

AUDIT REPORT



CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
BUREAU OF FINANCIAL AUDIT
WILLIAM C. THOMPSON, JR., COMPTROLLER

Audit Report on the Management of The City Geographic Information System and the Monitoring of Its Citywide Projects by the Department of Information Technology and Telecommunications

7A06-066

June 19, 2006



THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
1 CENTRE STREET
NEW YORK, N.Y. 10007-2341

WILLIAM C. THOMPSON, JR.
COMPTROLLER

To the Citizens of the City of New York

Ladies and Gentlemen:

In accordance with the responsibilities of the Comptroller contained in Chapter 5, §93, of the New York City Charter, my office has audited the management of the City Geographic Information System and the monitoring of its Citywide projects by the Department of Information Technology and Telecommunications (DoITT).

DoITT oversees the use of existing and emerging technologies in City government operations and delivery of services to the public. We audit the management and oversight of City resources such as this to ensure that they are properly managed and protected from unauthorized use.

The results of our audit, which are presented in this report, have been discussed with Department of Information Technology and Telecommunications officials, and their comments have been considered in preparing this report. Their complete written response is attached to this report.

I trust that this report contains information that is of interest to you. If you have any questions concerning this report, please e-mail my audit bureau at audit@Comptroller.nyc.gov or telephone my office at 212-669-3747.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Will C. Thompson, Jr.'.

William C. Thompson, Jr.

WCT/fh

Report: 7A06-066

Filed: June 19, 2006

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*The City of New York
Office of the Comptroller
Bureau of Financial Audit
IT Audit Division*

**Audit Report on the Management of the
City Geographic Information System and
The Monitoring of Its Citywide Projects by the
Department of Information Technology and
Telecommunications**

7A06-066

AUDIT REPORT IN BRIEF

This audit examined the management of the City Geographic Information System and its Citywide projects by the Department of Information Technology and Telecommunications (DoITT). DoITT oversees the use of existing and emerging technologies in City government operations and delivery of services to the public. DoITT's Information Utility Division (Division) deploys, operates, and maintains the technical infrastructure to support critical agency functions, including the 311 Citizen Service Center, the NYC.gov portal, the City Geographic Information System (GIS), the MetroTech data center, and the CityNet and I-NET networks. GIS is an integrated system of computer hardware and software capable of capturing, assembling, storing, manipulating, retrieving, and displaying geographically-referenced information. A goal of GIS application deployment is to eliminate redundant data collection and use. The principle is that data should be collected once and then accessed by all who need it.

Audit Findings and Conclusions

DoITT is adequately monitoring and managing Citywide GIS projects. However, a Citywide standard does not exist concerning geospatial data. Consequently, DoITT has been adhering to federal industry-wide "best practices" guidelines as criteria when monitoring the project. In addition, DoITT has adequate security controls in place to ensure that its GIS data is protected from unauthorized access. Further, the GIS environment has developed adequate provisions for regular backup of information, a disaster recovery procedure, and contingency plans.

Although DoITT has adequate security controls, we found one control weakness regarding 177 individuals (including 20 DoITT employees) who have access to the City's GIS

resources. These individuals do not have current authorization to use the system, and their access rights have not been reassessed. DoITT should reassess the status and access rights of these individuals, since some may no longer be employed by the City or may not be justified in continuing to have access to the system.

Audit Recommendations

To address these issues, we recommend that DoITT:

- Work with the New York City Department of Investigation's (DOI) Citywide Information Security, Architecture, Formulation, and Enforcement Unit (CISAFE) to develop a set of formal Citywide GIS standards for all users to follow.
- Verify the status of each user on its GIS User list and deactivate those who are no longer authorized to access this information.

INTRODUCTION

Background

DoITT oversees the use of existing and emerging technologies in City government operations delivery of services to the public. DoITT works to improve the government's efficiency through use of technology and to make communication with the government straightforward and clear.

DoITT's Information Utility Division (Division) deploys, operates, and maintains the technical infrastructure to support critical agency functions, including the 311 Citizen Service Center, the NYC.gov portal, the City Geographic Information System (GIS), the MetroTech data center, and the CityNet and I-NET networks. The Division's responsibilities include:

- Achieving the highest accessibility and availability of these systems;
- Leveraging technical resources to reduce City costs, avoiding duplication of functions, and improving service delivery;
- Maintaining a secure, redundant environment to meet agency business needs; and
- Defining and implementing technical solutions for City agencies to reduce or avoid substantial costs in hardware, software, and in-house expertise.

One of these emerging technologies is GIS. GIS is an integrated system of computer hardware and software capable of capturing, assembling, storing, manipulating, retrieving, and displaying geographically-referenced information. It is also a computer-based tool for mapping and analyzing physical objects and events and relates the objects and events on a map. GIS is capable of linking topographic, demographic, utility, facility, image, and other resource data that is geographically referenced. It integrates database information with the visualization offered by maps. GIS tools can store, analyze, and visually display information. In addition, GIS stores and manages information as a collection of layers linked together through geographic references.

A goal of GIS application deployment is to eliminate redundant data collection and use. The principle is that data should be collected once and then accessed by all who need it. GIS deployment also benefits the user(s) in creating a capability to complete tasks that were not routinely done because of their size, cost, or complexity. With GIS, major data-intensive projects can be updated regularly and used for routine decision-making. Any data element that includes a location reference has potential for GIS application. The level of detail in geographic references can be as general as a city, county, or zip code, or as specific as land parcel or global positioning system point references.

Digital mapping and GIS have been in use in City government since at least 1978, but typically all activity and resources were decentralized among a number of City agencies. Then

in 1995, the Department of Environmental Protection agreed to fund the creation of a Citywide photogrammetric base map. By 1999, a Citywide GIS needs-assessment study occurred. This study recommended that the City establish an entity to provide centralized cross-agency GIS coordination, data handling, and technical support. The primary product of this study was the Citywide GIS Utility Master Plan, which led in early 2000 to the creation by DoITT of the Citywide GIS utility.

In January 2000, the GIS Unit was established within the Division to host and maintain a City basemap called NYCMap as well as to provide other data and services to City agencies. The mission of the GIS Unit is to develop, support, and host an accurate digital map and geo-referenced data along with associated tools and applications that allow all City agencies to use the spatial data collected by many City entities.

The GIS Unit is responsible for developing and maintaining a repository of current, accurate spatial data regarding the City of New York. This includes NYCMap, a physical basemap of the City, associated GIS tools, applications, and digital maps for use by all City agencies. In addition, the GIS Unit provides the public with geographically-based information on NYC.gov, such as My Neighborhood Statistics. The data is used to support City operations, data analysis, policy making, and public safety.

The GIS Unit also maintains GIS hosting environments for Internet and Intranet applications. GIS information is provided to the public through the New York City Map portal, which provides the user with a map indicating the specific building requested. Users can select additional icons to identify schools, day care centers, senior centers, libraries, and hospitals; in addition, the portal links users to other Web sites for these facilities. This Web page also functions as a single access point to many of the location-based applications on NYC.gov such as online property, building, census, statistics, and safety information for New York City.

Finally, as a service to the public, Citywide GIS has made some mapping utility data available for download¹. This data can be imported into a variety of commercially available products, including the free GIS data viewers from both ESRI (Arc Explorer) and MapInfo (Pro Viewer).

Objectives

The objectives of the audit were to determine whether DoITT has:

- Adequately monitored and managed Citywide GIS projects;
- Established policies for governing the use of its GIS resources and whether such policies are being followed; and

¹ The user must agree with the terms of an Online License Agreement.

- Adequate security controls in place to ensure that its GIS data is protected from unauthorized access.

Due to its importance and relationship to GIS data protection, we added an additional objective, specifically, to determine whether DoITT has:

- Adequate provisions for backup of GIS data that has been included in DoITT's disaster recovery and contingency-planning strategy.

Scope and Methodology

Our fieldwork was conducted between September 2005 and January 2006. To achieve our audit objectives, we reviewed and analyzed DoITT's:

- GIS Unit and its organizational structure;
- Performance Highlights as reported in the Mayor's Management Reports from 2000 through 2005;
- Historical documents related to the development of GIS;
- Filings pursuant to Comptroller's Directive #1, "Principles of Internal Control," from 2003 to 2005 and other system-related documentation, policies, standards, and procedures.
- Strategy document (*Department of Information Technology and Telecommunications Strategy, Calendar Year 2005*), which provides a broad overview of the key goals and priority initiatives that DoITT will undertake over the next few years, including projects in progress;
- Service offerings document (*Department of Information Technology and Telecommunications Service Offerings Catalog 2005, Version 2*), which describes the range of services provided to City agencies by DoITT to achieve efficiencies and to enable the agencies to develop their own strategic business priorities;
- Citywide GIS Project List.² The list includes the individual projects in progress, including schedules of meetings called to ascertain any development issues, project status memoranda, and related documents;

² Example of GIS applications created include the following: Poll-site Locator application for the Board of Elections; GIS Utility Home Page; Capital Project Browser application for the Department of Design and Construction; Asbestos Mapping application for the Lower Manhattan Air Quality Task Force; GIS Web interface for the *Mayor's Management Report* coordinated by the Mayor's Office of Operations; GIS Web interface to the Department of Housing Preservation and Development's HPDInfo system; Property Info application for the Economic Development Corporation; and Mass Transit Strike Information application for the Department of Emergency Management.

- GIS Intranet and Portal Access procedures that define the process by which access to these resources are requested and granted;
- Spatial Data regions of the GIS Portal environment on the Intranet that require authorized access. Our analysis included a review of the GIS Portal resources that are actively used by the GIS user community;
- Public-access Internet connection to the GIS Portal and its resources. The audit team accessed the public GIS data after agreeing to the terms of the Online License Agreement;
- GIS operations document, which describes the architecture of the Internet-hosting environment along with the servers and each server's function;
- GIS Intranet configuration information (GeoDataShare and GIS Environment maps);
- List of GIS users who were only granted browsing capabilities, i.e., users only able to view information;
- GIS Unit's licensing policy, which, began in May 2001;
- GIS security configuration;
- Backup procedures;
- Disaster recovery and contingency-planning procedures;
- GIS software tool information; and
- GIS list of licensees capable of downloading data.

In order to download detailed mapping data, DoITT requires that a properly executed written license agreement be filed with the GIS Unit. In addition to a standard license, DoITT uses a Memorandum of Understanding (MOU) for governmental or business entities when there are elements not covered in the License Agreement, such as mutual sharing of a specific GIS end-product. In order to confirm evidence of proper execution of the License Agreements and MOUs, such as having the names and signatures of all affected parties and the date, we examined a randomly selected mix of 25 licenses and MOUs, which represented 29 percent of the total of 87 that were on file.

In addition, we interviewed members of the GIS Unit to clarify the information DoITT employees provided to us, conducted a walk-through of the DoITT GIS environment to evaluate its controls, and tested the validity of the information supplied to us using independently

gathered information. This independently gathered information concerns various GIS projects, standards, opinions, articles, and miscellaneous information from NYC.gov, and Federal and State websites, specifically pertaining to governmental reports, and public documents from the Internet, such as generally accepted project management practices, regulations, and standards.

Fieldwork also included reviewing pertinent sections of the Fiscal Year 2003 and 2004 management reports provided by the City's external auditors, specifically those sections relating to the City's internal controls at DoITT.

The Comptroller's Internal Control and Accountability Directive #18, "Guidelines for the Management, Protection and Control of Agency Information and Information Processing Systems" (Directive #18), the Department of Investigation's *Citywide Information Security Policy*, and the Department of Investigation's *Information Security Directive* were used as criteria for the audit.

Since the City has no stated guidelines concerning geospatial data, *Geospatial One Stop*, which is one of the Federal Government's Office of Management and Budget's E-Gov initiatives, was used. The goal of this document is to effectively organize, broaden, and accelerate Federal government plans to develop and provide improved access to geospatial data for multiple levels of government and the private sector.

This audit was conducted in accordance with generally accepted government auditing standards (GAGAS) and included tests of the records and other auditing procedures considered necessary. This audit was performed in accordance with the audit responsibilities of the City Comptroller, as set forth in Chapter 5, §93, of the New York City Charter.

Discussion of Audit Results

The matters covered in this report were discussed with DoITT officials during and at the conclusion of this audit. A preliminary draft report was sent to DoITT officials and discussed at an exit conference held on May 11, 2006. On May 15, 2006, we submitted a draft report to DoITT officials with a request for comments. We received a written response from DoITT officials on May 26, 2006. In their response, DoITT officials stated that they believed a set of formal Citywide GIS standards already exists, but agreed to verify the status of each user on its GIS User list.

The full text of DoITT's comments is included as an addendum to this report.

FINDINGS AND RECOMMENDATIONS

DoITT is adequately monitoring and managing Citywide GIS projects. However, a Citywide standard does not exist concerning geospatial data. Consequently, DoITT has been adhering to federal industry-wide “best practices” guidelines as criteria when monitoring the project. In addition, DoITT has adequate security controls in place to ensure that its GIS data is protected from unauthorized access. Further, the GIS environment has developed adequate provisions for regular backup of information, a disaster recovery procedure, and contingency plans.

Although DoITT has adequate security controls, we found one control weakness regarding 177 individuals (including 20 DoITT employees) who have access to the City’s GIS resources. These individuals do not have current authorization to use the system, and their access rights have not been reassessed. DoITT should reassess the status and access rights of these individuals, since some may no longer be employed by the City or they may not be justified in continuing to have access to the system.

These matters are discussed in the following sections of this report.

Need for a City GIS Standard

The City has no stated standards or formal guidelines concerning geospatial data. Standards are essential elements of information-technology hardware, software, and networks. Standards provide benchmarks that can be followed to fully realize the widespread benefits that technological advances are anticipated to deliver. Consequently, DoITT has been operating within the range of best practices, as outlined in *Geospatial One Stop* of the federal Office of Management and Budget. The best practices followed by DoITT include:

- Collaborative development of geospatial databases to help avoid redundancies, minimize costs, and promote GIS project deployment.
- Development of geospatial data standards. The use of *Geospatial One Stop* promotes the use of standards to help increase data sharing and collaboration among GIS users in City government.
- Development of geospatial data portals to provide public access to geospatial data, which promotes increased use of geospatial data and, in the case of the City, increased information delivery to the general public.

DoITT’s GIS efforts impact how it monitors and manages other City agencies’ GIS development. Therefore, DoITT should have its current practices formalized as a Citywide

standard acceptable to the CISAFE Unit of DOI³ or work with CISAFE to develop an effective standard to help guide DoITT and its GIS users.

Recommendation

DoITT should:

1. Work with DOI's CISAFE to develop a set of formal Citywide GIS standards for all users to follow.

DoITT Response: “The audit report mentions the need for citywide standards for GIS. We feel that these standards are available thru our Intranet and implemented for new applications hosted by GIS. Application testing is done by DOITT before launch of any application in our environment.

“Our GIS Intranet site indicates some of the best practices for NYC agency use - <http://gis-prd-ft1.nycnet/nycgis/Transorm.do?t=data&a=12>.”

Auditor Comment: As stated in the report, DoITT should have its *current* practices formalized as a Citywide standard acceptable to DOI as required by Mayoral Directive 81-2, Electronic Data Processing Security issued June 24, 1981. The Directive assigns to DOI the responsibility to establish and approve Citywide standards that ensure the security of the City's electronic data processing systems.

Furthermore, the site for “best practices for NYC agency use,” (<http://gis-prd-ft1.nycnet/nycgis/Transorm.do?t=data&a=12>), mentioned in the response, could not be found on DoITT's Intranet site. We encourage DoITT to correct this error.

Monitoring and Managing Citywide GIS Projects

Overall, we consider DoITT to be carrying out its project management responsibilities. The process of project management involves the following major tasks:

- ***Development process.*** Choosing an appropriate System Development Life Cycle⁴ process.

³ The Citywide Information Security, Architecture, Formulation, and Enforcement (CISAFE) Unit of the New York City Department of Investigation (DOI) is responsible for design and implementation of a system of IT Security for the City and its constituent agencies and the enforcement of secure computing solutions as agencies design and implement systems to create, develop, and enforce consistent and cost-effective security procedures, standards, and controls to ensure the confidentiality, integrity, and controlled accessibility of all electronic information that is processed through the City of New York. The development and assurance of high integrity software is paramount to the overall security of a City agency.

- **Requirements.** Gathering and agreeing on requirements.
- **Design.** Establishing a balanced approach to the design for each project.
- **Testing.** Ensuring that the software is functioning as planned.
- **Quality and defects management.** A plan to identify and correct any defects.
- **Deployment.** Creating a plan to ensure operations are successful.
- **System operations and support**
- **Data migration.** Ensuring the data is accurate and complete when transfer occurs.

DoITT currently monitors and manages 18 GIS projects, of which 10 concern DoITT’s GIS and 8 are projects at other City agencies. DoITT has incorporated all these above-listed aspects of project management in its practice, and actively monitors the projects for any problems. When there are project impediments, DoITT properly documents them providing proposed solutions and specific tasks for appropriate follow-up.

GIS Portal Use Policy and Its Enforcement

DoITT has policies governing the use of its GIS Portal and its resources. It enforces those policies by limiting access only to approved users, and it has adequate security controls in place to ensure that GIS data is protected from unauthorized access. Further, DoITT requires a properly executed and approved License Agreement be filed with the GIS Unit before downloading of information is permitted. However, we did find a legacy issue (i.e., it existed prior to the formal establishment of the GIS Unit) regarding access that should be clarified or removed.

Legacy GIS Users Not Controlled

There are several distinct categories of users of the GIS resources. Table I, following, defines the categories of users:

Table I
Categories of GIS Users

User Category	City Government	State Government	Federal Government	Individual/Business Entity
GIS projects or interests	X	X	X	
GIS application developers	X	X	X	
GIS application developer-vendor				X

Prior to the formation of the GIS Unit, access to the GIS resources were not adequately controlled or monitored. As a result, 177 individuals, including 20 DoITT employees, representing 40 City, State, and quasi-governmental entities were permitted access to the City’s GIS resources. However, DoITT does not know whether any of the 177 users have left

⁴ System Development Life Cycle (SDLC) is the overall process of developing information systems through a multi-step process from investigation of initial requirements through analysis, design, implementation and maintenance.

government employment and therefore the users should have their access deactivated from the system. This situation poses a risk of unauthorized access to GIS resources.

DOI User Account Management Directive §3.6, entitled “Suspension of a User Account,” states: “The security or system administrator may, through either voluntary or directed processes, suspend any user account on the City agency network. Suspension of account privileges must be used for circumstances that are temporary in nature or as a precursor to permanent account termination.”

If an unauthorized person gains access to a City agency computer, the entire network may be compromised. Therefore, to ensure that the City agency systems are safeguarded against unauthorized access, accidental or deliberate interference with operations, or the destruction or unauthorized modification of information, system administrators must review the settings of the user accounts at all levels of system access. The review would help ensure that administrators restrict access to only those individuals who have current authorizations at the appropriate level of access.

Recommendation

DoITT should:

2. Verify the status of each user on its GIS User list and deactivate those who are no longer authorized to access this information.

DoITT Response: “The audit report indicated that DOITT has a control weakness for those individuals who have access to Geographic Information System Resources. We feel that DOITT imposes adequate security controls for those who have access to GIS resources. The federal and state governments, along with vendors with city contracts have access to our GIS Resources and not our Portal. The vendors only receive data via DVD or external hard drive.

“The GIS unit does control the Legacy Portal Users. The 177 names listed by GIS as having access are city employees. When an individual has left City employment and their agency has eliminated their profile, they can no longer gain access to the GIS Intranet or the GIS Portal. We agree that the GIS Portal Access should be monitored on a regular basis. Beginning July 2006 the Assistant Commissioner will contact senior management of each agency on a quarterly basis and let them determine if their employees still require access.”

Auditor Comment: We agree that DoITT should monitor this situation. However, we disagree with DoITT’s intention to delegate its responsibility as custodian of GIS security to other City agencies. The fact that the 177 individuals who at one time had, and may continue to have, access to GIS resources via the Portal without formal approval or license creates a control weakness: if these users have not been suspended, then unauthorized users can still access GIS resources. Further, as custodian of GIS, DoITT

should have contacted senior management of each agency before GIS was made operational (pre-2001) to determine if all employees using GIS were granted formal approval to use the system. .

**GIS Data Backup and Provisions
for Disaster Recovery and Contingency Planning**

DoITT has a comprehensive GIS data backup scheme and a set of established GIS-specific disaster recovery procedures. We reviewed the data backup scheme and the disaster recovery procedures and found the scheme and procedures to be consistent with DoITT's agency-wide overall backup and disaster-recovery program. DoITT's GIS backup procedure and schedule provides for full production system backups done on a nightly basis. Its backup process has built-in backup failure alerts as well as recovery features. DoITT also has specific procedures to follow during disaster-recovery. DoITT last tested its disaster-recovery program on January 3, 2006.

Glossary

Geographic Referencing (Geo-Referencing) is a process of assigning map coordinates to image data to conform to a map grid.

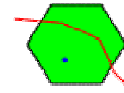
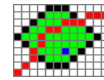
Photogrammetry is the art, science, and technology of obtaining reliable information about physical objects and the environment by recording, measuring, and interpreting photographic images.

Spatial information (data) is central to any GIS. Spatial data is commonly called themes or layers. Data layers within a GIS are considered spatial data because they have been geographically referenced, i.e., data have been linked to geographic coordinates.

- At its simplest, GIS is “mapping,” providing a geographic arrangement of extremely diverse information.
- GIS has been applied in geology, biology, psychology, anthropology, sociology, linguistics, history, political science, economics, and many other fields.

GIS data is any collection of related facts, ranging from raw numbers and measurements to analyzed and organized sets of information. GIS data is commonly organized in one of two forms:

- Raster: Data that is organized in a grid of rows and columns of cells, which might represent photographic or scanned images.
- Vector: Data that represents physical elements such as a geometric shape, including points, lines, and polygons, which might represent buildings, roads, and counties.



Rasters and vectors can have tables of data associated with them, e.g., elevation, population, or financial values.

Such associated data can be used to color a map so that it conveys information with visual impact.

	AREA	PERIMETER	BLOCK	POP_2000
▶	10346168.824	29908.416	1000	70
▶	6895.08	378.319	1001	2
▶	648572.331	3415.719	1002	3
▶	541.585	147.614	1003	0
▶	1524.277	216.038	1004	7
▶	336543.061	2990.08	1005	105
▶	4644070.428	12598.984	1006	87

Basemap is a map showing certain fundamental information used as a base upon which additional data of specialized nature is compiled.

Digital Map is a computer-readable representation of a geographic area that can be displayed or analyzed by a computer.

Intranet is an internal or private network that can only be accessed within the confines of a company, university, or organization. An intranet belongs to an organization and is designed to be accessible only by the organization's members or employees or others with authorization. An intranet's Web site looks and acts just like other Web sites, but has software security surrounding it to fend off unauthorized users. Like the Internet itself, intranets are used to share information.

Portal is a term for a World Wide Web (www) site that proposes to be a major starting site for users when they get connected to the Internet. There are general portals and specialized or niche portals. Some major general portals include Yahoo, Excite, Netscape, Lycos, CNET, and Microsoft Network. Examples of niche portals include Garden.com (for gardeners), health.gov (for health information from the U.S. government), and SearchNetworking.com (for network administrators).



ADDENDUM

THE CITY OF NEW YORK
DEPARTMENT OF INFORMATION TECHNOLOGY & TELECOMMUNICATIONS

Ronald M. Bergmann, Acting Commissioner

May 26, 2006

Honorable John Graham
Deputy Comptroller
Audits, Accountancy & Contracts
1 Centre Street
New York, N.Y. 10007-2341

Re: Draft Audit Report on the Management of The City Geographic Information System and the Monitoring of Its Citywide Projects by the Department of Information Technology and Telecommunications-7A06-066 dated May 15, 2006

Dear Mr. Graham:

The Department of Information Technology and Telecommunications would like to clarify and comment on the above referenced report.

The audit report indicated that DOITT has a control weakness for those individuals who have access to Geographic Information System Resources. We feel that DoITT imposes adequate security controls for those who have access to GIS resources. The federal and state governments, along with vendors with city contracts have access to our GIS Resources and not our Portal. The vendors only receive data via DVD or external hard drive.

The GIS unit does control the Legacy Portal Users. The 177 names listed by GIS as having access are city employees. When an individual has left City employment and their agency has eliminated their profile, they can no longer gain access to the GIS Intranet or the GIS Portal. We agree that the GIS Portal Access should be monitored on a regular basis. Beginning July 2006 the Assistant Commissioner will contact senior management of each agency on a quarterly basis and let them determine if their employees still require access.

Finally, the audit report mentions the need for citywide standards for GIS. We feel that these standards are available thru our Intranet and implemented for new applications hosted by GIS. Application testing is done by DOITT before launch of any application in our environment.

Our GIS Intranet site indicates some of the best practices for NYC agency use- <http://gis-prd-ft1.nycnet/nycgis/Transorm.do?t=data&a=12>.

In conclusion, we appreciate the efforts of the Comptroller's office in reviewing DoITT's management of the City Geographic Information System.

Sincerely,

Handwritten signature of Ronald M. Bergmann.
Ronald M. Bergmann

cc: M. Brown, M. Kaunitz, L. Mercurio, file