STATE OF HAWAII
STATEWIDE GEOGRAPHIC INFORMATION SYSTEM
BUSINESS PLAN

March 2006

SECTION 1: EXECUTIVE SUMMARY

Description of the Statewide Geographic Information System

Geographic Information Systems (GIS) are powerful high tech tools used to collect, organize, store, analyze and display spatial information. Implementing GIS technology is particularly important to government agencies because approximately 80 percent of all records collected and analyzed by government agencies include a geographic component. GIS technology helps facilitate government's ability to effectively analyze spatial data sets to make better decisions.

Over the past two decades, GIS's have evolved from very complex software programs available to only people with specialized training, to a technology that is becoming more user-friendly and as a result, is being used by more people on an everyday basis. In many ways, parallels can be drawn between the evolution of GIS and the Internet. Twenty years ago, the Internet was an obscure technology that very few people knew about or even had access to; however, today, the Internet is part of our everyday vocabulary. Similarly, GIS has grown and is no longer what might have once been considered a niche technology.

Although the Statewide GIS Program has been in existence since 1988, the effectiveness of the system has been compromised by three factors. First, many agencies are utilizing outdated GIS applications and licenses, and therefore are unable to access all of the data stored in the Statewide central database, leaving them with a less effective analytical tool. Second, the variance between GIS applications utilized by different agencies reduces the inter-operability of the GIS systems across State agencies. Third, the fact that each State agency administers separate GIS licenses has led to inconsistent data sharing, increased data redundancy and duplicated administrative responsibilities.

Chapter 225M of the Hawaii State Statutes designates the Office of Planning as the agency responsible for planning, developing, implementing and coordinating the statewide Geographic Information System. As the lead agency for coordinating GIS development and implementation within Hawaii State Government, the Office of Planning (OP) is committed to the continued growth of the system. While there are already a number of agencies, including OP, that use the system on a daily basis, there is potential for a number of other agencies to either start using or increase their usage of the system.

The purpose of this plan is to develop a strategy to help improve the accessibility and power of the system to make GIS a meaningful tool to any state agency that analyzes geospatial data. A key component to this strategy is to implement a statewide GIS Enterprise License Agreement (or ELA) to help improve the acquisition and maintenance of GIS software licenses that are deployed throughout Hawaii State Government.

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Targeted Market and Customers

Agencies targeted for this activity include all those units that collect, manage, store and analyze geospatial data. Currently, the following departments are using GIS in some capacity: DOA, DAGS, Attorney General, DBEDT, DOD, DOE, DHHL, DOH, DLNR and DOT.

For example:

- The State Attorney General's Office uses GIS to monitor and analyze juvenile crimes. To do this, they hired a consultant to develop a secure Internet application that allows authorized users from their office or their partner agencies to access and use the application;

- The Department of Health also combines GIS and Internet technologies. Their Disease Outbreak Control Division hired a consultant to develop an application to monitor and track incidences of disease outbreaks;

- DOH Safe Drinking Water Branch and the Department of Agriculture Pesticides Branch are sharing data and working with the University of Hawaii to develop models showing where pesticides may be leaching into drinking water.

In addition to the above examples, Appendix A provides a summary of how existing user agencies are using the system and provides insights into how GIS is improving various agencies' abilities to analyze spatial data sets to carry out their particular duties and responsibilities.

While there are a number of agencies that are using GIS to support their various activities, the state is failing to harness the full power of GIS as an analytical, planning and information tool. The lack of full, regular sharing of data with the central database and the inconsistent technology levels between agencies has weakened the state GIS system, and, in some cases left Hawaii more vulnerable during emergency situations.

For example:

- State Civil Defense needs current data to effectively respond in a crisis situation. If a road network exists, but does not appear on a map due to outdated data, a potential evacuation route could go unused.

- The Safe Drinking Water Branch of the Department of Health has a need to map groundwater resources and quality for a variety of public health issues. This mapping would allow them to site new water sources in areas that minimize potential contamination and locate activities with contamination potential (e.g. landfills) in areas that are less likely to contaminate water resources. The

Department of Land and Natural Resources has a groundwater well database in GIS format, while the Department of Health has a water quality database. Joining these two databases could help the DOH in its mission of improving public health and safety.

- The Department of Land and Natural Resources has a need for current imagery to monitor remote conservation areas. Some of their Divisions, however, do not have current versions of the GIS software. As a result, agencies that have older versions of the software cannot access the latest and best sources of imagery.

In summary, GIS can be a very powerful tool and can support a multitude of state mandates. Appendix B lists some examples of potential applications where GIS might help other state agencies that are not using the technology in meeting their mandates. To fully realize the potential of the system, regular updates and exchanges of data would ensure that the best and most current data are centrally located and available to all users. Consistency in software would ensure that all agencies have equal access to all data sets. These factors would go a long way in establishing a true enterprise GIS.

Growth Trends In The Statewide GIS

Agencies are discovering the value of GIS and OP has fielded a steady flow of "GIS inquiries" about connecting to the system. ICSD has been issuing an average of 2 to 3 new user logons to the system every week. As of November 2005, State agencies had approximately 88 current "seats," or authorized copies, of the GIS software. In addition, State agencies had an additional 52 "outdated" seats of the software. In other words, these "outdated" software licenses were for previous versions of the software, usually versions that are unable to recognize much of the State GIS data, particularly imagery data. A software license becomes "outdated" when the agency that purchased the software does not pay the annual maintenance, and new software versions (with new functionality) are released. It should be noted that in the first 10 months of 2005, over $62,000 was spent by State agencies on GIS software – this figure includes **only** licenses that were purchased directly from the software manufacturer, and not from resellers (many agencies purchase their software from resellers). In addition, within the last 3 months, the Office of Planning has received numerous calls from state agencies inquiring as to how to purchase GIS software as well as several calls requesting use of the few shared licenses available on the State GIS file server (these shared licenses were originally purchased by OP, ICSD and DLNR; maintenance on these licenses is paid by OP and ICSD). This indicates the rapid growth of GIS use among State agencies, and points to a need to improve the delivery of resources, especially in the areas of data, software and training.

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Improving Accessibility to the System

When the Statewide GIS Program was first initiated, the Office of Planning began building a centralized database of geospatial data. OP has continued to build the database with layers of data contributed by federal, county and other state partner agencies. In addition to the traditional mapped data sets, other geospatial products such as aerial and satellite imagery including those acquired by National Oceanic and Atmospheric Administration, the Natural Resources Conservation Service, the City and County of Honolulu, Maui County and the state CZM Program are included, resulting in a rich centralized database, which now contains over 150 data layers.

As it becomes known that such a rich database exists, more agencies are interested in gaining access to this library of information. Access to the centralized fileserver, which is operated by ICSD, is available to any state agency that is connected to the fiber optic-based NGN (Next Generation Network). The ability to use certain databases, however, can be limited by the version of software an agency is running. For example, many agencies are not able to view all data sets, particularly the newer satellite imagery and data received from the counties, because their software is too outdated. OP has been performing time-consuming conversions to data sets received from the counties in order to make them viewable to those agencies using the older software, but this conversion is not possible in the case of the satellite imagery, so agencies with older software are unable to view the newer imagery at all. In some cases, agencies may not even have any GIS software required to utilize the data. Full access to all databases can be achieved by having all agencies on the most current version of software and by making additional licenses available to those agencies that need them. The statewide GIS license or ELA will, for a pre-determined, flat fee (to be negotiated), bring all agencies up-to-date so that all agencies are running a standard set of GIS software components and will allow the State to deploy unlimited additional licenses.

Another significant limitation that has recently arisen is the performance of the system (file server and network) itself. The fileserver was recently upgraded by ICSD to add more storage capacity, to facilitate backups and to provide fail-over capabilities in the event of hardware failures. At the same time this upgrade was taking place, both ICSD and user agencies were implementing a new firewall/security structure for the State NGN. However, since the upgrades to the fileserver and firewalls, user agencies that access the GIS data from the server have been experiencing frequent timeouts, software crashes and problems when trying to save map documents to the server. In addition, OP has recently learned that most users copy the GIS data stored on the server to their local drives due to the slow response time in using the GIS data directly from the server. This is an area of great concern because it will lead to multiple copies and different versions of the State GIS data being used by different people for different projects. For example, Agency A and Agency B could both be doing projects involving data for major landowners with different versions of the parcel/land ownership data, thus leading to different results depending on what version of the data they were using. However, the problem of multiple copies of the data can't be addressed until system response times improve.

SECTION 1: EXECUTIVE SUMMARY

Improving Accessibility to the System (continued)

ICSD and OP are in the process of investigating and isolating the causes of the diminished system performance. Some possibilities that are being explored include inadequate network bandwidth, incorrect firewall settings, hardware and software incompatibilities, and the need for additional file management software. It is possible that additional funding may be required to address the problems, particularly if network bandwidth or additional software needs are identified as the remedies. In addition, the use of web mapping or web services could be explored as a way to give access to GIS data to the casual user. In any case, existing problems need to be addressed quickly, or the momentum gained in the use and growth of GIS within State government agencies will be quickly lost due to dissatisfaction and frustration among the users.

Training Opportunities

OP recently surveyed and evaluated the user agencies' interest in executing a statewide GIS license. One area of strong interest was the need for training, both introductory to accommodate new users, and advanced classes for the existing "power users." An ELA can be negotiated to include a pre-determined number of hours of training.

Applications

Another area of strong interest indicated by the user agencies was the need for user-friendly applications. In particular, web-based applications are of interest to widen the spectrum of GIS users in such a way that simple applications could be carried out through an Internet browser. Such applications would have to be developed through contracts outside of the proposed ELA.

SECTION 2: VISION AND MISSION

The Vision

Establish a national model for Statewide GIS programs by leading and coordinating the continued growth of the State of Hawaii's enterprise GIS that reflects advances in GIS technology and provides a one-stop point of access to spatial databases for the purpose of improving overall efficiency and effectiveness in State government decision-making.

The diversity of data sets, variety of potential applications and the need to secure funding make the realization of a true statewide enterprise GIS a difficult task. Effective coordination in terms of data sharing, application development and maintaining hardware/software standards, while challenging, will be instrumental in realizing the vision.

The Mission

Maximize the effectiveness of the Hawaii Statewide Geographic Information System (GIS) within state government by increasing the capacity of the existing enterprise GIS, which is an integrated, multi-departmental system, composed of interoperable components. The Statewide GIS currently provides broad access to a centralized geospatial database that is organized and maintained by OP and is housed within the Information and Communication Services Division of the Department of Accounting and General Services. This database serves as a common building block upon which to design and deploy GIS applications. Improving the overall Statewide GIS system is the ultimate goal.

First Steps

As the lead coordinating agency for GIS activities, OP has shared its thoughts with the various user agencies on the vision, mission and improving the overall GIS Program. In line with this, the concept of an Enterprise License Agreement (ELA) was introduced. The perceived benefits of an ELA include upgrading all existing GIS software licenses, including un-maintained licenses to the current version, unlimited deployment of new licenses, and GIS training opportunities.

A meeting was held with the Statewide GIS User Group to introduce the concept of the ELA. As a follow-up to this meeting, a survey was conducted to obtain information about levels of software deployment, the amount of money that is currently being spent by the State of Hawaii on GIS software and training needs.

ICSD and OP are working on identifying and are attempting to resolve various system issues. As more information becomes available, a plan will be developed to address current, emerging and long-term growth of the system.

SECTION 3: GOALS AND OBJECTIVES

Goals/Objectives

The overall goal is to maximize the effectiveness of the Hawaii Statewide Geographic Information System (GIS) within state government by increasing the capacity of the existing enterprise GIS, which is an integrated, multi-departmental system, composed of interoperable components. The Statewide GIS currently provides broad access to a centralized geospatial database that is organized and maintained by the Office of Planning, and is housed within the Information and Communication Services Division of the Department of Accounting and General Services. This database serves as a common building block upon which to design and deploy GIS applications. To upgrade the quality of the system, OP has been working to: a) increase accessibility of GIS data and software, b) improve communication and data sharing between agencies, c) integrate non-geospatial data sets, and d) institutionalize training of existing and new users of the system. An ELA is seen as a means of realizing these objectives.

Keys to Success

Building a consensus with all user agencies will be a critical first step necessary to implement this plan. Agency buy-in, particularly at the Director's level, must be obtained since there are budgeting issues involved. Equally important will be the need for staff level buy-in particularly in the areas of coordination, communication and cooperation.

Measures of Effectiveness

It is anticipated that the execution of an ELA would help provide the following benefits:

- Reduce data redundancy and duplication of effort
- Improve accuracy and integrity of geographic information
- Increase efficient and timely data sharing
- Improve enterprise wide knowledge management and decision support capabilities
- Lead to a higher level of interoperability between GIS and non-GIS applications
- Lead to more effective use of departmental GIS skills and resources
- Reduce overall GIS maintenance and support costs
- Make State GIS expenditures more transparent and easier to track
- Reduce administrative time spent on GIS software and maintenance procurement

SECTION 3: GOALS AND OBJECTIVES

Why Execute an ELA?

1. Improve the power of GIS by bringing all state agencies up to current technology and providing for regular maintenance and updates over the term of the license.
2. Improve the quality of data by fully executing a systematic data sharing arrangement between all state agencies.
3. Save money and significantly improve record keeping of State GIS software purchases.

Currently, there are more than 46 individual customer accounts with the GIS software vendor – 15 accounts within the Department of Health alone. There is usually no one person in an agency who knows about all of the software purchased in that agency. The ELA will help keep this information well organized.

SECTION 4: ORGANIZATION, FINANCING AND RESPONSIBILITIES

Organization

As the agency responsible for statewide planning and coordination, OP will continue to coordinate the user agency GIS activities and database development and administer the database. As the state's IT agency, ICSD will continue to operate the fileserver and maintain the networking infrastructure. OP is willing to administer the ELA, or to assist ICSD in administering the ELA, at ICSD's discretion.

Financing

There are a number of options that need to be considered in negotiating an ELA. Appendix C outlines various scenarios and the level of funding required for each option. Ideally, all user agencies will contribute their fair share of license agreement. In any event, an agreement must be reached at the administrative levels of the departments to determine which agencies are willing and able to contribute to a Statewide ELA.

ELA Billing

To minimize confusion on the part of the state agencies, user agencies can be billed directly by the vendor as negotiated in the ELA. This would eliminate the need for a single agency having the responsibility of being liable for the entire amount of the contract and it would facilitate the flow of funds from the agency to the vendor.

SECTION 5: CASE EXAMPLE—STATE CIVIL DEFENSE APPLICATION

Building GIS Capacity within State Civil Defense

Currently, State Civil Defense (SCD) is highly dependent on the Pacific Disaster Center (PDC) for GIS support. Since the operations center for PDC is in Kihei, Maui, there are concerns that communications could be cut off between SCD and PDC during a catastrophic event – SCD is working to address those concerns. SCD currently has 2 GIS licenses, however, additional licenses will likely be required. The execution of an ELA will help assure that licenses can be acquired as the system grows.

Until recently, SCD lacked in-house personnel to do GIS work in the event of an emergency situation. Within the past several months, however, some SCD staff have begun learning and using the GIS software. It must be noted, though, that they also have other responsibilities that keep them occupied and unable to devote the time necessary to fully implement GIS activities within SCD. At this time, the combination of customized application development and hosting by PDC and some in-house GIS knowledge is meeting the needs of SCD. The agency does recognize the need for more in-house expertise as well as the need to address connectivity concerns in the event of a disaster and they are working to address those concerns.

Another issue of critical concern to SCD is the need for a diverse set of current and accurate data. SCD's ability to effectively respond to an emergency situation will require current critical infrastructure data including such layers as utility lines (for energy, water, sewage and communications), transportation networks and emergency service centers. Implementing a regular schedule of interagency data sharing and updates would be a first step in assuring that SCD has the best and most current information for many of these layers. Agreements with private entities holding such information would supplement those sources held by government agencies. Other non-critical infrastructure data also needs to be acquired and updated on a regular basis to further enhance SCD's ability to effectively respond to different situations. For example, obtaining information from the Department of Human Services on the medically fragile would help emergency responders in prioritizing rescue efforts. Other data sets that could be valuable in crisis situations are likely available and need to be "discovered" and integrated with the existing GIS database. A strong coordination effort among all state agencies along with a commitment to sharing on the part of contributing agencies would be necessary to ensure that SCD has access to information that would make their efforts more productive.

Concurrently, there are certain databases that need to be created, updated or improved. One example is the need to improve the existing address range database. Address range data for Hawaii is weak in the rural areas of the islands. When there is an emergency in a rural area, locating an address can sometimes be a challenge. Developing an accurate address range database for all parts of the State of Hawaii would ensure that first responders have the best available information to locate the site of an incidence.

SECTION 5: CASE EXAMPLE—STATE CIVIL DEFENSE APPLICATION

Development of Fire Response Application

With increased GIS capacity, the next logical step for SCD is to build customized applications, particularly web-based, easy-to-use programs that can be readily accessed during an emergency situation. As an example, and to address one of SCD's many responsibilities, the development of a fire response application is being considered by SCD and PDC. Currently, when there is a wildfire, the Fire Chief on the respective island calls the respective County Emergency Operations Center (EOC), which in turn calls the State EOC, which then notifies the DLNR Division of Forestry and Wildlife. Apparently this system is not working well, and DOFAW ends up calling the fire chief to get information and updates. DOFAW recently requested that a secure application be created with real time information relevant to wildfires, and with access given to appropriate parties. This would consist of two primary components: a graphical user interface (GUI) and geospatial data. Appropriate data sets such as roads, hydrographic features, topography and slope, potential fuel sources (e.g. vegetation), dangerous materials (e.g. gas lines) and vulnerable areas such as housing developments could be obtained or derived from the statewide GIS database. Other supplemental data sets should also be imported. For example, real-time weather would be important in predicting the direction in which the fire is likely to spread. Although this example relates to fire incidences, any interagency agreements should be generic to allow access to such databases for a multitude of emergency events.