Mapping Better Services for Colorado

A Plan for Geographic Information Technology in the State

July 2010

STATE OF COLORADO

GOVERNOR'S OFFICE OF INFORMATION TECHNOLOGY

601 East 18th Avenue, Suite 250
Denver, Colorado 80203
Phone (303) 764-7700
Fax (303) 764-7725
www.colorado.gov/oit

Bill Ritter, Jr.
Governor

Leah Lewis
Acting State Chief Information Officer

July 2010

In accordance with Section 24-37.5-111, C.R.S., I am pleased to present "*Mapping Better Services for Colorado: A Plan for Geographic Information Technology in the State*" to the Governor and the Members of the Senate and House State, Veterans, and Military Affairs Committees.

Geographic information systems (GIS) are becoming increasingly critical to state operations and services. More agencies are realizing the benefits of displaying and analyzing the locations of their activities, their clients, or the facilities they regulate or protect. Similarly, with the advent of Google maps and other web-based map services, more citizens want to see where state services are located and what services are near their homes.

The attached plan identifies a vision for GIS in the state that will increase the effectiveness of government services to Colorado citizens and reduce costs for these systems over the long term. It identifies some of the successes from GIS consolidation to date, obstacles encountered, and a set of recommendations to produce an effective and efficient enterprise GIS operation.

We look forward to discussing with you this plan and future steps to realize its vision. Please do not hesitate to contact me with any questions or comments on this plan.

Best regards,

Leah Lewis
Acting State Chief Information Officer

Mapping Better Services for Colorado

A Plan for Geographic Information Technology in the State

I. Vision

Our vision for Geographic Information Systems (GIS) is to transform GIS in state government to support better decision-making, promote information sharing, facilitate interactions with the federal government and political subdivisions, and inform citizenry throughout the state. We intent to lead a shared services initiative which will allow governmental agencies within Colorado to build, share and use a common system, saving all of us money by streamlining efforts and leveraging our volume to reduce operating expenses.

We will do this by following the Governor's Office of Information Technology's (OIT) mission, as expressed in our recent report to the Governor and Legislature[1]:

> *...increase the effectiveness of government through the use of shared information and technology. Information technology will be used to maximize the efficiency of service delivery and will operate as a seamless enterprise, delivering consistent, cost-effective, reliable, accessible and secure services that satisfy the needs of the citizens of Colorado, its business communities, and its public sector agencies.*

A Future System of Geographic Information Technologies in Colorado

The future environment for geographic information technologies in Colorado should follow certain basic principles:

- Data, applications and services should be created once and used many times.
- Data should be available and gain value through use.
- State agency lines of business should be supported and not constrained by enterprise GIS standards and procedures.

[1] *Transforming Colorado Government for Today and the Future: Governor's Office of Information Technology 2010 Report*

- Full visibility regarding GIS activities is necessary to promote more efficient use of these technologies, and the State should always consider how solutions to specific business needs may serve as a foundation for enterprise-wide solutions.

- Geospatial systems and data are valuable assets of the state and should be protected and managed accordingly.

- Combining data and systems across state agencies and jurisdictions provides valuable business intelligence for better governing.

- The State has a vested interest in and can support local, regional, state and federal government geospatial efforts, and these efforts should be integrated as much as possible to achieve the full benefits of statewide information.

A fully integrated system for geospatial information includes the following components:

- Data discovery – those who need data should be able to find it easily.

- Data access – data that exists should be available.

- Data integration – combining data across jurisdictional lines and across departments within a jurisdiction ensures comparability of the data.

- Data governance and stewardship – data is a valuable asset and should be maintained and stewarded to maximize the value and the usefulness of the data.

Figure 1 illustrates the geospatial environment in Colorado before coordination efforts. The main point of the diagram is to show that all state agencies share data with other state agencies, other jurisdictions and the public in an unorganized, point-to-point fashion. Applications or services are not shared among agencies, and there is no main source of information about ongoing activities to promote the concept of developing data or applications once and using it many times. In addition, access to geospatial data is handled independently by individual agencies according to their independent protocols and policies.

Figure 2 depicts the current state of the geospatial environment as a result of the passage of Senate Bill 08-155. The Office of Information Technology is now coordinating various activities, such as purchase of statewide data, setting up central services for data availability and developing governance of geospatial data consistent with the enterprise architecture and data governance efforts of OIT. Some of these activities are described in more detail in the Successes section. There is still quite a bit of data sharing and dissemination as well as application development on an individual point-to-point basis.

Figure 3 shows the desired end state that takes advantage of rapidly developing technologies and presents an environment that provides security and recovery for data, efficient information sharing, and savings in cost. This environment involves a centralized database where state agencies and political subdivisions can edit data. This database would support integration of the data through standards and well-defined processes. Cities and counties that have highly functioning, robust GIS could also upload their data into a repository following defined protocols and standards. Federal agencies would then have access to regional or statewide data in one place for population censuses, wildfire response and numerous other activities.

Figure 1: GIS Environment in CO without Coordination

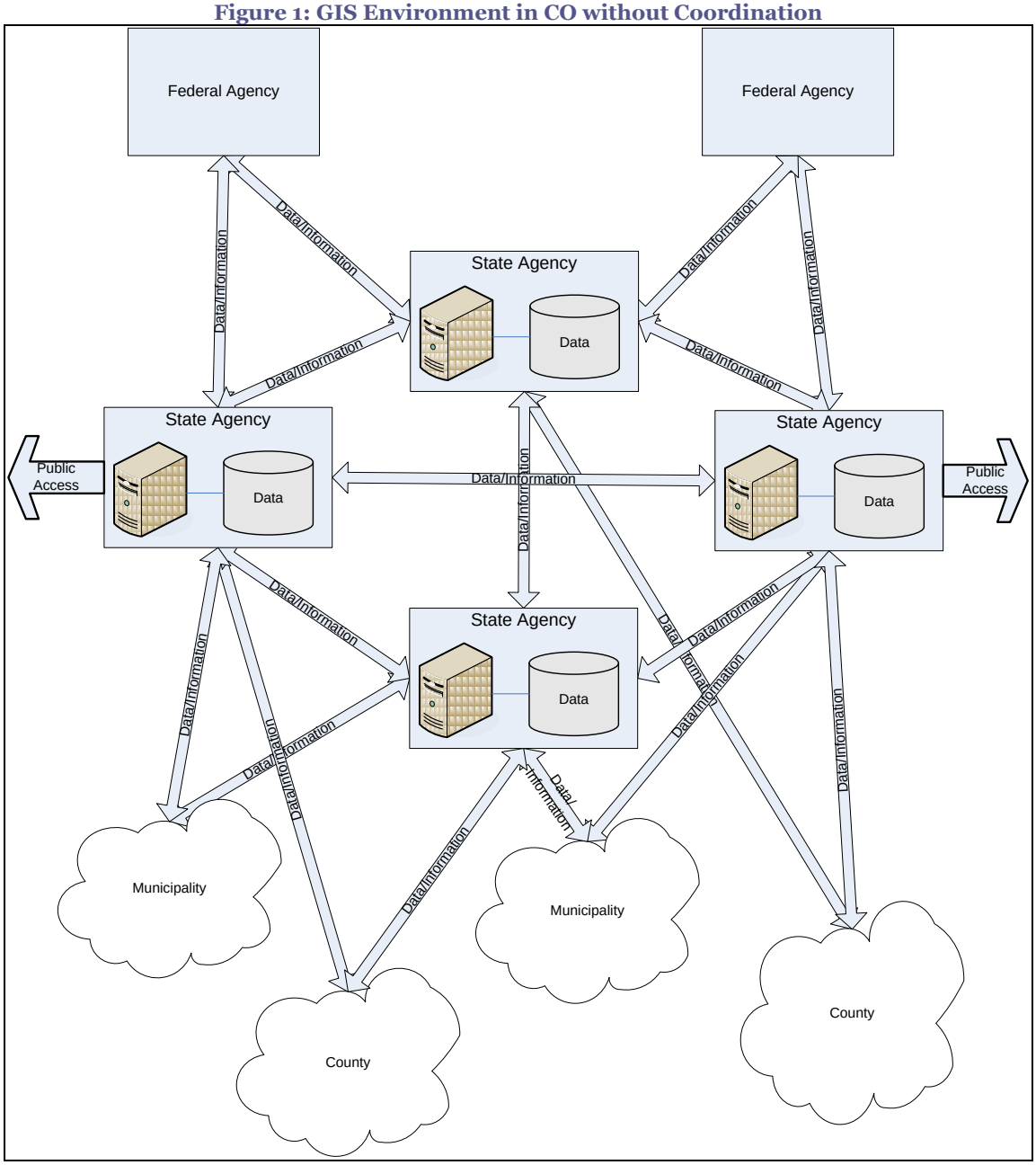


Figure 2: GIS Environment in CO after SB 08-155

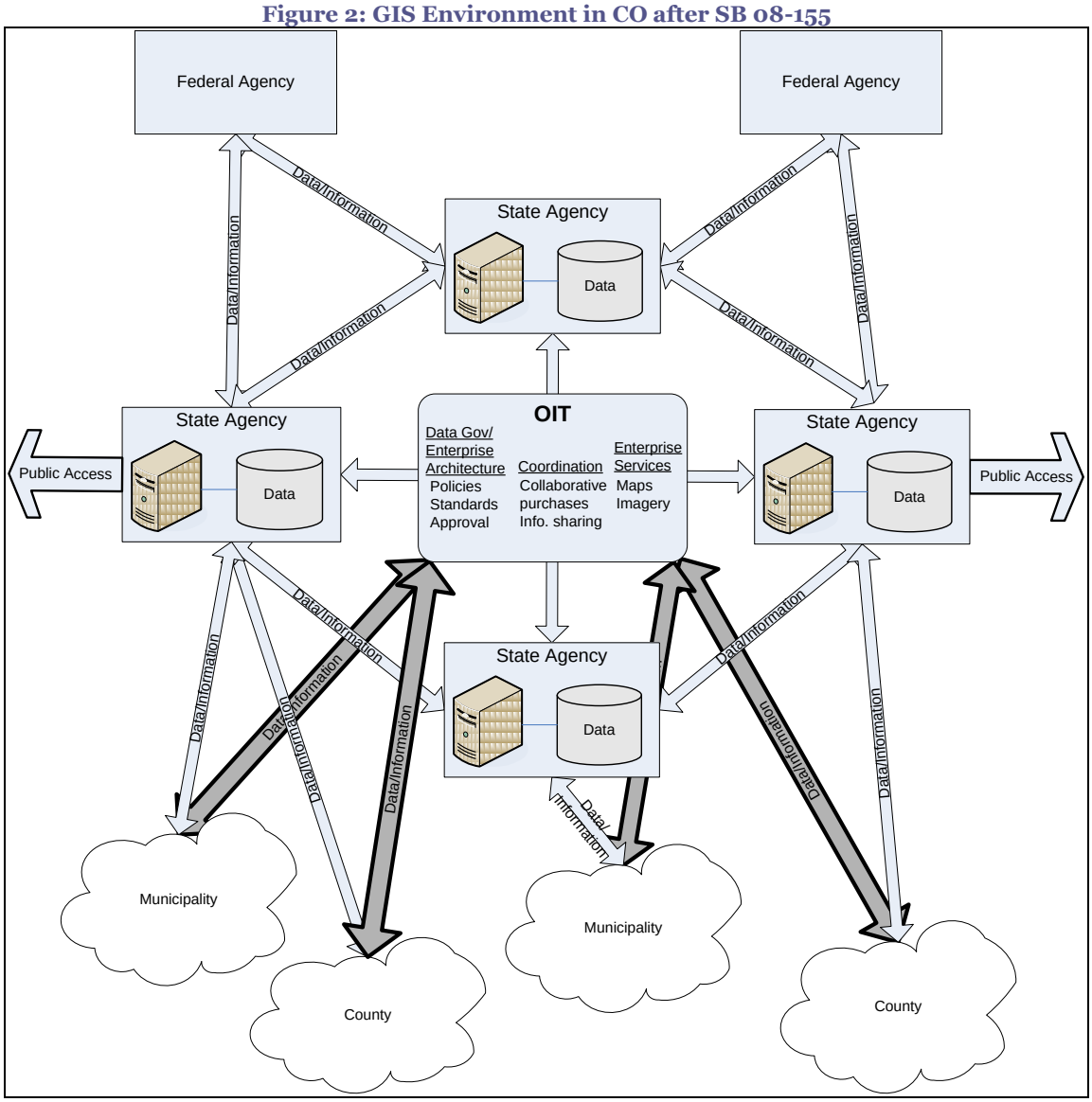
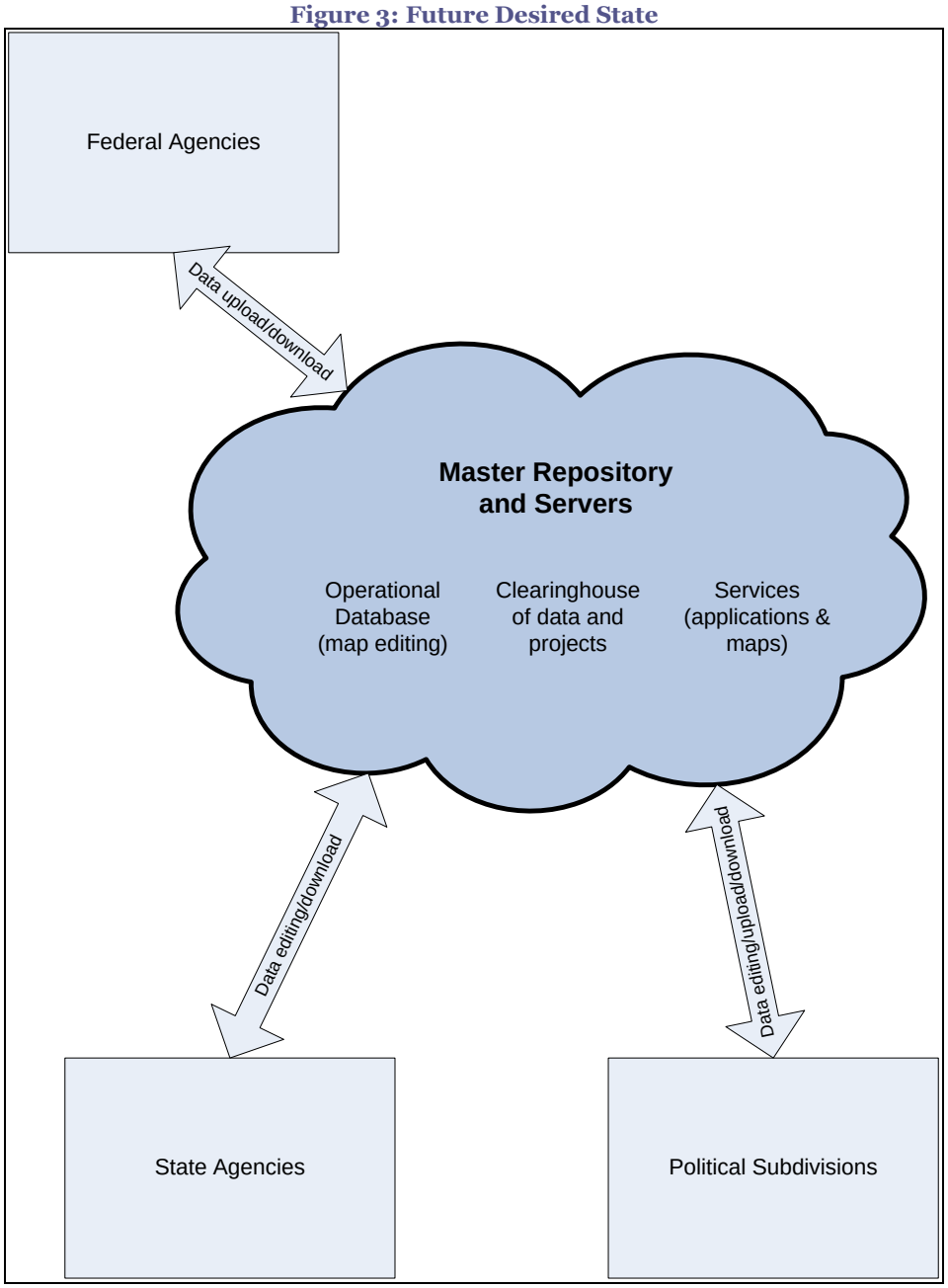


Figure 3: Future Desired State



Why should Colorado make this end state the objective for the future? The following section describes a current example of how such an environment would improve government operations and the services to Coloradans.

Example of the Need for GIS Collaboration

One classic example of GIS data sharing for critical governmental activities relates to preparing for and using information from the decennial census. The Census Bureau's data requirements are also similar to

those of many other application areas such as wildfire response, public health, elections management, and others.

The preparation for each decennial population count involves a tremendous amount of data updating and manipulation. The US Census Bureau collects data from local governments on addresses and streets in each county. Although it would be most efficient for the Census Bureau to collect this local data from one location at the state, they traditionally have had to talk to each political subdivision that collects these data. This process is in fact redundant with similar efforts occurring within state government to collect the same data for state use.

Another Census program collects voting precinct data from local governments and aligns them to boundaries of Census enumeration areas to support population counts by precinct. This is an intensive effort every ten years. A more efficient approach would be to maintain this information as it is changed throughout the decade and then provide it to the Census Bureau when they need it.

This discussion is critical for the State of Colorado. Voting precincts and legislative districts are delineated based on the census population counts, and having a good count of population and an accurate representation of where the population is relative to existing political geography is essential for an accurate realignment of these boundaries every ten years. The State is gearing up for this process currently.

II. Challenges

Although there have been notable successes in the OIT GIS consolidation, several challenges have impeded OIT from making progress as rapidly as desired. To achieve the transformation and resulting improvements that are possible, the following obstacles should be addressed:

- **Lack of clear authority for GIS technologies** – Geospatial information technologies, as one type of information technology, are subject to OIT oversight according to Senate Bill 08-155. However, due to the independent history of GIS, this authority is not considered clear where GIS activities do not traditionally fall within IT organizations.

- **Lack of budget to initiate and support enterprise GIS services** – Establishing enterprise geospatial services requires an investment in infrastructure, staff, training and software. While some of these needs may be addressed through the consolidation process, assuming the authority issue is clarified, there is no denying the need for resources to establish the enterprise systems. After the systems are in place, continued funding may be derived from a few sources.

- **Restrictions on spending funds from different funding sources** – One obstacle to leveraging funds to support enterprise developments is the limitations placed by federal funding agencies on the use of some of these funds. Some state agencies follow restrictive interpretations of these federal conditions, which severely constrains sharing resources purchased with dollars from these programs.

- **Lack of staff and training** – Geospatial technologies, like many information technologies, require a breadth and depth of knowledge. Training on the technologies is essential in the current, dynamic environment. To develop the enterprise infrastructure and supply the services envisioned by OIT, a core of technically competent staff is necessary.

- **Overall resistance to OIT oversight and management of GIS activities** – Related to the issue of authority is the general resistance to an enterprise view and oversight of geospatial activities. Again, this is due in large part to the historical positioning of GIS within organizations.

- **Lack of visibility of GIS activities and expenditures** – The last obstacle relates to the difficulty of developing an accurate picture of the exact activities occurring in the area of geospatial technologies, which therefore prevents an accurate assessment of money spent on them. In addition to the perspectives mentioned earlier, many GIS activities occur in the context of other programmatic activities and are not reported. This means these activities are not visible to OIT for planning or financial estimate purposes.

III. Successes

Despite the obstacles listed above, OIT has made notable progress in managing GIS as an enterprise. These include:

- **Inventories of state geospatial data and hardware supporting GIS** – As part of an effort among state agency GIS staff, the state has conducted an inventory of hardware supporting geospatial activities. A separate group has also thoroughly inventoried geospatial data maintained and required by state agencies. This is the first such inventory in ten years and will feed into and inform the data governance process represented by the Government Data Advisory Board (GDAB).

- **Beginnings of developing a GIS team and development of a detailed implementation plan** – A team of geospatial personnel from state agencies has been convened to develop a detailed implementation plan for a consolidated GIS environment in the state. This plan is near completion and will outline the steps necessary to achieve this consolidated environment. However, some of the steps will be constrained by the obstacles listed above.

- **Statewide purchase of aerial photography in partnership with the federal government** – The state partnered with federal agencies to obtain statewide aerial photography in 2009. This photography is used by many state agencies and local, federal and private GIS users. It is critical for many applications including land and resource management, water supply planning and management, transportation planning, emergency management and homeland security and many others. It is especially useful because GIS users can use the data directly, rather than simply looking at an image on a web site, and it is consistent across the state. By collecting funds totaling $117, 000 from local and state government entities, the state was able to procure a data product that costs approximately $1.4 million to produce.

- **State enterprise image service** – Once imagery is available for the entire state, the question arises about how to provide access to it. The state has obtained aerial photography for 2005 and 2009, and each of these data sets is very large in size. It is highly inefficient for multiple agencies to duplicate this data. OIT coordinated obtaining a $50,000 grant from the US Geological Survey to develop an enterprise service to display this data. This reduces the amount of time and resources required to make this imagery available across the state.

- **Detailed elevation data for the Denver region** – OIT assisted the US Geological Survey in coordinating local and federal partners to acquire highly detailed elevation data useful for

emergency management, flood modeling and many other things. This project saved local jurisdictions tens of thousands of dollars.

- **Coordination and stewardship of data sets and development of a geospatial data governance plan consistent with state enterprise data architecture** – In geospatial technologies, as in any information technology domain, it is critical to have data sets that have a well-defined stewardship process that attempts to meet the needs of multiple stakeholders. Such a process ensures that users know they are using the most authoritative data and know the utility and quality of that data. Stewardship is one part of data governance. The state has begun to develop stewardship programs for some necessary data sets. These programs will be consistent with the GDAB and enterprise data governance.

- **Colorado Geospatial Information Advisory Council** – This council has been authorized by the State CIO to provide input on GIS coordination activities from the variety of GIS stakeholders across the state including municipal, county, regional, state and federal entities as well as the private sector and higher education. The Council has begun to work on improving the communication of GIS activities across the state to allow local, state and federal GIS efforts to leverage these activities. It also will provide input on data stewardship and areas where GIS may facilitate other government process like the state's voter registration system.

- **Receiving and leveraging federal broadband mapping grant** – The GIS staff in OIT was instrumental in obtaining the $2.1 million broadband mapping grant from the federal government. This grant will establish some elements of the enterprise infrastructure for enterprise GIS services that also support broadband mapping. OIT has hired 3.5 FTE, of which one FTE is a GIS specialist, for the life of the federal grant.

IV. Recommendations and Steps Forward

How can the State of Colorado move from Figure 1 to Figure 3? Colorado is recognized as a national leader in local and private sector GIS efforts and expertise. OIT staff have been acknowledged nationally as well, one recently being elected President of a prestigious national organization of statewide GIS coordinators. The State of Colorado should also be a national leader in implementations of GIS by state governments and should be furthering these technologies to enhance state programs. In order to realize the vision of GIS, OIT is making the following recommendations and requests the following actions from the state legislature:

1. **Clarify OIT ownership of all computer hardware, software licenses and data supporting geospatial information and technologies in the state** – This addresses the obstacles to managing these technologies more efficiently from an enterprise perspective.

2. **Clarify OIT authority including appointing authority over GIS staff** – The position of many GIS staff was not clear in the personnel consolidation resulting from SB 08-155, because many of these staff are not classified as IT within the state personnel system. However, several GIS staff are supporting enterprise types of activities in their agencies and should support a state enterprise group that can develop geospatial applications, data and services based on the ones they produce for their line of business.

3. **Structure a state enterprise GIS group** – OIT recommends that each agency transfers a portion of a vacant FTE to support enterprise GIS operations. Based on enterprise GIS operations in

other states, OIT believes that approximately 7.0 FTE will fully staff the GIS operations, policy and coordination center, and the charge back model will be based on usage. This allows the agencies to retain their highly trained engineers, and for OIT to hire trained GIS experts. Include in OIT's common policy funding allocations to support the transferred FTE and infrastructure to support enterprise GIS. The common policy funding model is a charge back model used for all IT operations. Multiple agencies will take advantage of these services and, therefore, should contribute appropriate funding to them. Centralizing the core server and infrastructure services will reduce costs and enable the agencies to focus on using the technology to support their lines of business.