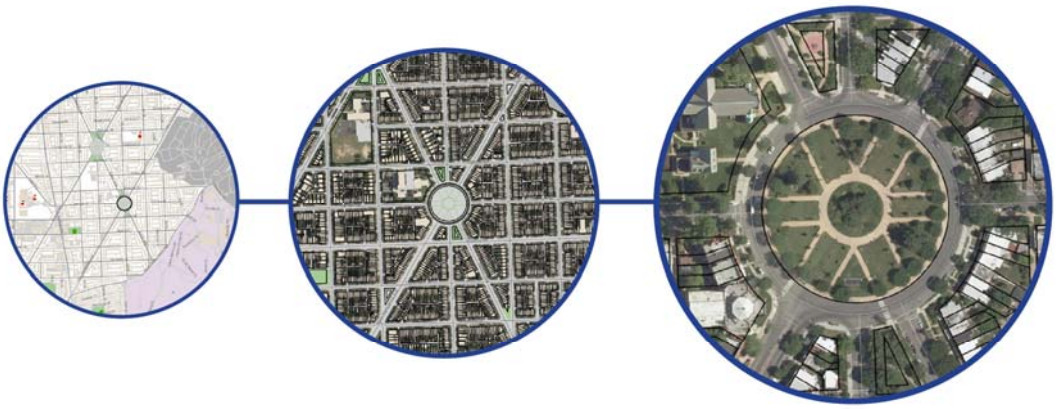
DISTRICT OF COLUMBIA



Business Plan for Data, Applications & Services for DC GIS:

Applying Portfolio Management

FINAL DRAFT

July 2011

PREPARED FOR

PREPARED BY

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Cover image from DC Atlas: Grant Circle, Washington, DC, at three scales -- 1:10,000; 1:4800; and 1:1200.

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EXECUTIVE SUMMARY

This business plan is a follow-on action to the District of Columbia GIS Strategic Plan (January 2009). The goals that are addressed in detail within this business plan were articulated in the strategic plan as part of the overall agenda for DC GIS. The strategic plan resulted in new a new governance structure for the **DC GIS Steering Committee (GISSC)**, including the formation of an Executive Committee to review DC GIS budget plans, and bylaws for how the GISSC conducts business.

This business plan focuses primarily on four strategic areas within DC GIS: **Mapping Data; Geospatial Applications; Web Services; and Customer Service.** Each area comprises a set of platforms and the people and systems that support them. It is intended to inform the DC GIS Steering Committee (GISSC) and OCTO executive leadership in support of the DC GIS governance processes, including the budget meeting, which was called for in the strategic plan to occur in the fall of each year, with a two-year budget outlook. This current plan looks at the fiscal years 2010 and 2011 to establish a baseline for budget planning, and sets expectations for fiscal year 2012. It applies the principles of IT portfolio management to DC GIS programs to classify investments, both current and future, representing a pioneering effort in the application of such techniques to GIS spending. It is anticipated that this plan will be updated and refined on a regular basis.

This Plan uses the conceptual construct of "platform" for organizing program elements and facilitating budget management for DC GIS. The OCTO GIS Group, working within the District's IT ecosystem, is either managing or leveraging a variety of platforms to support the DC GIS mission, customers and stakeholders. **A platform is a base technology (or technologies) on which other technologies, services, or processes are built. In addition, it may be construed as a whole "economic unit" in terms of aggregating budget costs to support it.** As platforms evolve, different investment strategies become more or less relevant, depending on both user demand and the technology life-cycle.

The GISSC formed a **Business Plan Subcommittee** to provide input to this Plan, and focus sessions were held to discuss and analyze the major program areas. Participants are listed in Appendix C (Acknowledgements). Conclusions and recommendations from the Subcommittee for each program area are listed in the section on Implementation. They are summarized, below.

DATA. The DC GIS data collection is world class, and befits the nation's capital city. Over 300 layers are freely accessible and widely utilized in a number of popular formats, reducing duplication of effort, creating

efficiencies, supporting government transparency and openness, and leading to innovation. These include all of the essential framework layers for basemapping, and much more, representing a substantial contribution to the National Spatial Data Infrastructure (NSDI). The DC GIS data is available through the Citywide Data Warehouse (CDW), making it more broadly accessible to non-GIS professionals as well as the traditional GIS stakeholder community.

The job of keeping existing data up-to-date, and acquiring new data, is never done. Given the cyclical nature of data maintenance, spending on data went down between FY 2010 and FY 2011, but is expected to rise again when the next update is required for the planimetric basemap layers, and when new data sources are acquired to support the demand for 3D applications, including 3D buildings and street-level imagery.

APPLICATIONS AND WEB SERVICES. Together, these program elements put data to work in support of business processes and workflow-oriented solutions. Major new initiatives include mapping and planning to support Broadband infrastructure and its utilization in the District to help bridge the digital divide. This will include the implementation of an open source software (OSS) technology stack to support development on GeoServer and PostGIS, leading alternatives to proprietary, license-restricted software from commercial vendors. Another major initiative is the Regional Geospatial Data Exchange project, to support emergency management and homeland security applications in the Metropolitan Washington region.

Fewer desktop applications will be developed going forward, and the shift will continue toward Web applications; and, development is needed to support applications on mobile devices. In addition, OCTO will stay current on Esri and Google products as important platforms for DC GIS development and application support, including the management of the enterprise license agreement (ELA) with Esri. This includes retiring older technology, such as Esri's ArcIMS, while modernizing with more recent products, such as Esri's ArcGIS Server and ArcGIS Online.

The DC GIS Web services are an indication of OCTO's agility in deploying useful platforms that agencies and the public can both take advantage of, readily. This greatly enhances the return on investment in data, by increasing utilization, and putting it to use in problem-solving workflow. The Master Address Repository (MAR) Web service is a true enterprise asset; it is fundamental to all applications requiring an addressable location. There is interest amongst stakeholders on the GISSC to look even more closely at

how addresses are assigned in the District, including the street dedication approval process for roadways in new subdivisions.

CUSTOMER SERVICE. This organizational unit supports all of the DC GIS program areas, providing effective training and support to users of DC GIS data, applications, and Web services. OCTO is managing the use of training credits as part of the available services available under the Esri ELA, to help improve GIS knowledge and utilization, and also provides help desk support for GIS questions and issues.

NON-OCTO GIS RESOURCES. In addition, departments other than OCTO have GIS staff and activities that support the larger GIS community. An example of non-OCTO departmental resources that are accessible to the enterprise are the Office of Planning "Map Requests" and "Property Quest" offerings.

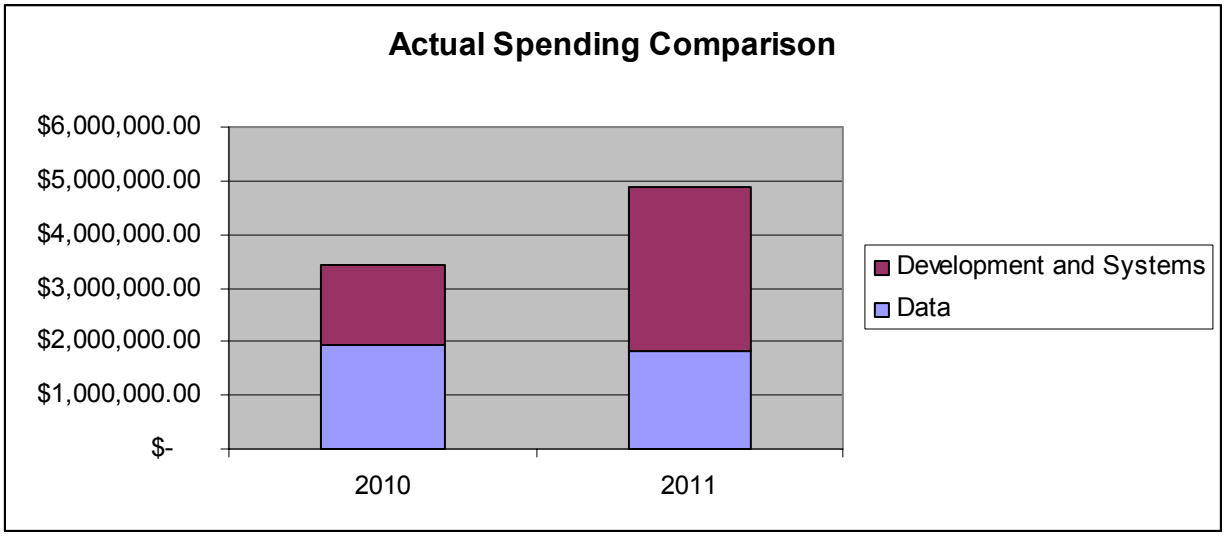
Going forward, these can be factored into business planning more rigorously in terms of overall portfolio management and a comprehensive services catalog. In the meantime, the business plan is weighted toward the allocation of OCTO GIS Group resources and activities to support the DC GIS stakeholder community.

OCTO GIS BUDGET ALLOCATION. The following table is an approximate budget breakdown, whereby OCTO GIS budget dollars are allocated to major program groupings. Across all of these groupings, people comprise a substantial portion of all costs. When emphasis is shifted across programs, it impacts where people spend their time; and also, it reflects the cyclical nature of data maintenance, whereby years when new photogrammetry is needed result in a greater percentage of costs allocated to data investments.

BUDGET ALLOCATION BY PROGRAM ELEMENT			
PROGRAM ELEMENT	**2010 Actual**	**2011 Actual**	**2012 Planned**
Data	$1.9 m	$1.8 m	**$1.9 m**
Development and Systems	$1.5 m	$3.1 m	**$1.4m**
Total	**$3.4 m**	**$4.9 m**	**$3.3 m**

As a baseline for DC GIS business planning, the OCTO GIS budget in 2010 was approximately $3.4 million, and it increased in 2011 to almost $4.9 million, even though the OCTO contribution declined. In 2011, OCTO GIS was fortunate to receive an increased amount of grant funding from external sources, including: the American Recovery and Reinvestment Act (ARRA); the Federal Geographic Data Committee (FGDC) Cooperative Agreement Program (CAP); and the Department of Homeland Security's

(DHS) Urban Areas Security Initiatives (UASI). This grant funding substantially helped to offset a decline in capital funding, which is expected to continue to decline for the next several years, and resulted in an overall increase in available funds. **The projected budget for FY 2012 is approximately $3.3 million**, slightly below the spending level in 2010, and significantly less than spending in FY 2011. Below is a bar chart comparing actual spending for 2010 and 2011. **Planned amounts for FY 2012 will be similar to 2010.**



Unlike a conventional IT plan that considers the cost of building a particular application, DC GIS often considers the cost of building a data set or a service that can be consumed by multiple applications. Any one investment decision is likely to support multiple end users. If these invest decisions are made wisely, the application development costs drop considerably.

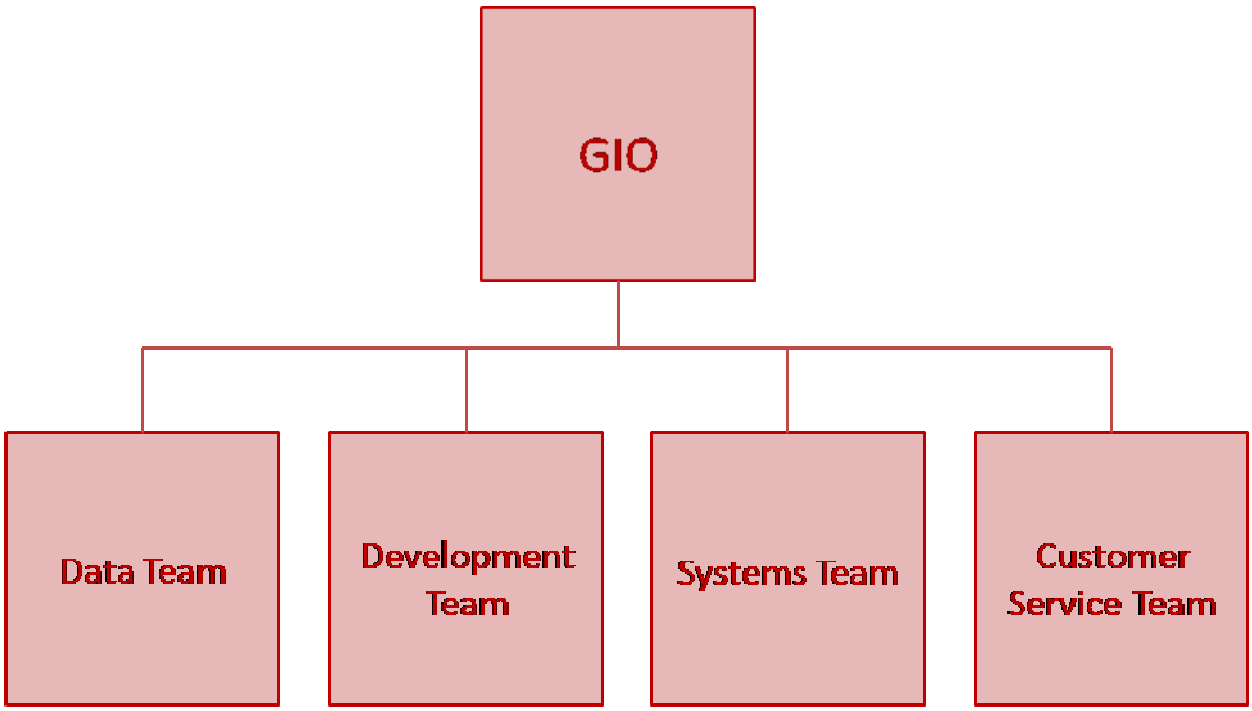
This plan will present the business aspects the overall DC GIS program areas for Mapping Data, Geospatial Applications, Web Services, and Customer Service, as well as the underlying system platforms that are part of the DC GIS infrastructure. For different views of the budget, customer service is included across all areas; mapping data is viewed as a major subdivision called “Data”; and geospatial applications , Web services, and software systems are sometimes combined as “Development & Systems” as in the bar chart, above. The intent of the plan is to provide both a baseline of information and an **actionable blueprint for DC GIS** to follow in order to achieve its goals under the Mayor’s priorities.

1 OCTO GIS PROGRAM TEAMS & DC GIS GOALS

The DC GIS Program comprises stakeholders from both inside and outside DC government, but governance is a function of agency membership on the GIS Steering Committee (GISSC), which is chaired by OCTO. The OCTO GIS Group is organized into four main program teams, focused on achieving the goals of the DC GIS Strategic Plan (2009). The program teams and the goals are described in the following sections.

1.1 PROGRAM TEAMS

The four program teams for organizational purposes include: Mapping, Development, Systems, and Customer Service. They are briefly described after the organizational chart, below.



Mapping Team

- ★ Mapping data is central to the OCTO GIS Group's service-oriented mission.
- ★ OCTO provides acquisition, maintenance, and quality control of layers and associated metadata that serve multiple agencies, and operates the central data repository for discovery, publishing, and distribution of all District government layers.

- Importantly, some of these layers are contributed by non-OCTO departments, and some are contributed by OCTO, directly.
- There are over 300 data layers made accessible by DC GIS have been grouped for management and budgeting purposes into the following mapping data platforms.

Development Team

- Develops and customizes applications and Web services based Commercial Off-The-Shelf (COTS) and Open Source platforms on behalf of OCTO and other DC agencies.
- Responsible for the full application development life cycle from requirements gathering to maintenance and sun setting.
- Responsible for oversight of contractor development activity.

Systems Team

- Supports the software and hardware infrastructure upon which DC GIS operates.
- Includes specialists in database administration, systems architecture, and systems administration with an emphasis on geospatial tools.
- Coordinates with other systems people within OCTO on networking and shared resources.

Customer Service Team

- OCTO is committed to offering quality GIS customer services with people and processes
- There is a customer service team dedicated to GIS information dissemination, communications, training, and technical support.
- The current configuration of the OCTO GIS Customer Service organization includes the following program elements: Education; General Consulting; Technical Services; Outreach.

1.2 PROGRAM GOALS & SUCCESS FACTORS

The Business Plan is a follow-on action to the District of Columbia GIS Strategic Plan (January 2009), and is focused on the following programmatic goals, which were specified in the Strategic Plan in 2009:

- Develop and operate enterprise mapping data, geospatial applications, and Web services that **enhance the utility, reduce the cost, and expand the interoperability** of citywide and agency IT systems
- Provide outstanding customer service and training that enables DC GIS users and stakeholders to **leverage the full power of GIS technology**

These goals are two of six programmatic goals ("Goal 2" and "Goal 3") articulated in the GIS Strategic Plan to sustain and enhance the overall DC GIS program. The following table enumerates specific, goal-oriented factors that will be used to measure the progress and success of programmatic goal implementation.

OVERALL PROGRAM GOALS AND SUCCESS FACTORS	
Program Goal →	**Develop and operate enterprise mapping data, geospatial applications, and Web services that enhance the utility, reduce the cost, and expand the interoperability of citywide and agency IT systems.** ("Goal 2" in DC GIS Strategic Plan, January 2009)
Mapping Data	
Success Factor 1:	Develop and maintain comprehensive mapping data programs. Ensure the availability and currency of core datasets on a regular planned schedule, including the following examples: a. Vector Property Map (VPM) b. Master Address Repository (MAR) c. Photogrammetric data such as streets, building footprints, elevation, and imagery d. Agency originated layers such as administrative boundaries and zoning
Success Factor 2:	Maintain and expand the one-stop shop of current, accurate, and documented DC geospatial data. Continue to implement the DC GIS Federated Geospatial Data Model (FGDM) approach; adopt clear criteria to determine whether any dataset poses an unacceptable privacy or security risk
Success Factor 3:	Adopt a standard for feature-level metadata. Require such metadata for geospatial data sets, and provide tools to create and manage it
Success Factor 4	Add underground utilities data as feasible. Work with DDOT, WASA, and utility companies to develop and maintain this data, seeking FOIA exemption to protect critical infrastructure security concerns.
Geospatial Applications & Web Services (aka Development & Systems)	
Success Factor 5:	Develop and deploy high-demand applications for internal professional and external public use cases. Offer a DC Intranet version of Google Earth that combines the richness of DC GIS data with the ease of use of Google (for DC Government use only, due to licensing constraints in the Intranet case for Google); assess application demand for citywide deployments, agency clusters, and functional areas
Success Factor 6:	Continue the development and deployment of Web services. Support integration of DC GIS services into departmental business processes, such as permitting and customer/citizen relationship management, as well as public needs, with accessible Web services
Success Factor 7:	Deploy mobile device applications. Provide support for DC First Responders (FRs) mobile requirements
Success Factor 8:	Make it easier for non-GIS users to contribute spatially-oriented data. For example, deploy a Web-based version of the MAR batch geocoder that works with Microsoft Excel and Google Docs
Success Factor 9:	Improve business processes with the use of GIS. Support integration of geospatial data in workflow-oriented application solutions
Success Factor 10:	Achieve a greater degree of uniformity and usability by improving consistency in DC Government's many interfaces a. Develop a standard look-and-feel

OVERALL PROGRAM GOALS AND SUCCESS FACTORS	
	b. Implement the new standard as mapping websites are built going forward
Program Goal →	**Provide outstanding customer service and training that enables DC GIS users and stakeholders to leverage the full power of GIS technology** ("Goal 3" in DC GIS Strategic Plan, January 2009)
Customer Support Services	
Success Factor 10:	Train GIS users a. Add entry-level course for using Google Earth b. Continue other aspects of the DC GIS Training Program c. Provide "executive-friendly" training
Success Factor 11:	Provide technical support (Tier II -- help desk) and consulting. Deliver Tier II help desk support.
Success Factor 12:	Expand penetration of GIS to where it is not utilized; prioritize one cluster of departments per year that could benefit from the use of GIS in their business processes and mission activities

2 PROGRAM JUSTIFICATION

The need to better quantify program benefits and value is recognized as an important requirement for justifying the DC GIS program going forward. It is easier to quantify the program costs as compared to the benefits, which would go beyond the scope of this immediate project. This plan achieves an important first by openly presenting the costs of the DC GIS program in terms of OCTO's budget; but DC GIS is more than OCTO-only investments. Agencies contribute data and applications to the greater DC GIS community of users, coordinated and facilitated by the OCTO GIS group. The list of data layers in the Appendix of this plan helps to distinguish between DC GIS data that is from OCTO as compared to contributed by agencies. In addition to the data, there are applications, Web services, systems, and customer service provided by OCTO. Justifications for the ongoing support of the DC GIS program include:

- Continued demand for current, spatially accurate geographic data for the District
- Increased implementation of custom GIS applications to deliver geospatial services to District customers
- Success of Web services as an accessible platform for application development
- Administrative priorities for measurable outcomes and transparency in DC government
- Strong governance with stakeholder input and support c/o the DC GIS Steering Committee, a multi-agency body formed by Mayoral Executive Order
- Perception of shared value with citizens, government, and business interests in the District

2.1 BENEFITS AND VALUE GENERATING QUALITIES

A primary benefit of the DC GIS program overall is that it makes information and analytical capabilities more accessible to both citizens and District employees, in the spirit of transparency and government accountability. Collectively, the DC GIS program areas:

- Add value to District government operations (e.g. time and money savings by minimizing duplication of effort)
- Promote quality of life and economic progress in the District (e.g.in better decisions based on accessible and timely data)
- Build trust and understanding (e.g. by bringing transparency to how resources are distributed and utilized in the District, geographically)

The following matrix describes the types of outcomes expected to accrue from executing this Plan. Each of the featured DC GIS program areas – Mapping Data, Geospatial Applications, Web Services, and Customer Service – is listed on the left, and the desired outcomes are described in terms of the following asset classes: Innovation, Information Utility, Economy, and Infrastructure. These desired outcomes are directly congruent with goals and success factors described in the Strategic Plan, relative to the DC GIS program areas as well as its overall mission.

PROGRAM VALUE MATRIX

VALUE GENERATING QUALITIES				
PROGRAM AREAS (BELOW)	**Innovation**	**Information Utility**	**Economy**	**Infrastructure**
Mapping Data	Investigate and apply new data acquisition methodologies to keep DC GIS data as accurate and current as it should be	Provide user community with enhanced geospatial intelligence for improved decision-making, transparency, and superior quality data products	Reduce unnecessary redundancy, conflict, and duplicate spending in data creation and maintenance efforts	Produce a common operating basemap across District IT systems (*)
Geospatial Applications	Expand and enhance application platforms to avoid vendor lock-in and preserve openness and encourage innovation	Leverage untapped spatial data in existing business systems	Automate and streamline business processes to make DC government more efficient	Expose business information across the enterprise through spatial and map-centric reporting for intra-agency benefit
Web Services	Create enterprise assets that can be accessed widely via open Web services for data and applications	Exploit the web and its protocols to facilitate integration of mapping into existing systems	Deploy free, re-usable functionality to the development community to increase efficiency in application development efforts	Offer a standardized development platform to deliver consistent GIS functionality across disparate District IT systems

VALUE GENERATING QUALITIES				
PROGRAM AREAS (BELOW)	**Innovation**	**Information Utility**	**Economy**	**Infrastructure**
Customer Service	Apply modern methods to information exchange and knowledge development	Provide training and support to expand and enhance the utilization of geospatial information	Minimize wasteful 'futzing' around by users by providing a resource for answering GIS questions	Promote best practices for consistent and productive application of geospatial data and technology

(*) NOTE: Achieve compatibility with commercial systems, so that (for example) it is easy for a 'Google' developer to add the DC basemap to his/her application.

2.2 RETURN ON INVESTMENT AND SHARED VALUE

RETURN ON INVESTMENT (ROI). The value generating qualities presented in the matrix, above, are key contributors to ROI. The largest ROI is achieved when geospatial assets are utilized as much as possible, for expected activities with direct benefits, and unanticipated uses and indirect benefits. This is true for DC Government agency usage as well as the general public and private sector usage. Freely distributing data, applications, and services – which is the current and historic practice for DC GIS -- achieves efficiency of distribution and maximizes return on investment, with the following characteristics:

- ★ Rational utility maximization (users who want it can have it – demand is satisfied)
- ★ No perverse outcomes (unintended consequences of charging for public data such as demand rationing or double-charging)
- ★ Lower marginal costs (no added costs of administration for delivery and billing)
- ★ Innovation is fueled (no restrictions on use)
- ★ Transparency and integrity in government are encouraged (facilitated access to open records)

CREATING SHARED VALUE: The concept of shared value *"involves creating economic value in a way that also creates value for society by addressing needs and challenges."* [1] Michael Porter, who has written extensively on the value chain and global competition over the past 30 years, wrote an article about this topic that was published at about the same time as the annual meeting of the World Economic Forum in Davos, Switzerland, during January 2011. It is a concept that is highly congruent with the operating

[1] Kramer & Porter, "The Big Idea: Creating Shared Value," Harvard Business Review, Jan-Feb 2011

philosophy of the DC GIS program, which is why it is mentioned in this context. DC GIS is more than just OCTO's GIS program – it is DC Government-wide, and more. OCTO is the custodian of a very important social compact when it comes to GIS, and has achieved a distinctive stakeholder-embraced approach for its GIS governance, stewardship, and value-added.

Throughout the recent business planning process there was acclaim from outside of OCTO for the value of the program to users from many sectors, including:

- Specific agencies within DC Government
- Other government entities in Metro DC region
- The DC citizens
- The public at-large
- Businesses

In general, MAR is widely leveraged as a Web service to support a myriad of applications, both internal and external to DC Government, as is DC GIS basemap data. For example, **Google** uses DC GIS data in its widely available Google Maps and Google Earth applications. **DDOT** uses the DC GIS Master Address Repository (MAR) Web service in its popular and modern Transportation Online Permitting System (TOPS); and DDOT's Cityworks application leverages DC GIS data, too. **WASA** leverages the impervious surface data captured from DC GIS imagery, and uses it to calculate fees that are collected through billing for water and stormwater services. The **Office of Planning** uses DC GIS data for visualization and "what if" planning scenarios and as a component of its widely accessed "Property Quest" application; and, OOP considers DC GIS data to be essential for DC getting its fair share of Census-related funding. The DC **DPW** depends on DC GIS data for mapping and routing related to street sweeping and ticketing. And the **DCRA** Zoning Map and associated business processes rely on DC GIS data, and in turn, become part of what others can use, too. Another example is the DC 311 Online City Service Requests (CSR) application via the **Mayor's Office**, which uses the DC GIS MAR Web service.

Other noteworthy applications using and benefitting from DC GIS data and services include:

- Redistricting
- Broadband mapping and planning
- Regional geospatial data exchange
- Emergency management and public safety

3 KEY TECHNOLOGY TRENDS

Technology continues to evolve, and keeping up with it is an essential part of keeping DC GIS modern, relevant, and valuable to the growing user community. Expectations are high for a diversity of platforms and ways to deliver data to both end-users and applications developers. Below is a description of some of the major technology environments.

3.1 THE GOOGLE PHENOMENON

Google Maps and Google Earth have become ubiquitous in popular culture, with huge numbers of citizens using these platforms. DC GIS was an early adopter of these platforms, and continues to integrate and work with Google technology to improve services. As platforms, Google Maps and Google Earth will remain attractive for continued investment.

The District of Columbia's comprehensive geospatial data warehouse is now available within Google, Inc's visualization software, Google Earth. The familiar interface enables users of any technical sophistication level to use publicly available DC GIS data. There are over 300 geospatial layers available from the DC GIS Data Clearinghouse/Catalog. Users may select the Google download option to save or open KML data directly in Google Earth. Also, there will be a new Application Programming Interface (API) for Google Earth, to more easily allow non-GIS programmers to add DC GIS data layers to directly to their applications. Currently, approximately 300 KMZ layer files are now available to DC GIS users, making it easier to display large data sets, such as District-wide property parcels.

3.2 THE CONTINUED IMPORTANCE OF ESRI PRODUCTS

The professional GIS community has been a long-term consumer of products from Esri, a leading manufacturer of geospatial software. This is the case within DC GIS, and across the GISSC constituency. While less popular with the public-at-large, Esri products provide GIS professionals with in-depth capabilities for developing, managing, and analyzing geospatial data. This will continue to be the case for the foreseeable future, even though older generations of Esri products (i.e. ArcIMS) are being gradually retired as platforms.

The DC **Esri Enterprise License Agreement (ELA)** gives broad access to geographic information systems (GIS) software and support to District government. The distribution of Esri software products and

governance of the ELA is coordinated by OCTO. The ELA is in effect for fiscal year 2011, with options to extend into fiscal years 2012 and 2013. Eligible DC government organizations which may gain access to the benefits of the ELA are:

- District of Columbia Government agencies
- Commercial contractors doing work on behalf of the District of Columbia Government

3.3 OPEN SOURCE ALTERNATIVES COME OF AGE FOR GIS

There are proven alternatives for most GIS needs from the open source software (OSS) community. These OSS alternatives are viable substitutes for proprietary, licensed products and may create a business need for product manufacturers to reduce prices and improve functionality due to competition from OSS. The National Broadband Map is deployed using OSS, as are many successful and innovative geospatial websites around the world. Even the market leading GIS product manufacturer, Esri, is committed to supporting open source technology with their products, such as the Linux operating system, the Apache Web server, the GDAL graphics library, and now PostgreSQL databases. As a strategic initiative, DC will launch its new Internet Web Map Application for broadband data on an OSS stack using GeoServer and PostGIS in 2011.

GeoServer is open source software that allows users to share and edit geospatial data. Designed for interoperability, it publishes data from any major spatial data source using open standards, and can connect to existing information in Esri, Google Earth, Google Maps, and Bing Maps. It is considered the reference implementation of the Open Geospatial Consortium (OGC) Web Feature Service (WFS) standard, and also implements the Web Map Service (WMS) and Web Coverage Service (WCS) specifications. **PostGIS** is an open source software program that adds support for geographic objects to the PostgreSQL object-relational database, using the Simple Features for SQL specification from the Open Geospatial Consortium (OGC). GeoServer and PostGIS are part of the OSS stack supported by Open Geo. **OpenGeo** is the geospatial division of OpenPlans, a 501(c)(3) not-for-profit focused on open government and livable streets.

4 APPLYING PORTFOLIO MANAGEMENT

OCTO embarked on a pioneering effort to apply portfolio management to geospatial assets for the DC GIS Program. As a management approach, it is better known in IT circles, but still not widely applied. Methodology was reviewed and then tailored to the DC GIS situation. Some key considerations and applications are described, below.

4.1 PLATFORM DEFINITION AND CHARACTERISTICS

The first step in applying portfolio management is to define the platforms that are being managed. DC GIS, working within the District's IT ecosystem, is either managing or leveraging a variety of platforms to support its mission and its customers. The following definition of platform is adapted to fit the DC GIS portfolio management and business planning needs.

PLATFORM DEFINITION

> **A platform is a base technology (or technologies) on which other technologies, services, or processes are built. In addition, it may be construed as a whole "economic unit" in terms of aggregating budget costs to support it.**

Thus platform is the unit at which an economic decision to invest, maintain, or divest can be made. This plan divides platforms into groups related to major DC GIS program elements, including data, applications, and Web services. As platforms evolve, different investment strategies become more or less relevant, depending on both user demand and the technology life-cycle. Below are some important platform characteristics:

PLATFORM CHARACTERISTICS

- The cost of one platform may increase overtime while another one decreases
- One platform may cost more than another
- Platforms can be analyzed in isolation or as part of a portfolio
- Future alternatives will arise and be different than today's alternatives
- The expected utility and business value of platforms will differ
- Any one application can depend on multiple platforms

4.2 ASSET CLASSES AND INVESTMENT STRATEGIES

Managing GIS technology investments in the District involves the alignment and balancing of OCTO's priorities and citywide responsibilities with the needs of many departments and the citizens of the District. When it comes to GIS, these needs are diverse and dynamic. The OCTO GIS Group regularly demonstrates agility and responsiveness to meet this challenge, and has built a large portfolio of GIS applications and Web services to serve its constituents. Borrowed from managerial finance, the term "portfolio" is classically defined as: "*A combination of assets to reduce risk through diversification*." For the DC GIS context, it is considered to be a set of geospatial assets for managing investment decisions based on different strategic objectives.

ASSET CLASSES

This Plan will begin to classify DC GIS assets in accordance with IT Portfolio Management best practices, including the classes depicted in the table, below[2]:

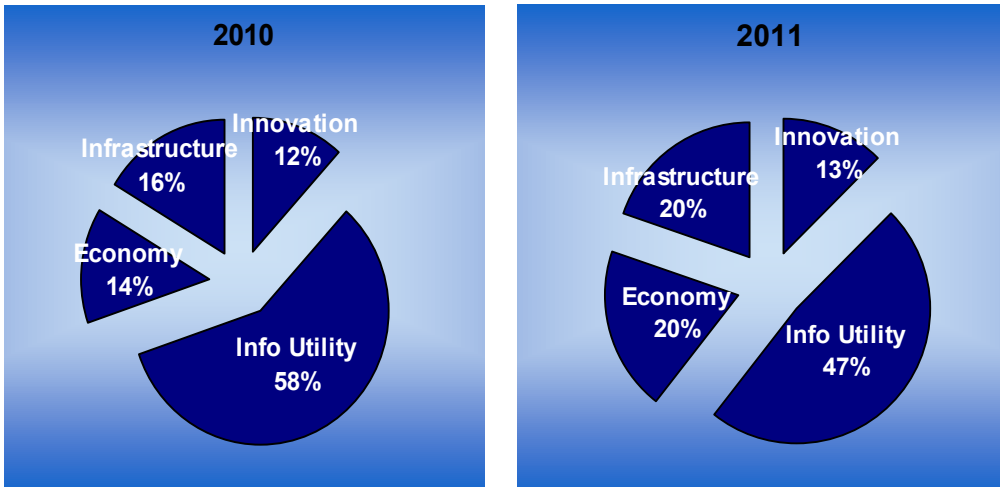
ASSET CLASS	STRATEGIC OBJECTIVE	CLASSIFICATION CRITERIA
Innovation	Achieve progress and modernization by leveraging the full power of GIS	▪ Long lead time ▪ Will achieve modernization and higher productivity ▪ Considered essential to the vitality of the enterprise
Information Utility	Provide better information	▪ Better information delivery – Improved quality – Better integration ▪ High business value (responsive to departmental and citizen needs)
Economy	Reduce cost of business	▪ Reduces cost of doing business ▪ Increases throughput (faster results)
Infrastructure	Provide shared base capability and expand interoperability	▪ Provides shared base capability ▪ Enables faster deployment of applications ▪ Easier integration with business processes ▪ Supports standardization and interoperability

These classes provide another lens through which to look at and categorize the DC GIS portfolio of investments. Applying the abovementioned classification criteria to OCTO's GIS portfolio is not an exact

[2] Derived from Weill and Broadbent, "Leveraging the New Infrastructure: How Market Leaders Capitalize on IT," Harvard Business School Press, 1998. The classes and objectives have been modified to fit the DC GIS technology ecosystem and operating environment.

science; but, it results in a considered view that can be the basis of future investment strategy. This methodology was applied during the current planning process, and spending allocation by asset class for 2010 and 2011 is shown in the following pie charts.

OCTO GIS Investments by Asset Class for 2010 and 2011:



For the upcoming FY 2012, it is generally expected that the split by asset class will be more similar to 2010 than 2011, due to the lower projected budget for FY2012. Given the robust budget for FY2011 courtesy of supplemental grant funding, there was the opportunity to invest proportionally higher amounts into Infrastructure and Economy, while maintaining comparable dollar investments for Innovation and Information Utility from year to year (even if the percentages were different as a function of the total available budget).

Some additional basic considerations that relate to portfolio management – i.e. investment strategies – are described in the following section.

INVESTMENT STRATEGIES. A repeatable planning process is needed to periodically assess GIS investments, to help determine customer satisfaction and performance improvements, and to make sure that business value is being delivered to the DC Government as an enterprise. The OCTO GIS Group has established a precedent for periodically reporting on noteworthy GIS project spending at regular GISSC meetings, but executive leadership has not always participated; and assessment of both risk and return on investment, whether qualitative or quantitative, has not been formal.

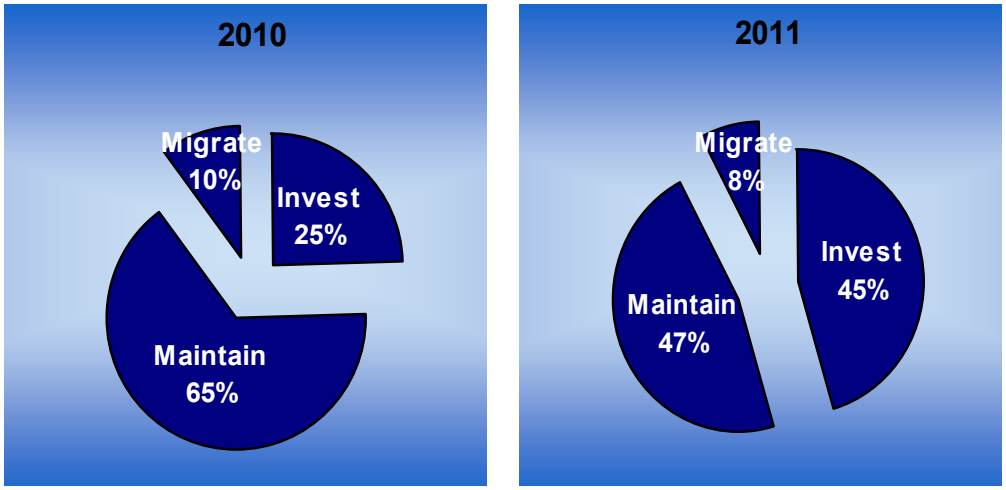
As a step toward a more formal and business-like approach, a **DC GIS Budget Meeting** was instituted as recommended in the DC GIS Strategic Plan, to convene the GISSC Executive Committee to review investment decisions and priorities. The purpose of the meeting is for executive leadership to review overall DC GIS investment plans, and to share and discuss information about departmental investments in the utilization of GIS. This will help the District at-large assess how much spending on GIS is being done throughout the enterprise, and ensure alignment with strategic goals and District priorities.

Platforms (and projects), depending on life-cycle management considerations, have different associated investment strategies, as follows:

INVESTMENT STRATEGY	DESCRIPTION
Invest	Build or enhance; develop new capabilities
Maintain	Provide basic support; hold steady and keep the status quo; version upgrades only; no active development of new capabilities
Migrate	Move or 'reinvent' onto a new or different platform
Sunset	Set expectations for shutting-off spending at some point, completely; the path to retirement
Divest	Shut-off spending and "kill;" discontinue all spending and support

The following pie charts show how OCTO's DC GIS budget was allocated by investment strategy. The 2011 strategies were developed with input from the GISSC Executive Committee, as recommended in the DC GIS Strategic Plan of 2009.

OCTO GIS Budget by Investment Strategy for 2010 and 2011:



The increase in the "Invest" category in 2011 reflects the availability of additional funding to spend on new initiatives, primarily related to geospatial assets devoted to Economy and Infrastructure, as mentioned previously in terms of asset classes. However, in FY 2012, it is expected that the percentage of spending to "Maintain" geospatial assets will be more similar to 2010, when an update to photogrammetric basemap layers was accomplished.

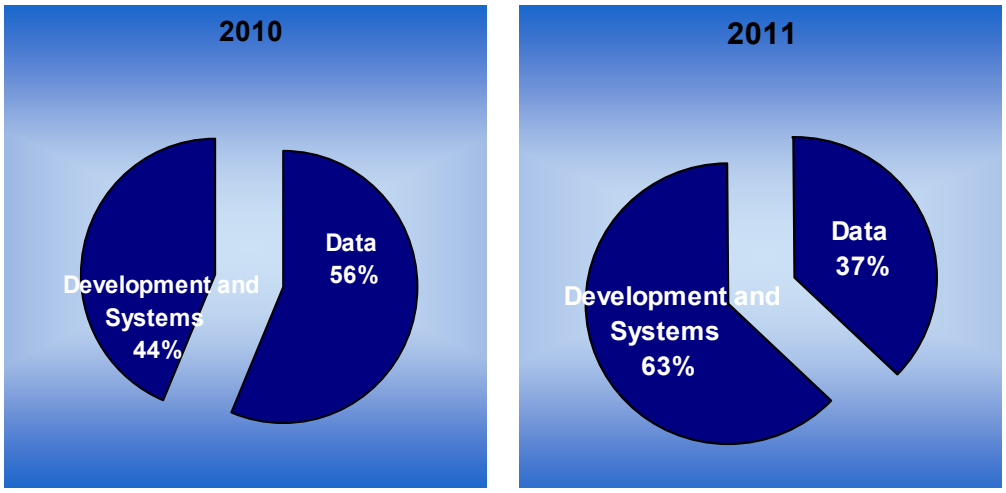
5 DC GIS PLATFORMS BY PROGRAM AREA AND ORGANIZATIONAL COMPONENT

The following program areas and organizational components will be elaborated upon in this section. These are the logical groupings for which OCTO provides resources to support the overall DC GIS Program for the benefit of all stakeholders.

- Mapping Data
- Geospatial Applications
- Web Services
- Software Systems
- Customer Service

The following pie charts graphically depict the budget allocation for "Data" as compared to "Development and Systems." While the dollars increased overall between 2010 and 2011, the percentage spent on the data program element declined. However, in actual dollar terms, the amount spent on data declined only slightly between 2010 and 2011, by about $110,000 or approximately 6% fewer dollars spent on data in 2011 compared to 2010. The FY 2012 budget is expected to be slightly less than the 2010 funding level, with a similar percentage split between "Data" and "Development and Systems."

OCTO GIS Budget for Data vs. Development & Systems:



Updating data represents a recurring cost for the DC GIS program, as does modernizing applications and systems used to support the program and its services. In some years, increased amounts are needed largely due to the normal cyclical requirements for new aerial photography and photogrammetry to update DC GIS basemap data.

5.1 MAPPING DATA

The topic of mapping data is central to the OCTO GIS Group's service-oriented mission. OCTO provides acquisition, maintenance, and quality control of layers and associated metadata that serve multiple agencies, and operates the central data repository for discovery, publishing, and distribution of all District government layers. Importantly, some of these layers are contributed by non-OCTO departments, and some are contributed by OCTO, directly.

There are **over 300 data layers** made accessible by DC GIS have been grouped for management and budgeting purposes into the following mapping data platforms.

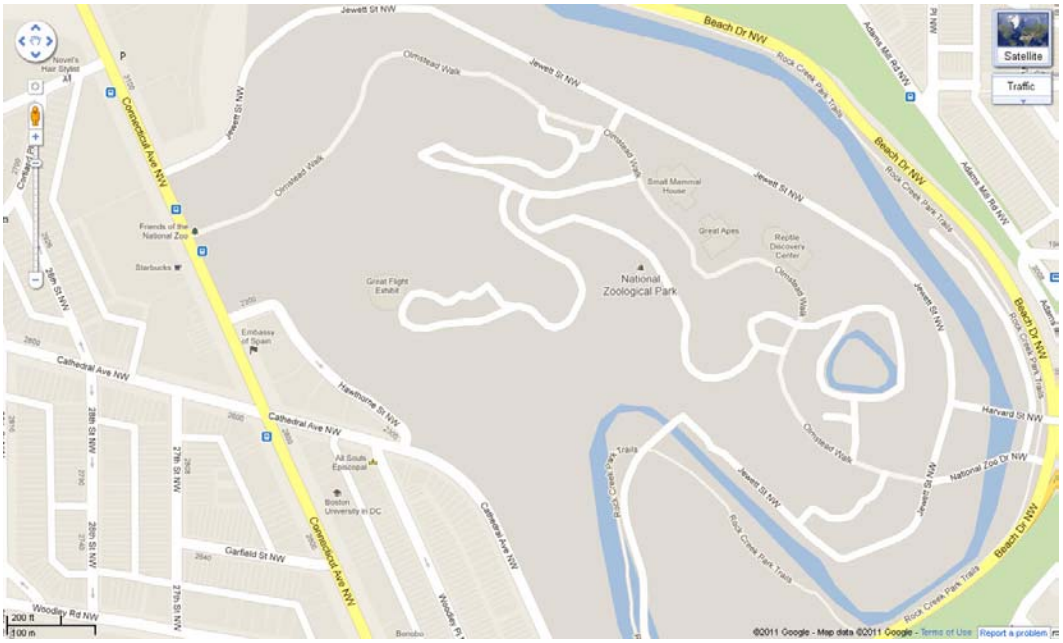
DATA PLATFORMS	
1) Photogrammetric *(Orthoimages, Planimetrics, Impervious Surfaces, Elevation)*	13) Partner Data (e.g. Federal Government)
2) 3D Buildings	14) Addresses (MAR, Location)
3) Property *(VPM, MAR, ROW, Survey)*	15) Agency Layers
4) Demographics	a) Administrative and Other Boundaries
5) Ground Imagery	b) Cultural and Society
6) Transportation (OCTO)	c) Education
7) Routing *(Pedestrian, Vehicular, Mass Transit)*	d) Environment
8) Aerial Oblique Imagery	e) Facility and Structure
9) Business Data	f) Historic
10) LiDAR	g) Zoning (Closely related to Property)
11) Regional Data	h) Planning (Closely related to Property)
12) Dynamic Data	i) Utilities Data
	j) Transportation (DDOT)

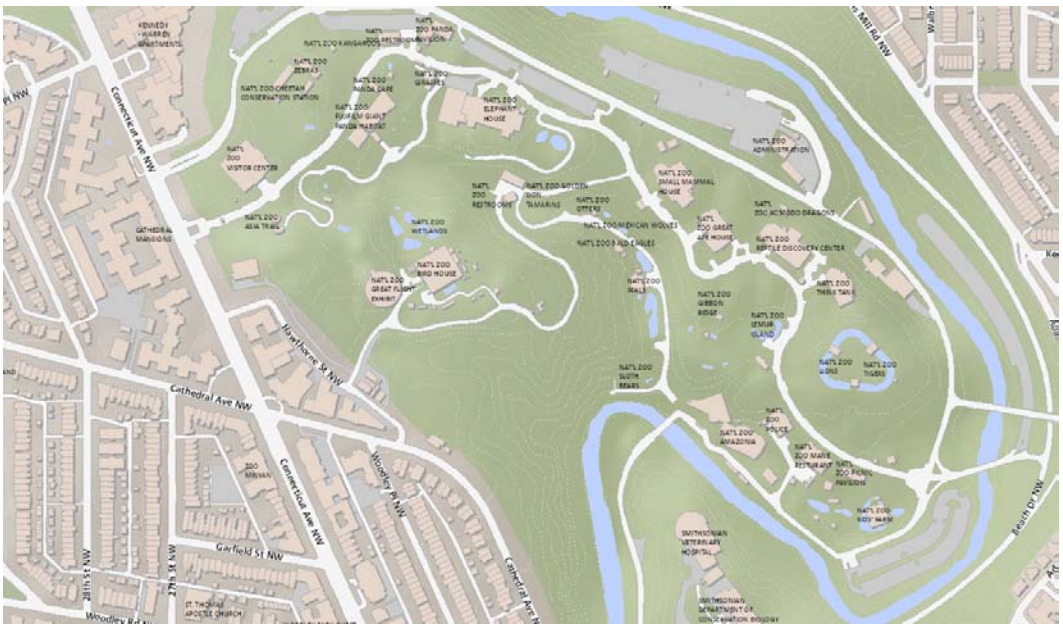
In the Appendix, the list of data layers accessible from DC GIS is grouped by platform category. The following sections cover data layers that are particularly important to DC GIS's stakeholder community as **essential platform data** because they are used throughout the DC GIS Enterprise as core geographic content for many applied scenarios. These platforms include:

- ★ Property
- ★ Photogrammetric

Also included under the overall heading of “Mapping Data” are sections on topics that may apply to multiple platform categories, and that are therefore, **cross-platform** in nature. These sections include:

- Agency-originated Data
- Citywide Data Warehouse (CDW)
- Standards





Above is a comparison of the cartography typical of Google Maps (top) as compared to the DC GIS basemap (bottom). The area shown is for the National Zoo. Image Source: OCTO

5.1.1 Property (VPM, MAR, Zoning, Planning, ROW, Survey)

VECTOR PROPERTY MAP (VPM). In the late 1990's the District georeferenced all tax maps. OTR then created a layer called "OwnerPoints" which were centroids of property tagged with tax information. Aside from these two datalayers, the bulk of the DC land records database was on paper.

In 2004 OCTO initiated an effort to automate all property in the district. This effort was undertaken with two primary goals:

- Support and improve the daily business processes of the DC agencies that originate and manage land records in the District of Columbia.
- Provide important GIS base layers that will be used extensively by many DC government agencies and private companies.

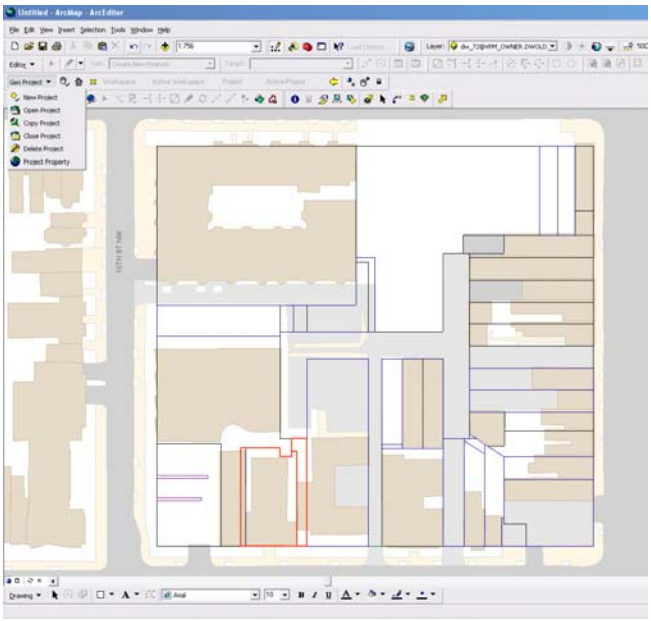
The Vector Property data was developed with the oversight of the Office of Chief Technology Officer (OCTO), DC GIS, Department of Consumer of Regulatory Affairs (DCRA); Office of the Surveyor (OS); and Office of Tax and Revenue (OTR), Real Property Tax Administration (RPTA).

DATA LAYERS CONTAINED IN THE VPM	
Squares	Parcels
Record Lots	Reservations
Tax Lots	Appropriations
Condo Lots table	Alleys
Air Rights Lots	Building Restriction Lines

Currently, OCTO functions as a data management and support resource for the VPM. GIS data origination is conducted by the Office of Tax and Revenue, Maps and Titles division of the Real Property Tax Administration, but OCTO conducts GIS quality assurance and checking, and data dissemination. OCTO has created the VPM Maintenance Application (MA) to facilitate their efforts. Current OCTO efforts emphasize resolution and research of additional properties such as public lands, as well as GIS user and technical support.

The VPM has logical and physical database design models, with topology, feature classes, object classes and attribution. It also stores historical information about the how land has changed over time,

beginning in 2005. For example, if a parcel is subdivided, the original lot lines and polygons are retained along with a parcel "retirement" date stamp.



Screenshot of VPM data.
Image source: OCTO/OTR/DCRA

The VPM contains approximately 140,000 taxable parcel features, and 60,000 additional condo records. These parcels were automated using coordinate geometry ("COGO"). Relative positional accuracy of features in the VPM is quite high, however city squares are not tied down and therefore the absolute position of the dataset is less than the high accuracy photogrammetric data.

The VPM is maintained through a custom ArcGIS Application. Soon, OCTO will release an ArcGIS Server 9.3.1 application for VPM "look ups" using the property web service and VPM (vector property map) data.

The following is a list of current challenges and requirements facing the VPM team:

- ★ Addresses are created daily and edits to the VPM are conducted on a continuous basis, and now the publication cycle of the VPM is weekly; the lag is better but may pose some problems for users who require up-to-the minute property maps.
- ★ Deeds-of-record exist in paper form, meaning the legal description of properties is still relatively inaccessible compared to the VPM.
- ★ Recorded dimensions do not necessarily match actual
- ★ Approximately 80% of federal lands are in the VPM database
- ★ Achieving the "best fit" of data (until surveying program can tie-down parcel layer to ground control – only a small percentage of the District is surveyed)
- ★ Global ID issue and replication – this was handled by automating the update via SDE command line scripts
- ★ Authoritative document project 2011 (could be an interagency District-wide resource)
- ★ Tie-in to DDOT ROW work

- Transfers of Jurisdictions (land set aside, highway plan, recreational right of use, school right of use)

MASTER ADDRESS REPOSITORY (MAR). The Master Address Repository (MAR) is a true enterprise application. It is an address lookup and validation tool that anyone can use via Web services. The MAR database contains:

- A comprehensive point address database for Washington, DC. 140,000 valid addresses assembled and researched from more than 20 Address Databases.
- Front elevation photographs of most taxable structures
- Locations for intersections, blocks, and city squares.
- Alias records that contains relate to government offices, memorials, museums, landmarks, statues, hospitals, schools, police
- Apartment and residential units

DC GIS is responsible for maintaining the MAR. The Department of Transportation is responsible for maintaining street centerlines.

MAR DATA SOURCES	
United States Postal Service (USPS) Data	ADC 2005 Maps
Orthophotography Imagery	Owner Points from Office of Tax & Revenue
Pictometry Imagery	Mobile Video
DDOT - Street Centerline	Vector Property
Internet Searches	Water and Sewer Authority (WASA)
Field Research (site visits)	Metropolitan Police Department (MPD) – ADDRESS
DC Employees Database	Department of Motor Vehicle (DMV) - Drivers License
Voter Rolls	DMV - Registered Vehicles
Student database	INFO USA Business Directory
Military Data	Mayor's Call Center (MCC)
Public Housing Data	OTR - Property Inventory
Sanborn Maps	Board of Elections (BOE) - Registered Voters
MiniMAR	Department of Health (DOH)
Building Permits	Emergency –911 (E-911)
Real Estate Databases	Department of Consumer and Regulatory Affairs (DCRA)

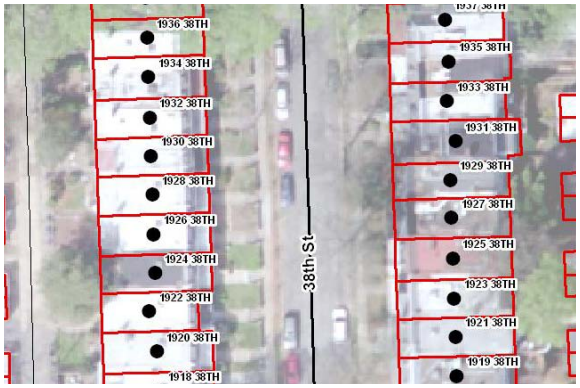
The MAR is widely used throughout the DC Government as it is the best way to locate addresses, places, intersections or blocks in Washington, DC. Furthermore, organizations

outside the DC Government are using the MAR to locate and verify address information. A notable characteristic of the MAR is that it contains national grid coordinates (NGRS), thereby supporting emergency applications and First Responder needs.

The MAR has excellent geographical information content and is easy to access. The MAR Web Services, using XML, allow for easier integration of MAR into enterprise applications. The MAR is being used to some degree by all major DC Government agencies. Increasingly, MAR is being integrated into applications and processes throughout the DC Government, and beyond, since it is widely accessible as a resource.

MAR contains the following geography attributes, which reduces the need for users to perform their own geoprocessing, such as "point-in-polygon" operations.

- Ward
- Police District
- Police Service Area
- ZIP Code
- Neighborhood Cluster
- Single Member District (SMD)
- Advisory Neighborhood Commission (ANC)
- Census Tract
- Census Block Group
- Census Block

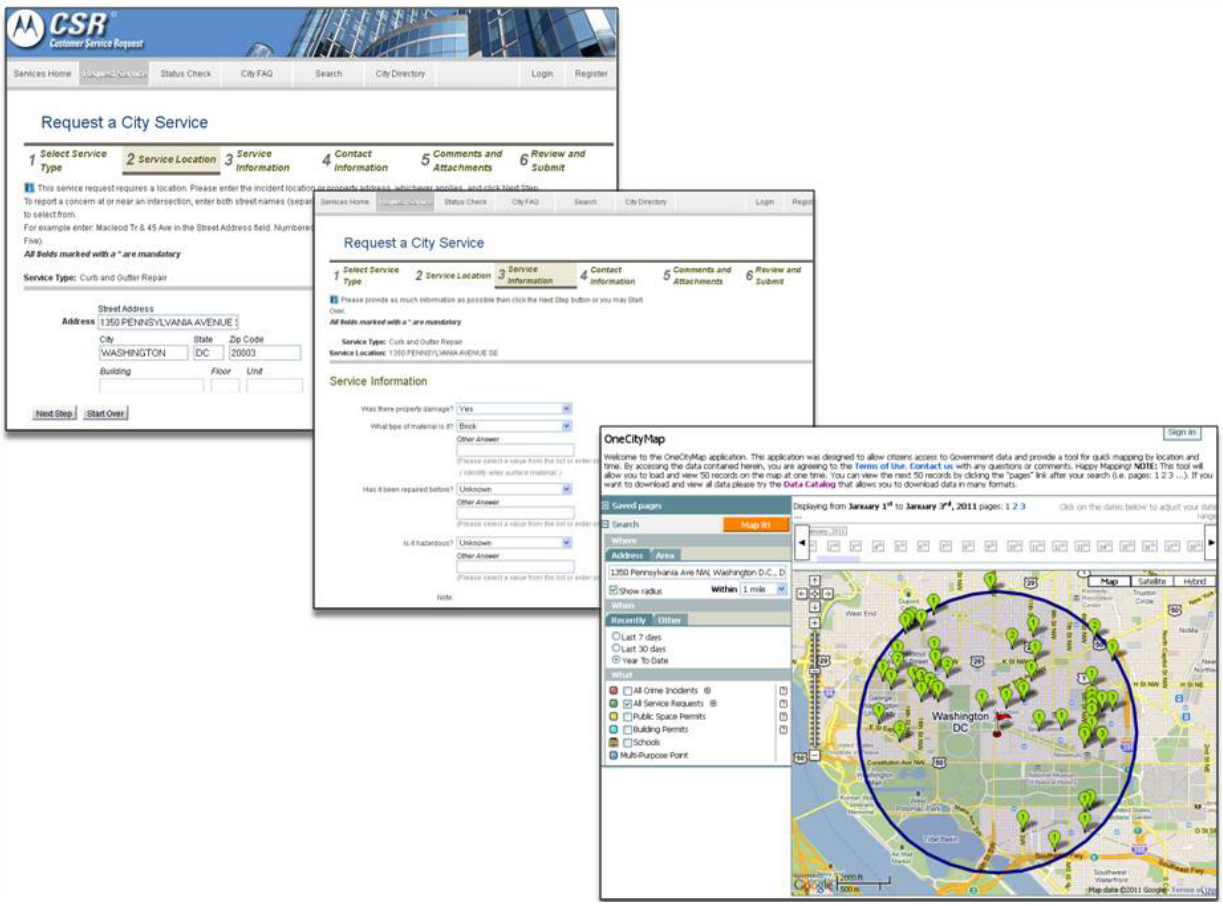


MAR address points.
Image source: OCTO/DCRA

For more information about MAR, including the MAR blog and the MAR data dictionary, see:
http://octo.dc.gov/DC/OCTO/Agency+Support/IT+Standards/Geography+Standards/MAR+Data+Dictionary

DC GIS has provided the US Census Bureau with MAR addresses. Unfortunately, due to US Title 13 regulations, DC GIS cannot use addresses from Census to improve the MAR. The MAR does not contain information that is considered classified by the US Government, and the MAR does not contain personal information such as who lives where or tax information.

The **MAR is an award-winning project**—a true enterprise resource—that could serve as an exemplar to other cities. Currently, the biggest challenge facing OCTO GIS with respect to the MAR is facilitating its integration across the enterprise. For example, the Mayor's Service Request Center, which allows citizens to request DC government services and track their requests online, will be calling the live MAR via a Web service to verify addresses, blocks & intersections. Once OCTO implements an online searchable catalog of Web services and their descriptions, it will be easier to discover MAR as an enterprise.



DC 311 Online City Service Requests. Image source: Mayor's Office.

The following is a list of challenges and requirements going forward:

- Level of completeness and accuracy
- MAR maintenance tool (live editing)
- MAR modernization
- Citizen feedback

- Multi-agency utilization
- City street names
- Addresses on military installations
- DCRA feeds (e.g. buildings)

5.1.2 Photogrammetric Data (Orthoimages, Planimetrics, Impervious Surfaces, Elevation, 3D Buildings)

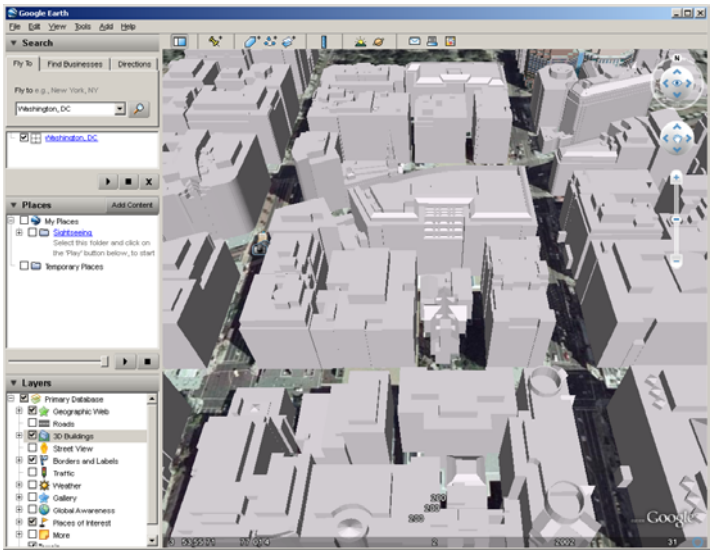
DC GIS is conducting a new photogrammetric data capture based on spring 2010 photography to update the data from 2008. The update has the following discrete deliverables:

- A new high resolution orthoimage
- Vector photogrammetric data update
- 3-D building update based on building roof outline change detection
- New transportation datasets such as manholes and guardrails
- Impervious surfaces to support stormwater billing

EXAMPLE PHOTOGRAMMETRIC THEMES (FROM DC GIS CATALOG)	
Hydrography	Stairs
Roads	Recreation courts
Wooded areas	Waterbodies
Bridges and tunnels	Wheelchair ramps
Railroads	Sidewalks
Obscured areas	Buildings
Street centerlines	Hydrography centerlines

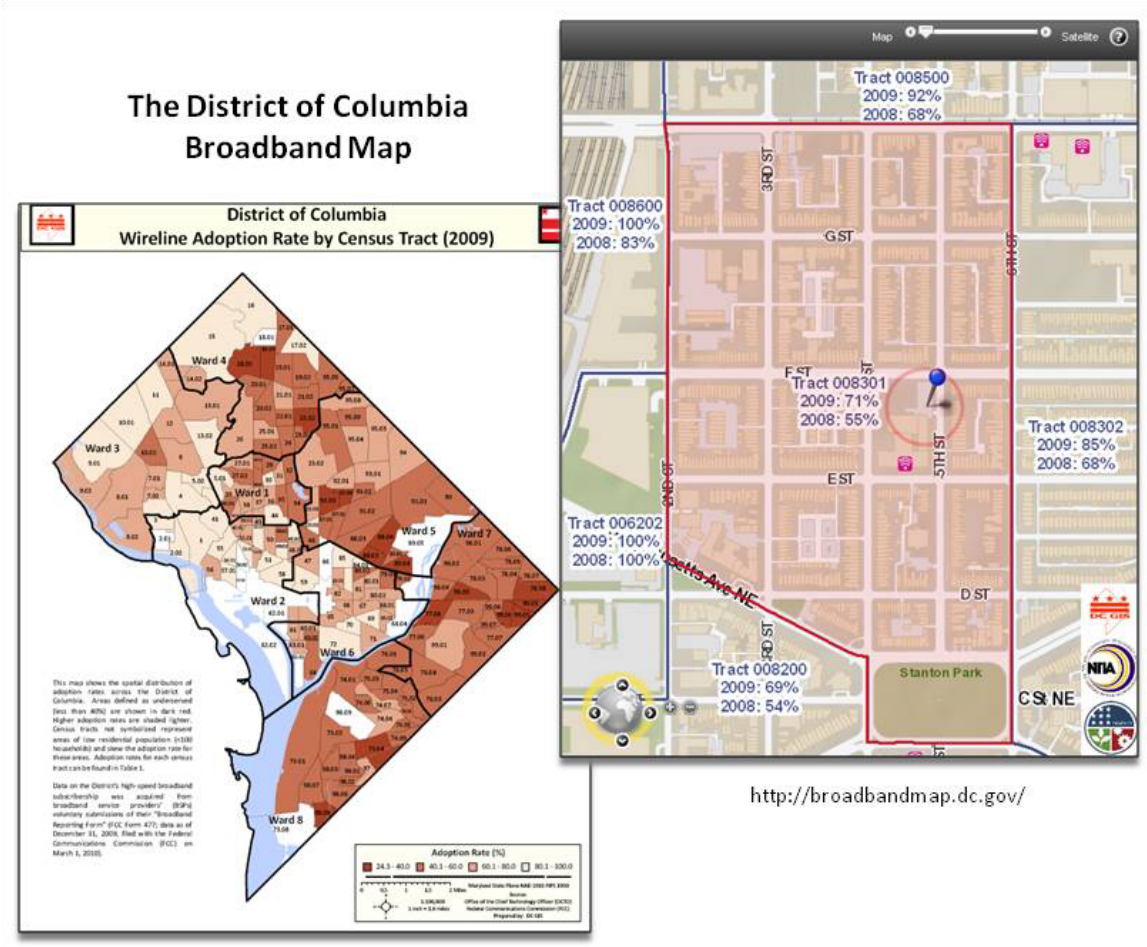
The following is a list of challenges and requirements going forward:

- Customer expectation and demand for high-quality, current data have necessitated an increase in the planned update cycle of photogrammetric data from every five years to every two, with a commensurate increase in resources
- Arranging flyovers is extremely difficult due to federal restrictions on the use of airspace in the Capital City; also, this is a recurring cost
- Capturing building textures



DC 3-D Building Footprints in Google Earth.
Image source: OCTO

- ★ Acquisition of oblique aerial imagery
- ★ Acquisition of ground imagery
- ★ Support for CDW (vis-à-vis the Data Catalog)
- ★ One-time "data grabs" vs. ongoing data collection
- ★ Utilities and other assets
- ★ What are the 3D requirements for the District?
- ★ When to retire existing planimetric layers and replace with an entire new capture?



DC Broadband Interative Web Map. Image source: OCTO.

5.1.3 Agency-Originated Data (Cross-Platform)

There are numerous agencies within the District that collect and/or define geospatial data "precursors." These data are the base upon which GIS data is created. For example, an address in an agency customer

database is tabular; however through address matching to the MAR this file can be given coordinates and stored as a GIS point datalayer. Administrative units, through which agencies allocate resources, acquire revenue, and/or otherwise conduct daily business, are often derived from aggregations of base units of geography such as parcels and census units.

For the purposes of this Plan, agencies that are responsible for collecting, defining, or otherwise maintaining these base data elements and/or data elements, will be referred to as *data originators.* Data originators may not necessarily be doing GIS or publishing GIS datalayers (hereby distinguishing them as *GIS leads* for those datalayers), but they are crucial partners in the DC GIS stakeholder community because they are closest to the data and are therefore data experts. Data originators may push data to OCTO GIS Group directly, either as a regular update or by OCTO request. This data is valuable to the overall DC GIS program, and the OCTO GIS Group dedicates people time and system resources to the integration of such data.

In order to fulfill its mission of providing efficient data dissemination of GIS data across the District, OCTO has become the default GIS lead for most GIS datasets in the District, meaning that OCTO conducts data conversion, standardization, quality assurance, and metadata compilation on data so that they are suitable for distribution. GIS Group's GIS leadership has effectively relieved many agencies from the technical burdens of GIS data maintenance and has resulted in a higher quality GIS data library; however, this role is primarily supported by OCTO's budget and staff resources.

As a result, the following challenges and requirements are related to Agency-originated data:

- OCTO's resources are consumed, but these activities are not necessarily managed as a key administrative priority
- OCTO's efforts are taken as a given across the DC stakeholder community, but they are not entirely documented, publicized, and recognized
- The OCTO GIS Group may have mapped agency data as a "one off," but neither OCTO nor the data originator may have since initiated data updates or other maintenance; data in the business systems evolves through time but the associated GIS datalayer grows obsolete

To answer these challenges, OCTO GIS DC drafted a cooperative data maintenance plan in 2005, centered on the **Federated Geospatial Data Model**, whereby maintenance of agency data layers would be redirected back to agency data originators. Under the plan, OCTO GIS group and agencies would enter into Memorandums of Understanding (MOUs) to jointly define data maintenance expectations

and responsibilities. Since 2005, this model has been successful only in agencies with a relatively sophisticated level of GIS implementation.

This data maintenance strategy is weakest when partner agencies lack the GIS resources to participate, do not perceive the benefits, or have become reliant on OCTO's services and lack incentives to change.

5.1.4 DC GIS Data Catalog (Cross-Platform)

In support of the Citywide Data Warehouse (CDW), the OCTO GIS Group maintains the DC GIS Catalog. The catalog is an inventory of the entire DC GIS library, including datasets are that are available to the public, restricted due to confidentiality or licensing restraints, under development, improvement, or quality assurance, and planned datasets. While the catalog no longer drives the public data download site, DC GIS staff maintains it as layers are updated and published. There is a legacy data catalog link still available on the DC GIS website.

Different data layers have different life-cycles, and the frequency of update may vary, depending on the data. The basic stages of a data's life-cycle include:

- Capture/Acquire/Develop
- Enhance/Improve
- Maintain
- Discontinue/Replace

The DC GIS Data Catalog serves as an internal tracking tool to describe both data layer source descriptive information (e.g. ownership, update frequency, and legal limitations), and also process information (e.g. update cycle).

Challenges and requirements going forward:

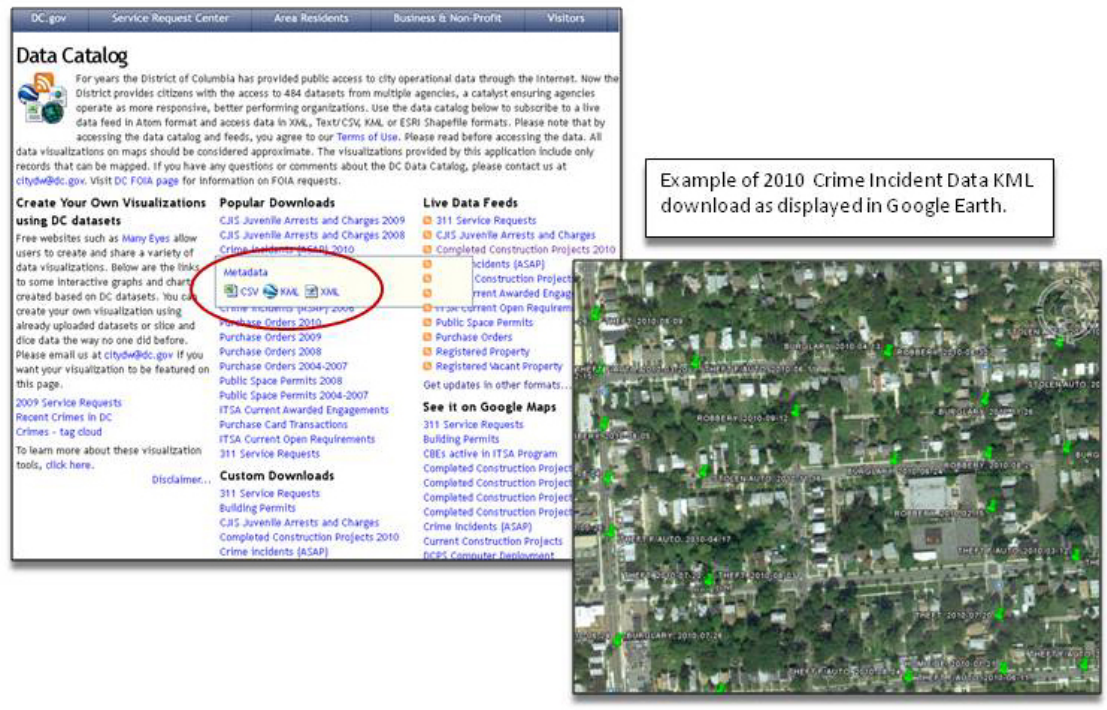
- Currently, approximately half of the Catalog is not "discoverable" to the public; this is data that has not been updated, and was acquired as part of a one-time collection effort; this data could be purged from the Catalog, or efforts could be made to determine current status, or it could be made discoverable as-is
- Other resources, such as web services, are not part of the online search
- Coded domains are not clearly defined and data entry has not been entirely standardized
- Many fields are legacy—leftover from historic administrative initiatives/priorities
- Maintenance of the Catalog is laborious and time consuming because the burden of metadata capture and data entry falls largely upon OCTO GIS Group's database administrator

- ★ Off-the-shelf alternatives to modernize the Catalog, such as the Esri Geospatial Toolkit, have proven to be inadequate for DC GIS requirements, which include making the metadata searchable with standard SQL queries
- ★ Users would benefit from enhanced search capabilities

Modernization of the Catalog needs to be evaluated in light of the progress made by the CDW and enterprise content management initiatives.

5.1.5 Citywide Data Warehouse (CDW)

OCTO GIS Group may also access and/or supply data through the Citywide Data Warehouse (CDW). Having evolved from "DCStat" originally designed for the District's Hot Spot crime reduction initiative, CDW 's mission is to provide a centralized access point for **enterprise-wide data** with a focus on providing real-time operational data from multiple agencies and sources that enable decision support and government transparency. To that purpose, CDW works with the Office of the City Administrator and district agencies supplying both data and business intelligence tools that benefit both the DC Government and the public, facilitating "one stop shopping" for all types of data. DC GIS data layers are now accessible through CDW in multiple formats to support an even wider variety of users and applications.



Crime Data in KML format from Citywide Data Warehouse. Image source: OCTO

5.1.6 Standards (Cross-Platform)

GIS standards is a multi-faceted topic that encompasses data modeling, data documentation (metadata), data procedures (e.g. automation techniques and quality assurance methods), and presentation (e.g. map cartography and display). To elaborate on all of the relevant GIS standards, specifications, and protocols would be beyond the scope of this plan, but several merit being mentioned, including OGC, REST, KML, and the Open Data Protocol.

The Open Geospatial Consortium (OGC) is a non-profit, international, voluntary consensus standards organization that is a leader in the development of standards for interoperability in geospatial and location based services. Software developers use these standards to build open interfaces and encodings into their products and services. OGC standards and supporting documents are available at no cost to everyone. DC GIS is currently using several OGC specifications, including Web Map Service (WMS) and Web Feature Service (WFS), as well as the Keyhole Mark-up Language (KML), which is described below.

Keyhole Markup Language (KML) is XML notation originally developed to show geographic data with Google Earth, but is also now used with Google Maps and Mobile and other 3D geobrowsers for displaying geographic data, but some KML information cannot be viewed in Google Maps or Mobile. The KML file specifies a set of features (place marks, images, polygons, 3D models, textual descriptions, etc.) that are displayed based on longitude and latitude. KML shares some of the same structural grammar as the Geography Markup Language (GML), another XML notation defined by the Open Geospatial Consortium (OGC) to express geographical features. KML files are very often distributed in **KMZ files**, which are zipped files with a .kmz extension, and which make it easier for geobrowsers to display large geographic files, such as parcel data for the District. DC GIS now has over 300 data layers available as KMZ files.

Representational State Transfer (REST) is a style of software architecture for Web applications. It helps keep things simple by making use of pre-existing interface and other built-in capabilities of the chosen network protocol, without introducing new and arbitrary vocabulary. It is used for transferring resources, such as a map or document, between clients and servers. A map is an example of a representation of a resource in the REST context. When a request to get a map is made from a client application, and is processed by a server, the application's state changes when the server responds with

the map, and the client's display transitions to the newly requested representation of the map resource – to wit, "Representational State Transfer." The client-server separation of functionality simplifies implementation, while increasing scalability. Because of this, REST is very popular for exposing Web services as a simpler alternative to Simple Object Access Protocol (SOAP) and Web Services Description Language (WSDL). DC GIS is a leader in making Web services available for both map data resources and application functionality, both internally and externally to DC Government.

The Open Data Protocol (OData) is a Web protocol for querying and updating data. It provides a way to access and integrate existing data may be tied-up in independent applications, thereby expanding interoperability. OData does this by applying and building upon Web technologies such as HTTP, AtomPub (an application-level protocol for publishing and editing Web resources) and JSON (JavaScript Object Notation – an easy-to-use, lightweight data-interchange format to provide access to information from a variety of applications, services, and stores). OData is being used to expose and access information from a variety of sources including, but not limited to, relational databases, file systems, content management systems and traditional Web sites.

The following part of this section of the plan discusses two prioritized topics within the subject of GIS standards: ***feature-level metadata and application interface "look and feel."*** *These are particularly important for DC GIS, as evidenced by their strong mention during stakeholder workshops.*

FEATURE LEVEL METADATA. Feature level metadata are attributes that define and track the accuracy of GIS features, such as when they were entered, what date they were updated, and the source and quality of the data sources. This type of metadata is distinguished from, and does not serve as a replacement for, "thematic" or layer-level metadata that describes in general terms the characteristics of the dataset. For example, an individual property parcel might be split or merged, while the rest of the data set for parcels remains the same.

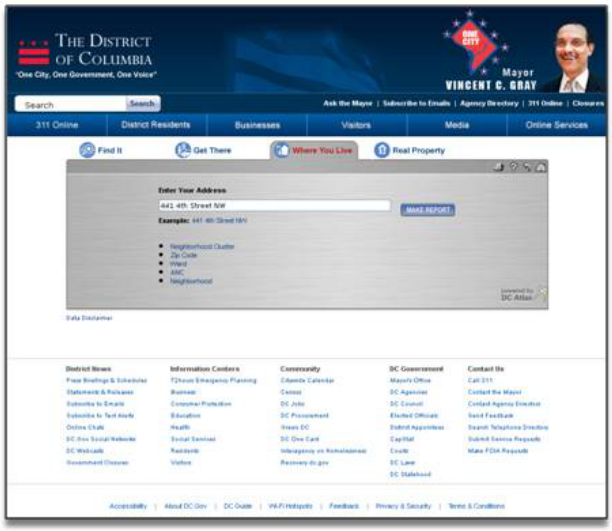
Integration of feature-level metadata is especially important when data editing and maintenance activities involve datasets with multiple data sources of various quality and vintage. Unfortunately, the FGDC metadata standards do not accommodate this type of metadata, and despite their utility, metadata of this type is not always considered in data maintenance plans. In addition, DC GIS gets some of its data from departments that do not necessarily provide feature-level metadata, and may not time-stamp their data.

The DC Federated Geospatial Data Model mandates that a feature update date be added to every layer maintained in the Data Model; however, it is recommended that the following feature-level metadata fields be maintained as a matter of DC GIS policy:

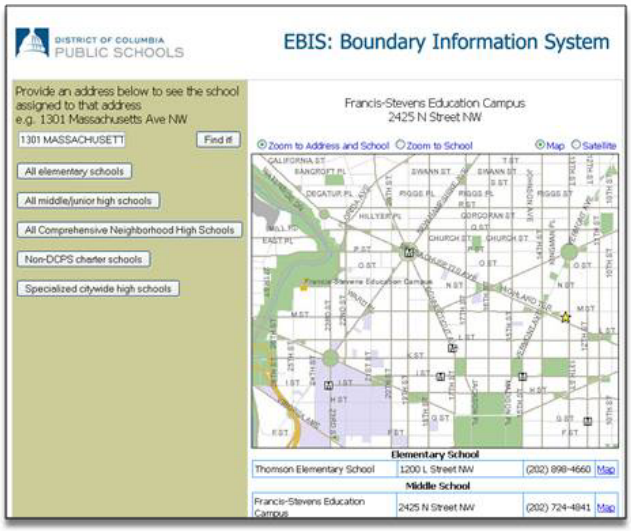
- ★ Source citation (description of the source of the record)
- ★ Process Description (free text)
- ★ Editor Contact (organization and/or staff person making edits)
- ★ Date of Edit (date of change or addition to dataset)

STANDARD LOOK AND FEEL. The DC GIS is a familiar "brand" that is widely recognized; however DC GIS "products," particularly application interfaces, are not designed with an explicitly standardized look and feel. This disparity has arisen through time and reflects varying technologies, design and programming approaches, and the authors' subjective decisions. For example, access methodology, icons, interface tools, and search functionality vary from application to application.

The following DC GIS applications are similar in that they provide search functionality, but they are entirely different in layout and design (image source: OCTO).



http://citizenatlas.dc.gov/atlasapps/reporthometab.aspx



http://dcatlas.dcgis.dc.gov/schools/default.aspx

5.2 GEOSPATIAL APPLICATIONS

Geospatial applications are computer programs that offer query, viewing, and analytical functionality to answer questions that have a spatial or location component. OCTO GIS and agency contributors sponsor application development for the DC GIS community, for both casual and professional audiences. Over a

period of years, OCTO GIS Group has developed geospatial applications using a variety of platforms, which are listed in the section on “Software Systems.”

The richness and variety of DC GIS applications is substantial, and is not entirely a function of what OCTO builds. The business process and workflow expertise in each agency is the driver for many applications, and in some cases, the line agency has the expertise to build some of their own applications, leveraging OCTO services.

Multiple user views of geospatial applications.
Image source: OCTO ELA Webpage

Challenges:

- ★ Prioritizing applications for migration to new platform(s)
- ★ Deciding what to leave on ArcIMS vs. migrate to a newer platform
- ★ Determining target platforms for migrating applications
- ★ Migration is an opportunity for repackaging or reinventing applications; applications may migrate in their entirety, or, just partially
- ★ Coordinating applications across agencies to meet business requirements
- ★ Establishing a consistent “look and feel”

5.3 WEB SERVICES

Web services are self-contained application components that provide specific functionality to other applications via the Internet. DC GIS offers a variety of Web services and desktop applications that are used by application developers to provide geospatial data and functionality to departmental business applications and to the general public. The following diagram illustrates the relationships between DC GIS web services and the geospatial applications they support.

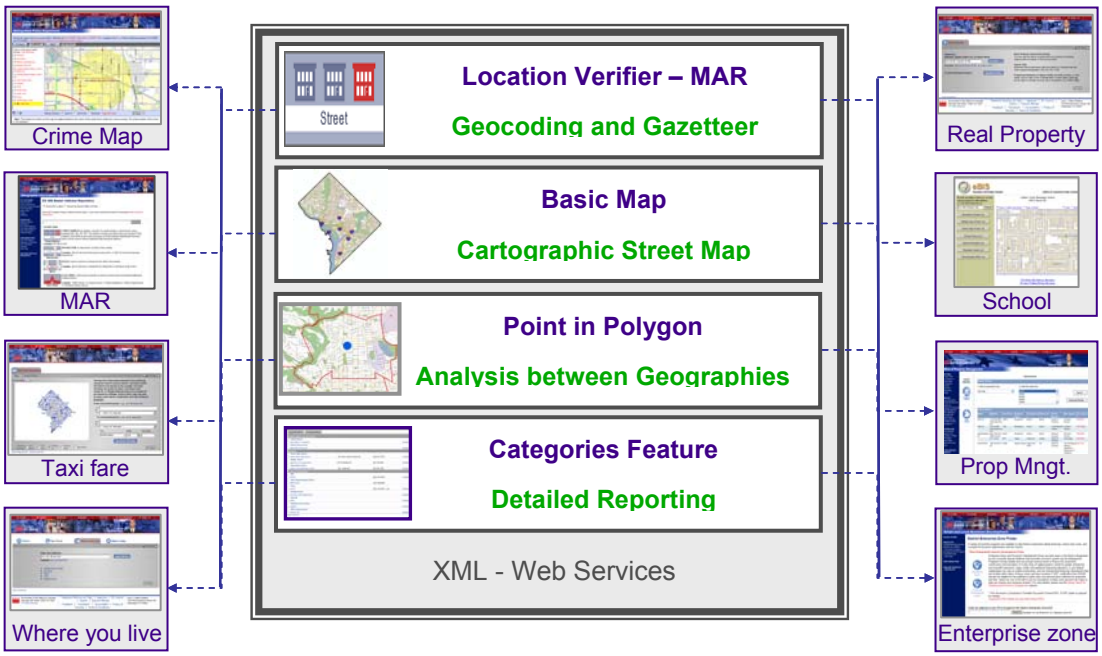


Image Source: OCTO

5.3.1 Applications Using DC GIS Web Services

Web services are vital to the DC GIS infrastructure, to support the discovery and sharing of resources across the enterprise. They are used by programmers and application developers to easily integrate sharable date into their applications. A growing list of departments and applications are dependent on DC GIS Web Services. Some examples are included in the following table.

EXAMPLES OF APPLICATIONS USING DC GIS WEB SERVICES	
Application Context	**Purpose**
Citywide Applications	311 Service Requests
	Citywide Data Warehouse
	DC.gov
Public Safety	911 Computer-Aided Dispatch (CAD)
	I-Mobile Client (Inside FEMS and MPD Vehicles)

EXAMPLES OF APPLICATIONS USING DC GIS WEB SERVICES	
Application Context	**Purpose**
	Fusion Center
	MPD Data Warehouse
Economic Development	Accela Permitting
	Historic Preservation
	Office of Planning Tools
	Office of Zoning Tools
Education	Attendance Boundaries
	Student Transportation
Environment	Impervious Surface Billing
	Watershed Protection
Government Operations	Sanitation
	Facilities Management
	City Works
	311 Online City Service Requests
Human Services	Common Client Intake
	Meals on Wheels
Revenue Generation	Computer-Aided Mass Appraisal (CAMA)
	SDS Analysts Service
	I2TS
Transportation	Transportation Online Permitting System (TOPS)

5.3.2 Existing Web Services

DC GIS Web services are grouped into two sets: 1) Web Data Services; and, 2) Web Map Services. DC GIS's Web services generally provide display of database-level contents; more sophisticated services would provide access to advanced application logic such as geoprocessing. The services are available publically; however, support is limited to District of Columbia agencies and their contractors only. This section briefly describes the existing ASP.NET Web Services, which are also documented online at the following URL:

http://octo.dc.gov/DC/OCTO/Agency+Support/Development,+Training+and+Support/Develop+Websites+Using+GIS+Web+Services.

WEB *DATA* SERVICES. Many of these are accessed through DC Guide, and therefore, are being migrated from ArcIMS to ArcGIS Server before the current version of DC Guide can be replaced by a new version.

WEB *MAP* SERVICES. Web Map services are available in two projections: Maryland State Plane and Web Mercator. If for some reason the services are interrupted or unavailable a notice is posted through

the DC GIS subscription service. The following services are mostly new, so migration is not an issue at this time.

5.4 SOFTWARE SYSTEMS

In information technology, value is usually created when end users interact with applications that help them do their job, and these applications are supported by software systems. In the geospatial context, applications are often combining several Web and map services, which are based on a COTS or Open Source software platform. The application is also likely to call up multiple geospatial data sets. Unlike a conventional IT plan that considers the cost of building a particular application, DC GIS often considers the cost of building a data set or a service that can be consumed by multiple applications. Any one investment decision is likely to support multiple end users. If these invest decisions are made wisely the application development costs drop considerably.

The following table lists the software platforms currently supported by DC GIS:

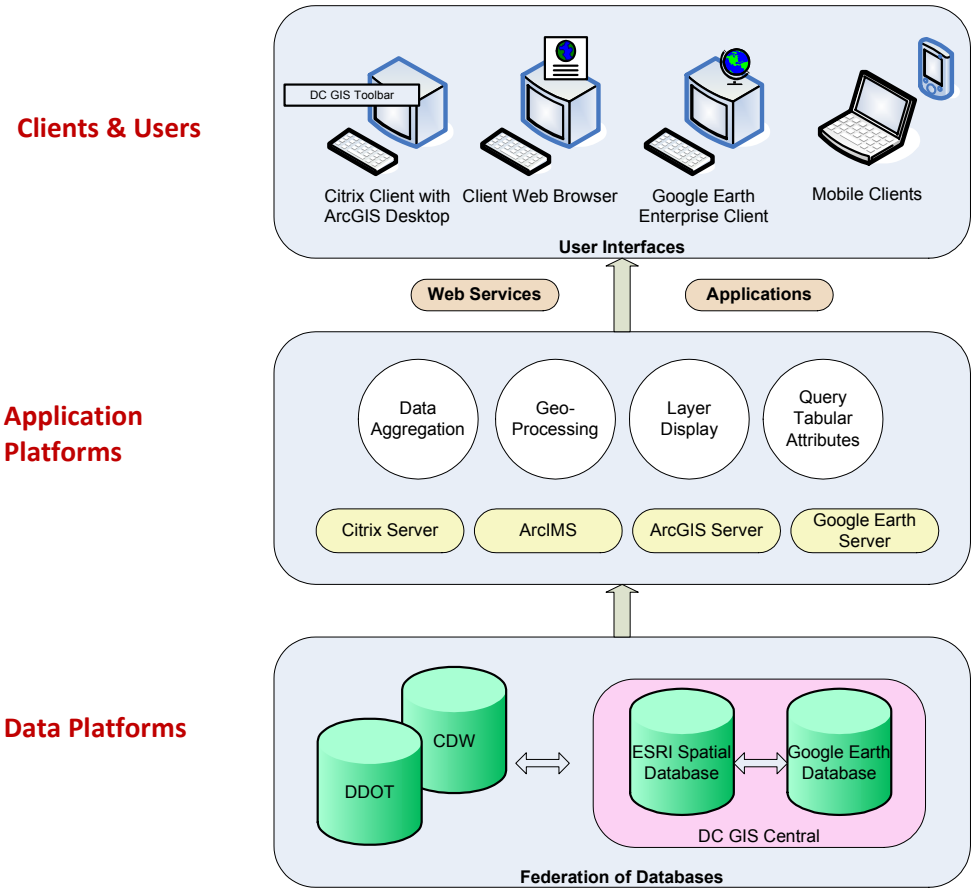
SOFTWARE PLATFORMS CURRENTLY SUPPORTED BY DC GIS	
1) Google Map	9) RouteSmart
2) Google Earth/KML and KMZ	10) Oracle RDBMS
3) Citrix	11) VM Ware (OCTO Environment)
4) Pictometry Online and EFS	12) DC Guide DB
5) ESRI ArcGIS Desktop	13) DC Guide WS
6) ESRI ArcIMS	14) DC Guide Link
7) ESRI ArcGIS Server (and Extensions)	15) Master Address Repository (MAR)
8) ESRI ArcPAD	

During 2011, DC GIS will also be adding support for open source software (OSS) for geospatial applications. Specifically, this will include the GeoServer and PostGIS OSS technology stack supported by OpenGeo.

The foundation of the DC GIS is the shared data comprising OCTO's data repository stored in an Esri Spatial Database combined with Google Earth Enterprise data. Data is provided from a federation of data originators from across DC government. This federation is coupled through database direct-connect as well as services that are provided through software such as ArcGIS Server. GIS data and functionality such as data aggregation, geoprocessing, layer display, and querying capabilities are provided through a combination of web services and GIS applications. Web services are defined by the WorldWideWeb Consortium (W3C) as "a software system designed to support interoperable machine-

to-machine interaction over a network." Developing and consuming Web services is key to enterprise GIS. These should not be confused with end-user applications accessed through a web browser.

Conceptual View of Existing DC GIS Architecture
(To support both GIS and non-GIS users and applications)



The n-tier services-oriented architecture is a convenient framework for the technical program themes in this document: The bottom tier is where mapping data reside, Web services exist within the middle tier alongside application middleware and other logical entities, and geospatial and non-geospatial applications occupy the top tier, interfacing with users. This diagram also illustrates an important distinguishing characteristic of the OCTO GIS challenge: **provisioning data as well as the applications and system platforms that put it to work.**

Going forward, implementation of an open source software (OSS) stack is planned, using GeoServer and PostGIS (described under "Key Technology Trends").

5.5 CUSTOMER SERVICE

DC GIS is committed to offering quality GIS customer services. DC GIS has a customer service team dedicated to information dissemination, communications, training, and technical support. The current configuration of the Customer Service organization includes the following program elements: Education; General Consulting; Technical Services; Outreach.

Current challenges facing the Customer Service group include:

- OCTO GIS Group's customer service is not a part of OCTO's help desk, and DC GIS has limited amount of system administration access through OCTO. A user needing help with a GIS problem cannot necessarily distinguish an IT issue from a GIS one, and may not be able to determine whether to call DC GIS or OCTO. Often, DC GIS fields a report and determines that the follow-up action requires OCTO's involvement, but the burden is on the user to report the issue to OCTO, which generally establishes a new ticket. Issue resolution under this system becomes compromised and user satisfaction with DC GIS suffers.
- DC GIS fields many customer service requests via phone and email but does not log these calls into OCTO's Remedy system. Use of this could be improved amongst DC GIS as a whole.
- Human Resources (HR) handles class facilities; Registration is handled through the PeopleSoft system. DC GIS is not able to get the registration list of class attendees prior to the class.
- Harnessing the new Content Management System (CMS)
- Making use of Google Analytics for better understanding website use and customer demand. Google Analytics is controlled through the OCTO Web Maintenance team.
- Measuring customer satisfaction with surveys. The Customer Service team needs a better understanding of surveys. What questions to ask and how to ask.

5.5.1 Education

DC GIS currently offers classes in the DC Government Course Catalog:

- **Google (Earth) DC:** This popular one-day class helps participants understand DC's customized version of Google Earth. It shows how various agencies are using this platform, and provides

instruction on how to use Google (Earth) DC to view the many data layers available through DC GIS, as well as participants own data. There are no prerequisites.

- **Overview of DC GIS Using ArcGIS:** This is a one-day class to help participants navigate the many services of DC GIS. It is not so much about how to use GIS, but rather, how to find it. It is offered monthly, and is a prerequisite for the other ArcGIS-oriented courses.
- **ArcGIS 1:** This is an in-depth introduction to GIS, including principles and concepts important for understanding ArcGIS. It is a three-day class offered quarterly, and is a prerequisite for more advanced courses.

Occasionally there are special classes for specific departments, such as DDOT, HSEMA and DOH. Trainees may require follow-up phone support as well, especially if the skills obtained in the class are not immediately exercised on-the-job. Training seems to be more effective when there are several from the same department involved, since they can support each other.

5.5.2 General Technical Counseling

DC GIS provides email and phone support to users with basic questions about finding data, using ArcGIS, and GIS-related matters. These are generally handled as a courtesy service, with no charges. When a question is more complicated, or involves a substantial amount of time and effort to accommodate, it might turn into a project for Technical Services.

5.5.3 Technical Services

For agencies without any personnel or resources, DC GIS may provide direct application development, data development, and mapping services. These projects are usually undertaken informally, on a case-by-case basis. Requests may go unrecorded or untracked, especially if a request for service starts out seemingly small and inconsequential; some may then expand to full project status. While OCTO allows service fees to be recovered through an IT chargeback process, the OCTO GIS Group generally absorbs the cost of development, for several reasons:

- Fees may deter demand for GIS applications that can improve departmental effectiveness and minimize unnecessary duplication of resources and effort
- Chargeback agreements can be slow to establish, difficult to price, and costly to administer

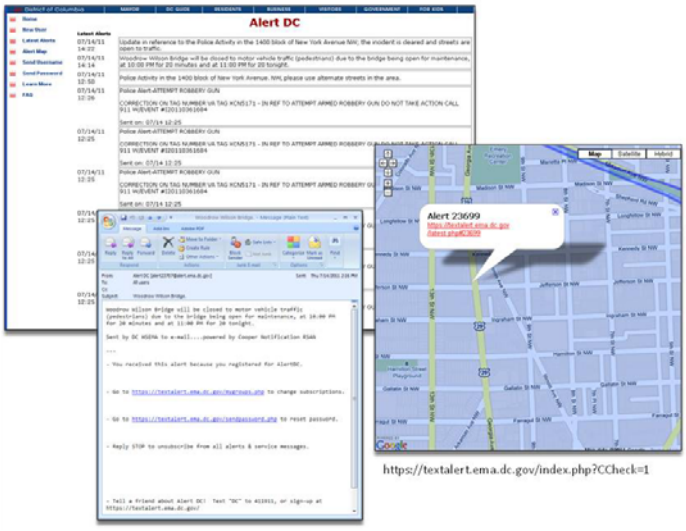
- Chargebacks are perceived as a "threat" within the DC GIS stakeholder community where so much depends on sharing and collaboration

Once there is a greater alignment of strategies and budgets across the DC GIS stakeholder community, the topic of chargebacks can be revisited.

5.5.4 Outreach

Outreach to the DC GIS stakeholder community and beyond is an active component of the OCTO GIS Customer Service. Constituents include GIS users, developers, and other interested parties, both internal and external to DC Government. A large part of the Outreach effort involves communications, and the following list is a summary of these communications-related elements of the Customer Service program:

- DC GIS Webpages (Internet)
- DC GIS Intranet Site
- Notifications to agencies (e.g. data updates, outages)
- News releases
- Newsletter (monthly, on Education)
- Web page and links for Web apps
- CDW tie-in
- GIS Steering Committee (GISSC) meeting support
- Coordinating equipment for interns



DC GIS Customer Service Notification Service. Image Source: OCTO

6 IMPLEMENTATION PLAN

The current DC GIS has grown somewhat organically as needs arise, within a conceptual framework. Flexible system architecture, with an optimal degree of *extensibility* to support future growth and diversification is envisioned. This architecture should exhibit *interoperability* across multiple vendor platforms, including ESRI, Google, Microsoft, and Open Source alternatives. Furthermore, the design would take into account cross-integration with non-GIS business systems.

Given the maturing of the DC GIS program, the OCTO GIS Group is faced with the need to migrate from older platforms, such as ArcIMS, to newer ones such as ArcGIS Server, Google Earth, and Google Maps. There are also many non-GIS dependencies that need to be managed, such as data base platforms, virtualization platforms, and other IT infrastructure.

In addition, to maintain its national leadership posture for the advanced state of DC GIS, the OCTO GIS Group needs to devote time and effort to staying current with emerging new technologies by researching relevant breakthroughs and platform-shifting developments.

Specific actions, directions, and implementation considerations (including investment strategies) are described in the following sections, by program elements and related platforms.

6.1 MAPPING DATA: KEY PLATFORMS

The breadth of data collected, maintained, and managed as part of DC GIS is substantial. The frequency of updates is a cost driver, as are new acquisition efforts. The following input on shaping future investment decisions for DC GIS mapping data was provided by the Business Plan Subcommittee (numbered for tracking and measuring progress).

1. Maintain the current set of widely used data layers, for users of both Esri and Google technologies and applications
2. Assess the demand for data in formats other than Esri and Google; need to determine what other formats make sense in advance, as well as on-demand services
3. Determine the level of essentialness of each layer by monitoring demand and identifying application dependencies and willingness to cost-share when sensible, but mostly by common sense

4. Budget for recurring investment in data acquisition to update planimetric layers (e.g. photogrammetric flyovers to acquire new imagery should occur every two years; once the data is acquired, it needs to be maintained and distributed to DC GIS stakeholders that depend on it)
5. Assess the update frequency required for other essential layers, since this is a cost-driver; it is not anticipated that there will be budget increases to support more frequent data updates
6. Develop and refine data to support routing applications (e.g. oversized vehicle routing, delivery of meals, trash pick-up, and property assessments); currently, multiple departments are in need of fully routable street networks, and there is a risk of duplication of effort in acquiring suitable data sets; and there are multiple street centerline data sets to choose from (and attendant maintenance requirements) – resources need to be allocated to more fully define routing requirements
7. Complete the cadastral fabric needed for the District (i.e. property maps) and resolve 'fitting' issues vis-à-vis what has been surveyed – significant progress has been made on this task
8. Research the creation of photo-realistic building textures are a future needs
9. Investigate geospatial data availability and suitability for areas adjacent to the District; this is being done as part of the Regional Geospatial Data Exchange/Hub project
10. Monitor and investigate public data for usefulness and relevance to the District (e.g. geo-tagged photos)
11. Support Utility and ROW data collection and data management efforts
12. In addition to the popular Raster Basemap Service with annotation, create one without annotation, too
13. Reconcile support for the 911 basemap for Computer-Aided Dispatch
14. Acquire 3D buildings
15. Refine data services; investigate the Open Data Protocol for leveraging federated data with secure Web

The following table describes planned investment strategies, going forward.

MAPPING DATA PLATFORMS			
Data Type	**Investment Strategy**	**Data Type**	**Investment Strategy**
Photogrammetric *(Orthoimages, Planimetrics, Impervious Surfaces, Elevation, 3D Buildings)*	Maintain (Invest for next update cycle)	Business Data	Maintain
Property *(VPM, MAR, Zoning,*	Maintain	LiDAR	Invest

MAPPING DATA PLATFORMS			
Data Type	**Investment Strategy**	**Data Type**	**Investment Strategy**
Planning, ROW, Survey)			
Demographics	Maintain	Regional Data	Maintain
Ground Imagery	Invest	Dynamic Data	Invest
Transportation	Maintain	Partner Data *(e.g. Federal Government)*	Maintain
Routing *(Pedestrian, Vehicular, Mass Transit)*	Invest	All Other *(OCTO Maintained, Agency Contributed)*	Maintain (Invest in Utilities)
Aerial Oblique Imagery	Maintain		

The DC GIS "Federated Geospatial Data Model" plan has been guiding DC GIS activities for several years, and continues to be relevant. The goal is to share in the creation, use, and maintenance of GIS datasets at the least possible cost, while providing District government staff, citizens, the media, and others easy access to this resource.

The DC GIS Federated Data model enumerated specific steps to develop and maintain the DC GIS enterprise database to be consistent with data from numerous source agencies, such as:

- ★ Identify a primary GIS contact(s) for the agency
- ★ Negotiate the layers that each agency will own and maintain and determine the update cycle for each
- ★ Maintain a consolidated geospatial data maintenance plan, including but not limited to QA procedures and change management methodologies
- ★ Encourage cross-agency adherence to geospatial standards

DC GIS should continue to pursue the plan in the Federated data model, but an alternate strategy to consider when participation is lacking would involve:

- ★ Exposing the business need for these datasets through publicized use and download statistics
- ★ Estimating and documenting the person-hours necessary for future rounds of updates and contrasting that with available OCTO GIS in-house or supplemental resources
- ★ Reconsider service fees to recoup these costs or provide guidance on agency grant submittals to encourage agency self-sufficiency

The following sections address several high-profile topics, consistent with those covered in the earlier section on "Inventory of Existing Infrastructure and Suitability Assessment." The content in this section is weighted toward implementation items, organized by the following topics:

1. Property Data
2. Addresses
3. Photogrammetric Data
4. Agency-Originated Data
5. DC GIS Data Catalog
6. Standards

6.1.1 Property Data (Platform)

VECTOR PROPERTY MAP (VPM). To fully address the needs of the VPM, the following action items are priorities:

- ★ Hyperlink parcels to existing scans of official plats, subdivision plans; the scanning of these plans is still underway, but the effort is limited by existing manpower and management buy-in
- ★ Create feature-level metadata
- ★ Add remaining Public/Federal lands; ~20% still need to be captured
- ★ Reconcile VPM with public parks layer

6.1.2 Addresses (Platform)

MASTER ADDRESS REPOSITORY (MAR). A comprehensive program for the MAR would include these elements:

- ★ Redefine the scope of MAR
- ★ Define standard operating procedures (SOP) for maintaining existing datasets within the MAR, and include who has what authority
- ★ Anticipate future staffing levels to meet demand
- ★ Leverage collaborative technologies such as wiki knowledge sharing and Google Docs for data development
- ★ Elevate the use of MAR and promote its use through the development of a web-based version of the MAR batch geocoder that works with Microsoft Excel and Google Docs

6.1.3 Photogrammetric Data (Platform)

The 2010 mapping update effort will serve as a model for future planimetric updates. The project exceeded expectations and was delivered sooner than any other update to date.

6.1.4 Agency Oriented Data

In the Strategic Planning project that preceded this Business Plan, stakeholder participants identified the following agency data as particularly important for their business requirements, and are therefore reiterated in this Business Plan:

- Neighborhood boundaries
- Law enforcement jurisdictions
- Socioeconomic/demographic data
- Geo-located crash data
- Street Furniture
- 360 degree views of streets from DDOT
- Geocoded and generalized income tax records
- City street names

6.1.5 Data Catalog

The OCTO GIS is in the process of evaluation alternative data warehousing strategies to the DC GIS Data Catalog. DC GIS is considering a portal approach, however available tools do not meet all of DC GIS's cataloging needs. Therefore DC GIS should:

- Migrate the entire DC GIS metadata collection to a single FGDC metadata repository database; this would eliminate redundant collection of metadata elements in separate xml files and the DC Catalog
- Build metadata repository tools to gather metadata elements in an automated rather than manual fashion
- For non-FGDC data elements in the repository, create standardized coded values to streamline data entry and facilitate analysis
- Create a Data Dictionary to help users select the correct fields and use the correct domain codes

- ★ Expose full catalog to the public online, so users have the benefit of discovering the existence of restricted, planned, or datasets in improvement stages and make informed decisions about current or future data development projects

6.1.6 Standards

Tools are available to encourage adherence to GIS standards, as follows:

FEATURE LEVEL METADATA. Feature level metadata can be tedious to collect and maintain. While the standard Esri tools do not accommodate these metadata, there are examples of custom software solutions that may be appropriate for DC GIS. For a relatively modest investment, desktop and web tools can be constructed to capture feature-level metadata at point of data entry or modification; certain elements such as editor and edit date could be captured from the system credentials automatically. The tools would input into the metadata repository, which would then dump xml or other metadata files for download distribution.

STANDARD LOOK AND FEEL. Style sheets and other template products will be considered to standardize the look-and-feel of all future applications, in order to better associate its products with the DC GIS brand and provide users with more consistent and familiar environment.

6.2 PORTFOLIO MANAGEMENT FOR NEW GIS APPLICATIONS & WEB SERVICES

This section is focused on new applications and Web services that are either planned or underway. It complements the section earlier in this Plan, under "Existing DC GIS Architecture and Platforms," which focused on existing applications and services. Input from the Business Plan Subcommittee is included under sub-headers for applications and Web services, respectively (numbered for tracking and measuring progress).

Applications.

1. As mentioned in the context of data, routing is emerging as a much needed application across many departments, and initiatives in this direction need to be coordinated and leveraged for maximum benefit to the enterprise
2. In addition to routing, new applications and/or integration to routing are needed to support mobile computing, green buildings, tracking and dispatching (focus on this set)
3. No new applications will be built on ArcIMS; it is being sunset by the vendor (Esri)

4. Development of new desktop ArcGIS applications is unlikely – the shift is toward Web and mobile applications

5. Numerous applications are currently deployed on ArcIMS, which is a platform in its latter life stage; it would be disruptive to cease support for ArcIMS, but an ongoing migration strategy is needed for the applications and/or functionality currently in use, including DC Guide and DC Atlas, to move or re-factor onto a new platform; for example, Crime Map is being migrated to ArcGIS Server

6. There are not enough resources to migrate everything in lock-step, so prioritization is needed to designate the primary candidates; the Subcommittee consensus is that DC Guide and DC Atlas will be the first to migrate and/or reinvent onto a new platform; there are Web services linked to DC Guide that also need to be migrated, before the current version of DC Guide can be shut down

7. Applications that are not scheduled for migration and/or re-factoring will be left running on ArcIMS for the time-being, with minimal support

Web Services.

1. For reasons mentioned above, Web services linked to DC Guide need to be migrated onto a new platform to remove any ArcIMS dependencies

2. A growing list of departments and applications that depend on DC GIS Web Services is included in this Plan, in the section on Web Services

3. Web services tend to be less visible to end-users, but they are critically important to application developers, both internal and external to OCTO and DC GIS

4. New Web services for routing and utility data are needed to support new applications; new Web services for Property and ROW were recently completed

5. Investigate links to Google Maps Street View to support interest in street-level imagery

6. Improve the reliability and performance of Web services, which are now integral to numerous business processes and workflow solutions developed both internal and external to DC government

6.2.1 Existing Applications

The following chart shows a list of existing applications, grouped by platform(s). Some depend on more than one platform**. Platforms that have an investment status of "sunset" or "migrate" are shown in bold red type**. This is to indicate that action is needed going forward for the dependent application.

EXISTING DC GIS APPLICATION PORTFOLIO BY PLATFORM(S)						
Application	**Software Platform**	**Accessibility**	**User Sophistication**	**Asset Class**	**Investment Status**	**Migration Required? Status?**
Flood Risk Zone Viewer	AGS for Flex , MAR	General Public	Casual	Information Utility & Economy	Maintain	No
DPW Trash/Recyc-ling Pickup Data Lookup	AGS, MAR	General Public	Casual	Information Utility & Economy	Maintain	No
Broadband Map	AGS, MAR, Geoserver	General Public	Casual	Information Utility & Economy	Invest/Main tain	Yes; WIP
VPM Maintenance Tool (formerly RPGM)	ArcGIS Desktop	DC Gov't	Professional	Information Utility & Economy	Maintain	No
DC GIS Tool Bar	ArcGIS Desktop via Citrix	DC Gov't	Professional	Economy	Maintain	Yes; Done
DPW Seasonal Leaf Collection	ArcGIS Server, MAR	General Public	Casual	Information Utility	Maintain	No
DC Guide	**ArcIMS, DC Guide DB,** MAR	General Public	Casual	Information Utility	Sunset/ Migrate	Yes
Real Property	**ArcIMS, DC Guide DB,** MAR	General Public	Casual	Information Utility	Maintain	Yes: WIP
MAR Sample Client	**ArcIMS, DC Guide WS, DC Guide Link,** MAR	General Public	Casual	Economy	Maintain	Yes; Done
District Government Property Search	**ArcIMS, DC Guide WS, DC Guide Link,** MAR	General Public	Casual	Information Utility	Maintain	Yes
Watershed Finder	**ArcIMS, DC Guide WS,** MAR	General Public	Casual	Information Utility	Maintain	Yes; Done
DC Public	**ArcIMS, DC**	General	Casual End-	Information	Maintain	Yes; WIP

EXISTING DC GIS APPLICATION PORTFOLIO BY PLATFORM(S)						
Application	**Software Platform**	**Accessibility**	**User Sophistication**	**Asset Class**	**Investment Status**	**Migration Required? Status?**
Schools (DCPS) Boundary Information System	**Guide WS,** MAR	Public	user	Utility		
Enterprise Zone Finder	**ArcIMS, DC Guide WS,** MAR	General Public	Casual End-user	Information Utility & Economy	Maintain	Yes
DC Atlas	**ArcIMS**, MAR	General Public	Casual	Information Utility	Sunset/ Migrate	Yes; WIP
Crime Map	**ArcIMS,** MAR	General Public	Casual	Information Utility	Maintain	Yes; WIP
MAR Unverified Unit Submission	ASP.NET	General Public	Casual	Information Utility & Economy	Maintain	No
OFC campaign funds info site	ASP.NET	General Public	Casual	Information Utility & Economy	Maintain	No
Sex Offender Lookup	ASP.NET using Web Service	General Public	Casual	Information Utility & Economy	Maintain	No
Public library Finder	**DC Guide WS,** MAR	General Public	Casual	Information Utility	Maintain	Yes
Pictometry Viewer	EFS via Citrix	DC Gov't	Professional	Information Utility	Maintain	No
DDOE ArcPad Survey Application	ESRI ArcPad	DC Gov't	Casual	Information Utility & Economy	Maintain	No
BOEE	Flex and AGS	General Public	Casual	Information Utility & Economy	Maintain	No
Emergency Information Center	Google	General Public	Casual End-user	Information Utility	Maintain	Yes
Wi-fi Area on National Mall	Google Earth Plugin	General Public	Casual	Information Utility & Economy	Maintain	No
Google (Earth) DC	Google Earth, MAR	DC Gov't	Professional	Infrastructure	Invest	No
DDOT Occupancy / Parking System GIS Support (TOPS)	Google Map, MAR	General Public	Casual End-user	Information Utility & Economy	Maintain	No

EXISTING DC GIS APPLICATION PORTFOLIO BY PLATFORM(S)						
Application	**Software Platform**	**Accessibility**	**User Sophistication**	**Asset Class**	**Investment Status**	**Migration Required? Status?**
DC WIFI Hotspot	Google Maps	General Public	Casual	Information Utility & Economy	Maintain	No
DCPS School Profile	Google Maps, **ArcIMS, DC Guide WS,** MAR	General Public	Casual	Information Utility	Maintain	Yes; Done
Evacuation Route Finder	Google Maps, **ArcIMS**, MAR	General Public	Casual	Information Utility	Maintain	Yes
Snow Response Reporting System	Google Maps, MAR	General Public	Casual	Information Utility	Maintain	No
Sex Offender Lookup	Google Maps, MAR	General Public	Casual	Information Utility	Maintain	No
Senior Lead Agency Locations	Google Maps, MAR	General Public	Casual	Information Utility & Economy	Maintain	No
DC Capital Project map	Google Maps, MAR	General Public	Casual	Information Utility & Economy	Maintain	No
DDOT SmarTrip Qual-Checker	Google Maps, MAR ArcIMS, DC Guide WS	General Public	Casual	Information Utility & Economy	Maintain	No
WDCEP Retail Site Search	Google Maps, MAR, AGS	General Public	Casual	Information Utility & Economy	Maintain	No
DC Business Incentives Map	Google Maps, MAR, AGS	General Public	Casual	Information Utility	Maintain	No
MAR Batch Geocoder	MAR	General Public	Application Developer	Infrastructure	Maintain	Yes; Done
DC GIS Data Catalog	Oracle	General Public	Casual	Infrastructure	Invest	Yes

WIP = Work-in-progress

6.2.2 New Applications

NEW APPLICATIONS (PLANNED OR UNDERWAY)				
Application	**Platform**	**Asset Class**	**Deployment Status**	**Investment Status**
DHS Service Locator	AGS, Google Maps	Information Utility & Economy	Near Deployment; On-hold	Invest

NEW APPLICATIONS (PLANNED OR UNDERWAY)				
Application	**Platform**	**Asset Class**	**Deployment Status**	**Investment Status**
311 Service Request	AGS, MAR WS	Information Utility & Economy	Deployed	Maintain
VPM Lookup & Map View Web Site	ArcGIS Server using Web Service and Flex	Information Utility & Economy	Near Deployment	Invest
Google Map based point picker	ASP.NET	Innovation & Infrastructure	Planned	Invest
DDOE Sewershed Finder	Flex , AGS, MAR WS	Information Utility & Economy	Deployed	Maintain
Incorporate Google Docs/Map/Gadget	Google	Information Utility & Economy	Underway	Invest
DC Capital Project map	Google Maps, MAR	Information Utility & Economy	Deployed	Maintain
DOH Food Safety	Google Maps, MAR	Information Utility & Economy	Near Deployment	Invest
DCRA FileNet on Web (a.k.a. Survey Docs)	TBD	Information Utility & Economy	Planned	Invest
Routing	TBD	Infrastructure	TBD	Invest
Solar/Green Buildings	TBD	Information Utility & Economy	TBD	Invest

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6.2.3 Existing Web Services

DC GIS Web services are grouped into two types: 1) Web Data Services; and, 2) Web Map Services. The services are available publically; however, support is limited to District of Columbia agencies and their contractors only. The typical users' level of sophistication is that of an application developer.

These Web services are very popular and highly consumable by both DC government and external users. It would be valuable to assess in a more rigorous way how they are being used, but some examples were provided in an earlier section on "DC GIS Platforms by Program Area and Organizational Components." Performance and reliability are sometimes an issue, and measures should be taken going forward to make improvements. The following table shows what is currently available.

EXISTING DC GIS WEB *MAP* and *DATA* SERVICES PORTFOLIO					
Service	**Description**	**Type of Service**	**Software Platform**	**Asset Class**	**Migration Required? Status?**
Coordinate Converter	Converts Maryland State Plane Coordinate System to United States National Grid or Latitude/Longitude	Data	.Net	Infrastructure	Maintain
MAR Location Verifier	Verify or find a DC address, intersection, block, square suffix lot and place name	Data	.Net	Infrastructure	Maintain
Property Data Services	Functions to retrieve property identifiers from Vector Property data.	Data	AGS Server	Infrastructure	Maintain
Administrative and Other Boundaries	Administrative and Other Boundaries	Map	AGS Server	Information Utility & Economy	None (New)
Annotation	Annotation	Map	AGS Server	Information Utility & Economy	None (New)
Business and Economic Development	Business and Economic Development	Map	AGS Server	Information Utility & Economy	None (New)
Cultural and Society	Cultural and Society	Map	AGS Server	Information Utility & Economy	None (New)
DC Basemap	DC Basemap	Map	AGS Server	Information Utility & Economy	None (New)
Demographic	Demographic	Map	AGS Server	Information Utility & Economy	None (New)
Education	Education	Map	AGS Server	Information Utility & Economy	None (New)
Elevation	Elevation	Map	AGS Server	Information Utility & Economy	None (New)

EXISTING DC GIS WEB *MAP* and *DATA* SERVICES PORTFOLIO					
Service	**Description**	**Type of Service**	**Software Platform**	**Asset Class**	**Migration Required? Status?**
Environment	Environment	Map	AGS Server	Information Utility & Economy	None (New)
Facility and Structure	Facility and Structure	Map	AGS Server	Information Utility & Economy	None (New)
Health	Health	Map	AGS Server	Information Utility & Economy	None (New)
Historic	Historic	Map	AGS Server	Information Utility & Economy	None (New)
Location	Location	Map	AGS Server	Information Utility & Economy	None (New)
Orthophoto 2010	Orthophoto 2010	Map	AGS Server	Information Utility & Economy	None (New)
Orthophoto 2008	Orthophoto 2008	Map	AGS Server	Information Utility & Economy	None (New)
Orthophoto 2007	Orthophoto 2007	Map	AGS Server	Information Utility & Economy	None (New)
Owner Polygons	Owner Polygons	Map	AGS Server	Information Utility & Economy	None (New)
Planning, Landuse and Zoning	Planning, Landuse and Zoning	Map	AGS Server	Information Utility & Economy	None (New)
Property and Land	Property and Land	Map	AGS Server	Information Utility & Economy	None (New)
Property Square Labels	Property Square Labels	Map	AGS Server	Information Utility & Economy	None (New)
Public Safety	Public Safety	Map	AGS Server	Information Utility & Economy	None (New)
Public Service	Public Service	Map	AGS Server	Information Utility & Economy	None (New)

EXISTING DC GIS WEB *MAP* and *DATA* SERVICES PORTFOLIO					
Service	**Description**	**Type of Service**	**Software Platform**	**Asset Class**	**Migration Required? Status?**
Recreation	Recreation	Map	AGS Server	Information Utility Economy	None (New)
Transportation	Transportation	Map	AGServer	Information Utility & Economy	None (New)
Utility and Communication	Utility and Communication	Map	AGServer	Information Utility & Economy	None (New)
Basic Map	Generate a jpeg map with user defined parameters including map width, height and layers	Data	DC Guide	Infrastructure	Sunset
Category Contents	View category information based on Category ID	Data	DC Guide	Infrastructure	Sunset
Category Features	A point-to-polygon service using Category ID and Maryland State Plane Coordinate System	Data	DC Guide	Infrastructure	Sunset
Feature Details	Query a feature based on Feature ID	Data	DC Guide	Infrastructure	Sunset
Point Area Report	Returns results based on Maryland State Plane Coordinate System and Category ID	Data	DC Guide	Infrastructure	Migrate
Political Area Report	Query political area information	Data	DC Guide	Informational	Migrate
Political Area Summary	Get all political area information based on Maryland State Plane Coordinate System	Data	DC Guide	Information Utility	Migrate

6.2.4 New Services

NEW SERVICES (PLANNED OR UNDERWAY)				
Description	**Platform**	**Asset Class**	**Deployment Status**	**Investment Status**
New Point Polygon	Web Service by ArcGIS Server 9.3	Infrastructure	Deployed	Invest
Buffer	Web Service by ArcGIS Server 9.3	Infrastructure	Planned	Invest
MAR Web Service Improvement (adding REST/JSON endpoint; linking to StreetView)	VS.NET 2008	Strategic and Infrastructure	Planned	Invest

6.3 SOFTWARE SYSTEMS

A variety of software platforms comprise the underlying infrastructure that enables DC GIS to be a world class program. Each support application development and Web services; and they have overlapping constituencies. None is a perfect substitute for the other, but they can interoperate in a synergistic way. OCTO requires expertise in all of these platforms to support the DC GIS Program. The following table lists the platforms and the related investment status.

SOFTWARE PLATFORMS AND INVESTMENT STATUS			
Software Platform	**Investment Status**	**Platform**	**Investment Status**
Google Map	Invest	RouteSmart	Maintain
Google Earth	Invest	Oracle RDBMS	Maintain
Citrix	Maintain	VM Ware (OCTO Environment)	Maintain
EFS (Pictometry Family)	Maintain	DC Guide DB	Sunset & Migrate
ESRI ArcGIS Desktop	Maintain	DC Guide WS	Sunset & Migrate
ESRI ArcIMS	Sunset & Migrate	DC Guide Link	Sunset & Migrate
ESRI ArcGIS Server (and Extensions)	Invest	Master Address Repository (MAR)	Maintain
ESRI ArcPAD	Maintain	GeoServer and PostGIS	Invest

6.4 CUSTOMER SERVICES

The following bullets comprise planned action items for the OCTO GIS Group's Customer Service Team, from both an OCTO and a DC GIS perspective.

Education

- ★ Evaluate on-line course delivery materials and mechanisms
- ★ Survey/poll students during classes on GIS needs
- ★ Survey/poll students after classes on how they are using what they learned, and on ideas for additional training
- ★ Advocate for an "IT Class for Managers" that would include a GIS component

General Technical Counseling

- ★ Log customer service requests
- ★ Improve coordination with OCTO Help Desk

Technical Services

- ★ Review internal processes for transitioning requests into projects
- ★ Assess current use of fees for services

Outreach

- ★ Social/professional networking such as a User Group and user Wiki
- ★ Review communication protocols for outages and other notifications
- ★ Prioritize one cluster of departments per year that could benefit from the use of GIS in their business processes and mission activities for targeted outreach
- ★ Migrate to new open source DC-wide Web content management system (i.e. Drupal)
- ★ Apply Google Analytics as feasible to track and analyze website usage
- ★ Survey/poll DC GIS customer satisfaction

Input from the Business Plan Subcommittee on Customer Service follows (numbers for tracking and measuring progress). There may be some overlap with items above, but the source of the request or actionable item is different.

1. Investigate the viability of an "IT Class for Managers" that would include a GIS component; the GISSC could advocate for this, as an alternative to an "executive friendly" GIS-only class
2. Explore getting onto the educational program for the Capital City Fellows with a GIS overview; some of the CCFs have attended standard GIS classes

3. Consider on-line training for specific GIS topics, including "Address-Matching" and "Cartography," as an alternative to classroom training for certain topics; investigate interactive on-line training materials, including videos, that may be available for this purpose – this is somewhat dependent on what DCHR can support

4. Implement formal follow-up surveys to get a sense of how people are using (or not using) what they were taught in DC GIS classes; need a better questionnaire

5. Continue to develop awareness of resources outside of OCTO for referrals and access to additional expertise (such as Office of Planning and DDOT), and work towards a comprehensive 'clearinghouse' of services (i.e. a service offering catalog)

6. If new applications such as routing are developed, corresponding coursework will be needed, but the demand has not emerged, yet, and the requirements might be very agency-specific (requiring tailored training)

7. Explore a "Centers of Excellence" concept whereby various departments with special expertise and mission requirements can be leaders in certain initiatives or application areas, such as routing for instance; this is a good topic for discussion at a GIS SC meeting

8. Explore collaborative approaches with external parties for alternatives to DC GIS coursework and curriculum development; making use of Esri ELA training credits, which OCTO manages

9. Migrate from Vignette content management system (CMS) to Drupal, which is the open source CMS selected by OCTO to replace Vignette

10. Occasionally review departmental websites for reconciliation across departments and with regard to DC GIS links; the technology is there for sharing, and this is not an issue, just a reminder

11. Continue to provide support to DC's summer youth intern program; need equipment for interns

12. Update and reconcile distribution lists for data notifications and news dissemination

13. The Fiscal Year provides a hard constraint on fees for services, in terms of when the work must be completed and the money spent

14. Investigate a website for knowledge-sharing (e.g. Wiki); strengthen channels of communication and collaboration for GIS technicians to communicate

15. Continue to strengthen and refine methods of notifying data subscribers of changes; currently, interested parties can self-subscribe; leverage the list of subscribers as part of the DC GIC Community of Interest (COI) – notifications could be two-way

16. DC GIS "Web Services and Basemap Camp"

17. Plan for presentations on GIS Day at a university

6.5 BUDGET PLAN

The proposed OCTO operating budget for DC GIS is **$3.3 million for FY 2012**. Compared to FY 2011, this represents a substantial decline of approximately 33%, which is largely due to less available grant money to invest in FY 2012. The DC GISSC Executive Committee will convene to discuss the priorities for the coming year, to sustain the current level of excellence in the DC GIS Program, and make improvements as feasible. The projected budget for FY 2012 is expected to support the current level of staffing and basic activities of the OCTO DC GIS Group, with reduced investment in discretionary programs. Additional supplemental funding from grants will support strategic initiatives, such as Broadband Mapping and Planning, and the Regional Geospatial Data Exchange Hub, but at reduced levels when compared to FY 2011.

Initiation of a comprehensive program for mapping underground utility data is not covered by this budget; that effort is estimated to require an additional rough estimate of $2.5 million, the burden of which would be divided across DC GIS Program sponsors, including OCTO, DDOT, and WASA, primarily. Other unfunded needs include ground-based imagery to support 3D immersive GIS, and 3D buildings from LiDAR and other technologies.

6.6 MEASURING FEEDBACK& RECALIBRATION

On a periodic snapshot basis (e.g., quarterly), status will be monitored using the following chart, or a similar rubric. Ratings are based on a qualitative assessment, all things considered. The success factors in the following chart are distinguished as either ongoing or planned initiatives needing resource commitments and schedule attention.

Programmatic Goals	Overall Goal Status (Green, Yellow, Red)*	Success Factors	Schedule	Comment and Color-Code (Green, Yellow. or Red)*
Goal 2: Enterprise GIS		Develop and maintain mapping programs	Ongoing (but photogrammetric data every two years, every four years for elevation)	
		Deploy high-demand applications	Ongoing	
		Continue to develop Web Services	Ongoing	
		Expand and enhance DC GIS available data	Ongoing	
		Deploy mobile device apps for First Responders	Planned	
		Adopt a standard for feature-level metadata	Ongoing	
		Improve business processes with GIS	Ongoing	
		Achieve greater uniformity and usability in interfaces	Planned	
		Add underground utilities data as feasible	Planned	
Goal 3: Customer Service		Train GIS users	Ongoing	
		Provide technical support and consulting	Ongoing	
		Expand GIS within clusters	Planned	

*Color Key (during operational use, cells in the preceding table will be color-coded and comments added as appropriate).

Color: Rating
Green: Fully meets expectations and requirements (e.g., on schedule and achieving desired outcome)
Yellow: Partially meets expectations and requirements (e.g., behind schedule, but making reasonable progress toward desired outcome)
Red: Not meeting expectations and requirements (e.g., behind schedule and very little or no progress toward desired outcome)

On a cumulative basis, overall status reported on the previous chart (i.e. Green, Yellow, and Red)***** will be "rolled-up" and tracked using the following chart:

Progress Matrix	**Year 0**	**Year 1**				**Year 2**			
	Sept 2011	Oct 2011	Jan. 2012	April 2012	July 2012	Oct. 2012	Jan. 2013	April 2013	July 2013
Programmatic "Goal 2"									
Programmatic "Goal 3"									
Running Assessment									

***NOTE:** Chart cells will be color-coded (i.e., Green, Yellow, Red) based on overall goal status as assessed by OCTO GIS Group and presented to GIS

APPENDICES

Appendix A: OCTO GIS DATA Catalog of Available Layers

Appendix B: Source Documents

Appendix C: Acknowledgements

Appendix D: Document History

APPENDIX A: OCTO GIS DATA CATALOG OF AVAILABLE LAYERS

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Administrative and Other Boundaries				
Admin Boundaries	ANC - 1990	BOEE	OCTO	5 years
Admin Boundaries	ANC - 2002	BOEE	OCTO	5 years
Admin Boundaries	Architect of the Capitol Areas	AOC	OCTO	5 years
Agency Layers	Campus Areas - Zoning	OZ		Annually
Agency Layers	Catchment Area - DHS	DHS		Annually
Admin Boundaries	Central Employment Areas	NCPC	OCTO	Annually
Agency Layers	Civic and Neighborhood Associations	EOM		Annually
Admin Boundaries	Collaborative Area	CFSA		Annually
Admin Boundaries	DC Boundary	OCTO	OCTO	10 years
Agency Layers	Lead Service Boundary - Office of Aging	OA		Annually
Agency Layers	Lead Service Provider - Office of Aging	OA		Annually
Agency Layers	Neighborhood clusters	OP	OP	Annually
Admin Boundaries	Parking Beats	DDOT	OCTO	Annually
Admin Boundaries	Quadrants - DC	OCTO	OCTO	5 years
Agency Layers	Small Area Plans	OP		
Admin Boundaries	SMD - 2002	BOEE	OCTO	2 years
Admin Boundaries	Voting Precincts - 1990	BOEE	OCTO	2 years
Admin Boundaries	Voting Precincts - 2000	BOEE	OCTO	2 years
Admin Boundaries	Voting Precincts - 2002	BOEE	OCTO	2 years
Admin Boundaries	Voting Precincts - 2008	BOEE		
Admin Boundaries	Wards - 1990	OP	OCTO	5 years
Admin Boundaries	Wards - 2002	OP	OCTO	5 years
Business Data				
Agency Layers	ABRA license locations	ABRA	OCTO	Annually
Agency Layers	Bank Locations	DCISB		Annually
Agency Layers	Broadband Adoption Rates - Residential	OCTO		Semi-Annually
Agency Layers	Business Improvement Districts	Individual BIDs	OCTO	Annually
Agency Layers	Cellular Service Area Boundaries	FCC		Annually

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Business Data *(continued)*				
Agency Layers	District Revitalization Areas - includes Anacostia Waterfront Initiative (AWI)	OP	OP	Annually
Agency Layers	Economic Development Zones	OP		Annually
Agency Layers	Enterprise and Empowerment Zones	EOM	OCTO	Annually
Agency Layers	Gas Stations	DCEO		Quarterly
Agency Layers	Grocery Stores	OP		Quarterly
Agency Layers	High Tech Development Zones	EOM	OCTO	Annually
Agency Layers	Historically Underutilized Business Zones	OP	OP	Annually
Agency Layers	Hotel	OCTO		Annually
Agency Layers	Main Street Program Area	OP	OP	Annually
Agency Layers	Neighborhood Investment Fund Areas	EOM	OCTO	Annually
Agency Layers	Non Depository banks	DISB		
Agency Layers	Notary Public	ONCA		Monthly
Agency Layers	Retail Site	WDCEP		Quarterly
Agency Layers	Shopping Centers	OCTO		Annually
Agency Layers	Strategic Neighborhood Investment Program Areas	OP	OP	Annually
Agency Layers	Tax Increment Financing Areas	EOM		Annually
Cultural and Society				
Agency Layers	Cemeteries	OCTO	OCTO	5 years
Planimetrics	Cultural features	OCTO	OCTO	5 years
Agency Layers	DHS Service Center	DHS		Annually
Agency Layers	Libraries	DCPL	OCTO	Annually
Agency Layers	Places of worship	OCTO	OCTO	Annually
Admin Boundaries	Polling Places	BOEE	OCTO	2 years
Agency Layers	Polling Places - Alternate	BOEE		
Agency Layers	Post Offices	USPS	OCTO	Annually
Agency Layers	RSA Counselor Location	DDS		Annually
Demographics				
Agency Layers	Census - Public Use Microdata Area	Census Bureau		Semi-Annually
Agency Layers	Census Block Groups - 2000 - DC	Census Bureau		10 years
Agency Layers	Census Block Groups - 2010 DC	OP	OCTO	10 years
Agency Layers	Census Blocks - 2000 - DC	Census Bureau	OP	10 years
Agency Layers	Census Blocks - 2010 - DC	OP	OCTO	10 years

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Demographics *(continued)*				
Agency Layers	Census Tracts - 1930 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 1940 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 1950 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 1960 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 1970 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 1980 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 1990 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 2000 - DC	Census Bureau	OP	10 years
Agency Layers	Census Tracts - 2010 - DC	Census Bureau	OP	10 years
Agency Layers	Neighborhood Composition	OP	OP	Annually
Education				
Agency Layers	Charter Schools	DCPCSB	OCTO	Annually
Agency Layers	Elementary School Attendance Zones	DCPS	DCPS	Annually
Agency Layers	Independent schools	OCTO		Annually
Agency Layers	Middle School Attendance Zones	DCPS	DCPS	Annually
Agency Layers	Public School Administration Locations	DCPS		Annually
Agency Layers	Public Schools	DCPS	OCTO	Annually
Agency Layers	School Election Districts	DCPS	OCTO	Annually
Agency Layers	School Grounds	DCPS		Annually
Agency Layers	Senior High School Attendance Zones	DCPS	DCPS	Annually
Agency Layers	University Areas	EMA		
Agency Layers	University Locations	OCTO	OCTO	Annually
Environment				
Agency Layers	Air Emissions	EPA		Annually
Agency Layers	Community Gardens	DOE		Annually
Agency Layers	Energy Star Locations	EO		Annually
Agency Layers	Floodplains - 1985	FEMA		5 years
Agency Layers	Floodplains - 2010	FEMA	OCTO	5 years
Agency Layers	Floodplains - Base Flood Elevation	FEMA		
Agency Layers	Floodplains - Cross Section	FEMA		
Agency Layers	Floodplains - FIRM panel	FEMA		
Agency Layers	Floodplains - General Structure	FEMA		

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Environment *(continued)*				
Agency Layers	Green Resources and Sites (Green Roofs incl)	DDOE		
Agency Layers	Hazardous Waste Locations	EPA		Annually
Planimetrics	Hydrography	OCTO	OCTO	5 years
Planimetrics	Hydrography Centerline	OCTO		5 years
Agency Layers	Land Cover - 2006	DDOT		Annually
Agency Layers	LEED Sites	EO		Annually
Agency Layers	MS4 Storm Sewershed - Areas	DDOE		5 years
Agency Layers	MS4 Storm Sewershed - Boundary	DDOE		5 years
Agency Layers	MS4 Storm Sewershed - Impervious Areas	DDOE		5 years
Agency Layers	No Fly Zones	NGA		Annually
Planimetrics	Obscured areas	OCTO	OCTO	5 years
Agency Layers	Parks	OCTO		Annually
Agency Layers	Soil areas	USDA	EHA	10 years
Agency Layers	Subwatersheds	USGS		5 years
Agency Layers	Subwatersheds - Anacostia River	DDOE		Annually
Agency Layers	Toxic Release Inventory Sites	EPA		Annually
Agency Layers	Water Discharge Locations	EPA		Annually
Planimetrics	Waterbodies	OCTO	OCTO	5 years
Agency Layers	Watersheds	DOE		5 years
Agency Layers	Wetlands	USFWS	EHA	5 years
Planimetrics	Wooded areas	OCTO	OCTO	5 years
Facility and Structure				
Agency Layers	Above Ground Storage Tank	FEMS		Annually
Agency Layers	Ambulatory Surgical Centers	DOH	OCTO	Quarterly
Planimetrics	Basketball and Other Recreation Courts	DPR		Annually
Planimetrics	Bollards	OCTO	OCTO	5 years
Planimetrics	Buildings	OCTO	OCTO	5 years
Agency Layers	Buildings - 3D (ESRI Format ONLY)	OCTO		As Needed
Agency Layers	Child Care Sites	DOH	OCTO	Quarterly
Agency Layers	DC Government Locations	DRES	OCTO	Annually
Agency Layers	Dialysis Clinics	DOH	OCTO	Quarterly
Agency Layers	Embassies	OCTO	OCTO	Annually

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Facility and Structure *(continued)*				
Agency Layers	Fire Alarm Districts	FEMS		Annually
Agency Layers	Fire Battalion Areas	FEMS		Annually
Agency Layers	Fire Stations	FEMS	OCTO	Annually
Agency Layers	Golf Courses	OCTO	OCTO	5 years
Agency Layers	GSA Federal Locations	GSA	OCTO	Annually
Agency Layers	Halfway Houses - Correctional	DOC	OCTO	6 months
Agency Layers	HIV Aids Clinics	DOH		Annually
Agency Layers	Hospitals	DOH	OCTO	Annually
Agency Layers	Human Service Locations	DHS	OCTO	Quarterly
Planimetrics	Impervious Surface - 2008	OCTO		
Agency Layers	Litter Cans	DPW		Annually
Agency Layers	Marinas	DDOE	EMA	Annually
Planimetrics	Miscellaneous Polygons	OCTO	OCTO	5 years
Agency Layers	Nursing homes	OA	OCTO	Annually
Agency Layers	Police Districts	MPD	OCTO	Annually
Agency Layers	Police Service Areas	MPD	OCTO	Annually
Agency Layers	Police Stations	MPD	OCTO	Annually
Agency Layers	Primary Care Facilities	DOH	OCTO	Quarterly
Agency Layers	Public Housing	HA		Annually
Agency Layers	Recreation Facilities	DPR	DPR	Annually
Agency Layers	Recreation Outdoor Amenities	DPR		Annually
Agency Layers	Recreation Parks	DPR	DPR	Annually
Agency Layers	Recycling Day Pickup	DPW		As Needed
Agency Layers	Red Light Cameras	MPD	OCTO	6 months
Planimetrics	Salt Domes	DDOT		Annually
Agency Layers	Senior Service Network Locations	OA	OCTO	Quarterly
Planimetrics	Stairs	OCTO	OCTO	5 years
Planimetrics	Structures Lines	OCTO	OCTO	5 years
Agency Layers	Supercan Pickup Days	DPW		As Needed
Agency Layers	Supercans	DDOT		
Planimetrics	Swimming pools	OCTO	OCTO	5 years
Planimetrics	Tennis Courts - Dept of Recreation	DPR		Annually

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Facility and Structure *(continued)*				
Agency Layers	Trash Pickup Days	DPW		As Needed
Agency Layers	Underground storage tanks	EHA		Annually
Planimetrics	Wheelchair Ramps			
Historic				
Agency Layers	African American Heritage Trail	CulturalTourismDC	OCTO	Annually
Agency Layers	Baker Plan	OCTO		None
Agency Layers	Commission of Fine Arts Review Area	CFA		Annually
Agency Layers	Ellicott Plan	OCTO		None
Agency Layers	Good Plan	OCTO		None
Agency Layers	Hawkins Topography	OCTO		None
Agency Layers	Heritage Trail	Cultural Tourism		Annually
Agency Layers	Heritage Trail Sign	CulturalTourismDC		Annually
Agency Layers	Historic Districts	OP	OP	Annually
Agency Layers	Historic Sewer Survey	OCTO		None
Agency Layers	Historic Shaded Relief	OCTO		None
Agency Layers	Historic Street Lines	OP	OP	Annually
Agency Layers	Historic Streets	OP	OP	Annually
Agency Layers	Historic Structures	OP		Annually
Agency Layers	Historic View of DC	OCTO		None
Agency Layers	Hopkins Survey	OCTO		None
Agency Layers	Jattnig Plan	OCTO		None
Agency Layers	Johnson and Ward Survey	OCTO		None
Agency Layers	Keily Survey	OCTO		None
Agency Layers	Kroe Plan	OCTO		
Agency Layers	Latrobe Survey	OCTO		None
Agency Layers	LEnfant Plan	OCTO		None
Agency Layers	L'Enfant Plan Boundary	OP	OP	5 years
Agency Layers	Other Historic Areas	OP		Annually
Agency Layers	Shaw Historic Sites	OP	OP	Annually
Agency Layers	Shipstead-Luce Act Boundary	OP	OP	
Agency Layers	Thackara Vallance Plan	OCTO		None

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Location				
MAR	Address Points - MAR	OCTO		Weekly
Agency Layers	Block - Street	OCTO		Quarterly
Planimetrics	Geodetic Control	OCTO		5 years
Agency Layers	Landmark Areas	OP	OCTO	Annually
Agency Layers	Landmark Buildings and Structures	OP		Annually
Agency Layers	Points of Interest (Address Alias Names)	OCTO		Monthly
Agency Layers	Zip Codes	USPS	OCTO	Annually
Photogrammetric				
Agency Layers	Orthophoto of DC - 1995	OCTO		Annually
Agency Layers	Orthophoto of DC - 1999	OCTO		Annually
Agency Layers	Orthophoto of DC - 2002	USGS	OCTO	Annually
Agency Layers	Orthophoto of DC - 2005	OCTO		Annually
Agency Layers	Orthophoto of DC - 2008	OCTO		
Agency Layers	Orthophoto of DC - 2010	OCTO GIS		Semi-Annually
Agency Layers	Topography - Ten foot contours	OCTO		
Agency Layers	Topography - Breaklines	OCTO		5 years
Agency Layers	Topography - Spot Elevations	OCTO	OCTO	5 years
Agency Layers	Topography - Twenty foot contours	OCTO		Annually
Agency Layers	Topography - Two Foot Contours	OCTO	OCTO	5 years
Property				
Agency Layers	Abandoned Vehicle Inspection Area	DPW		
Agency Layers	Air Right Polygons	DCRA,OTR	OCTO	
Agency Layers	Alley Frontage Lines	DCRA,OTR	OCTO	
Agency Layers	Appropriations	OTR		As Needed
Agency Layers	Assessment Neighborhoods	OTR	OTR	Annually
Agency Layers	Assessment Subneighborhoods	OTR	OTR	Annually
Agency Layers	Building Restrictions	DCRA,OTR	OCTO	
Agency Layers	CAMA - Commercial Property	OTR	OTR	Quarterly
Agency Layers	CAMA - Condominium Property	OTR		Quarterly
Agency Layers	CAMA - Residential Property	OTR		Quarterly
Agency Layers	Certificates of Occupancy	DCRA		Quarterly
Agency Layers	Comprehensive Plan Planning Areas	OP		Annually

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Property *(continued)*				
Agency Layers	Condo Lots	DCRA		Annually
Agency Layers	Condo Tables - Relate, Regime, and One to Many	DCRA,		
Agency Layers	DC Properties	DRES		Semi-Annually
Agency Layers	Downtown Development Comprehensive Plan	OP	OP	Annually
Agency Layers	Land Use - 2002	OP	OP	Annually
Agency Layers	Land Use - Existing	OP		Annually
Agency Layers	Land Use - Planned 2006	OP		As Needed
Agency Layers	Military Locations	OCTO		Annually
Agency Layers	NonProfit Tax Abatement	EOM		Annually
Agency Layers	Overlay Zones	OZ	OZ	Quarterly
Agency Layers	Owner Points	OTR	OTR	Weekly
Agency Layers	Owner Polygons	DCRA,OCFO		
Agency Layers	Ownerpoint - Field Descriptions	OTR	OTR	Annually
Agency Layers	Ownerpoint - Use code descriptions	OTR	OTR	Annually
Agency Layers	Parcel Lots	DCRA,OCFO		
Agency Layers	Planned Unit Developments	OZ	OZ	Quarterly
Agency Layers	Public Easements	DCRA,OCFO		
Agency Layers	Record Lot Polygons	DCRA,OTR	OCTO	
Agency Layers	Reservations	DCRA		Annually
Agency Layers	Right of Way - street corridors	DDOT		Annually
Agency Layers	Right of Way - street corridors as polygons	DDOT		Annually
Agency Layers	Right of Way Scans - 1998	DDOT		
Agency Layers	Sale Point	OTR	OTR	Weekly
Agency Layers	Square Polygons	DCRA,OTR	OCTO	Daily
Agency Layers	Tax Lot Polygons	DCRA,OCFO	OCTO	
Agency Layers	Transfer of Development Rights - Zoning	OZ		Monthly
Planimetrics	Under Construction Areas	OCTO		5 years
Agency Layers	Zoning	OZ	OZ	Quarterly
Transportation				
Agency Layers	Air Space Restrictions	NGA		Annually
Agency Layers	Bicycle Count Locations	DDOT		Annually
Agency Layers	Bicycle Lane	DDOT		

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Transportation *(continued)*				
Agency Layers	Bike Routes - Signed	DDOT		Annually
Planimetrics	Bridges and Tunnels	DDOT	OCTO	5 years
Agency Layers	Bridges with Attributes - point	DDOT		
Agency Layers	Bridges with Attributes - polygon	DDOT	OCTO	Annually
Agency Layers	Bus Rapid Transit - planned	DDOT		
Agency Layers	Capital Bike Share	DDOT		Monthly
Agency Layers	Commuter Bus Locations	DDOT		
Planimetrics	Curbs	OCTO	OCTO	5 years
Agency Layers	DC Circulator Routes	DDOT		Annually
Agency Layers	DC Circulator Stops	DDOT		Annually
Agency Layers	Evacuation Routes - Regional	EMA,DDOT		Annually
Agency Layers	Heliports	USDOT	EMA	Annually
Agency Layers	Highway Advisory Radio	DDOT		
Agency Layers	Highway Plans	DCRA,OCFO		
Agency Layers	Intersections - Street	OCTO		Quarterly
Agency Layers	Metro Bus Lines	WMATA		Annually
Agency Layers	Metro Bus Stops	WMATA		Annually
Agency Layers	Metro Entrance Structures	OCTO		
Agency Layers	Metro Lines - Complete System	WMATA	OCTO	Annually
Agency Layers	Metro Lines - DC Only	WMATA	OCTO	Annually
Agency Layers	Metro Park and Ride Lots	WMATA	OCTO	Annually
Agency Layers	Metro Station Entrances	WMATA	OCTO	Annually
Agency Layers	Metro Station to Line Cross Reference	WMATA	OCTO	Annually
Agency Layers	Metro Stations - Complete System	WMATA	OCTO	Annually
Agency Layers	Metro Stations - DC Only	WMATA	OCTO	Annually
Planimetrics	Miscellaneous Transportation Features	OCTO		5 years
Agency Layers	Other Bus Route Stops	OCTO		Annually
Agency Layers	Other Bus Routes	OCTO		Annually
Planimetrics	Other traffic signs	OCTO	OCTO	5 years
Agency Layers	Partial Light Plow Routes	DDOT		Annually
Planimetrics	Pavement Marking	DDOT		Annually
Agency Layers	Portable Dynamic Sign Message	DDOT		Annually

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Transportation *(continued)*				
Agency Layers	Primary Signed Route	DDOT		
Planimetrics	Railroads	OCTO	OCTO	5 years
Agency Layers	Rapid Bus - planned	DDOT		
Agency Layers	Residential Parking Permit Blocks	DDOT		Annually
Planimetrics	Roads	OCTO	OCTO	5 years
Agency Layers	School Crossing Guard	DDOT		
Agency Layers	Secondary Signed Route	DDOT		Annually
Planimetrics	Sidewalks	OCTO	OCTO	5 years
Agency Layers	Signalized Intersection	DDOT		Annually
Agency Layers	Signed Bike Route	DDOT		Annually
Agency Layers	Smart Bike Location	DDOT		Annually
Agency Layers	Snow Emergency Routes	DDOT	DDOT	Daily
Agency Layers	Snow Removal Areas	DDOT	DDOT	Annually
Agency Layers	Snow removal routes - all	DDOT,DPW	DDOT	Annually
Agency Layers	Snow Removal Zones	DDOT,DPW	DDOT	Annually
Agency Layers	Specialty Lighting	DDOT		Annually
Agency Layers	Speed Detector	DDOT		Annually
Agency Layers	Speed Humps	DDOT		Annually
Agency Layers	Street Car - planned	DDOT		Annually
Planimetrics	Street Centerlines	DDOT	OCTO	Quarterly
Agency Layers	Street Light	DDOT		Annually
Agency Layers	Street Roadway Segments - Alleys, ramps, service, and drives	DDOT	OCTO	Quarterly
Agency Layers	Traffic Cabinet	DDOT		Annually
Agency Layers	Traffic Camera	DDOT		Annually
Agency Layers	Traffic Cameras (CCTV) - DDOT	DDOT		Annually
Agency Layers	Traffic Control Officer	DDOT		Annually
Agency Layers	Traffic Monitoring Stations	DDOT		Annually
Planimetrics	Traffic Pole	DDOT		Annually
Agency Layers	Traffic Push Button	DDOT		Annually
Planimetrics	Traffic Sign	DDOT		Annually
Agency Layers	Traffic Signal	DDOT		Annually
Agency Layers	Traffic Signal Arm	DDOT		Annually

PLATFORM CATEGORY	LAYER NAME	ORIGINATOR	GIS LEAD	UPDATE CYCLE
Transportation *(continued)*				
Agency Layers	Trails	DDOT	DDOT	Annually
Agency Layers	Trails - NPS	NPS		Annually
Agency Layers	Transportation Analysis Zones	COG		Annually
Agency Layers	Transportation Study Areas	DDOT		Annually
Agency Layers	Trees - Street	DDOT		Semi-Annually
Agency Layers	Weigh in Motion Station	DDOT		Annually
Agency Layers	Zip car locations	DDOT		Annually
Utilities Data				
Planimetrics	Electric SubStations	OCTO	OCTO	5 years
Agency Layers	Fire Hydrants	WASA	OCTO	Quarterly
Planimetrics	Grates	OCTO	OCTO	5 years
Agency Layers	Sewersheds - Combined (CSO)	DDOE		5 years
Agency Layers	Storm Sewer System areas	WASA		Annually
Planimetrics	Towers - AM	FCC	EMA	Annually
Planimetrics	Towers - Analog TV	FCC	EMA	Annually
Planimetrics	Towers - Antenna Structure Registration Locations	FCC	EMA	Annually
Planimetrics	Towers - Cellular	FCC		Annually
Planimetrics	Towers - Digital TV	FCC	EMA	
Planimetrics	Towers - FM	FCC		Annually
Planimetrics	Towers - Land Mobile Broadcasting	FCC	EMA	Annually
Planimetrics	Towers - Land Mobile Commercial	FCC		Annually
Planimetrics	Towers - Land Mobile Private	FCC		Annually
Planimetrics	Towers - Microwave	FCC		Annually
Planimetrics	Towers - Multipoint Distribution and Instructional Television Fixed Services	FCC		Annually
Planimetrics	Towers - Paging	FCC	EMA	Annually
Planimetrics	Towers - TV Contour Boundaries	FCC		Annually
Planimetrics	Utility poles	OCTO	OCTO	5 years
Agency Layers	Wireless Hot Spot	OCTO		Annually

APPENDIX B: SOURCE DOCUMENTS

PUBLISHER	TITLE	DATE
OCTO	Federated Geospatial Data Model	2005
OCTO	DC GIS Strategic Plan	2009 (January)
OCTO	Draft DC GIS Business Plan v.2	2009 (August)

APPENDIX C: ACKNOWLEDGEMENTS

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The District of Columbia contracted with Applied Geographics, Inc. (AppGeo) of Boston, Massachusetts to develop the plan documents. Project oversight was provided by the District of Columbia **GIS Steering Committee (GISSC),** its Executive Committee, and the OCTO GIS Group. For this purpose, the GISSC formed a Business Plan Subcommittee to provide input and feedback on both the planning process and content development. The following organizations and individuals contributed to this planning effort:

DC GIS Executive Committee:

- Barney Krucoff, Office of the Chief Technology Officer
- Charlie Richman, Office of Planning
- José Colon, Department of Transportation

OCTO GIS Staff:

- Alexandre Santos, Customer Service Team Lead
- Mario Field, Data Team Lead
- Matthew Crossett, Property and Address Team Lead
- Tianpu Liang, Development Team Lead
- Zhen Lo, Systems Team

Many staff from DC Agencies, including:

- Department of Environment
- Department of Public Works
- Department of Transportation
- Fire and Emergency Medical Services
- Metropolitan Police Department
- Office of Planning
- Office of Tax and Revenue
- Office of Zoning
- Washington Area Threat Reduction Center

Applied Geographics Inc.

- Rich Grady
- Kate Hickey
- Laura Healey

APPENDIX D: DOCUMENT HISTORY

VERSION #	DATE	DESCRIPTION	RESPONSIBILITY
Draft	July 15, 2011	DC GIS Business Plan	AppGeo
Final Draft	July 27, 2011	DC GIS Business Plan	AppGeo
Final			

NOTES: