# Corporate Geographic Information Systems

## A Review of Status and Accomplishments

August 2004

Office of the City Auditor
Portland, Oregon

CITY OF
PORTLAND, OREGON
OFFICE OF THE CITY AUDITOR
Audit Services Division

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August 19, 2004

TO: Mayor Vera Katz
Commissioner Jim Francesconi
Commissioner Randy Leonard
Commissioner Dan Saltzman
Commissioner Erik Sten

SUBJECT: Audit of the City's Corporate Geographic Information Systems program

Attached is our audit report on the City of Portland's Corporate Geographic Information Systems (CGIS) program. The audit was included in our annual audit schedule published in September 2003. Written responses to the audit are included at the back of the report.

As a follow-up to our recommendations, we ask that the Chief Technology Officer provide a status report in six months, detailing steps taken to address the report's recommendations. This status report should be submitted to the Audit Services Division and coordinated through the Commissioner in Charge's Office.

We appreciate the cooperation and assistance we received from staff in many City bureaus while conducting our audit and preparing our report, including the Office of Management and Finance, the Office of Transportation, and the Bureaus of Water, Environmental Services and Development Services.

GARY BLACKMER
City Auditor

Audit Team: Dick Tracy
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# Corporate Geographic Information Systems

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August 2004

A report by the Audit Services Division
Report #307


Office of the City Auditor
Portland, Oregon

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# Summary

The City of Portland's Corporate Geographic Information Systems (CGIS) program has successfully accomplished most of its objectives. Most importantly, a central distribution mechanism ("the Hub") provides City bureaus with access to several layers of GIS data that support a variety of critical City functions and operations. In addition, CGIS developed a number of valuable custom applications that expand access and use of GIS data by City staff and citizens. A City-wide GIS software license also allows GIS data to be distributed to any computer at a considerable savings to the City.

Despite these significant accomplishments, some important elements of the Hub are not yet complete, causing delays in full deployment of planned applications and concerns about data reliability. In addition, while CGIS spending and funding during the first seven years matched financial plans, the program has a forecasted deficit over the next several years that requires support from Information Technology reserves. City bureaus providing the major funding for the Hub have also expressed dissatisfaction with CGIS services, support, and communications.

Additionally, GIS systems developed by bureaus to support various internal operations have had varying degrees of success. While the Portland Office of Transportation's GIS is integrated successfully with its maintenance management systems, it has taken the Water Bureau longer than expected to develop a reliable GIS database and integrate GIS with other operational needs. The Bureau of Environmental Services has successfully integrated GIS tools in its operations but continues to operate

two systems to support users of different GIS software programs. PDOT has been slow to share their GIS data with the Hub, and BES has been slow to standardize its GIS, two continual goals of the CGIS program.

We believe that there are opportunities to improve the performance and coordination of CGIS and bureau GIS efforts. In brief, we recommend:

- better and more frequent communications between the CGIS program and user bureaus
- clearer program priorities, service level agreements, and performance expectations
- more training and support of City GIS users
- resolution of data ownership, metadata and mapping standards, and maintenance environments.

## Terms Used In This Report

We tried to limit the use of technical jargon throughout this report. However, certain terms are so exclusive to geographic information systems that their use cannot be avoided. We provide the following definitions for several GIS terms.

***Attributes***
The information attached to a point, line, or area. GIS attributes are both spatial—such as the geographic location of a census tract, and non-spatial—such as the statistics associated with a census tract. Because databases allow a geographic entity to have numerous types of information attached to its primary attributes, it is possible to obtain very specific information about a geographic location.

***Cadastre***
The shapes representing property lots and the corresponding information about each lot, such as ownership, taxation and value. Multnomah County has legal responsibility for the cadastre in Multnomah County. Cadastre information is composed of many adjacent shapes that share common boundaries, in contrast to the street network which is composed of many continuous line segments.

***Data maintenance environments (DME)***
The specific rules that allow for the efficient updating or "maintenance" of GIS data. DMEs establish standard editing procedures so changes in data can be performed with little effort. DMEs also help ensure that GIS data is complete and reliable. For example, when adding a new water meter to the GIS database, the DME requires the data editor to connect the meter to a water line and give the meter a service number.

***Metadata***
Metadata provides information about a data set such as when it was last updated, the source of the data, and definitions of its attributes. Accurate and current metadata is critical when sharing data among entities that may not be familiar with the data so that other users can understand how current the information is or assess the reliability of the data's origin.

***Replication***
The process which allows the direct transfer of data from a bureau's data environment to the City's central GIS data storage area (known as the "Hub.") Because replication allows data to be updated instantaneously to the central Hub, replication enables data users immediate access to the most current data available.

***Regional Land Information System (RLIS)***
A set of regional GIS data compiled, augmented and distributed by Metro, the regional government. Metro provides land use planning services for three counties and 24 cities in the Portland, Oregon region. Metro is a leader of GIS in the region and Country, and created RLIS in 1990. RLIS currently contains 117 different types of GIS data and is distributed quarterly on CD-ROM.

# Chapter 1 Introduction

This audit was included in the City Auditor's FY 2003-04 audit schedule. The audit is intended to provide information on the City's Corporate Geographic Information Systems (CGIS) program which is administered within the Bureau of Technology Services (BTS) of the Office of Management and Finance (Appendix A). Since its evolution beginning in the mid 1990s, little financial or performance information has been reported about the CGIS program. We conducted our work in accordance with generally accepted government auditing standards. The objectives, scope and methodology of our audit are described on page 5 of this report.

**CGIS program background**

In the early 1990s, several bureaus in the City of Portland started exploring ways in which geographic information systems (GIS) could be used to enhance City operations. Given the tremendous amount of information that can be attached to a spatial point or area, GIS is a powerful data management and analysis tool. For example, when linked to data from other information systems, a point that represents a fire hydrant can include spatial *attributes* (where it is), physical attributes (size, color, type), and by whom and when it was last maintained. Hence geographic information systems store and organize information in ways that allow map making and information retrieval for analysis and planning.

In FY 1996-97, the Corporate GIS (CGIS) program was formed within the Bureau of Planning. At that time, bureaus were independently developing separate GIS applications, so bureau directors and staff met regularly to develop a plan to reduce

redundancy and create efficiencies by sharing data. The CGIS program was formed to assist in this process by developing data standards, defining and assigning responsibility for City-wide shared data, and providing a forum for ideas and communication. In August 1997, CGIS developed a four-year business plan that included the program's mission statement and goals. Appendix B provides a time line which provides greater detail on the development of the CGIS program.

**The *Corporate CGIS program* manages a *system* that creates, integrates, maintains and distributes high quality *geo-referenced* information to enhance decision-making capabilities and to improve *delivery of city services*.**

CGIS mission statement from
*City of Portland Corporate GIS Business Plan 1997-2000*
(emphasis in original)

A primary objective of the CGIS program was to facilitate the exchange and updating of heavily shared, or "corporate" data. These City-wide shared data sets are currently aerial photography, the City street network, and Portland's property tax lots (the "*cadastre")*. Another program objective was to develop a mechanism to store and exchange widely shared bureau specific GIS data, such as the water delivery infrastructure. In November of 1997 the City issued an RFP for the design and development of the "Enterprise GIS Hub" or the central City-wide GIS data repository referred to as "the Hub". The Convergent Group of Denver, Colorado, was selected in July of 1998.

The Bureaus of Water (BWW), Environmental Services (BES) and Buildings (now Development Services, or BDS), and the Office of Transportation (PDOT) were seen as the primary beneficiaries of the Hub and became the primary financial contributors to Hub development. Proceeds from a $5.2 million dollar revenue bond provided immediate funding for Hub development that these bureaus agreed to repay over time. Additionally, the

original financial plan set General Fund contributions to the CGIS program and Hub development at 23 percent, in recognition that all City bureaus would benefit from the Hub.

**Primary Hub objectives**

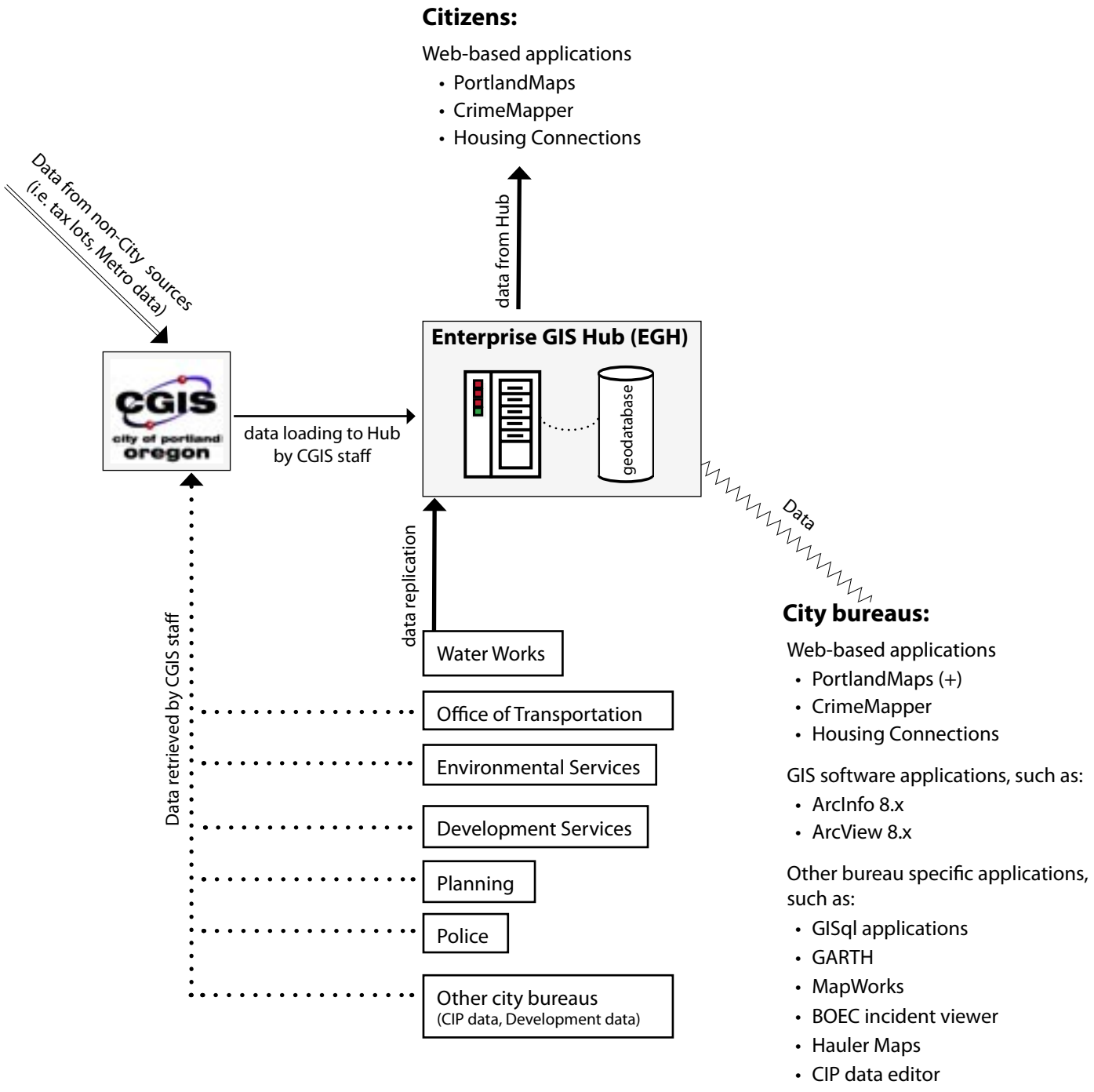
The City had several objectives in pursuing a centralized GIS data repository. One objective was cost savings resulting from reduced effort to retrieve, verify currency, and distribute GIS data to other bureaus and external users. Additionally, hardware components such as server space would be reduced by minimizing duplicative copies of GIS' typically very large files. Finally, the greatest benefits of the Hub were envisioned for casual users who could begin accessing GIS data from their desktop computers. The Convergent Group estimated that the Hub would save the City a minimum of $883,000 per year by reducing time required to find, verify and store GIS information.

**The Hub is a central repository for GIS data**

The Hub involves a complex architecture of servers, network connections and software tools which are configured to provide GIS data for a variety of uses. Figure 1 illustrates the current operation of the Enterprise GIS Hub and shows how it interfaces with City bureaus and external users. As illustrated, City bureaus provide data to, and retrieve data from, the Hub. Depending upon the type of data and analysis required and the user's GIS expertise, City staff may use either specialized software or web-based applications to retrieve GIS information. Citizens also have access to a variety of City data sets through web-based applications such as CrimeMapper and PortlandMaps.

To minimize duplicative or outdated data sets stored at other locations, a primary goal of the Hub is to have all GIS data provided by the Hub. In Chapter 4 we discuss in greater detail the GIS systems of three funding bureaus (PDOT, BWW and BES), and how these systems update and retrieve GIS data using the Hub.

**Figure 1 The Enterprise GIS Hub**




SOURCE: Auditor synthesis of interviews and system architecture documents.

**Audit objectives, scope and methodology**

We conducted the audit in accordance with generally accepted government auditing standards. The objectives of the audit were to:

1. Provide a complete picture of CGIS spending and resources, and compare actual to planned spending and funding.
2. Describe the accomplishments of the CGIS program and the status of program objectives. Describe how the CGIS program supports City operations and suggest areas for improvement where deficiencies are found.
3. Provide an overview of GIS operations in the bureaus that have been the primary supporters of the CGIS program and the Hub—the Bureaus of Environmental Services and Water Works, and the Office of Transportation. Describe how these operations interface with the Hub, and suggest areas for improvement where deficiencies are found.
4. Analyze how CGIS communicates and reports on its accomplishments. Recommend improvements if needed.

To gain an understanding of the CGIS program's evolution and original objectives, we reviewed several reports produced by City staff and consultants under contract for the City. These included the *City-wide Investigation AM/FM/GIS Strategic Plan* developed by Weston Consultants (1992), the City produced *GIS Business Analysis* (1995), and the *Corporate GIS Business Plan 1997-2000* (1997).

To understand the development of the Enterprise GIS Hub, we reviewed the request for proposal and subsequent documents that supported the award of the Hub contract to the Convergent Group. We reviewed scopes of work that accompanied Convergent's proposal and reviewed factors contributing to

delays in Hub completion and changes to the original Hub design. Although we contacted SchlumbergerSema (which acquired Convergent in 2000) to obtain information about the completion of their contract deliverables, SchlumbergerSema was unable to provide a list of completed reports and deliverables pertinent to the Hub project.

To develop a historical account of CGIS spending and funding, we worked with the Office of Management and Finance (OMF). We obtained records of bond issuance, spending, funding, and obtained CGIS financial plans and funding forecasts. Using this information, we reconstructed the annual financial history of the CGIS program from FY 1996-97 through FY 2002-03.

To understand what the Hub is and how it assists the bureaus with their data needs, we conducted several in-depth interviews with staff at CGIS, the Bureaus of Environmental Services, Water Works, Development Services, and the Office of Transportation. We also reviewed some of the applications and conducted brief interviews with several bureaus who have had special applications developed by CGIS—the Bureaus of Emergency Communications, Housing and Community Development, Police, and the Office of Sustainable Development.

We also interviewed GIS staff at Metro and Multnomah County to gain a picture of how the Portland GIS system interfaces with GIS data exchange in the region. Additionally, we interviewed GIS staff at the cities of Seattle, San Francisco, and Chicago to understand how Portland's GIS system compares to these municipalities. We chose these municipalities because our research of local government enterprise GIS indicated that these municipalities had highly developed enterprise geographic information systems.

We also reviewed various documents to identify factors affecting Hub development. Our interviews also gave us insight into the development of the GIS systems within the bureaus that have primarily funded the CGIS program. We requested some additional information from BES and PDOT on the staffing and

costs involved in developing and operating their internal GIS systems.

During the course of this audit we were also conducting another audit of the Bureau of Water Works. As a result, we obtained detailed information about the development of the Water Bureau's GIS system. The GIS systems at the Bureaus of Water Works, Environmental Services and the Office of Transportation evolved uniquely and at different paces, as will be illustrated in Chapter 4.

Finally, we obtained information on GIS applications developed, server performance, GIS software and Hub data use, and a CGIS assessment of City-wide savings accrued through the corporate GIS model. We used this information to assess the feasibility of performance reporting suggested in Chapter 3. Since this report did not focus on investment return on CGIS efforts, we did not include or verify most of CGIS' assessments. We did review CGIS' assessment of the City's software license savings.

# Chapter 2 CGIS financial history

We found that total CGIS spending and funding over the past seven years has generally been in accordance with the initial planning for the program. Between FY 1996-97 and FY 2002-03, the CGIS program spent over $14 million in operating costs from almost $15 million in net revenue received during that same period.

However, forecasted costs for the FY 2003-04 to FY 2005-06 period are greater than estimated available resources. The primary factor contributing to the projected shortfall is higher operating expenditures than originally planned. The Office of Management and Finance plans to address the program's expected deficit with reserves from the Information Technology Fund. Recent changes should improve financial monitoring and reporting but improved communication with funding bureaus is still needed.

**Spending consistent with CGIS financial plan**

Over the past four years, total CGIS program spending has tracked closely to what was planned between FY 1996-97 and FY 2002-03. Figure 2 shows a comparison between actual and planned expenditures. Although the CGIS debt payments have been $1.1 million less than planned, the program received $1.0 million less in bond proceeds than originally anticipated.

Figure 2 also shows planned and actual program resources. Funding from the interagency agreements, at $8.0 million, have tracked closely to planned. Revenue from special application development for various City bureaus provided $0.4 million in additional program support. General Fund support amounted to $4.2 million, $1.2 million more than planned.

Since FY 1999-00, when the CGIS program received $5.2 million dollars in bond revenue, the CGIS program operated with a fund balance that was carried into future fiscal years to support program expenses. At the end of FY 2002-03, this balance was $0.8 million.

**Figure 2** **Planned versus actual financial activity and forecast FY 1996-97 to FY 2005-06**, unadjusted millions

**SPENDING**

| | *'96-97 thru '98-99* | **'99-00** | **'00-01** | **'01-02** | **'02-03** | 7-year subtotal | **'03-04** | **'04-05** | **'05-06** | 3-year forecast |
|---|---|---|---|---|---|---|---|---|---|---|
| **ORIGINAL PLAN** | | | | | | | *Original forecast:* | | | |
| Operating costs | $2.3 | $4.0 | $2.9 | $2.2 | $1.6 | $13.0 | $1.6 | $1.1 | $1.1 | $3.8 |
| Debt payment | n/a | $1.0 | $1.0 | $1.0 | $1.0 | $4.0 | $1.2 | $1.6 | $0.3 | $3.1 |
| **ACTUAL** | | | | | | | *Updated forecast:* | | | |
| Operating costs | $2.3 | $2.4 | $2.4 | $4.8 | $2.2 | $14.1 | *$1.6* | *$2.1* | *$1.9* | *$5.6* |
| Debt payment | n/a | n/a | $0.9 | $1.0 | $1.0 | $2.9 | *$1.1* | *$1.6* | *$0.4* | *$3.1* |
| Capital | | | | | | | *$0.1* | *$0.3* | | *$0.4* |

**RESOURCES**

| | *'96-97 thru '98-99* | **'99-00** | **'00-01** | **'01-02** | **'02-03** | 7-year subtotal | **'03-04** | **'04-05** | **'05-06** | 3-year forecast |
|---|---|---|---|---|---|---|---|---|---|---|
| **ORIGINAL PLAN** | | | | | | | *Original forecast:* | | | |
| IA's* | $0.9 | $1.6 | $1.7 | $1.7 | $2.1 | $8.0 | $2.2 | $2.2 | $2.3 | $6.7 |
| General Fund | $1.4 | $0.4 | $0.4 | $0.4 | $0.4 | $3.0 | $0.4 | $0.4 | $0.4 | $1.2 |
| Bond proceeds | | $6.2 | | | | $6.2 | | | | |
| **ACTUAL** | | | | | | | *Updated forecast:* | | | |
| IA's | $0.9 | $1.6 | $1.7 | $1.7 | $2.1 | $8.0 | *$2.2* | *$2.1* | *$2.2* | *$6.5* |
| General Fund | $1.4** | $1.5** | $0.4 | $0.4 | $0.5 | $4.2 | *$0.3* | *$0.4* | *$0.4* | *$1.1* |
| Bond proceeds | | $5.2 | | | | $5.2 | | | | |
| Special Applications | | | | $0.2 | $0.2 | $0.4 | | | | |

NOTE: CGIS financial planning started in FY 1999-00, when bond was issued. For previous years, we used *actual* spending and resources for *planned* spending and resources. Financial activity does not include internal cash transfers.

* IA's are Interagency Agreements for CGIS program and Hub support with the Bureaus of Water, Environmental Services and Development Services, and the Portland Office of Transportation as reflected in the original plan. In FY '01-02, the Portland Development Commission also entered into a CGIS funding agreement but its contributions are less than the other bureaus. See Appendix C.

** We assume that resources of $0.4 million in FY 1996-97 and $1.5 million in FY 1997-98 were provided by the General Fund. The Office of Management and Finance could provide no documentation for these resources. The resources are necessary to assume because they balanced expenditures while the CGIS program was managed in the General Fund (AU 307 Fund 101).

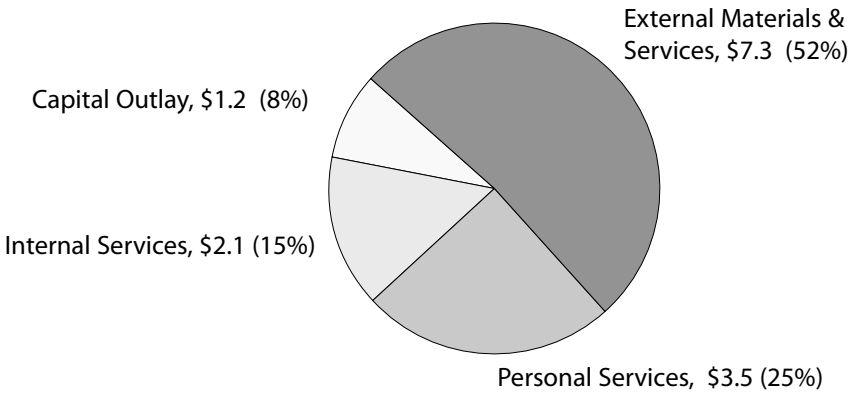
SOURCE: Auditor analysis of Office of Management and Finance reports. Original financial plan from OMF Debt Management.

**Most spending has been on consultants and hardware**

Figure 3 shows CGIS spending categories from FY 1996-97 to FY 2002-03. External Materials and Services, which includes payments to consultants and computer hardware, made up 52 percent of program spending. The largest portion of External Materials and Services during the past seven years was Convergent Group's two-part contract totaling about $4.1 million. The second largest spending category was Personal Services at $3.5 million. CGIS staff increased from two FTE in FY 1996-97 to eleven in FY 2003-04.

We were unable to report Personal Services spending by project type because CGIS staff did not begin to track staff time by project type until FY 2003-04.

**Figure 3** **CGIS program spending by category, FY 1996-97 through 2002-03,** unadjusted millions (% of total)




**Total: $14.1 million**

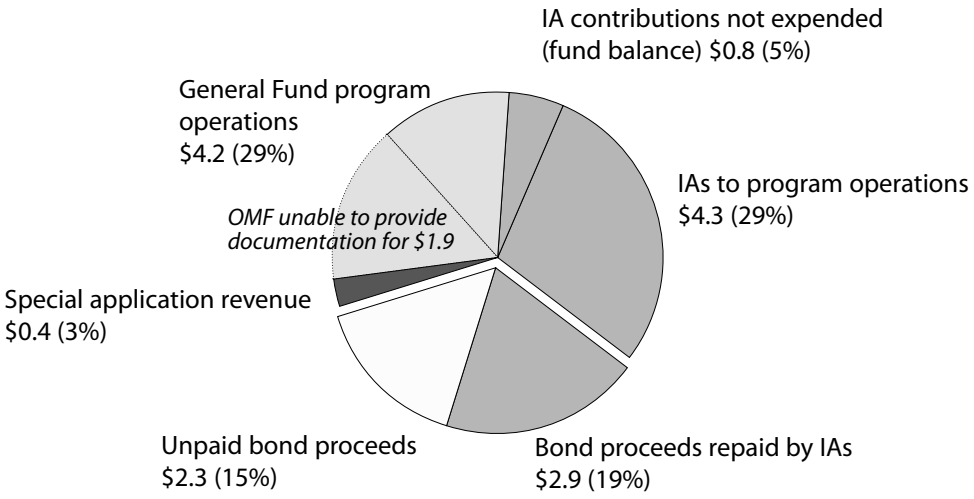
SOURCE: Auditor analysis of Office of Management and Finance reports.

**Enterprise bureaus contributed the majority of program resources**

Figure 4 shows the sources of program funding from FY 1996-97 to FY 2002-03. Enterprise bureaus contributed $8.0 million, or 53 percent, of program funding. The General Fund contributed $4.2 million, or 29 percent, to program operations.

In FY 1999-00, bond funds provided $5.2 million in program resources. At the end of FY 2002-03, $2.9 million of the bond funds had been repaid from a portion of the Enterprise bureaus' interagency agreements, and $2.3 million plus interest was still outstanding. Appendix C provides greater detail on program funding.

**Figure 4** **Net resources to CGIS program, FY 1996-97 through FY 2002-03,** unadjusted millions (% of total)




**Total: $14.9 million**

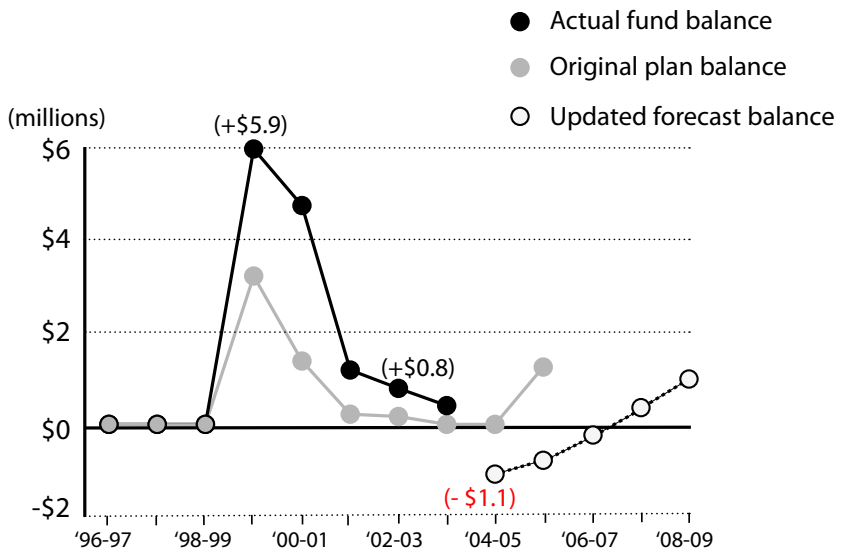
SOURCE: Auditor analysis of Office of Management and Finance reports.

**Higher operating costs and funding reductions result in negative fund balance**

Figure 5 shows the planned program balance versus the actual and forecasted program balance through FY 2008-09. As illustrated, the original financial plan did not project the program to run out of funds in FY 2004-05.

The primary factor for the shortfall is higher forecasted operating costs than originally planned for the three year period ending FY 2005-06. As shown in Figure 2 on page 11, the original plan forecasted operating costs for this period at $3.8 million compared to the updated forecast of $5.6 million, a $1.8 million increase in operating costs. Compared to the original plan, interagency contributions are forecast to decline by $200,000 during this period due to a City Council directive to reduce interagency rates from participating bureaus.

**Figure 5** **CGIS ending program fund balances, FY 1996-97 to forecasted FY 2008-09**



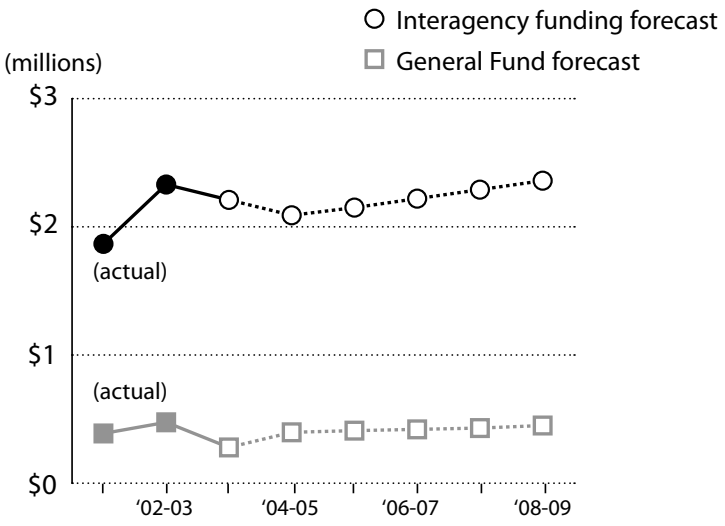

SOURCE: Auditor analysis of Office of Management and Finance reports. Financial plan from OMF Debt Management.

The Office of Management and Finance plans to use reserves in the Information Technology Fund to support the CGIS program through these years and to cover the fund shortages. OMF's most recent financial forecast projects a positive fund balance at the end of FY 2007-08.

Although the primary funding bureaus are expecting a reduction in interagency rates after the bonded debt is retired in FY 2005-06, OMF's current financial forecast does not project further rate reductions until the IT reserves are repaid.

Figure 6 shows projected contributions to the CGIS program.

**Figure 6 CGIS program funding, FY 2001-02 to forecasted FY 2008-09**




SOURCE: Office of Management and Finance *CGIS Financial Forecast FY 2003-04 to FY 2008-09* (March 17, 2004) and historical financial reports.

**Need for better financial monitoring and reporting**

Although recent changes should improve CGIS financial accounting and reporting, we found that the program has not consistently accounted for its expenditures and revenues over the past seven years. An error in FY 2001-02 overstated the CGIS fund balance by $786,236 but was included in program forecasts until March 2004. Additionally, OMF could not provide documentation for $1.9 million in resources that supported program expenditures in FY 1998-99 and FY 1999-00. While OMF indicates these amounts were available and budgeted in the fund in which the CGIS program was managed, it could not verify the transfer of resources to the CGIS program. Finally, bureaus that provide interagency funding have been dissatisfied with the quality and quantity of financial information reported about the CGIS program. Most bureau officials we interviewed believed that the City's web site and several of its e-government initiatives were supported at the expenses of bureau related GIS assistance.

OMF staff told us that CGIS accounting and financial management practices have been improved. In addition, starting in FY 2003-04, CGIS has developed a tracking system to record CGIS projects and staff assignments. We obtained records that verified staff in the CGIS work group were charging their time to a variety of project types, including e-government and strategic technology applications. CGIS is also tracking its activities in seven categories which include GIS data maintenance, Hub maintenance, GIS web applications, and data maintenance environments. Despite these improvements, we believe based on interviews with Bureau representatives that there are continuing opportunities to improve communication of CGIS financial management between OMF and the funding bureaus.

# Chapter 3 Most CGIS objectives accomplished but opportunities for improvement remain

The CGIS has successfully developed a central distribution mechanism for GIS data, called the Enterprise GIS Hub, which provides the City with GIS data to support a variety of critical City functions. CGIS also developed a number of custom applications that expands access and use of GIS data by City staff, in addition to data access through a cost-effective City-wide GIS software license. Additionally, citizens now have easy access to GIS data through the web-based application PortlandMaps. Figure 7 provides an overview of CGIS program goals and their accomplishments.

Despite these significant accomplishments, some important elements of the Enterprise GIS Hub plans are not yet completed including fully developing and deploying data maintenance environments and assuring data currency. In addition, the standardization of GIS software and the centralization of data distribution improved the overall functionality of the GIS Hub but also caused implementation delays, bureau training problems, and data management concerns that still need resolution.

The CGIS has established a solid foundation for the full deployment and use of the City's centralized GIS system. Additional efforts are needed to complete Hub components such as data maintenance environments and metadata standards, and to improve communication between CGIS and City bureaus.

This chapter discusses CGIS' accomplishments, factors that contributed to delays in completing program objectives, and improvements that are needed.

**Figure 7 CGIS program goals and accomplishments**

| | Accomplished / in use by bureaus | Partially complete | Incomplete |
|---|---|---|---|
| **Goal: Central data access and data currency** | | | |
| Create a central mechanism for GIS data storage and sharing (i.e. the Enterprise GIS Hub). | ✓ | | |
| Provide access to City staff from any personal computer. | ✓ | | |
| Participate in and leverage existing GIS investments in region. | ✓ | | |
| Provide access to the most current data layers needed by every bureau (i.e. taxlots, streets, aerial photography). | ✓ | | |
| Ensure that bureaus can rely on the Hub as the most current source of GIS data. | | ✓ | |
| Create an EGIS Hub that allows GIS staff to use their own GIS platforms and databases (e.g. MapInfo, Intergraph, ArcInfo). | *this objective abandoned fall 1998* | | |
| **Goal: Improved processes to maintain GIS data** | | | |
| Create and implement standardized system which enables bureaus to easily transfer GIS data updates to the Hub. | ✓ | | |
| Create and implement standardized maintenance environments for the cadastre and street network. | | ✓ | |
| Create and implement standardized data maintenance environment for sewer lines and corresponding data. | | ✓ | |
| Create and implement standardized data maintenance environment for maintaining and creating addresses. | | | ✓ |
| **Goal: Partnership with Enterprise bureaus** | | | |
| Water, BES and Transportation, the main beneficiaries, will substantially fund the program through interagencies. | ✓ | | |
| Bureaus will maintain and be responsible for the accuracy of their own data. | ✓ | | |
| Bureaus will share their data, unless confidential, illegal or inappropriate to do so. | | ✓ | |
| **Additional accomplishments outside of goals** | | | |
| Citizen access to corporate GIS data and selected City specific data through web applications (i.e. PortlandMaps). | ✓ | | |
| Specialized web applications for specialized citizen queries (i.e. CrimeMapper, Housing Connections). | ✓ | | |
| Specialized applications for Bureau specific queries (i.e. Camen 2, Bureaus of Development Services and Licenses GISql xml). | ✓ | | |

SOURCE: Auditor summary of assumptions and program expectations from: *Geographic Information Systems Business Plan* (City of Portland, 1994); *Corporate GIS Business Plan* (Corporate GIS program, 1997); *Enterprise GIS Hub Request for Proposal* (City of Portland, 1997); and *Enterprise GIS Hub Business Case Evaluation* (Convergent Group, 1999).

**Most goals achieved**

The primary objective of the CGIS program was to design a centralized system which would facilitate sharing and retrieval of GIS data among City bureaus using GIS software. It was envisioned that this system would create efficiencies by providing a single, central location for the most current and reliable GIS data. As shown in Figure 7, most of CGIS' goals have been achieved through the development of the Enterprise GIS Hub and the features which support it. These features enhance the currency, quantity and/or retrievability of GIS data on the Hub and are described below.

- A City-wide GIS software license allows GIS software to be distributed to any desktop computer. Through its tracking of ESRI software license and Hub user connections, CGIS can see the type and duration of Enterprise GIS usage by user.

  Using these user statistics and Metro's software pricing, CGIS estimates that the site license has saved the City about $2.2 million dollars in GIS software and maintenance costs over that past six years. We reviewed CGIS' analysis and determined these savings were reasonable assuming that the same amount and type of software would have been purchased by the bureaus individually.

- A "Layer Manager" that organizes GIS data in the Hub. This greatly enhances the user's ability to find and view Hub data using GIS software. Additionally, pre-defined settings, such as for colors and symbols, keep data views consistent and easy to understand.

- A data replication feature which allows bureaus to provide updated data to the Hub with minimal CGIS intervention. Currently only the Water Bureau replicates its data to the Hub.

- Enhancements to ESRI software's "versioning" process which allows multiple staff to edit a GIS data set simultaneously.

- Software tools for loading updated GIS data to the Hub. These tools automate processes based on desired time frames, and check and enforce file integrity. CGIS has created a user manual for these tools. As more bureau-specific data is replicated to the Hub, these tools will be used primarily for data received from external sources, like RLIS.
- Weekly updates of property/tax lot data from Multnomah County. An application developed by CGIS automates the retrieval of a wealth of information from Multnomah County's Assessment and Taxation database. Portland's cadastre is richly populated with data because of this application.
- Development of data maintenance environments (DMEs) which are necessary for PDOT, BDS and BES to maintain and replicate street centerline, address and sewer data to the Hub. As will be discussed below, these DMEs have not yet been fully deployed in these bureaus for a variety of reasons.

**Specialized software applications increase GIS Hub use**

The Corporate GIS program has also developed several different types of applications which allow easy data retrieval from the Hub for a variety of uses by City employees and citizens. Quick data retrieval by citizens and City staff creates efficiencies by reducing staff time needed to find geographic information.

Overall, we found that bureaus who have received application development services from CGIS are generally satisfied with their final products. Some of these applications are described below. Appendix D includes a full list of CGIS' special applications.

- *PortlandMaps* (2000)—a web based application retrieves information from the Hub and displays information on pre-formatted web pages. PortlandMaps displays information from map, text

and aerial photography files, and has search and scanning features. In our review of other cities' web based applications which provide similar property information to non-GIS users, PortlandMaps provided the most information with minimal effort.

- *CrimeMapper* (2001)—a web based application that allows citizens and City staff to view crime statistics by location. CrimeMapper uses information which the Police Bureau sends monthly to CGIS and is funded by the Police Bureau.
- *Housing Connections* (2002)—a web based application that allows citizens to locate and apply for housing. Funded by the Bureau of Housing and Community Development.

While the above applications may be used by citizens and City staff, CGIS has also developed applications for City staff only. These include:

- *BOEC incident viewer* (2001)—a browser based application that links to the Bureau of Emergency Communication's (BOEC) Computer Automated Dispatch system and provides mapping of incidents entering the dispatch system. The application provides emergency response personnel a visual overview of incidents in the vicinity they monitor.
- *MapWorks* (2002)—although based on older technology that is no longer supported by CGIS, MapWorks is a mapping application similar to PortlandMaps but which provides more powerful querying abilities. Currently City staff use a mix of PortlandMaps, MapWorks, and Garth—an application built under contract by GeoNorth for the Planning Bureau—to query and display property information independent of GIS software.

- *GISql* (2003)—a structured query language application that retrieves GIS information without the use of GIS software or maps at the user's end. GISql technology supports a variety of graphic and text based queries built into PortlandMaps.

  In addition, GISql also supports applications built into bureau-specific information systems. The Bureau of Development Services' (BDS) building permitting system uses GISql to retrieve zoning and other land-use information based on a tax lot identifier. The Bureau of Licenses also uses a similar application.

- *Camen 2* (expected completion summer 2004)—a browser based application which runs independent of GIS software. Camen 2 replaces an older MapInfo based application which assists Portland Police Bureau employees in crime analysis and mapping.

There are a number of other applications using CGIS technology and development resources such as the CIP data editor, Crashbot, and the BES AsBuilt viewer. We have not evaluated these projects for customer satisfaction or value added.

**Primary factors contributing to delays in completing CGIS program objectives**

Full and timely deployment of the Hub was impeded by changes in the original Hub vision, software problems experienced by Convergent Group, and changes made to the Convergent contract. As a result, CGIS took on more software development responsibilities than originally planned. Software standardization and delivery delays also created some bureau resistance to standardization and full integration of GIS processes to the Hub because bureaus were concerned that the new software and the Hub could not support their critical business operations. It should be noted however, that CGIS was an innovator in its dynamic Hub concept and used complex and emerging technologies to build it.

**Software standardization**

Convergent was awarded the Enterprise GIS Hub contract in July 1998 based on the initial premise that the Hub would be designed to act as a translator for different GIS data maintained by bureaus using GIS software of their choice. Upon completion of its business case analysis in October 1998, Convergent recommended a single software approach for the City's GIS. Bureau directors responded to Convergent's recommendation and agreed to move to a standardized GIS environment in November 1998. Convergent Group recommended ESRI as the City's software vendor in March 1999, and the City Council approved a 3-year City-wide GIS software license agreement with the Environmental Systems Research Institute (ESRI) that same month (see Appendix B).

We believe the decision to standardize was a good management decision because it created economies of scale for software purchases, portability of special applications, and a common knowledge base. Unfortunately, the change from a multi to a standard platform created some difficult organizational hurdles for CGIS. For example, standardization required new processes to maintain the cadastre and street network, and for BES to abandon its highly functioning MapInfo GIS system. Additionally, CGIS and bureau staff needed to learn the ESRI software and, in some cases, ESRI's programming language to migrate to ESRI.

The Bureau of Environmental Services and the Portland Office of Transportation have yet to migrate all their data processes to the ESRI platform. One group within BES continues to operate its MapInfo software for fear that conversion to ESRI would jeopardize data quality and the timely analyses needed to model the Combined Sewer Overflow project. Additionally, CGIS delays in the delivery of data maintenance environments necessary to efficiently maintain the cadastre and street network have forced the Portland Office of Transportation to maintain those data in old versions of their previously used Intergraph software.

**Figure 8** DELIVERABLES ACCEPTED BY CGIS: "TASK 5" HUB SOFTWARE DEVELOPMENT & INTEGRATION

✓ CGIS accepted.

***** ESRI Arc version 8.1 did not contain features needed for development.

**CENTERLINE MAINTENANCE** (Package 1)

- ☑ Data migration plan
- ☑ Data migration test plan
- ☑ Development dataset
- ☑ User Acceptance Test (UAT) dataset
- ☑ Centerline prototype workshop
- ☑ Centerline user interface design review workshop
- ☑ Centerline UAT plan
- ☑ Installation program
- ☑ Software installation & delivery
- ☑ Formal user acceptance testing
- ☐ Centerline user documentation

**CADASTRAL MAINTENANCE** (Package 2) *****

- ☐ Data migration plan
- ☐ Data migration test plan
- ☐ Development dataset
- ☐ UAT dataset
- ☐ Cadastral prototype workshop
- ☐ Cadastral user interface design review workshop
- ☐ Cadastral UAT plan
- ☐ Installation program
- ☐ Software installation & delivery
- ☐ Formal user acceptance testing
- ☐ Cadastral user documentation

**BUREAU OF PLANNING CUSTOM SOFTWARE** (Package 3) *****

- ☐ Data migration plan
- ☐ Data migration test plan
- ☐ Development dataset
- ☐ UAT dataset
- ☐ Planning prototype workshop
- ☐ Planning user interface design review workshop
- ☐ Planning UAT plan
- ☐ Installation program
- ☐ Software installation & delivery
- ☐ Formal user acceptance testing
- ☐ Planning user documentation

**O.P.D.R. CUSTOM SOFTWARE** (Package 4)

- ☑ Data migration plan
- ☑ Data migration test plan
- ☑ Development dataset
- ☑ UAT dataset
- ☑ OPDR prototype workshop
- ☑ OPDR user interface design review workshop
- ☑ OPDR UAT plan
- ☑ Installation program
- ☑ Software installation & delivery
- ☑ Formal user acceptance testing
- ☐ OPDR user documentation

**B.E.S. CUSTOM SOFTWARE** (Package 5)

- ☑ Data migration plan
- ☑ Data migration test plan
- ☑ Development dataset
- ☑ UAT dataset
- ☑ BES prototype workshop
- ☑ BES user interface design review workshop
- ☑ BES UAT plan
- ☑ Installation program
- ☑ Software installation & delivery
- ☑ Formal user acceptance testing
- ☐ BES user documentation

**PARKS & RECREATION CUSTOM SOFTWARE** (Package 6) *****

- ☐ Data migration plan
- ☐ Data migration test plan
- ☐ Development dataset
- ☐ UAT dataset
- ☐ Parks & Rec prototype workshop
- ☐ Parks & Rec user interface design review workshop
- ☐ Parks & Rec UAT plan
- ☐ Installation program
- ☐ Software installation & delivery
- ☐ Formal user acceptance testing
- ☐ Parks & Rec user documentation

SOURCE: *Amendment 2 to Contract U218 between the City of Portland and Convergent Group Corp.*, Exhibit G Rev 2 - Scope of Work, September 2001, and CGIS' assessment of deliverable status at time of contract acceptance.

**Software delivery problems caused contract amendments and software products which deviated from initial expectations**

Convergent Group consultants developed the architecture and tools that are the foundation of the Hub. However, several important components for full deployment of the GIS Hub that were envisioned in the Convergent contract and its authorizing City ordinance have yet to be implemented. The most important of these components are the street centerline, address and sewer data maintenance environments.

According to our discussion with CGIS and our review of contract documents, problems encountered in the functionality and delivery of ESRI's version 8.x software products impeded Convergent's work. As a result, Convergent missed its planned deployment target and CGIS amended its contract with Convergent when about 44 percent of the $3.5 million contract had been expended.

Convergent and CGIS agreed upon a new development approach with CGIS prioritizing tasks and sharing more software development responsibilities. Additionally, tasks were to be performed on a time and materials basis, rather than a fixed amount as originally agreed, until the remaining contract amount was expended. Appendix E simplifies the contract's fundamental tasks and its amendments.

Figure 8 shows the proposed deliverables from the largest task of the revised scope of work, and those that CGIS accepted as complete. As shown, three of the anticipated software packages were not completed because the software version could not provide the features needed. CGIS indicated that Convergent provided most of the deliverables for the centerline (PDOT), address (OPDR, now Bureau of Development Services), and sewer (BES) packages. With the exception of OPDR, these packages were tested by CGIS and the bureaus. However, CGIS indicated that the ESRI software was minimally functional, and BES and PDOT indicated the packages needed further development in order to be used in their production environments. CGIS made

final acceptance on the contract in April 2002, and has continued to develop the software. CGIS anticipates roll out of the three packages in the next several months. Parks and Planning packages will be developed when the City upgrades to Arc 9.x. The cadastral DME, needed to maintain the spatial component of Portland's tax lot data, is lowest priority and may not be completed by CGIS because Multnomah County, who has legal responsibility for this data, may soon be ready to maintain this data in its GIS system.

**Opportunities to improve**

The CGIS program has accomplished most of its primary objectives, providing a solid foundation for the City's Enterprise GIS. However, as shown in Figure 7, CGIS has not yet fully completed data maintenance environments for the street centerline, sewer and addressing, and the reliability of Hub data can be enhanced. In addition, we found other opportunities for improvement to assist all types of users in exploiting the Hub's benefits. We describe these opportunities below.

### DMEs need to be completed

Data maintenance environments (DMEs) are essential to routinize and simplify spatial and text data editing based on the requirements of the data set and the data editor's operating procedures. Due to a number of factors, DMEs for PDOT, BDS and BES are not fully operational. These factors include Convergent's delivery of minimally functional software, development priorities established by CGIS, and significant changes in ESRI's GIS technology that required additional software development by CGIS.

CGIS currently forecasts that the street centerline DME will be fully deployed at PDOT in the upcoming months, and that the address DME may be ready shortly thereafter. BES' sewer DME is in testing. We could not determine its deployment status due to different views of its current status.

**Metadata must be improved**

A primary objective of the Hub was to improve the reliability of GIS data. Metadata enables users to assess the reliability of GIS data and obtain more information if necessary. We found that very little documentation about Hub data is available to users. Metadata should be complete and current for all data layers so that staff time is not lost verifying data quality and currency. Additionally, CGIS should periodically publish a data catalog that categorizes data sets by owner and provides brief descriptions of the data available on the Hub.

CGIS must provide complete metadata for the corporate data sets, and the bureaus should submit, and CGIS must make readily available, the metadata for all bureau specific data on the Hub. At the time we were conducting our audit, CGIS was reconvening its bimonthly user meetings and metadata was discussed at those meetings.

**Policies on data security and sharing are needed**

Although the Hub allows bureaus to share their GIS data, some bureaus are concerned that sharing data with the Hub may compromise security and data reliability. Policies and practices on security and data distribution may provide bureaus more assurance that data will be coded and displayed correctly, and that sensitive data sets will be properly secured on the Hub servers.

Despite the concerns that sensitive or incomplete data could be accidentally posted to the Hub, we found that CGIS has been responsive to bureaus' data security and display requests. Additionally, because data security can be breached in many ways, we believe data security would be best addressed by City information technology policies and practices. The Bureau of Technology Services' recently completed security audit should result in updates to City administrative rules regarding security and data. Additionally, our interviews with ESRI and other

cities using similar GIS technologies confirmed that server technologies can provide highly specific security. While we understand bureaus may have specific data security concerns, they should not withhold data without good reason.

**Mapping standards needed**

We could not find City standards for map production on CGIS' web site. Basic map standards that address such issues as production date, data sources, disclaimers, and map presentation templates will become increasingly important as more casual GIS users develop maps through ESRI and web based applications. CGIS is currently developing a disclaimer statement for City produced maps.

**More accountability to funding bureaus**

Over the past several years, the funding bureaus have complained in writing to the directors of CGIS and BTS about inadequate support, communication and accountability from CGIS. Figure 9 lists the concerns of the bureaus and auditor comments on the status of suggestions for improvement.

The CGIS program has also not developed a business plan since 1997 that outlines the future needs and goals of the program. Additionally, the CGIS program has not consistently communicated with its stakeholders. When we interviewed other cities with Enterprise GIS systems, we were told that communication with stakeholders through forums, user groups, internal web-sites and newsletters are key to maintaining program sponsorship and involvement.

We also noted that although CGIS produced draft Service Level Agreements detailing its projects for FY '03-04, these SLAs were not signed and finalized by the Bureaus.

In addition to the development of better communication methods and a business plan, we believe CGIS should work with

**Figure 9 Funding Bureaus concerns over CGIS support**

| **No consistent communication forum to discuss Hub and bureau-specific accomplishments and difficulties.** | |
|---|---|
| *Status* | *Suggestion for improvement* |
| After a long lapse, CGIS stakeholder and user groups have started to meet again. Nonetheless, information on the program is hard to find. There are no newsletters, and minutes from meetings are sparse and do not reflect issue analysis.<br><br>Information on CGIS' internet site not reflective of current activities and accomplishments. | • hold bi-monthly meetings<br><br>• CGIS staff takes comprehensive meeting notes and posts on web site for comments / corrections<br><br>• consider if "issue" based meetings would be more productive, and /or if sub-groups should form to take on specific issues such as training, metadata, data security, mapping standards.<br><br>• CGIS to provide adequate administrative staffing to support bi-monthly and sub-group meetings. |
| **Overall stability of the Hub environment.** | |
| *Status* | *Suggestion for improvement* |
| Although CGIS has developed a number of tools and software enhancements to improve connections to the Hub and ESRI servers, we were unable to assess overall Hub stability due to the lack of reported performance statistics. | • CGIS should report quarterly server performance metrics for both the Hub and ESRI licensed servers.<br><br>• If the Bureaus believe that CGIS' current 8am to 5pm support level is not sufficient, CGIS and the funding bureaus need to establish what is necessary to support the Bureaus' operations. Server and help desk statistics may be useful in identifying areas where additional support is needed. |
| **Inadequate accountability for project completion, spending, and program performance.** | |
| *Status* | *Suggestion for improvement* |
| Although in the past year CGIS has provided lists of completed and in-process projects, there is no information on the utility, satisfaction and costs of these items. No business plan has been produced since 1997. | • CGIS should develop a business plan. Additionally, CGIS should develop a method to account for and communicate its spending by specific projects, and program performance measures. CGIS' improved tracking of staff time should facilitate such reporting. |

SOURCE: Auditor interviews with bureaus, and bureau correspondence to CGIS / BTS management December 2001 and May 2003.

the funding bureaus to develop CGIS performance measures. Performance measures will help track program successes, document improvements in program performance, and provide early indicators of underperforming areas. Some example performance measures can be found in Appendix F.

**GIS users need more technical support**

In 2002, CGIS entered into its second license agreement with ESRI and migrated the City to ESRI's new GIS version which contained significant software changes. Recent CGIS data show that 454 city staff have the base ESRI product ArcView 8.x installed on their desktops. As of July 2004, CGIS has provided 16 hours of basic ESRI ArcGIS software training to 181 city staff, primarily from the Office of Transportation, the Portland Development Commission, and the Bureaus of Water and Environmental Services. Despite this training, bureaus expressed a continuing need for training and support. User groups could provide the opportunity for users to discuss specific software and Hub difficulties so that CGIS can receive direct feedback from Hub and GIS users. Training can also help City staff gain proficient knowledge of the GIS software and Hub data which is available to all City staff and hence will mitigate user "work-arounds" such as using old versions of GIS software and data, and storing out-dated information on non-Hub hardware.

We also heard concerns from bureaus that the City's standard help desk system does not sufficiently support the type of problems encountered with their GIS operating environments, and that CGIS support staff does not appreciate the demands of a multi-user GIS operating environment. Contrary to these concerns, CGIS believes it is very responsive to technical problems that occur during its 8am to 5pm operating hours. We believe that the reporting of help desk performance (e.g. time of problem, type of problem, length to resolution) and Hub server statistics could help identify if and where problem areas exist.

Finally, while software standardization and data centralization creates efficiencies and reduces costs, centralization can disrupt workflows during scheduled and unexpected downtimes. According to the bureaus we interviewed, downtime and connection problems to the Hub geodatabase and ESRI servers have disrupted work and resulted in lost edits. Bureau managers have expressed concerns that instabilities may increase as City staff increasingly use the Hub. To address these problems, CGIS has improved server connections, monitors license availability, and provides E-mail notifications of server downtime. However, complaints remain that system notifications of server downtime should be broader and server support should be available beyond CGIS' 8am to 5pm office hours.

**Staffing assignments and project priorities should be clearer**

The funding bureaus believe that because CGIS staff time and expertise is disproportionately allocated to special application development, they have not received CGIS services commensurate with their funding levels and needs. Although we could not determine how much time CGIS staff spend on special applications versus bureau technical support, CGIS estimates that it spends an equivalency of 6 FTEs or 60 percent of its staff on application development. While this allocation of time does not appear unreasonable, CGIS may wish to evaluate its staffing assignments and priorities to ensure it is meeting the needs of the funding bureaus. Although CGIS has prioritized and designated staff in its FY 2002-03 project list, we believe identifying estimated completion dates and FTE allocated for each project would further clarify staff time spent in different project areas.

# Chapter 4 GIS in funding bureaus vary in complexity and completion

The GIS systems operating in three City bureaus differ in several ways. These differences include how they evolved, the type and complexity of data maintained, and the extent to which the systems link electronically with other information systems in the bureau. In addition, staffing and spending levels also vary and are not comparable. The following sections describe GIS systems in the Water Bureau, PDOT, and BES.

**Water GIS replicates data to the Hub but data quality is a problem**

The Bureau of Water Works (BWW) began developing its first GIS system in 1996 using Intergraph GIS software. The BWW contracted with Roy F. Weston consultants to develop a comprehensive GIS system. As a first step in developing Water's GIS, Weston began digitizing the quarter section maps of the water system. However, by 1998—the time the Convergent contract was signed—the BWW was experiencing significant delays and cost overruns with Weston.

These difficulties coupled with the discovery that Intergraph was making major revisions to its software occurred at the time the City was standardizing GIS software. Subsequently, the BWW terminated the Weston contract. The BWW spent approximately $1.5 million with Weston to convert their water system maps to an electronic format.

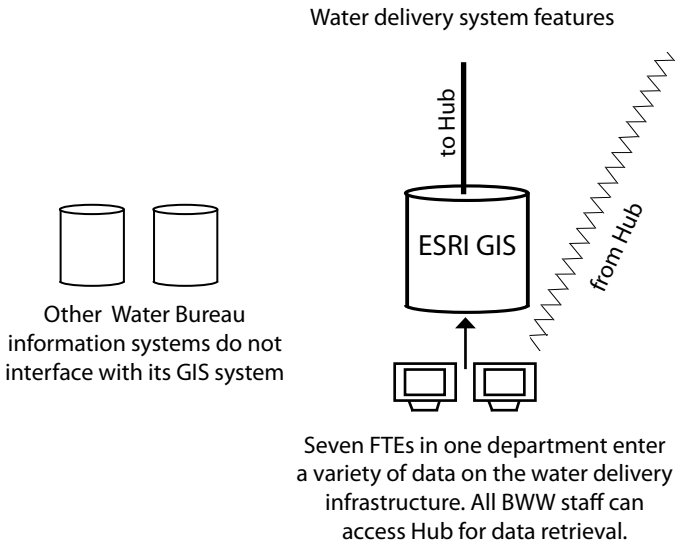
In early 1999, the BWW hired ESRI to complete its GIS system. This work included conversion of the digitized maps to usable ESRI GIS files, linking water asset data to these files, and developing tools and user interfaces for continued data maintenance.

System development with ESRI did not go smoothly because significant changes in ESRI's software required the BWW to twice convert its data to new and different ESRI formats. Each data conversion introduced error and reduced data quality. Because the data maintenance tools which ESRI developed were "painfully slow," CGIS staff provided assistance with ESRI code and in developing more efficient ways to enter data. By 2001, the BWW had spent approximately $878,000 with ESRI.

Although significant data quality and data entry backlogs exist, the BWW is the only bureau that currently has a GIS system which replicates its data directly to the Enterprise GIS Hub. That is, Water GIS data can be transferred directly to the Hub because the Water GIS uses the same ESRI data production environment as the Hub. However, contrary to original plans, the BWW's GIS system does not currently link to other information systems operating within the Water Bureau, such as its maintenance management and work scheduling systems.

Figure 10 simplifies the Water Bureau's GIS system and data flow between it and the Hub. Currently about seven full-time staff are allocated to GIS data maintenance and digital map making.

**Figure 10 Water Bureau's GIS**



**PDOT has a robust system but posts little data to the Hub**

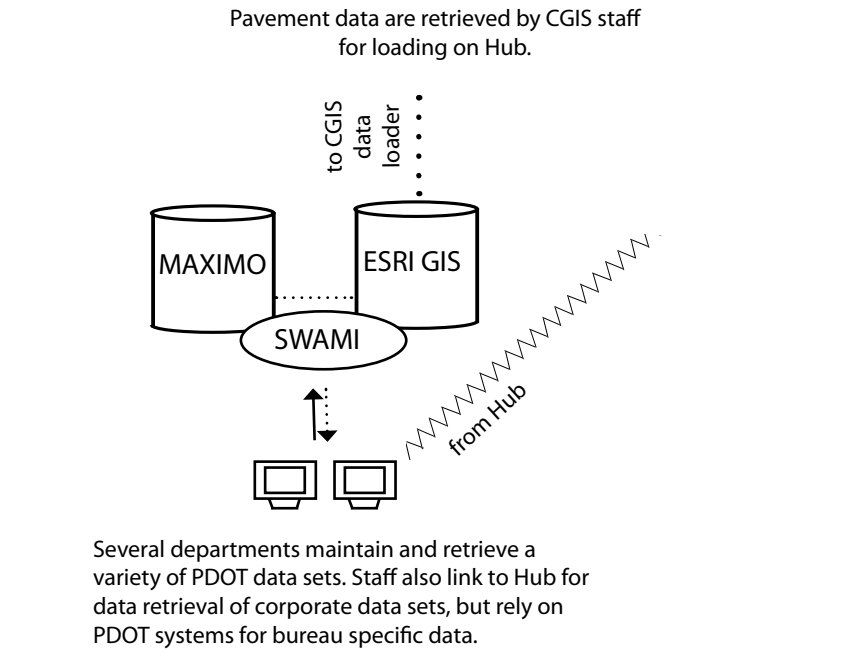
The Portland Office of Transportation (PDOT) was an early adopter of GIS technology, and one of the initiators of the CGIS program and Hub concept. PDOT used MapInfo and Intergraph GIS software to perform various GIS tasks within the bureau, such as maintaining the street lights and signals data sets. Additionally, PDOT was instrumental in developing the spatial formats of the City's street network and cadastre and has maintained them since the mid 1990s. PDOT continues to maintain these corporate data sets under an interagency agreement with CGIS.

In 2000, PDOT undertook a major information systems development initiative. Existing mapping data was migrated to the ESRI platform for eventual integration with PDOT's new work management system, called Maximo. Currently, PDOT has a robust system which allows users to access information from both its GIS and Maximo databases. A special user interface (called SWAMI) and data maintenance tools enable users across the organization to maintain and retrieve data. PDOT estimates that it spent $770,000 to develop the GIS portion of its work management system illustrated in Figure 11.

Despite the sophistication of the PDOT's geographic information system, PDOT does not replicate data to the Enterprise GIS Hub, and currently only makes its pavement data available to CGIS for loading to the Hub. PDOT is hesitant to replicate its data to the Hub because of the complexity of its data, the number of different users, and the length of time needed to complete and verify data editing transactions. Additionally, PDOT fears that the process of replication may expose their information system and organization to unnecessary downtime and security risks.

PDOT's concerns about replication and distribution of data to the Hub is counter productive to the Hub's central mission of providing a single repository for the most current GIS data. Moreover, our discussions with the Bureaus of Water and Environmental Services indicate that CGIS can provide the necessary levels of security and data manipulation. In short, we could not find any extraordinary reasons why PDOT should not begin trial replication to the Hub and provide data for CGIS to post to the Hub.

**Figure 11 PDOT's GIS**



**BES operates two GIS platforms and provides much data to the Hub**

The Bureau of Environmental Services was an early adopter of GIS technology. As shown in Figure 12, the BES uses both ESRI and MapInfo GIS software to maintain a variety of GIS data for the bureau. Using a number of routines, BES technical staff provides AutoCAD and Hansen data in GIS files that can support both ESRI and MapInfo users in the Bureau.

Top management at BES experienced a significant degree of indecision over whether and how quickly to migrate to the ESRI platform. Factors contributing to this indecision include fears of abandoning the highly functioning MapInfo routines and products and, concerns over ESRI's software performance. The result has been that BES has slowly migrated to the ESRI platform while certain staff continued to maintain MapInfo systems.

Despite the organizational confusion and extra costs involved in maintaining two GIS systems and duplicative data sets, we believe BES has taken extraordinary efforts to ensure that all its data users are supported. These decisions and efforts include the following.

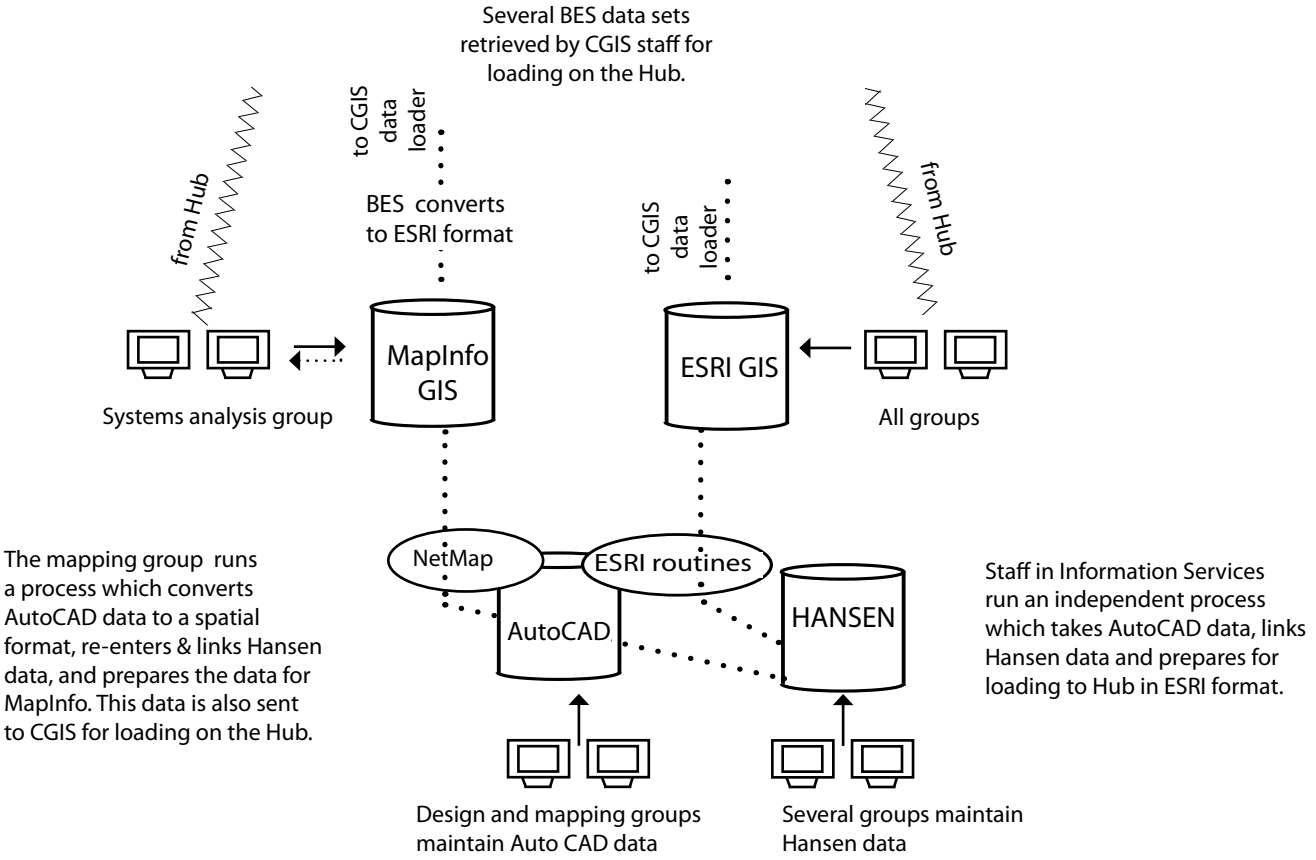
- BES' GIS staff did not freeze data entry into either GIS system while waiting for the ESRI data maintenance environment.
- BES created an alternate process for exporting computer automated drafting (CAD) data to the ESRI platform. This process also appends the GIS shapes with data from BES' maintenance management system (called Hansen). If BES' GIS and IT staff had not created this process, they would have a tremendous backlog of GIS data to convert when the DME arrives.
- GIS staff continued to support the routines that convert computer automated drawings to MapInfo and append Hansen maintenance management data to the MapInfo data.

- BES' staff provides both ESRI and MapInfo data to CGIS for posting on the Hub. BES does not yet replicate data to the Hub.
- BES' GIS and IT staff drafted a *Mapping and Data Environment* alternatives analysis for top management's consideration. The analysis recommended that BES proceed with ESRI migration and continue to work with CGIS on the development of its sewer DME. Additionally, BES plans to evaluate which MapInfo processes used by the Systems Analysis Group can be migrated to ESRI.

Recognizing that it is difficult to accurately capture all the costs associated with BES GIS efforts, IT staff at BES roughly estimate the bureau has spent around $125,000 over the past three years in data conversion, memory and software upgrades, and various other software support to keep the two systems functioning. These costs do not include modification or maintenance of the bureau's Hansen information system.

BES has five FTE providing bureau-wide support for GIS systems and mapping. An additional 11 FTE in the Mapping Group provide AutoCad, GIS and related database support.

**Figure 12 BES' GIS**



# Chapter 5 Recommendations

The CGIS program has developed a centralized system for GIS data storage and distribution. CGIS has also produced some valuable applications that were not envisioned in its original mission. However, other tasks are yet to be completed and additional opportunities exist to improve the operation of CGIS and the Hub. To help the CGIS program develop clearer objectives, communicate its accomplishments, and pursue a standardized operating environment, we make the following recommendations.

1. **Improve communication with bureau stakeholders and other users of GIS information.**

CGIS should develop a variety of methods to communicate with its stakeholders and other consumers of CGIS information and products. Communication could include newsletters, updated data catalogs, and users groups.

2. **Develop an updated CGIS Business Plan.**

The plan should include the program's mission, organizational structure, roles and responsibilities and strategic objectives. Additionally, CGIS' annual Service Level Agreements (SLAs) should provide greater detail on proposed tasks such as prioritization rationale, time lines, staffing levels and costs. The SLAs should be reviewed at GIS stakeholder meetings and minutes should reflect stakeholders' opinions and feedback on planned tasks.

**3. Develop CGIS performance measures.**

In order to evaluate performance and track program accomplishments, the CGIS should develop a set of performance measures for the major goals of the program. Suggested performance measures can be found in Appendix F.

**4. Prepare and issue annual financial information on program spending and resources.**

OMF and CGIS should prepare an annual financial report that accounts to the funding bureaus and City Council on the spending of program resources. Reports should include staff time spent on program activities.

**5. Enhance reliability and the use of the GIS Hub.**

CGIS should continue efforts to improve metadata for GIS data, establish map production standards, and provide broader technical support for users. With BTS, CGIS should develop policies on data security and distribution.

In addition to strengthening the content and reliability of the central Hub, all bureaus with GIS applications should:

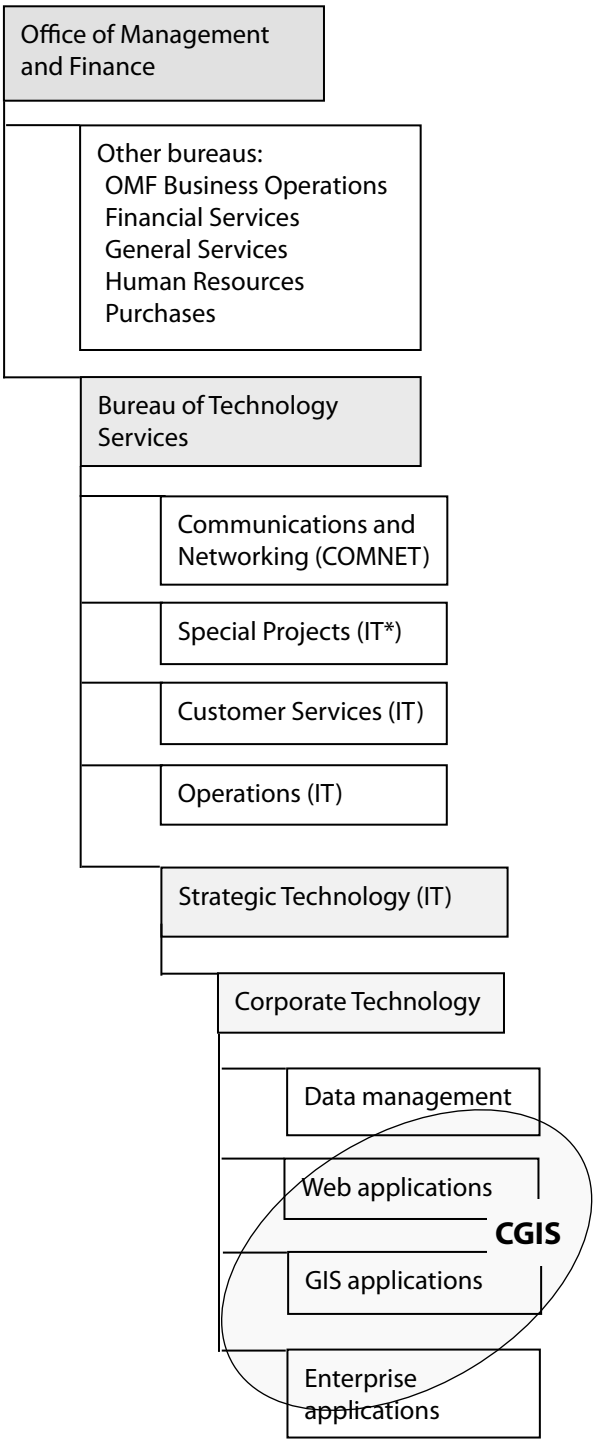
**6. Cooperate with CGIS to achieve a centrally shared data repository.**

Bureaus should be allowed to restrict or remove data on the Hub only if data are outdated, CGIS cannot meet security requirements, or if City policy prevents the distribution of such data.

# APPENDICES

Appendix A

## CGIS is part of OMF's Bureau of Technology Services

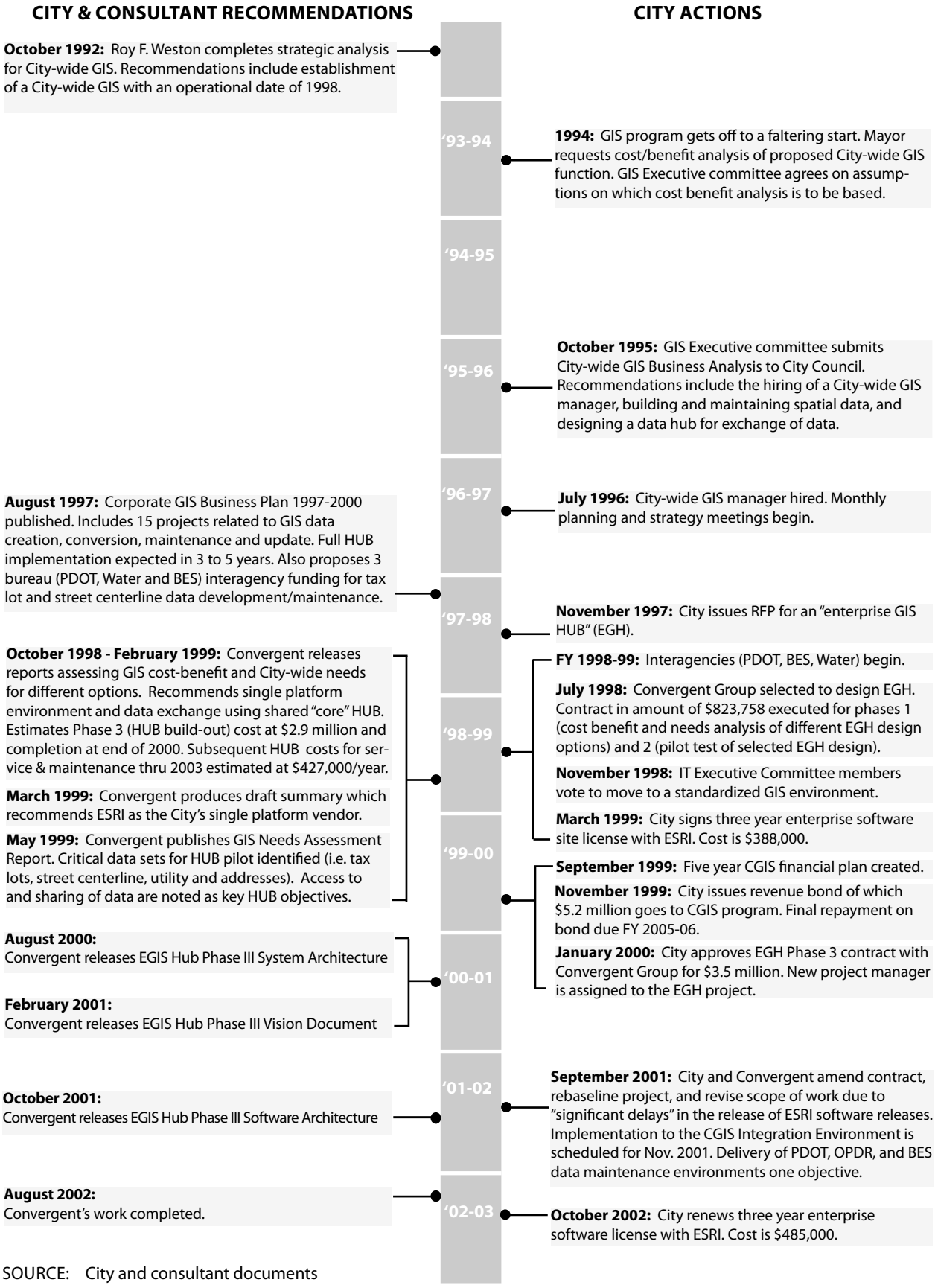



* Information Technology (IT)

SOURCE: Auditor synthesis of BTS organizational charts

Appendix B

# Hub and CGIS timeline: FY 1992-93 to FY 2002-03




SOURCE: City and consultant documents

Appendix C

## CGIS funding detail: FY 1996-97 to FY 2002-03

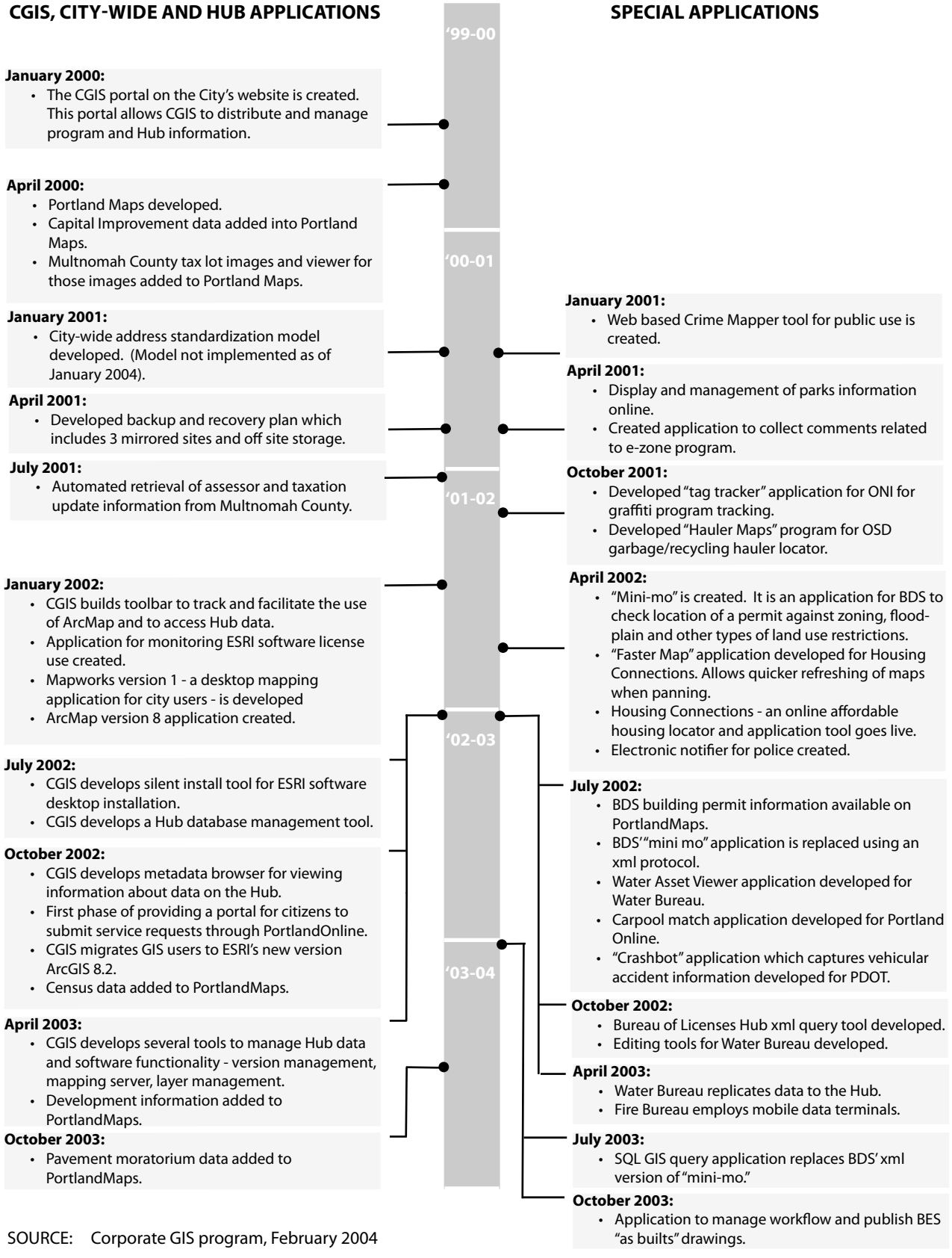
| | *'96-97 thru '98-99* | **'99-00** | **'00-01** | **'01-02** | **'02-03** | **TOTAL** |
|---|---|---|---|---|---|---|
| **INTERAGENCIES** | | | | | | |
| Water | $297,399 | $489,677 | $491,361 | $497,269 | $585,546 | $2,361,252 |
| PDOT | $297,399 | $489,677 | $491,361 | $497,269 | $605,022 | $2,380,728 |
| BES | $297,399 | $489,677 | $491,361 | $497,269 | $607,549 | $2,383,255 |
| BDS | $7,804 | $176,284 | $176,890 | $179,017 | $215,027 | $755,022 |
| PDC | | | | $47,000 | $102,700 | $149,700 |
| **Subtotal** | $900,001 | $1,645,315 | $1,650,973 | $1,717,824 | $2,115,844 | $8,029,957 |
| **SPECIAL APPLICATIONS** | | | | | | |
| BES: Hydra Project | | | | | $3,000 | $3,000 |
| BHCD: Housing connections | | | $20,000 | $115,521 | $57,563 | $193,084 |
| FIRE: MDT phase 1 | | | | | $19,000 | $19,000 |
| MDT phase 2 | | | | | $13,560 | $13,560 |
| OMF: TGM grant | $7,500 | | | | | $7,500 |
| Budget application | | | | | $35,370 | $35,370 |
| PDOT: Carpool Match | | | | | $42,000 | $42,000 |
| POLICE: CGIS Mapping | | | $10,000 | | | $10,000 |
| PIO Notification | | | | $13,000 | | $13,000 |
| Camen | | | | | $25,000 | $25,000 |
| PURCHASING | | | | $14,500 | | $14,500 |
| WATER: Asset Viewer | | | | | $13,500 | $13,500 |
| Miscellaneous revenue | | | | | $1,356 | $1,356 |
| **Subtotal** | $7,500 | | $30,000 | $143,021 | $211,705 | $392,226 |
| **GENERAL FUND** | | | | | | |
| documented | $1,074,516 | | $376,944 | $394287 | $474,900 | $2,320,647 |
| undocumented | $332,790 | $1,545,689 | | | | $1,878,479 |
| **Subtotal** | $1,407,306 | $1,545,689 | $376,944 | $394,287 | $474,900 | $4,199,126 |
| **BOND PROCEEDS** | | | | | | |
| *repaid through 6/30/2003 | | | $899,486 | $1,020,509 | $995,652 | $2,915,647 |
| unpaid | | | | | | $2,256,122 |
| **Subtotal** | | | | | | $5,171,769 |

*included in interagency funding

SOURCE: Auditor analysis of Office of Management and Finance reports.

Appendix D

# CGIS program accomplishments timeline




SOURCE: Corporate GIS program, February 2004

Appendix E

# Comparison of original and amended "Phase 3" contracts

**PHASE 3:**
**ORIGINAL SCOPE OF WORK, March 2000**

**Number of sub-tasks, by status, August 2001**

| Task | TITLE | FIXED COST * | COM-PLETE | Out of scope | In progress | Post-poned |
|---|---|---|---|---|---|---|
| 1 | Project Management | $835,000 | 2 | 1 | 1 | 0 |
| 2 | GIS Maintenance Software Functional Requirements Development | $155,000 | 4 | 0 | 5 | 0 |
| 3 | Hub Maintenance Quality Data Model Development | $312,000 | 2 | 1 | 1 | 0 |
| 4 | Hub Pilot Enhancement to Production System / ESRI 8.1 migration | $309,000 | 10 | 3 | 6 | 7 |
| 5 | Hub Software Development and Integration | $1,428,000 * | 0 | 2 | 11 | 4 |
| 6 | Data Maintenance Application Training & Deployment Planning | $180,000 | 0 | 0 | 0 | 3 |
| 7 | Production Deployment | $139,000 | 0 | 0 | 0 | 3 |
| | ORIGINAL CONTRACT TOTAL (does not include expenses) | $3,358,000 | | | REMAINING FUNDS | $1,960,000 |

* Hub development task was in contract as "estimated pool", *not* fixed cost

**PHASE 3:**
**<u>REVISED</u> SCOPE OF WORK, September 2001**

| Task | TITLE | COST |
|---|---|---|
| 1 | *same as original* | ** |
| 2 | Enterprise GIS Hub System Design | ** |
| 3 | Data Maintenance Functional Environments | *Time & materials* |
| 4 | Enterprise GIS Hub on ArcSDE | *Time & materials* |
| 5 | *same as original* (scope revisions) | *Time & materials* |
| 6 | Data Maintenance Application Training | *Time & materials* |
| 7 | *same as original* | *Time & materials* |
| | AMENDED CONTRACT NOT TO EXCEED | $1,960,000 |

** completion of the majority of sub-tasks at fixed cost

SOURCE: *Contract U218 between the City of Portland and Convergent Group Corp.,* March 2000; *Matrix of Status of Sub-tasks*, August 2001; contract *Amendment 2*, September 2001.

Appendix F

# Sample CGIS performance measures

| | Reliable data is available | Goal exists | Condition of suggested measure |
|---|---|---|---|
| **Goal #1:** Dependable system performance | | | |
| Percent of CGIS program budget which is expended on Enterprise Hub operations and maintenance v. goal | | *develop* | CGIS would need to develop a costing methodology based on personal, material & services, and capital costs |
| ESRI license and EGIS Hub server availability v. goal | ✓ | 99.5% | Server statistics collected by CGIS |
| Percent of code reused by CGIS in application development v. goal | ✓ | *develop* | CGIS has estimated its code reuse at 60% |
| Annual savings of ESRI site license per standard ArcView 8.x user v. goal | ✓ | *develop* | CGIS has assessed the cost savings derived from the City-wide site license. |
| **Goal #2:** High quality data | | | |
| Number of up-to-date, bureau specific data layers available on the Hub each year. | ✓ | *not applicable* | Additionally, a data catalog sorted by data origin would be useful to for a quick overview of available data |
| Percentage of data layers with complete metadata. | ✓ | 100% | |
| **Goal #3:** Improved delivery of City services | | | |
| Estimated annual savings from new CGIS applications developed each year. | | *not applicable* | Savings model would need to be developed to accurately capture usage statistics and labor cost factors. Also, recognize not all applications will generate savings. |
| Number of City staff connecting to ESRI software applications on a regular basis. | ✓ | *not applicable* | CGIS would need to define regular users to distinguish consistent GIS users from those who use ESRI products irregularly. |
| Number of City staff using special applications on a regular basis. | | *not applicable* | Bureaus receiving special applications should be responsible for tracking usage . |

SOURCE: Auditor.

# RESPONSES TO THE AUDIT

# CITY OF PORTLAND

OFFICE OF MANAGEMENT AND FINANCE

**Vera Katz, Mayor**
**Timothy Grewe, Chief Administrative Officer**

**Bureau of Technology Services**
**Matthew M. Lampe**
**Chief Technology Officer**
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August 16, 2004

TO: Gary Blackmer, City Auditor

FROM: Matthew Lampe, Chief Technology Officer

SUBJECT: Comments on Draft Audit

Thank you for the opportunity to comment on the final draft of the Corporate Geographic Information Systems report. The draft report provides a balanced view of the many accomplishments of the program, the difficulties in achieving all the desired outcomes, and provides valuable recommendations to further this work.

The financial review of the CGIS program provided valuable information for the 5-year forecast for the program for the FY 2004-05 Budget, which resulted in a lowering of revenue requirements ahead of debt retirement. The audit highlighted the improvement made over a year ago in the detailed accounting of staff time to assure that staff charges are appropriately distributed within CGIS projects and to non-CGIS projects.

The report identified key successes of the program in the areas of standardization, procurement of a unique city-wide license, development of a robust central infrastructure, and the successful deployment of many applications that made the GIS data accessible and valuable both to Bureaus and citizens at large. The report fairly described the challenges inherent in implementing immature technology, with resultant demands for increased effort by both CGIS and Bureau staffs to achieve the outcomes identified. As the report identified, additional functionality is in the testing pipeline for implementation.

The Bureau of Technology Services is committed to implementing the recommendations of the audit, and appreciated the recognition that efforts to improve relationships with stakeholders had begun prior to the audit, and will continue with an expanded presence for the key GIS reliant agencies supported by the General Fund. These efforts will take two forms, improvements specific to how CGIS works with, and reports to, its stakeholders, and improvements that occur within the context of BTS efforts to improve infrastructure, security policy, and security implementation, and negotiations in the context of the Service Level Agreements between BTS and the Bureaus.

cc Tim Grewe

# PORTLAND, OREGON

Bureau of Development Services

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MEMORADUM

DATE:: August 16, 2004

TO: Gary Blackmer, City Auditor

FROM: Ray Kerridge, Director, Bureau of Development Services
Ann Kohler, Site Services Manager

RE: Response to Final Draft of the CGIS Audit Report

BDS is pleased to have the opportunity to comment on your recent audit of the Corporate Geographic Information Systems services. Having participated in the findings phase of the audit, BDS is pleased the results reflect both the accomplishments and areas for growth outlined in the report. We are very appreciative of your thoughtful consideration of the input by all parties and look forward to continuing our commitment to a City GIS system that is the best possible system our citizens expect and deserve. There are several areas we believe can add to your report.

We are very troubled by the CGIS financial status and future trending reflected in the audit. Using BTS fund balance reserves to pay for CGIS services implies that other BTS services will not be available without additional costs to City bureuas. BDS was never alerted that CGIS costs were higher than forecasted in the original funding plan. Both the trend toward fee for service and the use of BTS reserves to pay for CGIS excess costs translate into ever-increasing costs to BDS for IT services, in general.

Service bureaus pointed out the ongoing need for better communication with CGIS regarding funding priorities, specifically, corporate vs. bureau products. Without this type of discussion, we are unable to effectively partner with CGIS around tough decisions but remain expected to fund corporate choices.

Another critical financial issue that must be addressed is the apparent BTS assumption that current funding agreements will extend beyond FY 05-06. BTS and other funding bureaus were told that the funding would be complete in a seven-year period ending FY 05-06. Our five year financial plan assumes the retirement of this debt. Any maintenance agreements for the CGIS hub products would certainly require substantial discussion and negotiation.

Lastly, BDS contributes to the GIS Hub so that development staff from BDS, PDOT, BES, Water, Fire, Parks and Planning can get access to HUB data in order to approve pending building permits and comment on Land Use Reviews. Six years ago we funded the integration of a GIS

viewer in the TRACS software for use by all development bureaus. It was designed to retrieve HUB data inside the TRACS software to support reviewer efficiency. To date, the viewer has not functioned well enough for deployment. City employees are forced to used multiple products on their desktops in order to accomplish their work, This is not acceptable. The viewer product represents the needs of over 250 concurrent users daily.

We appreciate the multiple demands placed on CGIS to create products for a wide audience. We remain committed to supporting the overall development of the Hub on behalf of BDS services and the public good.

Thank you for your excellent work on this audit. Internal accountability only enhances our ability to deliver efficient services to the citizens of Portland.

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

1120 SW Fifth Avenue., Room 1000, Portland, Oregon 97204-1912 Dean Marriott, Director Dan Saltzman, Commissioner

August 12, 2004

TO: Gary Blackmer, City Auditor

FROM: Dave Gooley, Business Services Manager, Environmental Services

CC: Dean Marriott, Director, Environmental Services
Debbie Douglas, Bureau Technology Manager, Environmental Services

Subject: BES Review and Response to Final Draft of CGIS Audit Report

BES is pleased to have been involved in the CGIS Audit and to have our comments, concerns, accomplishments and ongoing efforts included as part of the Audit. There are, however, several areas we believe warrant additional comment on our part.

Impact of IT Consolidation

BES is committed to the use of City Standards and historically has maintained strict control of bureau desktops in order to remain in legal compliance and to maintain standardization. As indicated on page 23 of the report "the decision to standardize on one GIS platform created the need for BES to abandon our highly functioning MapInfo GIS system". Several of the issues created by this decision are discussed. However, one factor with great impact to the BES migration to the ESRI tools and the implementation of the BES DME is not documented. This has to do with the City IT consolidation that happened around the same time the BES ESRI migration and the DME development was occurring. The technology managers who had oversight of these projects, Rick Schulte, CGIS Manager, and Debbie Douglas as BES IT Manager, were assigned to other roles in the Bureau of Information Technology (BIT). As members of the BIT Leadership Team, they focused on other BIT organizational, financial and service issues which were identified as higher priority to BIT at that time.

Since the point in time when Debbie Douglas moved back to BES, with responsibility for GIS and data administration, the BES ESRI migration has moved forward in several areas:

- The desktop migration from MapInfo tools to ESRI tools is now complete with the exception of the Systems Analysis group and a few other BES staff members with close ties to this group.
- A plan is currently under development to migrate the Systems Analysis tools to ESRI products as appropriate, and to seek exceptions to the ESRI standard when not appropriate due to cost, limited ongoing need of the tool or other exceptional situations.
- The DME base functionality has been finished by CGIS and tested by BES.

- The productivity tools required to bring BES to the same level of existing functionality in the AutoCad environment are now being developed by CGIS and tested by BES.
- The Mapping and Systems Analysis group anticipates the use of the improved ESRI tools, and the improvement in data quality inherent in the DME implementation.

It is important to note the BES DME deliverable from Convergent was not acceptable to BES or CGIS staff. Once this product was delivered to CGIS, CGIS staff spent nearly a year becoming familiar with the code and in effect, redeveloping what had been delivered by Convergent.

Funding

In regard to CGIS funding, the seven-year financing plan for the CGIS Hub was presented to the funding bureaus in February 1999. The funding bureaus were never informed that the CGIS program had higher than forecasted operating costs or would have a fund shortage that would require higher contributions by customers in the future. The document produced during the last budget process states "Currently the balloon payment for the GIS loan will require usage of the BIT fund balance in FY 2004-05 and FY 2005-06. This use of fund balance will not adversely impact the reserve levels of the IT fund. With the reduced contribution rates, the negative balance in the GIS program will extend through 2006-07."

One of the concerns that the funding bureaus had related to activities being undertaken by CGIS which appeared to be outside of the original scope of work, including the creation of Portland Online and several other public oriented projects. These concerns were expressed in CGIS stakeholders meetings without resolution.

Cost Allocations/Beneficiaries/Future Costs

The Water Bureau, Development Services, Transportation and BES were originally viewed as the primary beneficiaries of the HUB. In our view, this has not been entirely the case. For example, the BES, BDS and PDOT DME products are not complete. The product developed for BDS to provide access to GIS data from within TRACS does not work, requiring staff from BES Development Assistance, BDS, and ONI to rely on additional tools to complete their work. Many of the tools developed and implemented by CGIS are oriented to more casual GIS users and the beneficiaries of these tools are primarily staff in the General Fund bureaus or the public.

One concern we have going forward is cost. BES has contributed approximately $2.8 million to the development of the HUB. It was our understanding that once the loan that financed the HUB was retired, our annual costs would be approximately $150,000 for maintenance costs with some additional funding for CGIS to support the HUB. We were surprised to learn in the audit report that "OMF's current financial forecast does not project further rate reductions until the IT reserves are repaid." Our 5 year financial plan incorporates the original estimates for CGIS and HUB related costs. If these are now forecast at substantially higher levels, there will be a direct and measurable impact to forecast sewer and stormwater rates.

BES recommends CGIS and BTS look for other options to deal with the IT fund shortfall, including reduction of staff, limited or no replenishment of the IT fund, and/or a different distribution of costs across the City.

We believe once the debt has been repaid in FY 05/06 a new methodology should be developed to provide support to CGIS with the funding bureaus participating in the discussion of the level, types and costs of services to be provided. We also believe that staff currently housed in CGIS doing development and support of tools that are not GIS tools, such as Portland Online, should be removed from this calculation.

Summary

We appreciate the work done in the CGIS audit and support the recommendations made. BES remains committed to the implementation of city standard ESRI tools and the DME environment and in continued funding of CGIS, with the desire that there be a stronger link between funding support and the benefits and value received by BES.

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**August 16, 2004**

**To: Gary Blackmer, City Auditor**

**From: Brant Williams, Director, Portland Office of Transportation**
**Eileen Argentina, Director, Transportation Systems Management Bureau**

**Re: Response to Final Draft of the CGIS Audit Report**

Thank you for the opportunity to comment on your audit of the City's Corporate Geographic Information System. The Auditor's Report does a good job of describing both the successes and shortcomings of the program, and we are very encouraged that it can help us all continue to achieve the many benefits that GIS technology can provide. We appreciate your careful consideration of our earlier input. There are a few points that we feel would benefit from additional formal comments from PDOT.

**Financial Status**

We find the revenue shortfall cited on page 9 troubling, especially in light of the reduction in the interagency agreement for 04/05. We understood this reduction to be managed within the existing funding agreement. The document produced during the budget process this past spring entitled "GIS Financial Plan Review" recommending the reduction in the CGIS contribution rates states "The Bureau of Technology Services is comfortable with reducing rates to this level because it still fully funds the ongoing needs of the program for upgrading and improving the system in addition to fully funding regular operation and maintenance of the system. Currently the balloon payment for the GIS loan will require usage of the BIT fund balance in FY 2004-05 and FY 2005-06. This use of fund balance will not adversely impact the reserve levels of the IT fund. With the reduced contribution rates, the negative balance in the GIS program will extend through 2006-07."

PDOT would fully expect any substantive change in the financial plan and schedule for the CGIS system and Hub project to be the subject of discussion and negotiation with the funding bureaus. Failure to do so underscores the communication and prioritization problems noted in the audit summary and on pp. 28-30.

A second financial issue that should be addressed is the funding agreement for CGIS between BTS and the funding bureaus. The original ten-year agreement clearly shows debt service ending in FY 05-06. It is PDOT's belief that the funding bureaus will need to revisit what level of ongoing investment in CGIS is appropriate and necessary, and with the retirement of the debt as well as major development efforts concluding, we have anticipated a reduction in these costs. The funding bureaus made a discretionary decision in 1998-99 to commit scarce resources towards this investment in shared systems which had a finite time frame, although it is understood that the systems developed will have ongoing costs.

**PDOT GIS Status**

The audit states on page 35 that PDOT does not replicate data to the hub. We would like to emphasize that, as your audit demonstrates on p 34, there is only one bureau currently replicating data to the hub and that bureau has data quality problems as well as no integration to related bureau business systems like maintenance and infrastructure management. These facts are at the heart of the impediments to PDOT's being able to replicate data to the hub, and underscore the need for CGIS to accommodate reasonable bureau business practices and needs in its methods for extracting data. We are confident that this is achievable and are actively working with BTS on identifying the best approach for publishing PDOT's high quality data to the hub environment while continuing to support a robust set of user needs within the bureau, as indicated below.

PDOT has implemented Maximo. A brief discussion is found on page 35. As the final phase of the implementation of this system, PDOT did significant work in mapping the asset inventories that PDOT maintains. These asset inventories include GIS data sets, but are closely linked to field work history and condition monitoring functionality.

During this phase a number of data maintenance tools (DMTs) were developed. While this work was underway the schema for the asset data was in a fluid state. CGIS agreed with PDOT that it would be advantageous to wait until this work was complete before publishing PDOT's data to the Hub. The last DMTs were implemented in the spring of 2004. PDOT provided CGIS detail on the first group of assets ready for posting to the Hub this past April. We have been in conversation with CGIS since that time to verify how the potential impacts to PDOT's business needs and production environment will be addressed.

A correction is needed in the third paragraph on page 35. The audit states pavement data is available on the Hub. In actuality, "pavement moratorium" data is on the Hub. It is there to meet BDS' business need to check the status of the street prior to issuing permits which would allow any excavation of recently paved streets.

Again, thanks for the good work of the Auditor's office in examining and ensuring this very significant investment in technology yields appropriate benefits.

CITY OF
PORTLAND, OREGON
BUREAU OF WATER WORKS

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August 16, 2004

## *Memorandum*

TO: Gary Blackmer, City Auditor

FROM: Mort Anoushiravani, Administrator, Portland Water Bureau

CC: Commissioner Dan Saltzman

RE: Portland Water Bureau Response to Auditor's Report: "Corporate Geographic Information Systems" – A Review of Status and Accomplishments

Thank you for the opportunity to respond to the audit report your office has just completed regarding the City's Corporate Geographic Information System (CGIS).

We are very appreciative of the work done in this review and concur with the findings and recommendations of the audit report. The CGIS system is a vital tool in the bureau's ability to establish a comprehensive asset information system, support maintenance of the water system and ultimately invest in the City's drinking water infrastructure. It is also a vital tool in implementing the recommendations of the recent audit of "Portland's Water Distribution system", also by your office.

We stand ready to assist the CGIS program and implement the audit recommendations. We are especially supportive of improved communication and concur that a business plan with service level agreements will enhance prioritization and implementation timelines for services.

We are however, concerned that the program continues to forecast increased costs. It was our belief that once the implementation of the systems was complete that the annual costs would decrease and stabilize instead of continuing to increase. These types of interagency cost increases make it difficult for the bureau to hold the line on its costs.

Thank you again for the opportunity to provide this response.

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