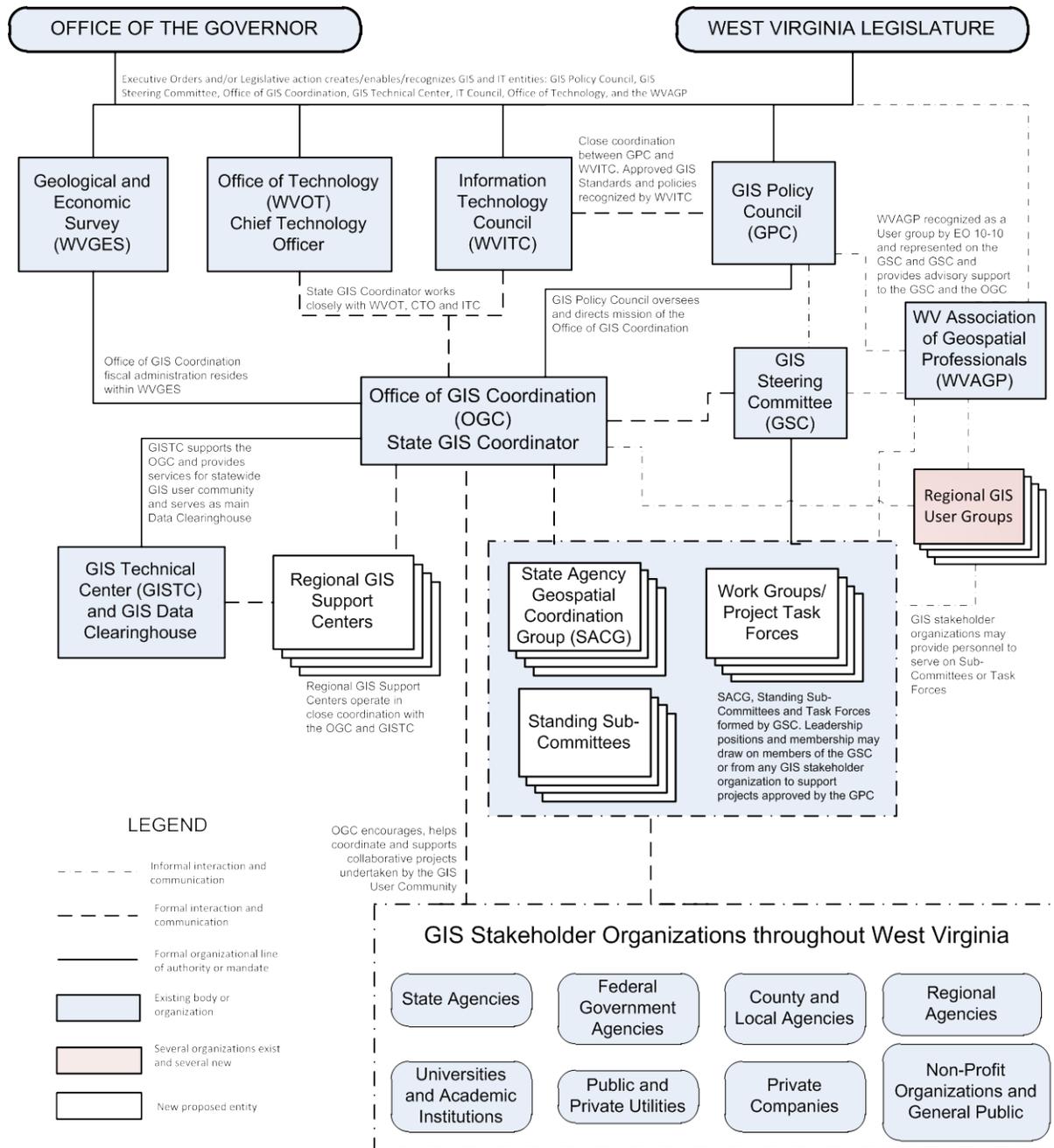

Table 6 provides more detailed information about the organizational governance structure depicted in Figure 3 above.

Table 6: Explanation of the Recommended Statewide GIS Program Governance Structure
(See structure depicted in Figure 3)

GIS Governance Entity	Description
State Technology Office (WVOT) and State CTO	Description: The WVOT is an executive branch office in the state's Department of Administration with a mission to develop an organized approach to information resource management for this state while providing technical assistance to state entities in the design and management of information systems. See www.technology.wv.gov Changes from Current Circumstances: WVOT increases level of participation in the statewide GIS program through its membership and involvement in the GPC and Steering Committee. WVOT technical personnel develop more expertise with GIS and support state agency GIS operations.
State Geological and Economic Survey (WVGES)	Description: Executive branch agency within the Department of Commerce. The WVGES is the administrative home of the Office of the State GIS Coordinator (OSGC) with administrative authority in the management of budgets, administration of contracts, and support in project management associated with the work of the OGC. See www.wvgs.wvnet.edu. Changes from Current Circumstances: Continues to operate as the "organizational/fiscal home" of the OGC. There should be policy statements that acknowledge the role of the OGC to coordinate and support statewide activities that may or may not be part of WVGES' original and legal scope. Definition of the primary role the GPC has on the oversight of the GIS Coordinator's activities. Need for an internal policy statement that defines the semi-autonomous role of the Office of GIS Coordination and the State GIS Coordinator.
Information Technology Council (ITC)	Description: An advisory body created by Executive Order 3-96 (www.technology.wv.gov/it-community/Pages/it-council.aspx) with administrative support by the WVOT. The ITC's role is to develop an organized approach to information resource management for the state while providing technical assistance to state entities in the design and management of information systems. Membership includes senior information technology personnel from state agencies and the State GIS Coordinator. Changes from Current Circumstances: Formally define relationship between the GPC and the ITC. GIS standards and policies approved by the GPC will be formally recognized by the ITC.
GIS Policy Council (GPC)	Description: Created through the Executive Order 4-93, and dormant for almost five years, it was revived by Governor Manchin in 2008. The Council oversees the development and implementation of West Virginia's GIS Program, in seeking to optimize the benefits of GIS technology for the state into the future. The Council is comprised of executive leaders from state departments, local government, and the GIS professional community. The WV Office of GIS Coordinator provides operational support for the Council and the State Steering Committee provides technical advice to both the Council and the GIS Coordinator. Membership includes senior management from state agencies and representatives of GIS stakeholder organizations outside of state government (Association of Counties, Municipal League, and the WVAGP). See www.gis.wv.gov/policycouncil Changes from Current Circumstances: The current membership and responsibility remains but the GPC assumes a more active role in GIS program oversight and advocacy for statewide GIS program goals (as provided for in EO 4-93). In addition, the GPC is formally designated responsibility for approval of GIS policies, standards, and guidelines. Formally define relationship between the GPC and the ITC. Creation of a State Agency Geospatial Coordinating User Group. Leverage Executive Order 10-10, which updates and modernizes Executive Order 4-93.

GIS Governance Entity	Description
Office of GIS Coordination (OGC)	Description: An office created though Executive Order 4-93 administratively placed in the WVGES with formal oversight by the GPC. The mission of the OSGC is to work with state agencies, West Virginia's GIS community, and regional and federal partners to provide and promote cooperative leadership, support, and innovative solutions for utilizing geospatial technology in serving the public good. The OSGC participates in and provides support for the GPC and the Steering Committee. See www.gis.wv.gov Changes from Current Circumstances: The mission of the OSGC remains the same but its role is clarified through formal policy statements and the update of Executive order 4-93 that defines: - administrative relationship with the WVGES and role of the GPC to oversee OSGC goals and activities - a strengthened role and authority to provide input, support collaboration, and encourage adherence to GIS standards and policies - relationship with the GIS Steering Committee, SACG, GISTC and the WVAGP One additional staff person with technical GIS skills should be added to the current staffing of the OSGC.
GIS Steering Committee (Steering Committee)	Description: The Steering Committee is charged with the development and implementation of the GIS Strategic Plan for the State of West Virginia. The Steering Committee was created by Executive Order 4-93, and was re-activated by the GIS Policy Council in 2008 with a newly formalized membership of GIS representatives from West Virginia state agencies, local government, the academic, federal, and private sectors, and a representative from the WVAGP. See www.gis.wv.gov/steering Changes from Current Circumstances: The stated mission of the Steering Committee remains the same but the level of involvement in GIS planning and operation coordination increases. Current overlap of membership on the Steering Committee and GPC is eliminated. Membership is revised to include other GIS organizations a needed. The Steering Committee, in close coordination with the OSGC and through sub-Committees and Task Forces that it assigns, will play a major role in GIS planning, specifications, and GIS project collaboration. The Steering Committee recommends GIS-related policies, standards, and guidelines for approval by the GPC. By-laws, to be prepared, clearly define the GSCs membership and responsibility.
Standing Sub-Committees (under Steering Committee)	Description: Standing Sub-Committees created by the Steering Committee have a defined, long-term role supporting GIS program development and coordination. Membership and the role of Chair may draw on any part of the statewide GIS community. At least one Steering Committee member serves on each standing Sub-Committee. Some possible standing Sub-Committees include: GIS Policies and Standards, GIS Education and Training, GIS Project Management and Coordination, GIS Funding and Financing, Spatial Data Stewardship, GIS Technology Trends. Changes from Current Circumstances: This is a new proposed entity not currently defined as part of the GIS governance structure.
Work Groups and Project Task Forces (under Steering Committee)	Description: Working Groups or Project Task Forces are established as needed by the Steering Committee and are temporary with a specific mission, leadership, membership and timeframe. They are formally dissolved after their mission is completed. Membership and the role of Chair may draw on any part of the statewide GIS community. They act as "project teams" with a plan and requirement for reporting to the Steering Committee, deal with such topics as: development of technical specifications, GIS application development, management of projects being carried out by contractors. Changes from Current Circumstances: This is a new proposed entity not currently defined as part of the GIS governance structure.

Table 6: Explanation of the Recommended Statewide GIS Program Governance Structure (cont.)
(See structure depicted in Figure 3)

GIS Governance Entity	Description
GIS Technical Center (GISTC) and GIS Data Clearinghouse	Description: The GISTC was established through Executive Order 4-93 and receives funding through HB 2222. The GISTC, located in West Virginia University's (WVU) Morgantown campus, plays a major role in providing technical services, data, and GIS application services to the statewide GIS user Community. The GISTC has a major role in hosting and maintaining the state's GIS Clearinghouse. See http://wvgis.wvu.edu Changes from Current Circumstances: No major changes to mission and operation. Staffing and resources for GISTC operations should be augmented and closer coordination between the GISTC, OSGC, and Steering Committee should be put in place so that the GISTC can more directly support implementation initiatives in the Strategic Plan and high-priority special projects.
Regional GIS Support Centers	Description: These Centers act as points of coalescence and support for GIS user organizations in different areas of the state and help to connect local activities with the statewide GIS program. Establishment of these Centers acknowledges that local governments and other organizations around the state have a need for GIS technology but may not possess the resources or technical capability to implement GIS in their organizations. These regional centers, established in coordination with the OSGC and the GISTC, are established as needed and as resources and sponsor organizations are identified. There is no single organizational model for these centers. They may be based at and sponsored by universities around the state, Regional Planning and Development Councils, or other organizations. Depending on the needs in a particular region of the state, they would provide a number of services and support functions, including: a) answering technical questions for users, b) providing some general "consulting" support and advisory services for organizations in the process of GIS development, c) training sessions, d) site for meetings and regional GIS events, and e) aggregate and serve regional GIS data Changes from Current Circumstances: This is a new entity not currently defined as part of the GIS governance structure. Establishment of a Regional Support Center will require a sponsor and a funding source These centers can be established and put in operation over a period of time as they are needed and as resources permit.
State Agency Geospatial Coordination Group (SGCG)	Description: A separate body organized and supported by the OSGC which recognizes the importance of and need for effective GIS coordination and implementation in state agencies. The SGCG has a purpose to facilitate communication, collaboration, sharing of resources, development and adoption of standards, joint project work among state agencies. It includes membership from all state agencies with current or planned use of GIS technology. Changes from Current Circumstances: This is a new entity not currently defined as part of the GIS governance structure.
Association of Geographic Professionals (WVAGP)	Description: The WVAGP is an independent, volunteer-based body with a mission to facilitate the use, development, sharing, and management of geospatial data and communicates the value of geospatial information to citizens and decision-makers. Members of WVAGP include representatives from local, state and federal agencies, educational and research institutions, the private sector, and other professional organizations. The WVAGP is governed by a board of directors and its operation is guided by formally approved by-laws. These by-laws establish several standing committees and allow for the creation of "special committees" as needed. The WVAGP has been formally identified through HB 4003/SB 359 as a GIS User Group. See www.wvagp.org Changes from Current Circumstances: The WVAGP should continue to operate under its established by-laws to support statewide GIS communication, coordination, education, sound GIS use by the statewide GIS community. The relationship of the WVAGP with the Steering Committee and OSGC should be more clearly defined—positioning the WVAGP to provide useful input to the OSGC and the Steering Committee with its membership actively involved in Steering Committee Sub-Committees and Task Forces. Also the WVAGP should be positioned to support and help coordinate regional GIS user groups in the State.

GIS Governance Entity	Description
Regional GIS User Groups	<u>Description</u>: Regional user groups are formally defined bodies or informal groups established to promote communication, collaboration, sharing of resources, and transfer of technology among GIS user organizations in a geographic region of the state. The current "Eastern Panhandle GIS User Group" is one example of a regional user group. <u>Changes from Current Circumstances</u>: The WVAGP and the OSGC should encourage and support the establishment and operation of regional user groups. Their formation requires a lead party in the region to take responsibility for setting up and managing the group
GIS Stakeholder Organizations	<u>Description</u>: Includes any public, private, or non-profit entity in the state which is currently using or is interested in GIS technology. <u>Changes from Current Circumstances</u>: The OSGC, Steering Committee, and WVAGP should encourage expansion of GIS technology by all stakeholder organizations. The stakeholder organizations participate in the WVAGP and serve on sub-committees and task forces established by the Steering Committee.

SECTION 5:
IMPLEMENTATION INITIATIVES, TIMING, AND RESOURCE ESTIMATES

This section describes strategic initiatives that comprise a five-year work program to accomplish the strategic goals presented in Section 3. This work program includes a series of implementation initiatives, each supporting one of more of the goals. These implementation initiatives fall into the following categories:

- Organizational and management structure, practices, and policies
- Data development and management
- System configuration, software, or application development and operation
- Education, outreach, and internal/external communications
- Funding, budgeting, cost-benefit evaluation, and financial management

These implementation activities provide a basis for specific projects to be undertaken by stakeholder organizations under the leadership and coordination provided by the Office of the State GIS Coordinator and the GIS Steering Committee.

5.1 HIGH-LEVEL GOAL ELABORATION

The high-level GIS Program Development goals are re-stated below with additional information on their context and scope:

1. Enhance and strengthen the governance structure and improve management practices of the statewide GIS program.

Goal 1 Context and Scope: The current GIS program governance structure and management practices currently have many of the elements needed for future success but there are limitations that present obstacles for achieving strategic goals and realizing all potential benefits from GIS technology. This plan includes strengthening and clarifying the roles of and relationship among existing entities as well as the formation of several new elements and policies that enable wider involvement and collaboration on GIS initiatives for all stakeholders.

2. Increase outreach efforts and awareness of the benefits of GIS technology and data and expand GIS access and use for all parts of the statewide GIS community.

Goal 1 Context and Scope: Increasing awareness and participation as well as maintaining support for the statewide GIS program will require active promotion and outreach directed at different communities: senior management/decision makers, program and operational managers, and users. Through the use of multiple communication channels (print and electronic media, conferences, participation at events of professional associations, and web resources), this promotion and outreach will focus on the ways in which GIS can support user needs and help deliver benefits to the entire GIS user community.

3. Identify and secure new funding sources and establish improved financing strategies for GIS development and operation

Goal 1 Context and Scope: Statewide GIS development and ongoing operation will require the allocation of funds and staff time from multiple sources. The current GIS program at the state level has been fortunate to receive annual legislatively supported funding. But these annual allocations (from HB 2222) along with other funds supporting GIS projects are not sufficient for accomplishing all strategic goals and GIS program implementation initiatives. This goal includes initiatives to prepare a business case for GIS program enhancement and demonstrations of application opportunities aimed at senior decision makers.

As explained in the Strategic Plan (Section 6) there are also initiatives to explore and put in place additional, non-tradition funding and resourcing approaches.

4. Encourage and improve collaboration and coordination through increased sharing of geographic data, technology transfer, and project partnerships

Goal 1 Context and Scope: Even with the successful history of GIS activity in West Virginia over the past 15 years and significant cooperation among GIS user organizations, there are still obstacles to effective collaboration and project partnerships. Changes to the statewide GIS program governance structure, creation of policies and standards that enable improved cooperation and better use of current technology for technical integration will be put in place to help achieve this goal.

5. Enhance the quality of geographic data and create effective stewardship practices and standards to efficiently develop and maintain statewide coverage of Framework geographic data.

Goal 1 Context and Scope: Significant progress has been made in GIS database development, but much work remains to be done to provide updated, statewide coverage of Framework themes (See Table 4) as well as metadata associated with these data themes. This database development requires additional funding, clear data standards and technical specifications to ensure statewide consistency and to give a basis for cost-effective development. It is critically important to design and establish sound stewardship of the Framework Data.

6. Support the development and maintenance of important, non-Framework geographic data.

Goal 1 Context and Scope: While Framework Database development is a priority for the statewide GIS operations, the importance of other, non-Framework Data themes is recognized as well. Development of non-Framework themes will be the primary responsibility of individual organizations and user groups which are the key users and custodians for non-Framework Data sets, but support should be provided through the statewide GIS program. This support may take the form of coordination in the development of data standards and specifications, enabling partnerships and collaborative projects, and supporting efforts for the integration of Framework and non-Framework themes.

7. Encourage and enhance programs and opportunities for training, education, and professional development for GIS staff, management, and users.

Goal 1 Context and Scope: The health and ongoing development of the statewide GIS program is dependent on knowledgeable and skilled technical staff, managers, and users. In addition, professional development programs support career advancement for GIS professionals which helps enhance GIS services and user support. This goal addresses the need to build on current training and educational programs to offer expanded opportunities for GIS professionals statewide. This includes university courses and GIS certificate programs, focused training and workshop offerings (from vendors, professional associations, and other training providers), in-house training and mentoring, and greater use of Web-based guided training (e.g., ESRI Virtual Campus). Finally, encouragement and support for active involvement in professional associations will support professional development needs of GIS technical and management personnel.

8. Maintain and upgrade computing and network infrastructure to provide adequate capacity to support current GIS applications and to adopt new information technology tools and environments.

Goal 1 Context and Scope: Long-term success of the statewide GIS program will require effective use of GIS technology infrastructure. This includes creation of policies and financial mechanisms for regular upgrades of hardware, networks, and software accompanied by training for technical staff for system administration and support. In addition it is important to regularly monitor technology advances. An ongoing monitoring and evaluation of industry trends will be implemented that will guide the procurement

of products and services and channel these in a way that maximizes their effectiveness in supporting user needs.

9. Establish core capability for developing in-house geospatial applications and services in state government to provide greatest benefit for State agencies and other GIS stakeholder groups.

Goal 1 Context and Scope: Enabling GIS technology and data to support business needs requires practical, accessible applications for GIS users. Providing these applications requires an appreciation of user needs and technical resources to develop and deploy them on a timely and continuing basis. State agencies and other GIS user organizations will benefit from building and maintaining in-house skills and capacity for application design and development.

5.2 DESCRIPTION OF STRATEGIC INITIATIVES

Table 7 identifies the strategic initiatives, their intended results, priority and the strategic goals which they support. Ideally, there will be sufficient funding and staff to complete all the proposed work, shown in Table 7, during the 5-year time period of this plan. But actual conditions, which cannot be fully predicted at this time, may prevent full completion of all the strategic initiatives. The priority scores provide a basis to assign relative importance to support decisions on timing and allocation of resources for the work. The priority scores are explained below:

- Very High (VH)—Fundamental for the accomplishment of the identified strategic goals with most other goals dependent upon it as well. It is critical that major progress be made on this initiative by the end of Year 1 (end of 2011).

- High (H)—Very important for accomplishing the overall mission with multiple goals dependent upon major progress. Work should begin as soon as possible with planned completion or major progress by the end of Year 3 (end of 2013) or sooner if possible.

- Moderate (MOD)—Significantly impacts achievement of the overall mission and other selected goals. Work should begin by the middle of Year 2 or before with planned completion or major progress by the end of Year 4 (2014) or sooner if possible.

- Low (L)—Adds to the overall health of the statewide GIS program and delivers benefits to users but are not critical for GIS program success. These initiatives should be scheduled and work initiated as resources permit with a projected completion of selected implementation initiatives, for which resources can be allocated, by the end of Year 5 (2015).

Implementation initiatives are organized by the following categories:

- Organizational and management structure and practices (O)
- Geographic Data development and management (D)
- System configuration, software, or application development and operation (S)
- Education, outreach, and internal/external communications (E)
- Funding, budgeting, cost-benefit evaluation, and financial management (F)
- Legal or policy development and management (L)

Table 7: Implementation Initiatives and Relationship with Strategic Goals

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Organizational and Management Structure and Practices											
O1 Revise/replace Exec Order 4-93	VH	●									Work on a new executive order to support the goals of this Strategic Plan
O2 Investigate and get support for legislative action establishing GIS governance modify and resubmit HB 4003 to reflect Executive Order 10-10	VH	●									Find key sponsors in the legislature that will help pass a GIS Bill that reflects the goals of this Strategic Plan and the new Executive Order
O3 Clarify and re-define authority and role of Office of State GIS Coordination (OGC) to enhance statewide coordination roles	VH	●	●								Executive Order 10-10 addresses this issue
O4 Add technical staff position to OSGC to augment project support services	H	●	●		●						Justify the need for the position and find funding
O5 Revise membership of the GIS Steering Committee to better reflect statewide GIS user community	VH	●	●		●						To be completed by a simple Council vote and a new executive order.
O6 Prepare by-laws for Steering Committee	VH	●			●						Steering Committee Chair should name a five-member By-Laws committee to prepare a draft and make recommendations to the Committee.
O7 Prepare/update by-laws and/or charter for GIS Policy Council (GPC) and clarify/strengthen its role in GIS program oversight	VH	●			●						Council chair should name five member committee to research, prepare and make recommendations to the Council on this issue

Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Strategic Goals spans columns 1–9											
Organizational and Management Structure and Practices											
O8 Formalize relationships between the GIS program (GPC, Steering Committee, and OSGC) and the State Office of Technology (WVOT) and IT Council (ITC)	H	●			●						Wording in New Executive Order is needed to address this issue
O9 Augment GIS expertise and support role of WVOT and clearly define roles (GIS staff in user agencies vs GIS support in WVOT)	H	●	●								Cooperation from Council and CTO is crucial
O10 Provide ongoing support for and communications with GPC	VH	●									Meet at least quarterly, and on occasion for special meetings to discuss immediate matters
O11 Define structure (in Steering Committee By-Laws) for establishment of Steering Committee standing sub-committees and working groups	VH	●			●						The five-member By-Laws committee mentioned before should include this on their draft and make recommendations to the Committee
O12 Create and assign leadership and membership of Steering Committee standing sub-committees and working groups (ongoing activity)	VH	●			●						Standing sub-committees are to be voluntary and have no more than five members whose expertise match those required to accomplish the goals of the committee. Working groups can have more than five members but less than ten whose expertise match those required to accomplish the goals of the committee
O13 Establish and assign members of the new State Agency Geospatial Coordination Group (SACG)	H	●			●						New Executive Order and/or the Council need to address this issue

Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

Implementation Initiative (Organized by Category*)	Priority	Strategic Goals									Key Activities and Results
		1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	
Organizational and Management Structure and Practices											
O14 Clarify role/relationship of the Association of Geographic Professionals (WVAGP) as an advisory body for OSGC, GPC, and Steering Committee	H	●			●			●			New Executive Order and/or the Council need to address this issue
O15 Clarify role of the GIS Technical Center (GISTC) as support for OSGC and the statewide GIS user community	H	●	●			●				●	New Executive Order and/or the Council need to address this issue
O16 Add technical staff to GISTC to support expanded role in data stewardship and technical support to users	H	●				●				●	Justify the need for the position and find funding to enhance the quality of the GISTC
O17 Define role and structure for regional user groups (RUGs) and initiate promotion of RUGs with WVAGP leadership	VH	●	●		●			●			Justify the need for the position and find funding
O18 Define roles and structure for Regional GIS Support Centers (RGSC) and initiate search for sponsors	H	●	●		●			●		●	New Executive Order and/or the Council need to address this issue
O19 Identify sponsors and establish RGSCs (ongoing activity)	H	●	●		●			●		●	Steering Committee, WVAGP in concert with the Coordinator can be a great asset for this activity

Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

Implementation Initiative (Organized by Category*)		Priority	Strategic Goals									Key Activities and Results
			1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	
Geographic Data Development and Management												
D1	Prepare and approve basic standard for geographic reference parameters (projection, coordinate system) and metadata	VH					●	●				Steering Committee needs to create a working group to address this issue and make recommendations for the Council to approve and the Coordinator to enforce
D2	Define content and format standards for content and of Framework themes if not currently well-defined	H, M					●					Steering Committee needs to create a working group to address this issue and make recommendations for the Council to approve and the Coordinator to enforce
D3	Design and document practices and guidelines for GIS data stewardship (general practice that applies to all Framework themes)	H					●	●				Steering Committee needs to create a working group to address this issue and make recommendations for the Council to approve and the Coordinator to enforce
D4	Reach consensus and build templates for creation of geospatial metadata and populate metadata for Framework themes	H					●					Steering Committee needs to create a working group to address this issue and make recommendations for the Council to approve and the Coordinator to enforce
D5	Complete data capture for all counties through the SAMB project	H					●					The Coordinator is currently working with WV DHSEM organizing workshops that will help counties achieve maximum coverage and continued update of the SAMB dataset.
D6	Plan and establish stewardship program for statewide critical facilities and address points (DHSEM)	H					●					Funds from the Broadband grant were used to update to critical facilities layer and is being continually updated by DHSEM personnel

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Strategic Goals											
Geographic Data Development and Management											
D7 — Clean-up and update existing hydrography data (NHD)	M					●					An MOU between the Coordinator's Office and the USGS is in place. The Coordinator's office is the principal steward and the GISTC is the technical steward of this important dataset
D8 — Establish partnership for funding statewide high-resolution orthoimagery acquisition	H					●					The Coordinator, DOT and other agencies are currently exploring this issue. A business plan that addresses imagery acquisition every 3 to 5 years is needed
D9 — Acquire updated high-resolution orthoimage coverage for entire state	H					●					This item is dependent of the one above
D10 — Improve accuracy of current jurisdictional boundary data (county and municipal boundaries)	M					●					Work with state and county agencies to meet this goal
D11 — Design and put in place stewardship process for jurisdictional boundary data	M					●					Steering Committee needs to be create a working group to address this issue and make recommendations as to how and who should be the steward
D12 — Plan and establish stewardship program for the NHD data	M					●					An MOU between the Coordinator's Office and the USGS is in place. The Coordinator's office is the principal steward and the GISTC is the technical steward of this important dataset

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Geographic Data Development and Management											
D13 Accelerate statewide mineral parcel mapping efforts (part of Mineral Lands Mapping Program – MLMP) and establish stewardship methods	H					●					The OSGC and Property Tax Division have been working to improve efficiency of mineral (coal) parcel mapping. In order to increase the coal parcel mapping levels, considerations have been made for contracting out part of the work to supplement the existing mapping efforts.
D14 Complete coal bed mapping (part of MLMP) and set up stewardship process	H					●	●				This ongoing project is near completion. A conservative estimate for a complete dataset is three years
D15 Plan and establish stewardship program for the MLMP	H					●	●				Work between the Coordinator, WVGES and PTD on the creation of this program is needed
D16 Complete statewide road centerline data compilation and LRS route definition	H					●					DOT is currently working on this issue
D17 Harmonize road centerline and address data from DHSEM and DOT and establish stewardship process	M				●	●					Work between the Coordinator, DHSEM and DOT on the creation of this program is needed
D18 Load, evaluate, and adjust Census Bureau Boundary Files in preparation for demographic data from 2010 decennial census	H					●	●				Steering Committee needs to create a working group to address this issue and make recommendations to the Coordinator as to how to achieve this goal
D19 Organize and establish general access to digital elevation points from the SAMB project	M					●					Steering Committee needs to create a working group that includes DHSEM to address this issue and make recommendations as to how to achieve this goal

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Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

| Implementation Initiative (Organized by Category*) | Priority | Strategic Goals | | | | | | | | | Key Activities and Results |
		1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	
Geographic Data Development and Management											
D20 Support work of Water Development Authority to complete water and sewer utility coverage	VH					●	●				The Coordinator is working closely with WDA and its contractor. It is estimated that work on this project will be complete by December 2010
D21 Initiate and oversee database development work for NTIA broadband mapping project	H					●	●				The Coordinator is working closely with WVGES and its contractor. The first phase of the project was completed in April 2010. This ongoing project will be completed by December 2014. Additional funding will be required for the stewardship of this data after federal funding dries up
D22 Design and set up program for access to county/city level GIS data (high-resolution ortho, road centerlines, address points, LiDAR. Parcels, jurisdictional boundaries)	M				●	●					Progress on this issue requires the participation of several state agencies and local governments. PTD has been working with counties to acquire parcel data, DEP has been collecting imagery, and LiDAR data, DHSEM has oversight of the address points. In some cases an NDA is necessary to acquire the data, in cases such as address points the data is property of individual counties and contains confidential information and in the case of parcel data it is covered by WV Code.
D23 Support projects that involve compilation of non-Framework geographic data	M						●				Ongoing
D24 LiDAR/DEM statewide project	H					●					DEP is gathering all existing LiDAR datasets which cover approximately 40 percent of the State

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Geographic Data Development and Management											
D25 WVDOT Road/Bridge inventory	H					●					Ongoing (DOT)
D26 CORS network	H					●					Ongoing (DOT)
D27 Support FEMA DFIRM production	H					●					Ongoing (DHSEM)
D28 Get improved access to private utility GIS data	M						●				Due to its confidential nature this process in some cases is not feasible. The Coordinator and DHSEM are signing an MOU/NDA with MISS Utility WV which will allow access to the MISS Utility's utility grid by E911 centers but it will not be available to non-emergency agencies.
D29 Complete National Wetlands Inventory Mapping	M						●				Ongoing (DEP Applied for grants)
System Configuration, Software, or Application Development and Operation											
S1 Inventory current GIS software licenses and servers in state agencies and recommend consolidation for cost savings	H				●				●		Coordination with agencies possible, but willingness and or time of individual agencies to provide data may be a problem that could be solved by including reporting of this data to a central location.
S2 Migrate state ESRI SW users to an ArcGIS Server environment and move to enterprise license arrangement	H				●				●		DOT has begun implementing an enterprise license. The Coordinator and the CTO are exploring the possibility of extending statewide

Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Strategic Goals											
System Configuration, Software, or Application Development and Operation											
S3 Enhance current services of WV Map for access to GIS Clearinghouse data	H		●						●		Definitely needed, better coordination with state, federal, local and private entities is needed. The Coordinator and the GISTC working in concert with the Steering Committee, WVAGP, SGCG's and regional GIS councils can be very helpful in achieving this goal
S4 Design and adapt data services of the GIS Technical Center to operate more as a "virtual clearinghouse" with selected data centralized but with Web-links to other data sources	M		●						●	●	Requires hardware and software upgrades and hiring of additional personnel
S5 Develop Web-based GIS services applications for easy access to Framework Data themes	M					●			●	●	Requires hardware and software upgrades and hiring and/or reassignment off personnel
S6 Prepare standards and best practices for GIS application development	M				●				●	●	The five-member sub-committee to study, research and make recommendations to the Steering Committee to approve and the Coordinator to publish disseminate and enforce
S7 Set-up process (standing Steering Committee sub-committee) for monitoring of IT and GIS trends and products	M				●			●	●		The five-member sub-committee to study, research and prepare a report for the Council, the Coordinator, and the Steering Committee

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Strategic Goals											
System Configuration, Software, or Application Development and Operation											
S8 Oversee and support development of GIS application for flood risk mitigation management (Hazus-based modeling for DHSEM)	H								●		DHSEM currently working on this
S9 Identify and initiate 2 to 3 high profile new GIS application projects (with funding) to generate interest in statewide GIS	H, M		●							●	Using conferences, workshops and meetings to showcase those projects. Publicly recognize those involved in the projects
S10 Oversee and support WDA water/wastewater application for project management and tracking	H		●						●	●	WDA and the Coordinator are working on the staffing of the WDA's GIS Section, to ensure the proper oversight and support for the project
S11 Design and develop GIS query applications—address locator and real property parcel query	M								●		GISTC has an online Geocoding service available based on SAMB data (although the SAMB address data is still incomplete) Some counties have online parcel location applications, some only allow in-house access
S12 Support to Sheriff's Association Pictometry project	M										The Coordinator, GISTC and DEP have been in contact with the Association and are providing all requested support.
Education, Outreach, and Internal/External Communications											
E1 Plan and conduct the 2010 State GIS Conference and include a session discussing the Strategic Plan	VH		●		●			●			Ongoing- Coordinator's Office, WVAGP, and the Marshall University Geography Department are co-hosts of the event. WVAGP and Steering Committee members have devoted time and effort to this conference

Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

	Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
	Strategic Goals											
Education, Outreach, and Internal/External Communications												
E2	Continue to maintain the on-line directory of GIS contacts (GISTC)	H		●		●						Ongoing
E3	Conduct an updated "agency roll-call" survey of GIS status with good coverage of local governments	M		●		●			●			Planned for Fall 2010
E4	Establish and maintain an on-line directory of training sources and events	M		●					●			Ongoing (WVAGP, RTI and GISTC)
E5	Set-up on-line GIS job posting service	M	●	●		●						WVAGP, RTI and GISTC
E6	Revise State GIS position descriptions and examine national compensation trends to set salary levels	H	●	●								Contemplated, in consultation with the Director of the Division of Personnel, advice from the GIS Steering Committee and approval from the Council the Coordinator will establish guidelines on appropriate GIS staff knowledge, skills and abilities and appropriate civil service classification use
E7	Prepare a GIS Program communications and promotion plan and implement (ongoing activity)	VH		●		●						Ongoing
E8	Prepare outreach materials (Web-based and documents) to promote GIS	H		●		●			●			Ongoing, GISTC, Office of the Coordinator, WVAGP, and individual agencies

Implementation Initiative (Organized by Category*)	Priority	Strategic Goals									Key Activities and Results
		1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	
Education, Outreach, and Internal/External Communications											
E9 Expand opportunities for technical and management training for GIS staff through short courses, workshops, Web-based sources. (ongoing activity)	H	●						●			Ongoing, GISTC, Office of the Coordinator, WVAGP, and individual agencies
E10 Increase outreach to senior officials and garner interest and support for statewide GIS program (ongoing activity)	VH	●	●	●	●						Ongoing, GISTC, Office of the Coordinator, Steering Committee, WVAGP, and individual agencies
E11 Expand communications and GIS program promotion with professional and trade associations (ongoing activity)	H		●	●	●						WVAGP, GISTC, and Steering Committee
E12 Increase activity of WV GIS professionals at national forums (NSGIC, URISA, etc.)	M		●					●			Ongoing, dependant on funding
E13 Increase outreach to the general public and garner interest and support for statewide GIS program	H		●		●						Ongoing, dependant on funding
E14 Encourage and support GIS courses, degree programs, or certificate programs at WV higher education institutions	M		●					●			Ongoing, Concord, Glenville, Marshall, Shepherdstown, and WVU have robust GIS programs
E15 Implement a "GIS map of the Month" program with Web-based access	M		●		●			●			Will need to work on this with WVAGP and Steering Committee

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Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

Implementation Initiative (Organized by Category*)	Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
Education, Outreach, and Internal/External Communications											
E16 Promote professional development for GIS staff (professional reading, involvement in professional societies)	M							●			Ongoing dependent on funding
Funding, Budgeting, Cost-benefit Evaluation, and Financial Management											
F1 Prepare a business case identifying GIS benefits and how GIS supports business needs	VH		●	●							Ongoing, but needs more participation
F2 Identify and prioritize new, non-traditional funding sources and financial strategies (ongoing initiative)	VH			●							Ongoing at all levels of government
F3 Generate support for increased funding through HB2222 and/or additional bill to support state GIS program funding	VH	●		●							Coordination with and between GPC, Coordinator, Steering Committee, and WVAGP
F4 In coordination with the project management office of the WVOT, prepare a best practices document for GIS project management	M	●		●							Close work between the Coordinator and CTO
F5 Set-up template agreement for joint funding (multi-department and multi-organizational) of major GIS dev. projects	H			●	●						GPC can vote on this, the Steering committee can help the Coordinator to prepare the document
F6 Increase grant applications and secure additional funding from outside grant sources	H			●	●						Ongoing

Implementation Initiative (Organized by Category*)	Priority	Strategic Goals									Key Activities and Results
		1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	
Legal or Policy Development and Management											
L1 Prepare template agreement with counties to access their GIS data		●			●	●	●				Ongoing, working with some counties
L2 Prepare key GIS Program Policies and guidelines for approval by the GIS Policy Council including: - terms for distribution and sale of GIS data - standards/guidelines development and approval - State agency collaboration on geographic projects	H, M	●			●	●	●				Contemplated, in consultation with pertinent agencies, the advice from the GIS Steering Committee the Coordinator will prepare those guidelines and submit for Council's approval
L3 Create and document process for creation and approval of GIS standards and policies	H	●									Contemplated, in consultation with pertinent agencies and advice from the GIS Steering Committee the Coordinator will prepare document
L4 Create template partnership agreements and encourage their use in future GIS initiatives	M	●		●	●						Contemplated, in consultation with pertinent agencies, the advice from the GIS Steering Committee and the WVAGP, and the approval of the Council the Coordinator will prepare documents

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Table 7: Implementation Initiatives and Relationship with Strategic Goals (cont.)

Implementation Initiative (Organized by Category*)		Priority	1. Enhanced governance and management	2. Increase awareness and access	3. New funding sources and strategies	4. Improve collaboration/Coordination	5. Framework Data development and stewardship	6. Non-Framework Data development and maintenance	7. Training, education, professional development	8. Infrastructure and technology maintenance and upgrade	9. Core capabilities for GIS applications and services	Key Activities and Results
						Strategic Goals						
Legal or Policy Development and Management												
L5	Create template contracts and terms for use for GIS-related projects	H	●			●						Contemplated, in consultation with pertinent agencies and advice from the GIS Steering Committee, and the approval of the Council the Coordinator will prepare documents
L6	Develop agreements and mechanism for access to GIS data maintained by local governments	M	●			●						Contemplated, in consultation with pertinent agencies and advice from the GIS Steering Committee, and the approval of the Council the Coordinator will prepare documents

5.3 PHASES AND TIMING FOR STATEWIDE GIS IMPLEMENTATION

This section describes phases for statewide GIS development, deployment and accomplishment of the statewide GIS goals over a five-year period. Table 8 describes the four phases. The description of phases defines a general timing for work on the implementation initiatives described above in Section 5.1. This is the basis for the preparation of more detailed work plans for each implementation initiative

Table 8: General Timing for Statewide GIS Development and Deployment

Phase	Projected Timing	Description	Key Milestones
Phase 1: Organizational Improvements and Technical Design	Jan. 2011 to Dec. 2011	Concentrates on completion or major progress on Very High Priority implementation initiatives. This includes getting formal approvals and putting in place the proposed governance structure changes, augmentation of staff. Includes garnering sustained high-level support and sustained funding through additional budget allocations and partnerships. Technical design work includes definition of standards for Framework Data themes, database design, and assigning responsibilities and establishing procedures for development and ongoing maintenance. Also includes identification, design, and initiation of development for several critical GIS applications. Continue and expand outreach and communication with stakeholders and define structure for regional or county-wide GIS center/partnerships. Existing work in database and application development, Web-based services, and application development continue at their current or accelerated pace.	• Get formal approval of plan by the GIS Policy Council • Promote the strategic goals and implementation initiatives to the GIS user community • Revise EO 4-93 • Document improved and clarified governance roles and relationships and get acceptance by key parties • Refine stated roles and authorities of key elements of the proposed governance structure (OSGC, Steering Committee, GPC) • Create Steering Committee Standing Sub-Committees and selected Task Forces • Begin work and make considerable progress on template specification, best practices, and other documents • Put in place formal relationship between the GIS Program, the WVOT, and the ITC. • Support existing GIS development projects (WDA water/wastewater application, Hazus, and NTIA grant work) • Prepare business case and present to senior officials • Identify and secure additional funding sources • Augment support staff in Office of State GIS Coordinator and GIS Technical Center • Define enhanced services of the GISTC and GIS Data Clearinghouse • Define data standards as needed for Framework Data layers • Define data stewardship structure and make progress in assigning data steward responsibilities for Framework Data themes • Design and begin development of critical GIS applications • Define Regional GIS Center structure • Make substantial progress on ongoing database development activities (NHD clean-up/update, MLMP parcels, road centerlines) • Establish joint funding for statewide orthoimage acquisition
Phase 2: High-Priority GIS Program Development and Deployment	Jan 2012 to Dec 2013	Maximize Geographic Information benefits for the State by developing and strengthening partnerships for data acquisition and stewardship. Continue to build partnerships that expand the state's GIS program development and deployment, continue to foster stakeholder participation, and secure funding sources. Make substantial progress or complete statewide development of critical Framework development including orthoimagery, LiDAR, cadastral/parcels, governmental units, and transportation datasets. Complete development of critical and other ongoing GIS applications and initiate development of others. Put in place the core data and map services sites with an enhanced virtual GIS data clearinghouse building on existing capabilities and expertise of the GIS Clearinghouse, State agencies(DEP, DOT, WDA, etc), and educational institutions, GISTC, RTI). Enhance outreach, education, and training programs for all GIS Program development stakeholders.	• Stewardship agreements in place • Secure additional funding sources and partnerships for the state's GIS development program • Complete development and deployment of critical GIS applications • Complete statewide development of selected Framework themes (orthoimagery, LiDAR, road centerlines) and begin transition to perpetual live maintenance (stewardship) mode • Make substantial progress on statewide development of other Framework themes (e.g., geodetic control, cadastral reference, parcels , governmental units. etc) • Establish/activate at least three regional GIS centers and at least two county-multi-agency partnerships at the local level (Raleigh County GIS Council is a good example of this local data and funding sharing partnerships) • Establish Core Data and Services operations

Table 8: General Timing for Statewide GIS Development and Deployment

Phase	Projected Timing	Description	Key Milestones
Phase 3: Continued GIS Program Development and Deployment	Jan. 2014 to Dec. 2014	Continue work on GIS Development partnerships and outreach activities. Continue Framework development and make significant progress toward full statewide coverage for all Framework themes. Support efforts for development and integration of non-Framework Data. Continue to enhance outreach and education programs.	• Maintain funding sources and partnerships for continued GIS development • Complete statewide development of selected Framework themes (cadastral reference, parcels) and transition to data stewardship mode • Make substantial progress on development of other Framework Data (geodetic control, parcels, governmental units, elevation) • Establish/formalize at least three additional Regional Centers and three county-multi-agency partnerships at the local level • Enhance Core Data and Services operations
Phase 4: Full GIS Program Development and Deployment	Jan. 2015 to Dec. 2015	All major GIS Program Development goals and implementation initiatives will be accomplished during this Phase. Sustained funding and high-level support will be achieved and there will be extensive participation from stakeholder groups throughout the state. Statewide Framework coverage will be in an ongoing maintenance mode, and GIS data access and related services will be enhanced.	• Maintain funding sources and partnerships for GIS Program development • Complete statewide coverage on most Framework Data themes • Prepare business plans for maintenance and update of State-wide Orthoimagery • Establish/activate additional Regional Centers and county-multi-agency partnerships at the local level • Review and update GIS Strategic Plan within the next five years

5.4 PLAN APPROVAL AND PERIOD

With approval by the GIS Policy Council, this Strategic Plan defines a long-term GIS Program Development vision and a foundation for action covering a five-year period. Progress will be monitored and adjustments in implementation initiatives and timing may be made if needed. It is recommended that a major revision of the plan be made after the 5-year period of this plan is concluded.

5.5 RESOURCES AND FUNDING GIS PROGRAM DEVELOPMENT AND OPERATION

Accomplishing the strategic goals will require the support of public and private organizations in West Virginia and the efforts of GIS professionals statewide. Completing the implementation initiatives described above will also require significant monetary expenditures. In-house resource and cost projections are presented in Section 6. Where will these funds come from? In part, from state agency allocations—legislatively designated funds that have supported GIS since the mid-1990s which are recommended for continuing with increases. But other funding sources will need to be identified and secured to meet the strategic goals. Important implementation initiatives call for the preparation of a business case and the identification of additional funding sources including "non-traditional" sources and financing mechanisms, which may include:

- Better leveraging of funds currently expended by federal, state, and local agencies to support GIS goals: Millions of dollars are already expended annually in West Virginia for geospatial data and system development. Insufficient standards and lack of collaboration means that some of this development work does not result in sharable or accessible information. The coordination structure and consensus standards established through the statewide GIS program will help to channel current GIS investments for greater benefit for all state GIS stakeholder organizations.

- State government budget allocations: Continued (and hopefully increased) legislatively mandated GIS program funding and GIS project budgeting by specific state agencies

- Federal budget allocations: A well-coordinated statewide GIS program will put the state in an improved position to receive federal agency funds for programs that support geographic data and application development. There are considerable opportunities for funding through federal agencies that oversee programs in environmental management, homeland security, telecommunications, transportation, defense installations, and others

- Grants from outside sources: Improve competitiveness in competing for grants from outside organizations (federal sources and private organizations) that support geospatial development. This requires increased activity to investigate grant sources (included federal government grants that may not specifically site GIS but which have a geographic component such as grants from NTIA, DOJ, FCC, USDA, EPA, DHS, DHHS, and others). The grants.gov Web site provides access to a searchable database of Federal grant opportunities.

- Leveraging of special project funds: Provide effective management of special projects in which funding has been allocated for a specific database or application development effort (e.g., WDA sponsored water/wastewater project tracking system, NTIA sponsored broadband mapping and some updates to other important datasets such as cadastral and SAMB). With sound management, these funds can be used not only to meet the specific project objectives but to add to the overall value and quality of the statewide GIS program.

- Improved public-private collaboration: Cost savings in geographic database development have already been exhibited in West Virginia through formal collaborations between government

jurisdictions and private companies (e.g. utilities). Many future opportunities with the potential for lowering overall costs and bringing in private funds for mutually beneficial development work.

- Special funds with fee-based support: A large number of local governments and state governments around the US have successfully established sustained sources for geospatial development by setting up funds supported by transaction fees. The fees are associated with certain programs that use geospatial information (e.g., recorder fees on land-based transactions, construction permit fees, stormwater utility fees, etc.).

It is also strongly recommended that a financial strategy, referred to as "benefits funding", be explored as a way of allocating resources to support GIS development (See NASCIO 2008 report: Innovative Funding for State IT). This approach would allocate funds from tangible benefits that are achieved through the increased use of GIS technology. This would require the tracking of benefits (cost savings, avoided costs, or revenue increases) from the use of geographic data and GIS applications and the establishment of an accounting mechanism to transfer funds to a special GIS program account. With the expected benefits from GIS, this approach is a realistic financing mechanism for short-term or long-term funding and has been successfully used in other states for information technology initiatives. There are other innovative financing and funding approaches, used in other states for IT and GIS initiatives, which could prove effective in West Virginia. Such approaches as bond financing, user fees, and allocation of portions of capital project and special project funds, and other financing mechanisms should be evaluated for possible use in GIS development.

SECTION 6:
IMPLEMENTATION MANAGEMENT AND MONITORING

6.1 MANAGEMENT STRUCTURE, IMPLEMENTATION APPROACH, AND RESPONSIBILITIES

The success of the GIS development work described in Section 5 is dependent on an effective management structure, project planning and management practices, and clearly defined roles. As illustrated in Figure 4, it is critical to maintain the relationship between the implementation work, the strategic goals from the Strategic Plan, and the business drivers from the Business Plan. This Business Plan identifies a series of implementation initiatives each of which requires a detailed work plan with assigned resources and a specific schedule.

Figure 4: Relationship between Strategic Plan, Business Plan, and Detailed Work Plans for Implementation Initiatives
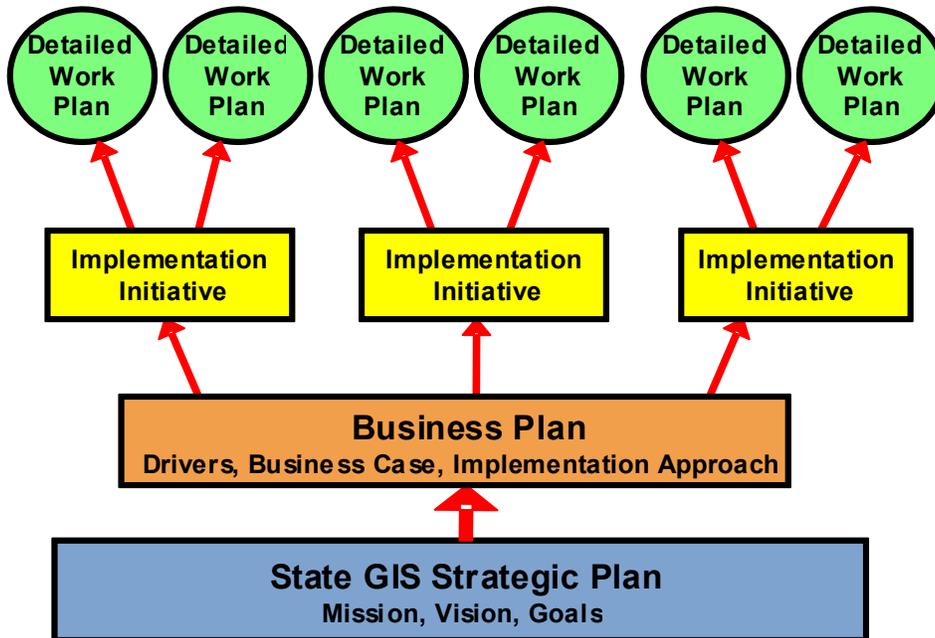
With leadership from key entities defined in the GIS program governance structure (See Figure 3), including the State GIS Coordinator and the GIS Steering Committee, all parts of the statewide GIS community will participate in work required to accomplish strategic goals. Preparation of detailed work plans will specifically identify roles at the task level for these participants as shown in Table 10.

Table 10: Participants and Roles in Statewide GIS Program Development

Main Roles in Statewide GIS Development	Main Participants in Statewide GIS Program Development (O=Oversight/Approval, L=Lead Role, S=Secondary or Support Role)													
	West Virginia Legislature and/or Governor's Office	WV Office of Technology/IT Council	GIS Policy Council	Geological and Economic Survey	Office of GIS Coordination	GIS Steering Committee (including Sub-Committees and Working Groups)	GIS technical Center/Regional Support Centers	State Agency Geospatial Coordination Group	Association of Geographic Professionals and Regional User Groups	GIS Managers and Technical Experts in Stakeholder Organizations	Universities/Training Service Providers	GIS Users	Product Vendors	Contractors/Consultants
High-level GIS program authorization and approval	O	L	O	S	L	S	S	S	S	S	S	S	S	S
Allocation and assignment of resources for GIS implementation	O	S	O	S	L	S	S	S	S	L	S	S	S	S
GIS program promotion, education, and communication	S	S	S	L	O	L	S	S	L	L	L	L	S	S
Finding and securing funding and resources	L	S	L	S	O	S	L	S	S	L	L	S	S	S
Overall progress tracking and work coordination	S	S	O	S	O	L	S	S	S	L	S	S	S	S
Preparation of work plans and project organization	S	S	O	S	L	L	L	L	S	L	S	S	S	S
Implementation project management and monitoring	S	S	S	S	O	L	S	L	S	L	S	S	S	S
Project implementation work (participation as project team members or support in implementation)	S	S	S	S	O	L	S	S	S	L	S	S	S	S
Review and comment on implementation work	S	S	S	S	O	L	S	S	S	L	S	S	S	S
Provision of products and ongoing contracted support	S	S	S	L	L	S	L	S	S	O	L	S	S	S

6.2 MONITORING AND REPORTING ON PROGRESS

Work on the implementation initiatives should be accompanied by regular tracking and reporting of development status. This includes the tracking of progress against strategic goals and individual implementation initiatives. Procedures for status monitoring and reporting are discussed in this section.

6.2.1 Strategic Goal Monitoring and Reporting

Goal monitoring and reporting is a high-level GIS Program management activity that gives a picture of general progress on GIS Program development. The result will be a "Strategic Plan Progress Report" prepared on a quarterly basis. The report will be formally prepared for the GIS Policy Council but distributed to all project stakeholders and posted for Web access. The report summarizes activities relating to each goal with summary remarks about overall progress and critical issues. The report will follow a format like that shown in Exhibit A.

Exhibit A: Suggested Format for Strategic Plan Progress Report

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WEST VIRGINIA STRATEGIC PLAN PROGRESS REPORT

Submitted by: xxxxx
Submitted to: xxxxxx
Submittal date: xx/xx/20xx
Report period: xx/xx/20xx to xx/xx/20xx
Summary of Overall Progress:

Xxxxxx xxxx x xx xxxxx x xxx xx xxxxxxx xxx xxxxxxxxx x xxx xxxx x xxx xx xxxx x xxx xx. Xxxxxx xxxx xxxxxx x xx xxx xxxxxxx xxx xxxxx xxx xxxxx xxxxx xxx x xxx xxx xxxxxxx xxxxxx xx xxxx xxxxxxxxxx x xxx.

Summary of Progress Against Goals:

Goal 1: Enhance and strengthen the governance structure and improve management practices of the statewide GIS program.
- Xxx
- Xxx
- xxx

Goal 2. Increase outreach efforts and awareness of the benefits of GIS technology and data and expand GIS access and use for all parts of the statewide GIS community.
- Xxx
- Xxx
- xxx

      I
      I [*Goals 3 to 8*]
      I

Goal 9. Establish core capability for developing in-house geospatial applications and services in state government to provide greatest benefit for State agencies and other GIS stakeholder groups.
- Xxx
- Xxx
- xxx

Important Issues:

Xxx xxxxx xxxx xxxxx xx x xxxxx xxxxxxxxxx xx xxxxxxxxxxxx xxx xxx xxxx xxxxxxxxxxxx xx xxx x xxx xxxxx xxx. Xxx xxxxxxx xxx xxx xxxxxxx xxxxx xx xxxx xxxxxxxxx x xxx xxxxx xxxxxxxx xx xxxxxx xxx xxx

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These quarterly Strategic Plan Progress Reports are completed by the State GIS Coordinator. This requires an efficient bottom-up communication process in which information on specific implementation work is reported on a regular basis. The GIS Program development Implementation Status Report, discussed below, provides information for completion of these quarterly reports.

6.2.2 Monitoring and Reporting on Implementation Initiatives

This is a more detailed reporting, referred to as the "Statewide GIS Implementation Status Report" that captures summary status information about work being carried out for the specific implementation initiatives by individuals, project teams, or working groups that have been assigned responsibility. The

intended audience for these reports is management personnel directly involved in GIS development oversight, project managers and team members, the GIS Steering Committee members, and other stakeholders who are actively engaged in implementation work. These reports should be prepared on a quarterly basis, or more frequently if desired, using information provided by project teams and individuals assigned responsibility.

Exhibit B: Suggested Format for Statewide GIS Implementation Status Report

WEST VIRGINIA STATEWIDE GIS IMPLEMENTATION STATUS REPORT

Submitted by: xxxxx
Submitted to: xxxxxx
Submittal date: xx/xx/20xx
Report period: xx/xx/20xx to xx/xx/20xx

Summary of Progress on Implementation Initiatives: Xxxxx xx xxxxxxxx xx x xxx xxxxxxxxxx xxxxx xxxxx xxxx x xxxx xxxxx xxxx xxxxxxxxxxxx xxx. Xxxxxxx xx xxxxx xxxxxxxxxxxx xxx xxxxx xxxxx xxxxx x xx xxxxx xxxx xx xxx x xx xxx xxxxx xxx xx xx x xxx

IMPLEMENTATION INITIATIVES	Plan Start	Plan Finish	Actual Start	Actual Finish	Percent Complete	Comments
Organizational and Management Structure and Practices						
O1: xxxxxxxxx						
Ox: xxxxxxx						
Geographic Data Development and Management						
D1: xxxxxxxx						
Dx: xxxxx						
System Configuration, Software, or Application Development and Operation						
S1: xxxxxxxxx						
Sx: xxxxxxxx						
Education, Outreach, and Internal/External communications						
E1: xxxxxxxxxx						
Ex: xxxxxxxxxxxx						
Funding, Budgeting, Cost-benefit Evaluation, and Financial Management						
E1: xxxxxxx						
Ex: xxxxxxxxxx						
Legal or Policy Development and Management						
L1: xxxxx						
Lx: xxxxxxxxxx						

6.2.3 Tools for Monitoring and Reporting

Compiling the Quarterly Strategic Planning Reports reporting will be completed using software packages that are part of the Microsoft Office suite—including Word, Excel, and Project. The Strategic Planning Report will be prepared as a Microsoft Word document. The GIS Program Development Implementation Status Report will use a combination of Microsoft Project and Excel. A Microsoft Project file accompanies this Business Plan. This file has been created with custom views for tracking and reporting progress. Information from the Project file may be exported to an Excel spreadsheet for creation of reports like that shown in Exhibit B.

6.3 MARKETING AND OUTREACH APPROACH

Continued, sustained communications and outreach activities are critical for accomplishing GIS Program Development goals. A fundamental tenet of the statewide GIS program is coordination among GIS users and maintaining awareness of and support from senior officials. Implementation Initiative E7 calls for the preparation of a "Communications and Promotion Plan" that defines all marketing, outreach, and communication activities. This "Communications and Promotion Plan" helps coordinate a variety of activities called for in this Business Plan.

The purpose of promotional activities is to increase the awareness and understanding of, support for, and participation in the GIS program and the services it provides. In essence, a GIS promotional campaign mixes education with a certain amount of advertising to connect with stakeholders and generate interest while conveying real information about GIS technology applications and benefits. In addition to promotion of the GIS program, there is an ongoing need to keep in contact with the user community, provide technical support, and to offer assistance in training and professional development. There are many approaches and communication elements that may comprise a successful promotional campaign including:

- Descriptive Information and Links: Information that describes and explains the GIS program and its services and products at summary and detailed levels. This includes various text and presentation pieces (brochures, guides, presentation materials) that can be accessed on-line or distributed in hard copy form.

- News and Status: Continuing information about the GIS program status and activities, and about the GIS community as a whole. This includes on-line posting information about major events, milestones, and the accomplishment of the GIS program.

- Professional Development: Education and training opportunities sponsored or coordinated by the GIS program or by other coordinating organizations.

- People Directory Information: Contact and profile information about the user community that the GIS program services and appropriate links to external contacts to support professional networking and the coordination of participants and parties interested in GIS.

- User Support: How-to information and specific user technical assistance and help relating to use of GIS software and applications, access to data, etc.

- Project Information and Support: Detailed information about specific projects sponsored or coordinated by the GIS program and tools supporting coordination and group collaboration for project work.

- Vendor Opportunities: Information about business opportunities for product and service vendors about competitive procurements for work supporting GIS projects and operations. Announcements and formal communications about RFPs, RFQs, etc., would need to be handled through appropriate procurement offices, but the GIS program could provide summary information and links to announcements and detailed information on procurement opportunities.

An important part of GIS program promotion is the concept of "branding"—a marketing term that refers to the creation of an identifiable name and symbol that represents the GIS program. Specifically, it involves the creation of a name or acronym, effective logo, slogan, and similar marketing devices and the use of these in all appropriate venues and channels. The purpose is to capture the attention of people and induce them to find out more—leading to participation and support.

GIS program branding is supported by the creation of a number of explanatory, promotional information items including such things as: a) brief single or two page brochure or flyer available in hard copy form and accessible via the Web, b) Web page with easily accessible information about the GIS program including mission statement and goals, c) more detailed descriptive documents about GIS program resources and services. Also, access to formal documents such as Strategic Plans, charters, etc. is important. The brand can be further communicated by various promotional strategies and "gimmicks" such as:

- Affix the logo and slogan to all appropriate materials, Web site, and information delivery channels

- Create icons that can be used symbolizing specific initiatives or products of the GIS program, and use these icons for communications and identification

- Prepare a music intro or sound cues that could be used in presentations. This would be a short but memorable "sound bite" that, after some use, people would associate with the GIS program.

- Produce and stock some appealing "promotional trinkets" with the GIS program logo (e.g., buttons, luggage tags, zipper pulls, compass balls, bookmarks, mouse pads, etc.) and give these away at GIS events. Avoid selecting expensive items but choose ones that will be appealing to the audience and which would likely be used in environments where they would receive additional exposure. Explore the possibility of vendor sponsorships to pay for these items.

- Devise an award/recognition program—perhaps in association with other GIS organizations or bodies in which people or organizations can be formally recognized for accomplishments that contribute to the GIS program and user community. Conduct award ceremonies in conjunction with special events and use other communication channels to promote the awards programs and the recipients.

- Use multiple communication channels for distribution of information about "people and applications." This could include brief articles that highlight GIS applications of interest, as well as "profiles" of GIS professionals on staff and among the user community.

Successful communication with the GIS community is dependent on selecting and using effective "channels" and delivery mechanisms. Take all opportunities to conduct briefings and education programs to local and regional groups and events. Some effective channels and mechanisms that can be valuable for GIS program outreach and promotion include:

- Presentations and Briefings at Organization Meetings
- Presentations at GIS and Professional Events
- Training and Education Sessions
- Content Search Tools and Applications
- Web Page and Web Portal Delivery
- Email Broadcast or Push
- Publications
- Sponsorship of or Participation in Special Events
- Press/Media Releases
- Exposure via Professional and Business Associations
- User Help Tools
- Collaboration Tools for Project Teams

A general outline for a GIS Program Development Communications and Promotion Plan is shown as follows:

- Characterization of the statewide GIS program and its goals
- GIS program "branding" and identification of and promotional elements
- Characterization of GIS stakeholder community, decision makers, and "customers"
- GIS products, services, applications and their benefits to users
- GIS program information and promotional pieces and media tools
- Communication channels and mechanisms and how to use them
- Promotional devices and events
- Communication and promotional actions, timing, and roles

6.4 IDENTIFY TRENDS AND FUTURE APPLICATIONS AND POTENTIAL IMPACT ON THE GIS PROGRAM

The GIS coordinator and the Steering Committee will have the responsibility to identify trends and future applications and the potential impact of the trends and applications on the GIS Program Development. In so doing, the Policy Council will stay informed of the latest GIS issues and technology.

6.5 MONITOR GIS ACTIVITIES IN OTHER STATES

The GIS coordinator and the Steering Committee will be required to keep track of GIS activities that are occurring on other states. By monitoring GIS activities in other states the coordinator and the Steering Committee can keep the State and local agencies advised of similar applications being implemented elsewhere. The GIS Coordinator and members of the Steering Committee are encouraged to attend national GIS conferences in their fields to keep up with these activities.

6.6 FOSTER COMMUNICATION ON THE STATUS OF GIS BETWEEN USERS, DEVELOPERS, COUNCIL AND STEERING COMMITTEE MEMBERS, WVAGP, AND SPONSORS OR CHAMPIONS IN THE LEGISLATURE

The GIS Coordinator and Steering Committee members will also be responsible for fostering communications between the users of the GIS, the developers of the applications, and the management in the different departments and divisions. Even if many effective GIS applications are developed resulting in savings and better provision GIS services, the entire GIS program will be at risk if these successes are not effectively communicated

APPENDICES

APPENDIX A: DETAILED STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND CHALLENGES (SWOC) MATRIX

The matrix below captures detailed information about the current status and the characteristics and conditions of the statewide GIS program. Columns in the matrix contain observations from members of the GIS Steering Committee about Strengths, Weaknesses, Opportunities, and Challenges (SWOC) which are explained as follows:

- Strength: Any factor, condition, or asset that may currently be considered a favorable attribute of something that positively supports GIS development and operation.

- Weakness: Any factor, condition, or deficiency of an organizational, financial, or technical nature that are clear problems or inhibitors that limit or work against effective use, access, or expansion of GIS technology and data.

- Opportunity: An internal or external condition or resource that supports GIS and can be leveraged to enhance GIS program improvements.

- Challenge: Internal or external forces, conditions, or risks of a technical, organizational, political or financial nature that must be overcome to accomplish GIS goals.

Information in the matrix is organized into the following categories:

- GIS Governance, Management, and the Statewide GIS User Community
- Geographic Data Development and Stewardship
- GIS Technical Infrastructure, Applications, and Services
- GIS Education, Technical Expertise, Professional Development
- Resource Availability, Management Support, and Funding

SWOC Evaluation for Statewide GIS Program

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
GIS Governance, Management, and the Statewide GIS User Community					
High-level GIS Mandate and Oversight	• Executive Order 4-93 (based upon 1993 GIS Development Plan) • HB 2222 (1995) provided initial funding for state GIS program • New HB 4003 recognizing GIS coordinating elements re-introduced • Executive Order 10-10 signed on August 2010.	• State GIS program established in 1995 See HB 2222 • Base funding has continued since 1995 under HB 2222	• Lack of Visibility/awareness of GIS programs at high levels of government and legislature • HB 2222 and EO 4-93 contain "legacy language" that does not fully reflect current situation • HB 2222 funding only includes WWGES and Property Tax • Office of GIS Coordination perceived as part of WVGES	• EO 4-93 updated by GIS Policy Council and signed by Governor (EO 10-10) • Approve WV GIS bill recognizing GIS coordinating elements in State • GIS Day proclamation signed by Governor • GIS briefings to WV Legislative Committees	• Political changes at governor and cabinet level • Optimizing conditions for executive involvement • Greater visibility and demonstration of GIS as a decision-support tool at the executive and legislative level • Clarify GIS organizational structure, roles, and enhanced communication • Not all designated senior management members of GIS Policy Council actively participate
Statewide GIS Leadership and Management	• GIS Policy Council (High-level coordination; presiding officer Secretary of Commerce) • GIS Steering Committee (State interagency coordination; GIS Strategic Plan; presiding officer State GIS Coordinator) • WV Association of Geospatial Professionals (User group; education & training; GIS advocacy; broad-level coordination; elected president is presiding officer; bylaws) • GIS Technical Center provides support for GIS data and services to the statewide GIS community	• Funding for a State GIS Coordinator, the principal GIS contact for GIS coordination in State • Funding for a State GIS Clearinghouse and GIS Technical Center to provide GIS technical support services for data development and distribution • Other university-based GIS research centers; e.g., RTI at Marshall U.; NRAC at WVU • Federal GIS liaisons (e.g., USGS, USFS) • Inclusion of diverse stakeholders and sectors	• No liaisons for certain federal agencies (e.g., NGS) • No bylaws (executive or statutory authority) for GIS Steering Committee or GIS Policy Council • WVAGP has no full-time paid staff • Role of WVAGP as part of state GIS program is not clearly defined • Role, authority, and staff resources of GIS Coordinator Office are limited • Limited support from senior management • Quarterly Steering Committee meetings to discuss state issues.	• Process and progress on the formulation of GIS standards (database, application, software) can improve level of collaboration and integration • Improvement of GIS data sharing among organizations (inventory and access) • GIS data stewardship and funding strategies: orthos, cadastral, streams/NHD, etc. • State agency GIS program development and training • Improving communicative networks of coordinating bodies (e.g., meeting minutes, newsletters) • Improving outreach opportunities to decision makers to include state and county associations • Recognition and optimization of work currently being done • Utilization of grassroots momentum and support • Increase funding opportunities for State	• Effective communication - connectivity and interdependence • Preparing clear, defined roles and responsibilities for each statewide GIS body (Coordinators Office, Steering Committee, Council, WVAGP) • Preparing clear, defined roles and responsibilities for each statewide GIS body (Coordinators Office, Steering Committee, Council, WVAGP) • Collaborative leadership • Diverse representation - same GIS professionals may serve key positions on multiple GIS coordinating bodies • Getting people to volunteer time on committees/working groups to advance GIS initiatives • Resource constraints to advance GIS Strategic Plan objectives • Politicalization by state agencies to jointly fund WVU and Marshall on GIS projects

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SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
GIS Governance, Management, and the Statewide GIS User Community					
Policies and Management Procedures	• No formal, written GIS policies—currently ad hoc, within existing policies and procedures of participant agencies and organizations	• State Technology Office conducting survey of state government practices for sales/licensing of digital data	• Title 13 U.S. Code Protection of Confidential Information prevents sharing of address information from Census • Some governmental agencies have policies that do not support travel time to GIS meetings, conferences, or other GIS continuing educational opportunities; instead, GIS professionals must use personal leave • Inconsistent policies and approaches for selling and distributing geographic data	• Proposition of executive or statutory authority to promulgate legislative rules or other policies • Creation and approval of GIS best practices and key policies impacting statewide GIS program of GIS best practices and to guide GIS operations for state agencies	• For locally produced E-911 and tax parcel GIS data, finding a balance between "cost recovery" and "public access" • Possible decrease in federal funding for GIS database development and support to state (reflects level of federal deficits and cost-cutting trends
Organizational Coordination	• Current GIS governance allows for GIS professionals from various constituency groups to meet • GIS Steering Committee provides forum to support GIS coordination among state agencies and external partners • GIS Policy Council allows for high-level coordination and GIS Strategic Planning • WVAGP provides communication forum for statewide GIS user community	• Proactive coordination between GIS and Surveying communities • Through coordination efforts, more county and state agencies are sharing data and mapping services	• Unclear protocols for how to implement a GIS program • Limited support from senior management • Clearly defined linkage between GIS Coordinator and Chief Technology Officer • GIS Coordinator and WV GIS Technical Center have both fiscal and programmatic supervisors • Few regional GIS user groups exist • Organizational barriers limit interagency coordination among state agencies and external organizations	• Role and activities of GIS Steering Committee and Policy Council can be strengthened through by-laws and adjustment in membership • More coordination meetings and conferences at regional and state level • Where possible, agencies should pool their resources together to eliminate redundancy in systems, data, manpower, contracting, etc. • Social networking tools, Webinars, and other communicative networks should be evaluated for their usefulness in improving coordination and training • Public-private partnerships	• Challenging to get professors/teachers together because of teaching schedules

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SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
GIS Governance, Management, and the Statewide GIS User Community					
GIS Programs in State Agencies	• See 2008 GIS Roll Call which lists organization's mission and activities. • Mineral Lands Mapping Program. Multi-partners include GIS State Coordinator, WVGES, Tax, and other partners • Other multi-partner programs: broadband mapping, utility mapping, surface tax mapping, framework base layer development research, green infrastructure project, etc.	• Several state agencies (DEP, DOT, DHSEM, and others) have well established GIS programs, resources, and personnel • Although limited in numbers, some state agencies have seasoned competent GIS professionals with in-depth practical experience in applying GIS technology to state government business needs	• Resource limitations I e., very low number of GIS positions vs. IT positions in State government leading to poor ROI because of a lack of expertise in GIS Project Management, GIS Implementation Planning, Spatial Database Administration, Spatial Applications Design, etc. • Budget cuts • Staff cuts, hiring freezes with inability to fill vacant positions • Creation of data standards to encourage and enable data sharing and integration among state agencies • Problems with quality and currency of data maintained or used by state agencies • Enterprise-wide solutions for divisional offices have not been employed by certain departments yet.	• GIS return of investment (ROI) study to leverage benefits of GIS for effective government and better services for citizens • Many untapped applications for applying GIS to new program areas • Positioning GIS to support more efficient and productive government • More use of geo-services to share dynamic data among agencies and public • Data integration and maintenance • GIS cost sharing • Publish West Virginia datasets as geoservices using ArcGIS Server	• Overcoming legacy systems and organizational barriers • Establishment of statewide GIS data standards • Overcoming legacy geospatial quality problems so technology can actually produce accurate results. • Moving from legacy non-spatial RDMSs to geodatabases capable of supporting far greater applications diversity. • Funding statewide imagery and elevation datasets with sufficient resolution and accuracy to support both today's and future uses of geospatial technologies. • Expanding the count of GIS professionals in line with State IT staffing • Sharing expertise in GIS Management, Geospatial Applications Development and Geospatial Database Management so smaller programs have the benefits of these areas of expertise • Establishing sufficient IT resources (scientific computing power, bandwidth, storage, etc.) at each implementing location to sustain both today's and tomorrow's geospatial technological needs. • Publish West Virginia datasets as geoservices using ArcGIS Server

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Geographic Data Development and Stewardship					
Geodetic Control	• CORS densification project spearheaded by WV DOT • HARN densification 2003	• No license fee access to CORS network • Newly upgraded GPS stations	• No NGS state geodetic advisor • No funding source to refresh equipment at the end of its life cycle.	• Funding from WVDOT for geodetic control improvements • Participation of private sector engineering and surveying communities for funding and legislative support • Establishment of a sufficient number of permanent ground control points (GCPs) to eliminate or at least minimize cost to do aerial imaging in West Virginia. • Publish unique geodetic control datasets as geoservices using ArcGIS Server	• Moving from CORS to VRS • Providing data to support both mapping grade receivers and geodetic surveyors from the same infrastructure • Operating infrastructure owned by multiple agencies and Marshall University as a highly reliable network. • Publish unique geodetic control datasets as geoservices using ArcGIS Server
Orthoimagery	• Leaf off: SAMB 2003 statewide, 2-ft natural color • Leaf on: NAIP 2009 statewide, 1-meter, leaf on • CIR: NAIP 2007 statewide, 1-meter, leaf on • CIR 1996-98 statewide 1 meter, leaf off • Multiple local governments have recently acquired high-resolution orthoimagery (e.g., Charleston area, Berkeley County, Kanawha County, Raleigh County, Cabell County, Marion County) and others planning acquisition	• Public access to imagery (some states charge access to statewide imagery holdings) • Availability of historical imagery and multiple resolutions supports change analysis • DEP will host imagery geoservices produced from County orthoimagery if provided the data. Currently working on Cabell County's 2009 and Berkeley County's 2007 datasets	• No current or high resolution 1-foot leaf off imagery for whole State and not current plans for acquisition • Counties could be saving significant monies if imagery was acquired for multiple counties at one time • No in place services contract allowing rapid acquisition after an emergency event. • No in-house ability to collect airborne imagery.	• Statewide Imagery Program business plan for leaf off, natural color, 1 ft. pixel (1"= 100' scale). Counties can do buy-ups for 6" pixel (1" = 50' scale) higher resolution imagery. • WV Sheriff's Association DOJ grant to Pictometry for oblique imagery More counties are acquiring 1 foot or better leaf-off imagery • Lower acquisition costs due to improved CORS network and technology advancements • GIS inventory and access to county-level imagery assets • The State Office of Aviation has a fixed wing aircraft capable of flying aerial imaging missions • Publish unique orthoimagery datasets as geoservices using ArcGIS Server/Image Server	• Coordinating budgets and cost sharing of multiple organizations for additional high-res orthoimage acquisition • Fund a State imaging capability using the Office of Aviation's Caravan • Approach acquisition of county acquisitions in a more cost effective manner. • Publish unique orthoimagery datasets as geoservices using ArcGIS Server/Image Server • WV Sheriff's Association oblique imagery or top-down orthoimage data not publicly accessible. • Poor Public access to county acquired elevation data. • County organizations need technical support in drafting RFPs.

SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Geographic Data Development and Stewardship					
Elevation/Digital Terrain Data	• Statewide 3-m National Elevation Dataset (NED) derived from SAMB elevation points and breaklines captured in 2003. Supports 10-foot contours. • Legacy DLG-3 contours and DEMs • IFSAR ORIs, DTMs, DSMs and from 10 counties in southern WV flown in 2003, 5 meter postings x and y, 1 meter z • Ongoing acquisition of LiDAR data from approximately 30% of southern West Virginia, density as great as 1 return/meter, ±15cm z. • LiDAR already acquired in Cabell (2009), Jefferson County (2005), Marion (2009), Gilmer (2004) Counties. • State LiDAR working group developing a business plan which involves inventorying elevation assets, setting acquisition priorities, and identifying minimum standards.	• First state to have 3-meter elevation data in Nation; ingested into Google Maps • Complete range of 30M, 10M, 3M DEMs generated from SAMB elevation MPBLs • Contours can be generated on the fly using the SAMB data • USGS and FEMA updating national LiDAR specifications	• No statewide LiDAR business plan • No long-term plans or prioritization for elevation collection and maintenance especially in known flood prone or other hazards areas, or in areas of high change (urban, surface mining) • SAMB elevation data does not meet accuracy requirements for FEMA mapping or engineering studies and is now seven years old. • No program to produce derived data products from LiDAR over flights done by counties. • IFSAR dataset is copyrighted and therefore cannot be provided to anyone outside of WVDEP	• Release of SAMB elevation points and breaklines into public domain • GIS inventory and access to county-level LiDAR assets, Marion County intends to share, Cabell County has provided their LiDAR to DEP for classification of bare earth and buildings. • Establish a program and staff with expertise to produce derived data products from LiDAR over flights done by counties. • Publish unique elevation/digital terrain datasets as geoservices using ArcGIS Server/Image Server • High level of interest at federal, state, and county governments for high-resolution elevation (2 ft. contours)	• Mountaintop/surface mining and new road construction significantly alter terrain • Flood prone areas and inundation zones should be prioritized and recollected on a regular basis to provide baseline comparisons • Rugged topography complicates elevation data gathering and DEM compilation • Publish unique elevation/digital terrain datasets as geoservices using ArcGIS Server/Image Server • Public access to county acquired elevation data. • Hi-res Elevation data sets are large and more difficult to distribute
Hydrography	• 1:24k High Resolution NHD includes name attributes, flow direction network, and supports stream addressing. • 1:48k local resolutions streams collected from 2003 SAMB project • Development of NHD/WBD stewardship program	• NHD technical expertise at WVU • State GIS Coordinator supports NHD maintenance • High level of interest among state agencies for stewardship of local resolution hydrography data	• WV DEP not directly involved in stewardship or maintenance • No stewardship program exists. Stream delineations in West Virginia are based upon topographic maps which have not been updated in 30 years which is certainly a problem in the mountain top mining area in southern West Virginia. • NHD maintenance tool requires much time and effort to make stream updates • Cartographic generalization of NHD streams • No major EPA involvement for funding and program guidance	• Potential start-up funding from WV GIS Coordinator, USGS, & EPA • Clean up 1:24k streams • Updating 1:24k streams with local resolution streams of higher spatial resolution where appropriate • Fits into both state and federal programmatic emphasis on water resource issues and regulatory compliance • Revisit southern West Virginia's data after acquisition of LiDAR in mountain top mining area • Publish unique hydrology datasets as geoservices using ArcGIS Server	• Sustained funding for NHD maintenance • Simultaneous NHD & WBD updates • Mountaintop mining, road construction, urban dev. and karst terrain make it challenging to keep stream delineations current and attributed appropriately. • Identifying intermittent streams • Modeling often requires both elevation and stream layers to be consistent with one another • Revisit southern West Virginia's data after acquisition of LiDAR in mountain top mining area. • Publish unique hydrology datasets as geoservices using ArcGIS Server

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	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Geographic Data Development and Stewardship					
Transportation	• WVDOT taking on stewardship role for statewide road centerline database • Federal/Census TIGER: 1:48k road centerlines for all roads; contains feature attribute errors.	• WV DOT GIS Section expanding mapping programs and data maintenance capabilities • Centralized road database at WVDOT and process in place for regular updates	• A current state road centerline file that supports linear referencing, road network analysis, and addressing. • Sustainable funding for road maintenance and new construction • Process and resources for local road data maintenance not in place in all counties • Lack of full coordination in road centerline database maintenance between DOT and DHSEM	• WV DOT grant to RTI/WVU to build more robust LRS transportation network • Development of interagency trail standard • Obtaining transportation data from nationwide commercial systems. • 2010 GIS-T conference to be held in WV (April 2010) • Crowd-sourcing may provide new opportunities for collecting transportation and other features • Symbiosis of street centerline data with DHSEM address maintenance • Publish unique transportation datasets as geoservices using ArcGIS Server	• Integrating and maintain various transportation databases • Transportation network and databases can be very complex • Road centerline data maintenance with participation of multiple state agencies • Publish unique transportation datasets as geoservices using ArcGIS Server
Governmental Jurisdiction and Administrative Boundaries	• Census incorporated boundaries of municipalities • 1:24k state and county political boundaries digitized by WVDEP from topographic maps • Public service district boundaries in compilation (part of WDA project)		• Counties may not have the time or technical resources to submit digital boundary updates through CENSUS Boundary Annexation Survey (BAS) program. • County boundaries may have accuracy problems because of small-scale source (1:24K) used for compilation • Problems in maintaining detailed up-to-date municipal boundaries because of frequent changes	• Improving spatial accuracy of municipal of boundaries • Involvement of surveying community • Publish Governmental Jurisdiction and Administrative Boundaries datasets as geoservices using ArcGIS Server	• No statewide comprehensive planning process for update and maintenance of boundaries • Publish Governmental Jurisdiction and Administrative Boundaries datasets as geoservices using ArcGIS Server

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	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Geographic Data Development and Stewardship					
Cadastral	• Tax maps maintained at county level. About 28 counties have digital parcels; a few counties maintain seamless parcel maps in a geographic information system • Mineral Parcels: Parcels being digitized for Mineral Lands Mapping Program—improvements underway to increase productivity and elevate the number of mapped mineral (coal) parcels.	• Tax Dept. statewide collector and integrator of surface and subsurface parcels. • Assessment database "Integrated Assessment System" centralized and maintained by Tax Dept. • Uniform mapping standards set by WV Property Valuation Training & Procedures Commission	• Past misunderstanding and communication barriers regarding statewide tax map digital conversion program caused confusion—some counties were not well-informed of their new GIS responsibilities upon project completion • Capital investment of state funds to digitize surface parcels is lost if assessors do not assume digital mapping maintenance • Lack of cooperation between Lack of specific statewide regulations (WV Code, Rules, etc.) regarding GIS data handling results in data protection concerns when sharing data between state and local government agencies; hampers sharing and use of parcel information for County and State	• More counties are developing digital cadastral systems • Statewide cadastral (parcel) layer with limited use restrictions can be used by state agencies • Integration of web-based mapping services and IAS should be implemented to provide statewide parcel mapping coverage • Improving approach to MLMP parcel compilation to facilitate a more expeditious completion • Publish Cadastral datasets as geoservices using ArcGIS Server • Statewide parcel locator service	• Surface tax mapping decentralized at county level • Counties, Tax Dept. and private sector work towards a unified system • Creating and implementing new GIS data standards (via WV Code, Rules, etc.), including provisions for inter-governmental data sharing and data restrictions and use limitations. • Publish Cadastral datasets as geoservices using ArcGIS Server • Public access to county acquired digital parcel data.
Emergency Services / E-911	• County/E-911: 1:48k street addresses and point addresses; not complete for entire State. • WVDHSEM in process of completing statewide coverage of addresses and structure for support of public safety •	• WVDHSEM statewide integrator of E-911 address data • WVDHSEM statewide integrator of local E-911 data • GISTC created a statewide locator service of E-911 street and point addresses which are available to the public.	• Uniform statewide policy regarding sale and access to E-911 address data • Direct funding for E-911 to maintain county road centerlines and addresses • Missed Federal grant funding opportunities to complete addressing in remaining counties	• Improved spatial accuracy of incorporated boundaries using Census' BAS digital submissions • Secure Federal 911 grant funding • Symbiosis with WVDOT road centerline maintenance	• Centralized state funding pool to maintain addressing. This may require code changes • WV 911 Council does not have strong mandate
Land Cover/Vegetation	• 2001 USGS National Land Cover Dataset (NLCD) • WV GAP Analysis • WV DNR and other studies		• Statewide land cover needs to be updated more frequently, and preferably at a higher spatial resolution • No plan/program for monitoring landscape change over time	• New sensors and imagery for creating NLCD • Generate as by-product of potential statewide ortho and LiDAR acquisition • Publish Land Cover/Vegetation datasets as geoservices using ArcGIS Server	• Use Landsat, SPOT, GeoEye, Digital Globe, RapidEye, aerial imagery, etc. to monitor change over time • Publish Land Cover/Vegetation datasets as geoservices using ArcGIS Server

SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Geographic Data Development and Stewardship					
Water Utility	• Statewide water utility mapping project recently initiated Water Development Authority • WDA and IJDC plan on using GIS technology to identify, prioritize, manage, track and accelerate public utility projects in a cost effective and efficient manner • Two GIS positions being created at WDA	• When completed this will provide an initial GIS layer related to water lines integrated from DEP, Public Service folks, etc. for the first time • Application being created is ArcGIS Server – geoservices based	• No comprehensive coordination of water utility data compilation and update • Water utility networks managed by large number of individual public and private entities • Insufficient num. of positions to insure success as currently planned • Proximity of two positions to newly proposed ArcGIS Server architecture not well thought out – bandwidth, no ArcGIS Server knowledgeable person at proposed server location • ArcGIS Server installation is a duplication of existing infrastructure • Publish water utility datasets as geoservices using ArcGIS Server	• WDA and IJDC anticipate that over the next 5 years, $200-$325 million dollars will be available annually for funding WV water, wastewater and storm water infrastructure projects. • ESRI-based GIS technology implementation grant to CDM and Thrasher Engineering • Locate two staff at the same physical location existing ArcGIS Server infrastructure, RDBMS DBAs, GIS DBAs, etc.	• Maintain, update, and distribute data • Planning process at local and state level • Coordination among the many individual water utility entities • Lack of good, complete sources for water distribution networks
Wastewater Utility	• Statewide wastewater mapping project recently initiated the Water Development Authority project	• When completed this will provide an initial GIS layer related to waste water lines integrated from DEP, Public Service folks, etc. for the first time • Application being created is ArcGIS Server – geoservices based	• No comprehensive planning, all local based • Insufficient number of positions to insure success as currently planned • Proximity of two positions to newly proposed ArcGIS Server architecture not well thought out – bandwidth, no ArcGIS Server knowledgeable person at proposed server location • ArcGIS Server installation is a duplication of existing infrastructure	• Locate two staff at the same physical location existing ArcGIS Server infrastructure, RDBMS DBAs, GIS DBAs, etc. • Publish wastewater utility datasets as geoservices using ArcGIS Server	

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	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Geographic Data Development and Stewardship					
Telecommunications	• NTIA $1.4 million broadband grant for broadband mapping in West Virginia • Verizon principle funder for SAMB	• SAMB base map with telecommunications features • NTIA grant for broadband coverage	• Stewardship/maintenance if Public Service Commission (PSC) does not have GIS capability	• GIS broadband data & spatial analysis of un-served and underserved areas • Justification for PSC to get GIS-enabled • NTIA broadband project will gather detailed info on digital coverage • Publish Telecommunications datasets as geoservices	• Verizon SAMB funding ends in June, 2010. Need to find resources for ongoing update • Publish Telecommunications datasets as geoservices using ArcGIS Server
Public Safety Critical Facilities	• WVDHSEM principal steward and state coordinator of critical facilities. • TechniGraphics/HSIP Freedom, GISTC, and other entities have assisted in creating public safety critical facilities.	• Good cooperation between WVU/DHSEM/USGS (HiFLD / HSIP)	• Competing authorities (local, state, federal)	• Many critical infrastructure datasets are address-based which can benefit from Statewide Addressing and Mapping System • Publish Public Safety Critical Facilities datasets as geoservices using ArcGIS Server	• Setting up process and finding resources to keep existing data up-to-date
Geology and Mineral Resources	• WVGES provides geospatial data, services, and products for oil and gas, coal, geologic maps, and historical aerial photography • USGS STATEMAP funding for geological quad mapping (2-3 quads per year) • Geological mapping of New River Gorge - NPS contract 2010-2012 (14 quads) • WVGES nearly completed with coal bed mapping (part of MLMP)	• GIS technologies an integral part of mission • Integrated coal, oil, gas GIS /Oracle statewide database • Mineral Lands Mapping Program (MLMP) one of few statewide programs in country – innovative use of scanned mine maps; coal bed mapping should be completed by 2012	• No complete statewide bedrock geology at 1:24K (like Kentucky) • No plans for post-MLMP strategy	• Sharing data and services with other state agencies • GIS/Mapping expertise for future energy related projects (carbon sequestration, wind power) • Publish Geology and Mineral Resources datasets as geoservices using ArcGIS Server	• Publish Geology and Mineral Resources datasets as geoservices using ArcGIS Server
Soils	• WV SSURGO completed (status map)	• Federal contacts provides data sharing opportunities		• Enhance awareness about availability of digital soil layers	
Demographics	• State Data Center in Dept. of Commerce • Legislative Services	• 2010 Census will deliver comprehensive demographic data in GIS format	• Not visible or active in state GIS program	• Using data from Census 2010 to support a variety of program areas including: a) economic development, b) political redistricting, • Publish Demographic datasets as geoservices using ArcGIS Server	• Integrating data for census geography (based on Census Bureau TIGER files) with more accurate base map sources • Mandate beyond political use for redistricting • Publish Demographic datasets as geoservices

SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
GIS Technical Infrastructure, Applications, and Services					
Network Accessibility to Data and GIS Applications	• Good, high-speed network accessibility in Charleston and other urban areas • Existing IT infrastructure supports 2.5D GIS	• Bandwidth exists to allow a distributed computing model using geoservices to be implemented between key agencies	• Many rural areas of State do not have broadband coverage. • Lack of state network availability for all offices to provide enterprise wide availability • Existing IT infrastructure is not sufficient to handle increased load as GIS transitions to 3D	• NTIA broadband initiative to drive projects for increasing network accessibility • Take advantage of recent projects for cross-agency data integration (DEP-DNR) • Development of ArcGIS Server-based RIAs allows establishment of Enterprise GIS with current rural bandwidth limitations • Expansion of Web-based data and applications by private companies (Google Earth, Bing Maps) expands GIS interest and user base	• Citizens access to high-speed networks to take advantage of online mapping applications and services • Expand both computing backbone's bandwidth and wireless access to capitalize on exploding mobile use of geospatial applications/data • Maintain upgrade of IT infrastructure to handle greater demands of 3D, graphics intensive, very large geospatial dataset during IT consolidation leveraged at delivery of word processing, email, etc.
Web-based GIS portal and Clearinghouse	• MapWV.gov portal for general public • WV Data Clearinghouse for mapping professionals; discovery tool for locating distributed data resources that contribute to State's Spatial Data Infrastructure • WV View – Large remote sensing collection in State • Individual GIS data servers (e.g., DEP) support needs of state agency and other users	• Effective use of Web-based GIS tools for GIS data access • Free access to non-sensitive mapping layers; some states charge for access to framework base layers • Several more advanced GIS implementing agencies have already implemented ArcGIS Server successfully	• Agencies typically do not supply GIS data, services, and metadata information to Clearinghouse – must be "harvested" • Not all data layers are in public domain • No overarching statutory authority to mandate availability and access of public GIS data	• Sharing of data and services • Expansion of web-based services for state and local governments • Expansion of Web-based data and applications by private companies (Google Earth, Bing Maps) expands GIS interest and user base	• Harvesting new data layers and services into Clearinghouse • Continuously inventorying and updating data and services catalogs • Access to locally produced GIS data at county level • Sensitive versus non-sensitive data. Tracking, managing, and storing restricted data. • Funding to maintain web-based services at state enterprise level • Establishment of a Broadband Orchestrated Regional Group (BORG) of ArcGIS Servers providing access to most utilized GIS data as geoservices.

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SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
GIS Technical Infrastructure, Applications, and Services					
GIS Software	• ESRI ArcGIS primary mapping software used by GIS professionals in State (over 90% of organizations). • The 2nd most popular software for GIS and mapping applications is Autodesk (AutoCAD, AutoCAD Map) • MapInfo used in State Tax Dept. • Other software packages in use for mapping and GIS include Erdas Imagine and MicroStation	• GIS software capabilities by commercial vendors is improving in usability and functionality • ArcGIS is a de facto standard for majority of GIS users easing technical integration, licensing, and training concerns. • Improved capabilities for integration between GIS and non-GIS applications and databases	• Instructor-led GIS training is expensive • No statewide GIS software enterprise license • Software too expensive for certain local organizations	• Coordinated training opportunities • Migration toward enterprise licenses and web-based services to reduce overhead on individual agencies and organizations and improve citizen access to geospatial data • Consolidation of GIS SW licenses in state government (ESRI and MapInfo) • Increased availability of commercially available Web GIS services (Google Earth, Bing Maps) • Open Source GIS software provides low-cost alternatives	• Data exchange between different mapping software • New software versions are released every year requiring resources for migration and training • Funding to maintain state enterprise resources
GIS Applications	• Many state agencies have or are developing online GIS applications to better accomplish mission goals • Map WV Web-based tool provides basic Web-based GIS data query and display • Several major initiatives in State government will deliver useful applications (WDA project tracking by CDM, Hazus modeling by DHSEM)	• Advances in Internet mapping technology make applications easier to use, improved performance, and more modern looking • Mapping applications like Google and MapQuest are universally known • Increasing GIS knowledge-base and expertise within agencies	• Standards development for optimizing sharing of data and services • Poor communication between agencies means that much overlapping, redundant or worse, independent, work is being done that could benefit more than the originating agency • Google and MapQuest are universally known but have serious use limitations • Essentially no in-state production of qualified geospatial applications development candidates	• Significant growth and demand for online mapping applications and services • Well-designed pilot project to convince senior managers of GIS capabilities • Improve location based services for State (address, parcel, name, route) that can be integrated in any application • Produce qualified geospatial applications development candidates by modifying higher education curricula appropriately	• Customized application development and GIS services require considerable software, hardware, and personnel resources • Internet application technology rapidly changing • ArcIMS legacy applications must be converted to ArcGIS Server • Cross-browser compatibility of applications • Encouraging improved communication and collaboration in GIS application development and use • Convincing students taking geospatial classes to specialize in updated curricula that provide geospatial applications development skills

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
GIS Technical Infrastructure, Applications, and Services					
Technical Standards	• Standards vary, depending upon data theme, services, information exchange, applications, etc. • Historic adherence to FGDC and geospatial industry standards • De-facto adherence to standards but insufficient formal process for creating and approving IT and GIS standards	• Mature national programs for GIS-related technical standards which the WV GIS community can use (e.g., FGDC, professional associations, other states) • Development completed of several ASTM National Coal Mining Geospatial Standards.	• Need to focus on business needs and agency mission requirements to define standards, not specific hardware or software • Insufficient formal process for IT and GIS standards approval and oversight	Prioritize what standards should be implemented and Establish formal standards process • More active role of Department of Technology to identify IT standards impacting GIS • Create standard templates for county government GIS: internal needs assessments, Strategic Planning, and implementation planning • Completed development of remaining ASTM National Coal Mining Geospatial Standards	• Necessary policy decisions may hinder standards development • Applications and data are often driving force of standards • Mandate use of developed ASTM National Coal Mining Geospatial Standards by industry and by DEP's Abandoned Mine Lands Program
GIS Education, Technical Expertise, Professional Development					
Understanding and Technical Expertise in State Government	• Technical expertise varies from agency to agency • Many agency programs do not have sufficient FTEs to have all necessary skill sets needed to insure long term GIS viability and best ROI	• Some agencies have increased GIS staff and expertise	• Most agencies have lost GIS highly skilled staff due to uncompetitive salaries • Most agencies have been unable to fill geospatial vacancies because of hiring freeze/limitations. • Most agencies fail to increase geospatial FTEs at appropriate points in time in their GIS implementation in very poor ROI • Almost no geospatial applications development expertise in West Virginia	• A mechanism for sharing rarer expertise (Management, GIS Data Base Administration, Technical Systems Administration, Remote Sensing) across multiple agencies • Provide pay incentives for staff obtaining/maintaining professional certifications	• Knowing how people are using GIS in decision making without needing to travel to attend GIS meetings
Understanding and Technical Expertise Outside of State Government	• Broad level expertise correlates to cumulative experience and skills of GIS staff			• Smaller agencies with minimal GIS resources must share resources with other agencies, or outsource services	
GIS Programs in Higher Education Institutions	• GIS/Geography degree programs at Concord, Marshall, and West Virginia Universities, etc. • New GIS Certificate Program at Marshall	• Recent announcement of K-12 ESRI ELA through Dept. of Education	• Incentives to pursue K-12 GIS teaching programs • Lack of programs at technical and community college level • No Ph.D. program in GIS, Remote Sensing, etc. along the I64 Charleston/Huntington area where most State government GIS users are located	• Penetration into technical programs • Increasing exposure to GIS in K-12 • Establish a Ph.D. program in GIS, Remote Sensing, etc. along the I64 Charleston/Huntington area where most State government GIS users are located	• Increase level of coordination among the state's major universities • Establish a Ph.D. program in GIS, Remote Sensing, etc. along the I64 Charleston/Huntington area where most State government GIS users are located

SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
GIS Education, Technical Expertise, Professional Development					
GIS Training and Professional Development Sources/Availability	• WVAGP sponsors workshops and professional development towards GIS certification • Workshop survey done by WVAGP in 2008 • Instructor-led workshop catalog created in 2008 • Biennial State GIS Conference (June 2010)	• Certified instructors for ESRI, Autodesk, and FGDC metadata • Multiple sources for GIS training and education in WV (vendors, government sponsored workshops, higher-education sources)	• Ability to contact GIS professionals or forums for help; learning about best practices • Affordable training	• Collaborative training opportunities • The State and its partners should sponsor more GIS training events for regional and local organizations, as well as for GIS professionals and non-technical decision makers • Various training and educational opportunities for GIS professionals, decision-makers, and other user communities • Greater use of Web-based training programs (e.g., ESRI Virtual Campus). • GIS awards program to acknowledge accomplishments • GIS mentoring programs and in-house training sessions.	• Local training opportunities or Webinars – travel for training outside of State expensive • Different fee rates are charges for similar training courses or workshops • Coordinating resources to organize training events and conferences
GIS Professional Labor Pool	• Limited opportunities in state for GIS positions and advancement • WVAGP provides important networking forum for communications among GIS professionals	• Small yet active, grass roots community of GIS professionals	Lack of "critical mass" of GIS professionals to influence geospatial policy	• Expansion of energy sector (esp. wind, gas) as well as tighter environmental regulation (coal) may open market for GIS expertise • State is in process of revising all personnel classifications, including GIS	• Attracting GIS programmers with computer science degrees • Marketing GIS careers in WV • Career advancement • Produce qualified geospatial applications development candidates by modifying higher education curricula appropriately • Establish a Ph.D. program in GIS, Remote Sensing, etc. along the i64 Charleston/Huntington area where most State government GIS users are located

SWOC Evaluation for Statewide GIS Program (cont.)

	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Resource Availability, Management Support, and Funding					
Awareness and Support from Senior Officials and Upper Management	• Most senior officials are aware of mapping technologies, especially since mapping companies like Google have made it more mainstream		• In some cases, elected officials lack the leadership or initiative to champion robust county digital mapping systems • Some senior management are not inclined to adopting new technologies • Elected officials See GIS as a standalone technology and not interconnected in many functions of government • Most elected officials See GIS as nothing but a way to produce a paper map • Insufficient awareness of GIS business benefits by senior officials limits funding allocations	• Position WV GIS Council to play more active governance and advocacy role • Garner senior management support with pilot projects • Showcase best practices of successful programs • Educate decision-makers about how technology can streamline government practices and save dollars, and provide improved services to citizens (i.e. how GIS can help them get re-elected) • Provide GIS maps products and spatial analysis services to Governor's Office and Legislature	• Hi-level decision-makers' awareness and support of GIS programs and initiatives at all levels of government and the private sector • Continuing battle of privacy concerns vs public good • Budgeting and funding • Provide GIS maps products and spatial analysis services to Governor's Office and Legislature
Staff Availability and Recruitment	• Large GIS sections typically have a staff composed of a GIS manager, technical systems administrator, GIS DBA, GIS analysts, and GIS/Web programmers	• Growing pool of GIS professionals and training programs in WV and out-of-state	• Funding to retain qualified staff at competitive salaries • Small GIS initiatives can require multiple skills (e.g., project manager, systems administrator, GIS database, programmer, GIS analyst) • Lack of career paths for GIS • State hiring restrictions • Of GIS manager, technical systems administrator, GIS DBA, GIS analyst, and GIS/Web programmers, higher education programs in West Virginia really only turn out GIS analyst track graduates.	• Tweak West Virginia's higher education programs in GIS to graduate people far better trained in GIS management, GIS technical systems administration, GIS DB Administration and GIS/Web programming. • Evaluate numbers of GIS Professionals vs. numbers of IT FTEs in West Virginia and in States with most advanced GIS programs to determine if ratio is right in West Virginia.	• GIS programmers usually must be recruited nationally • Convincing West Virginia's higher education programs in GIS to adjust course offerings to graduate people far better trained in GIS management, GIS technical systems administration, GIS DB Administration and GIS/Web programming. • After determining that the number of GIS Professions is disproportional in our State, how to convince appropriate people to allow addition of GIS FTEs is the next hurdle.

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	Current Status	Strengths	Weaknesses	Opportunities	Challenges
Resource Availability, Management Support, and Funding					
Traditional Funding Sources	• Many assessors use valuation funds for GIS mapping projects • Mineral Lands Mapping Program provides funding to WV GIS Coordinator, WVGES, WV State Tax Dept., and WVGISTC • County E-911 fees supporting address-related data capture	• Some level of base state funding has existed since 1995 • Strong cooperative funding support from Federal agencies such as USGS, NRCS, FEMA, etc. • State government finances are stable—not experiencing major deficits like many other states	• Sustained funding • Budget decreases • Grant programs not adequately exploited to support geospatial projects due to lack of grant writing expertise at many agencies • Too much funding being spent on geospatially related work using last millennium's professional standards.	• Pooled 911 fees to support 911 addressing maintenance • Revision of WV Code to allow small percentage of currently collected fees to be used for geospatial infrastructure and data maintenance • Update workflow from the 1950's so monies spent have accurate coordinates, known datums, deliverables aren't just paper maps with contour lines drawn on them, etc.	• Resistance to status quo by elected officials • Getting higher level administrators to rethink obsolete business processes so monies spent insure accurate coordinates, known datums, are digital rather than paper-based, etc.
Non-Traditional Funding Sources	• Digital parcel mapping sales provide funding source for state and local governments supporting parcel mapping		• Surtax on recorded deeds to generate revenue at county levels not likely • State does not control E-911 funding for mapping like Virginia, which has pooled state level funding	• More grants available for funding GIS activities • Joint projects and multi-organizational consortia to jointly fund GIS projects • Explore possible allocation from existing fee-based programs (deed registration, permit fees) to support GIS development	

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