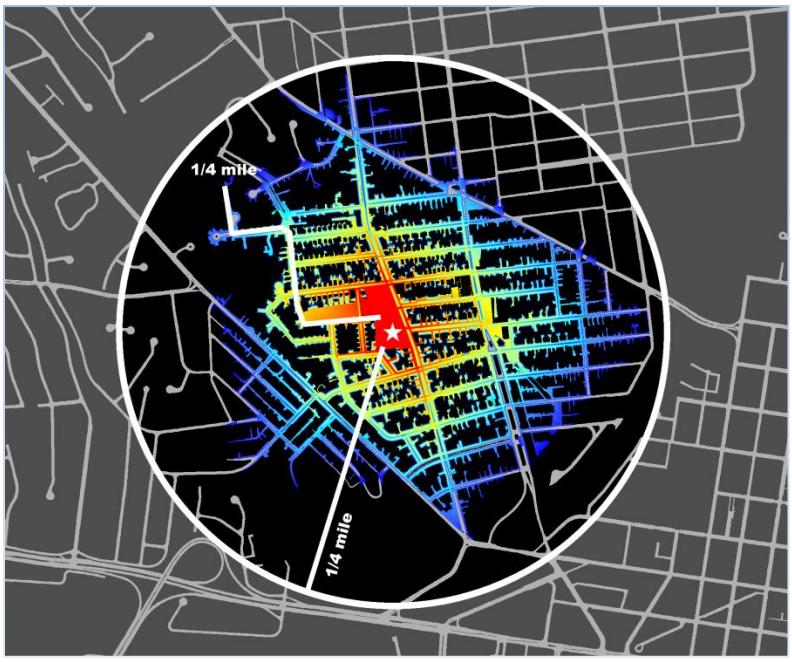
GEOGRAPHIC INFORMATION SYSTEMS (GIS)
FIVE-YEAR STRATEGIC PLAN
FY2013-FY2017

February 2012



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Department of Planning and Zoning
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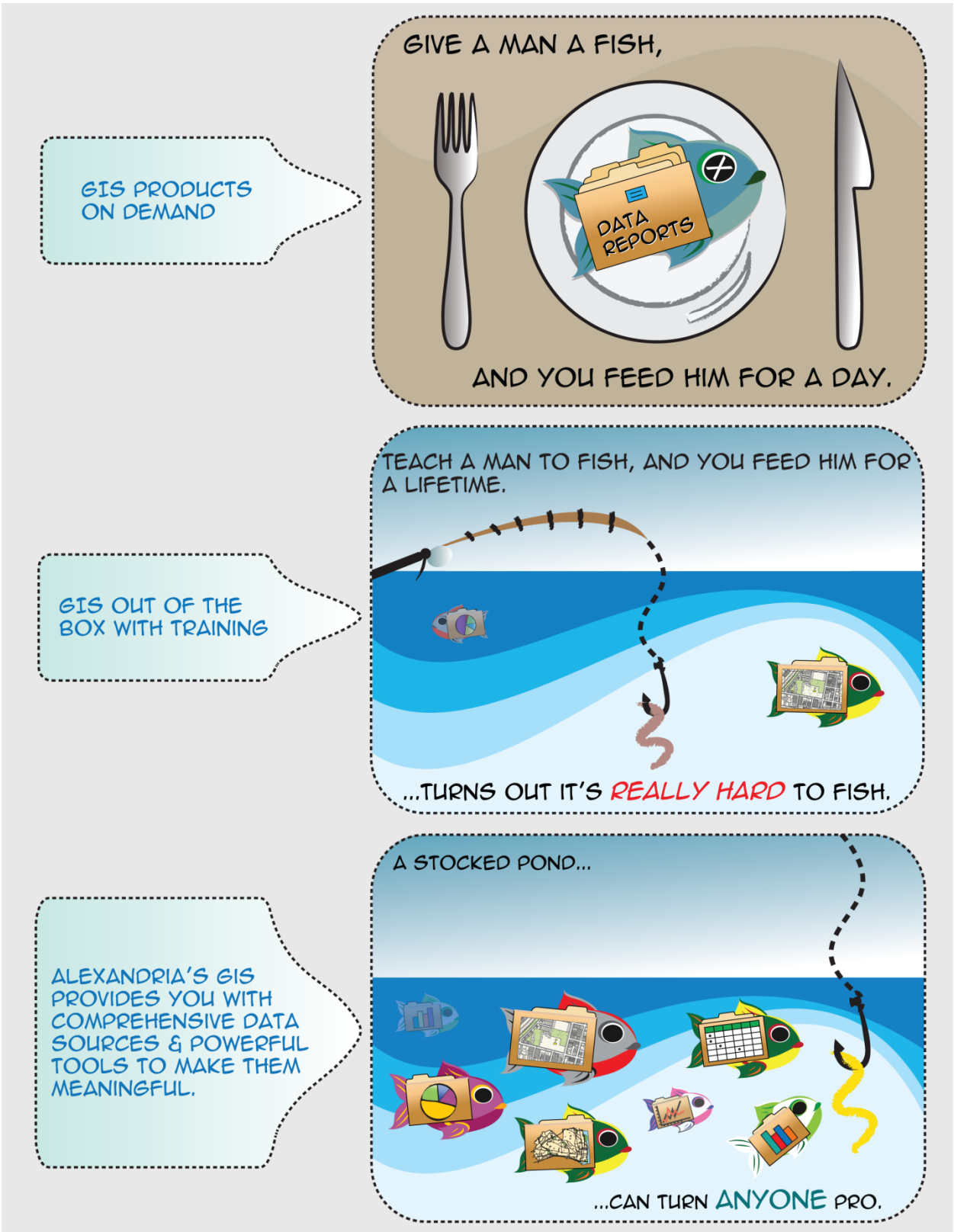
Approved by Rashad Young, City Manager (February 3, 2012)


GIVE A MAN A FISH,
DATA REPORTS
AND YOU FEED HIM FOR A DAY.
GIS PRODUCTS ON DEMAND
TEACH A MAN TO FISH, AND YOU FEED HIM FOR A LIFETIME.
...TURNS OUT IT'S REALLY HARD TO FISH.
GIS OUT OF THE BOX WITH TRAINING
A STOCKED POND...
...CAN TURN ANYONE PRO.
ALEXANDRIA'S GIS PROVIDES YOU WITH COMPREHENSIVE DATA SOURCES & POWERFUL TOOLS TO MAKE THEM MEANINGFUL.

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Executive Summary

In its simplest form, a Geographic Information System (GIS) is basic map data, software to make the data useful, and a person charged with coordinating its use. At the other end of the spectrum, is a system comprised of a complex array of data resources, applications integrations, and analytical spatial algorithms managed by a team of skilled professionals whose systems can provide the answers to nearly any complex spatial question. System cost and staff resources will vary accordingly: from next to nothing to millions of dollars annually. This plan establishes a framework to guide the alignment of Alexandria's GIS program with long-term City priorities and ensure that the program is sufficiently funded to achieve the plan objectives.

Alexandria's GIS is a mature and effective Division, delivering GIS services throughout the City and to the public. The function benefits everything from real property assessments to emergency management to land use and capital improvements. Over the years, Alexandria's GIS has had many successes. In the last year, Alexandria's GIS was a co-winner along with our Northern Virginia partners of *Esri's Special Achievement in GIS* award. In addition, the program's analytical approach to measuring and modeling walkability was presented at the 2011 American Planning Association Conference and an article based on Alexandria's approach entitled *Alexandria Takes the Next Steps Towards Walkability,* was published in the May 25th, 2011 edition of *Sustainable City Network*.

However, despite the success, there is still much unmet potential in its overall impact on the success of Alexandria's City Government. To adjust to changing circumstances including changing technology, organizational priorities, and economic circumstances, the Division has reinvented its service delivery approach several times over its 10 year existence. This Strategic Plan represents the first comprehensive look at all aspects of how GIS can provide the maximum benefit to the City. GIS and the City are now in a period where data-driven decision making and operational efficiency are more critical than ever in accomplishing the City's mission. There is an expectation for GIS to have a significant role in this effort. To maximize its return for the City's investment in GIS, the Division must do more than simply rearrange the overarching delivery model. A more strategic approach to long-term GIS success and sustainability is needed. This Plan addresses how the organization is structured and describes the system's capabilities and lays out a path forward for improving both.

Two items are essential to the program's success: (1) a clear mission, to ensure a common understanding of expectations and (2) a set of goals, to drive the direction.

Alexandria's GIS Mission:

Leveraging the power of geographical data to:
(1) expand the impact of shared information and critical thinking; and
(2) improve business processes and systems and inform decisions

The GIS goals ensure that the program is accounting for all of its diverse obligations in achieving the mission. The goals are divided into two functional areas: (1) Infrastructure, the development of the system resources

and analytical outputs; and (2) success factors, the activities related to ensuring that the infrastructure activities are properly targeted, understood, and well used.

To better align GIS resources and program objectives with the City's most pressing needs, the Plan defines a new governance model. The new governance model employs a senior level Steering Committee to replace the largely technical committee that is currently in place. In addition, the Plan defines a second user-based committee that is charged with improving operational efficiency by undertaking small GIS-based improvements and recommending more significant improvement projects to the Steering Committee for consideration in the GIS Work Plan.

Another significant aspect of the Plan is the *Strategic Opportunities Analysis*. The *Strategic Opportunities Analysis* lays out a path forward to improve data-driven decision making through a more comprehensive approach to GIS analysis and overall service delivery. It seeks to create efficiencies by addressing needs through a common framework, instead of discrete projects. Because geospatial needs are often functionally similar, there are many opportunities to maximize benefits by looking beyond the current need and identifying much broader opportunities. Coordinating funding, resources and partners who might not otherwise recognize the relationships among their needs can yield much greater organizational results than looking at the individual need of each stakeholder or department. This analysis identifies multiple similar projects and combines them into high value strategic opportunities referred to as "Common Solutions" to create the most cost-effective, comprehensive and sustainable approach.

A key challenge facing Alexandria's GIS in achieving its goals is attaining the right resource mix to sustain a large mature system which includes: extensive GIS data and applications, integration of new enterprise technology systems and an analytical program. The GIS Division does not have the resources to effectively address all of these obligations. Due to increasing needs and a reduction in resources, the Division has been scaling back support for all new initiatives during the last three to four years. The Division is still supporting all its obligations, but at a less effective level. The most significant resulting deficiency is the lack of a of a well-defined sustainable GIS analytical work program. Over the last several years, most GIS resources have first gone into maintaining and modifying the GIS infrastructure and supporting GIS integrations of enterprise technology systems, leaving few resources to advance the program's analytical aspects, arguably the single most significant reason the City has invested in GIS resources.

Glossary of Terms

Business Process: A collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers (Wikipedia)

Geocode: To assign a street address to a location (Esri)

Geodatabase: A database or file structure used primarily to store, query, and manipulate spatial data. Geodatabases store geometry, a spatial reference system, attributes, and behavioral rules for data. Various types of geographic datasets can be collected within a geodatabase, including feature classes, attribute tables, raster datasets, network datasets, topologies, and many others (Esri)

Geographic Information System (GIS): An integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analyzed (Esri)

Geospatial Technology: A set of technological approaches, such as GIS, photogrammetry, and remote sensing, for acquiring and manipulating geographic data (Esri)

Service Oriented Architecture: A set of principles and methodologies for designing and developing software in the form of interoperable services. These services are well-defined business functionalities that are built as software components (discrete pieces of code and/or data structures) that can be reused for different purposes (Wikipedia)

Spatial Analysis: The process of examining the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques in order to address a question or gain useful knowledge. Spatial analysis extracts or creates new information from spatial data (Esri)

Spatial Data: Information about the locations and shapes of geographic features and the relationships between them, usually stored as coordinates and topology (Esri)

Topological Association: The spatial relationship between features that share geometry such as boundaries and vertices. When a boundary or vertex shared by two or more features is edited using the topology tools in ArcMap, the shape of each of those features is updated (Esri)

Topology: In geodatabases, the arrangement that constrains how point, line, and polygon features share geometry. For example, street centerlines and census blocks share geometry, and adjacent soil polygons share geometry. Topology defines and enforces data integrity rules (for example, there should be no gaps between polygons). It supports topological relationship queries and navigation (for example, navigating feature adjacency or connectivity), supports sophisticated editing tools, and allows feature construction from unstructured geometry (for example, constructing polygons from lines). (Esri)

Walkability/Bikeability: A measure of how friendly an area is to walking or biking, taking into account many different variables, such as availability of pedestrian and biking infrastructure (paths, crosswalks, lanes, etc.), safety, and land use patterns (Wikipedia).

Acronyms

AVL: Automated Vehicle Location

CAD: Computer Aided Dispatch

COTS: Commercial Off-the-Shelf

DCHS: Department of Community and Human Services

EBSS: Enterprise Business Systems Support

FTE: Full Time Equivalent

GARI: Geographic Analysis and Research Interface

GIS: Geographic Information System

GISSC: GIS Steering Committee

GPS: Global Positioning System

IMS: Internet Map Server

ITS: Information Technology Services

ITSC: Information Technology Steering Committee

NCR: National Capital Region

P&Z: Planning and Zoning

QA/QC: Quality Assurance / Quality Control

ROI: Return on Investment

SOA: Service Oriented Architecture

T&ES: Transportation and Environmental Services

1. Introduction

The City of Alexandria's Geographical Information Systems (GIS) function is to manage the City's geospatial capabilities and tools, i.e., interactive reference mapping and spatial (map-based) analysis, and all of the data, applications, services and architecture that support them. This function is performed as a centralized operation from a division within the Department of Planning and Zoning, but serves the entire City enterprise and the public. The special utility of GIS for local government is its geographic framing of public policy; how it is developed and carried out. This perspective holds that a population, a process, or a problem is best understood when its geography is known: where it is located, how it is distributed, how it relates in time and space to other things. Such an understanding has the power to inform decisions and improve processes from the lowest levels of operation to the highest levels of decision making.

This is the first Strategic Plan to be developed for the City of Alexandria's GIS. It was undertaken with oversight from a Strategic Planning Committee comprised of high level City staff representing a broad cross-section of City functions, the experience and technical expertise of the City's GIS Division, and extensive project level input from an array of City staff. The Plan identifies high level goals for the Division, prioritizes a number of strategic opportunities, and creates a framework for governance and development of future Work Plans. The plan should be updated every 5 years.

Process

GIS held several needs gathering meetings and developed an on-line survey to get an understanding of the City's GIS needs landscape. These needs framed the Committee's direction as the Plan was developed. The Committee met seven times over a ten month planning process. Each meeting built upon the previous, while integrating findings from the needs gathering sessions with the overall plan. Strategic Planning meeting topics were focused on these topics: (1) process overview; (2) mission and goals; (3) needs gathering results and identifying common solutions; (4) program evaluation; (5) valuing projects; and (6) governance and budgeting.

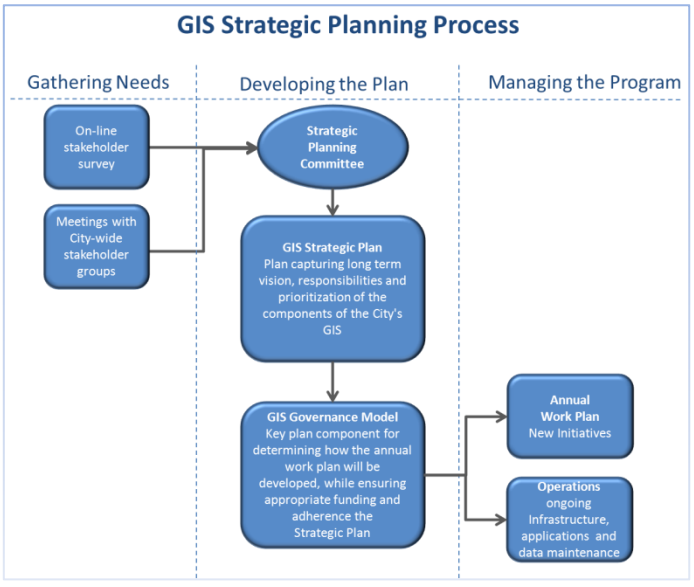

Figure 1. GIS Strategic Planning Process

2. Program Overview

Alexandria's GIS provides a platform for the City to improve service delivery through better informed business operations and decision making. The GIS Division is focused on delivering new insights to the organization through a commitment to research, information analysis, and operational efficiency.

Alexandria GIS Mission Statement

Leveraging the power of geographical data to: (1) expand the impact of shared information and critical thinking; and (2) improve business processes and systems and inform decisions

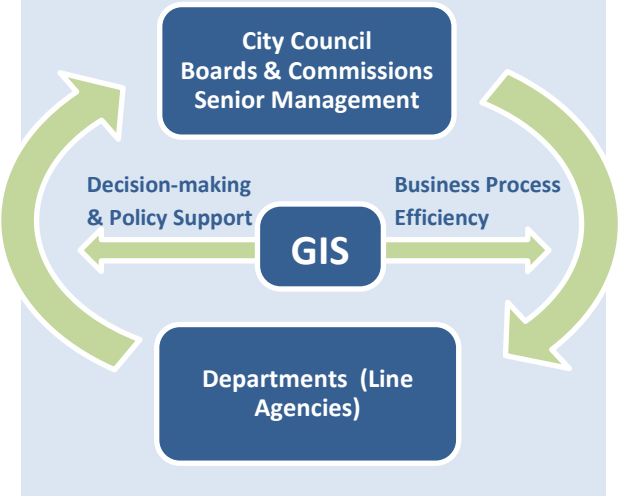

Figure 2. GIS Paradigm for Local Government

A. Benefits of a GIS Program to Local Government

Many GIS benefits are qualitative, such as improved collaboration, better decision making, and more efficient business processes. These efficiencies, when provided by a mature GIS, can have a significant impact on a City's financial bottom line. Geographical Information Systems are unique in that they attempt to satisfy support for many lines of business by standardizing approaches to many spatially and functionally similar, but organizationally dissimilar issues. For example, efficiently routing buses to get children to school and efficiently routing vacuum trucks to collect leaves are similar GIS projects. GIS benefits can be loosely categorized under three closely related general areas:

Operational/Business Process Efficiency

GIS is essentially integrative in its ability to unify information from different systems collected into location-bound databases, displays and analyses. GIS improves work flows, access to information and simplifies operational geography-based decisions. For example, GIS-based asset management systems can store information on assets such as fire hydrants and street signs with the feature itself, instead of the closest address. These features can then be symbolized on maps, enabling management to quickly view the statuses of hundreds of records by location and, most importantly, act quickly on that information. For example, in the case of fire hydrants, managers can get a quick bird's eye view of hydrants and readily identify the risks from out-of-service hydrants. Location-based storage of documents and reports can simplify access to land use history and regulatory decisions on a parcel or provide the fire department with specific access to emergency preplan information on a single building. GIS routing solutions can help more effectively assign daily workloads for field staff such as code inspectors or recommend the most efficient route to a first responder. GIS is also an important and effective means of interdepartmental coordination and collaboration. When used in a collaborative setting, GIS can quickly move conversations from anecdotal to factual and ensure all stakeholders are looking at the same comprehensive and relevant information.

Decision making and Policy Support

Good policies emerge from decision making processes that give the right people the right information at the right time in the right way. GIS offers an important advantage when formulating policies because it enables simultaneous analysis and visualization of different types of data that would not (or could not) otherwise be combined. For example, GIS staff has integrated Real Estate and Planning data to inform public school enrollment forecasts. In addition, GIS casts a uniquely geographical perspective on information: spatial patterns can be analyzed. GIS can inform decision making at all levels of City government in meaningful ways. Better basic information for operational plans can yield significant results when allocating resources: Where are the Human Service program participants clustered? Where are the crime hotspots? Which intersections have the greatest numbers of pedestrian accidents? More comprehensive GIS analysis can create significant efficiencies in the development of plans for multi-million dollar infrastructure or public facility projects such as the necessity and location of a new fire station, school or bike path. Likewise, GIS brings additional intelligence to high level policy decisions such as a better understanding of the geographic distribution of revenues and service expenses when trying to ensure equitable distribution of services throughout the City.

Transparency and Public Information

GIS increases the City government's transparency and acts as a first line of response for public inquiries. A mapping front end organizes information in a way that is intuitively discoverable for the public. For example, the Real Estate RealWare database is integrated with parcel boundaries and mapped alongside planimetric data to create Parcel Viewer. This on-line interactive mapping application allows members of the residential and business communities to query property values in relation to City features. Offering this service to the public frees up Real Estate staff to focus on tasks that are more productive than answering basic questions from the public. This same approach can be applied to virtually any internal process that does not have a legal confidentiality constraint, and has been integrated with the GIS database.

B. Guiding Principles

The GIS Division focuses on finding the right solutions for Alexandria. Over the last 10 years, it has been very successful in positively impacting a great many functions. Alexandria's GIS has taken the lead on projects as diverse as tree canopy studies, demographic projections and automatic vehicle location (AVL). This strategic plan is aimed at pushing GIS solutions beyond discrete projects that map-enable an old process or solution to a systematic and comprehensive focus on system capabilities. It will be implemented in accordance with the following guiding principles:

- **Cost Effective and High Return on Investment (ROI):** Ensure GIS projects address needs with the greatest positive organizational impact. Focus on economies of scale and long-term sustainability in all project approaches.
- **Innovative:** Leverage GIS capabilities and opportunities to create more intelligent, GIS-based business practices and processes.
- **Aligned with Alexandria's Geography:** Consider that Alexandria is a dense, geographically diverse urban community, which is heavily impacted by the greater region.

3. Goals

GIS program goals provide the overarching guidance to ensure that the GIS Strategic Plan helps the GIS Division achieve its mission and meet the goals as laid out in *Alexandria City Council's Strategic Plan*. The goals are broken down into two functional areas: (1) Infrastructure, the development of the system resources and analytical outputs; and (2) Success Factors, the activities related to ensuring that infrastructure activities are properly targeted, well understood, and well used. While both are equally important for program success, infrastructure activities consume more staff resources than success factors.

A. GIS Program Goals

GIS Infrastructure Goals

- **Data Development and Data Standards:** Ensure that each dataset meets its documented requirements for accuracy, timeliness, and reliability.
- **Complex Spatial Analysis:** Use GIS capabilities to develop data into resources that can reveal critical information and provide solutions to complex problems.
- **Application Development and Business Process Integration:** Guide agencies in leveraging spatial technology to improve their business processes and applications.
- **Interagency Collaboration and Coordination:** Help agencies work together more closely by developing institutional resources to facilitate sharing of programs, activities, regulations and plans.

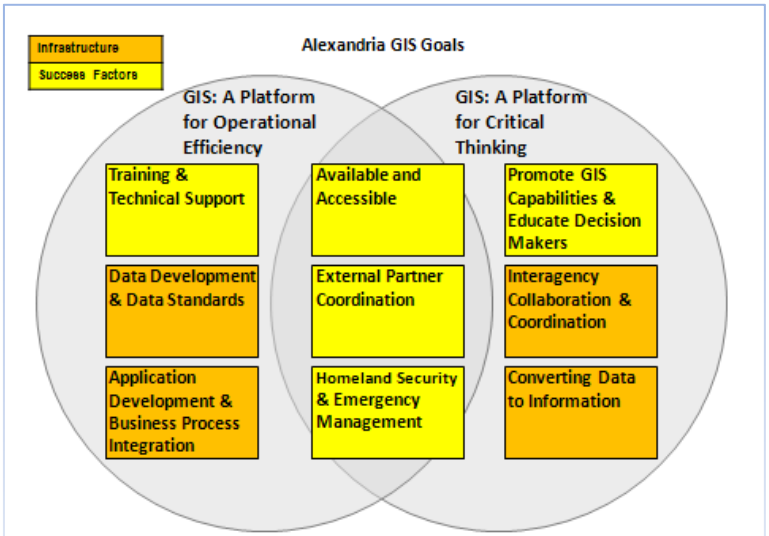

Figure 3. GIS Strategic Plan Goals

Success Factor Goals

- **Promote GIS Capabilities and Educate Decision Makers:** Implement education and outreach activities that help decision makers better identify opportunities to access existing or request new GIS solutions.
- **Training and Technical Support:** Be a committed partner in providing technical support and training to ensure that users can maximize GIS capabilities in fulfilling their missions.
- **Available and Accessible Systems:** Ensure that the City's GIS resources are available and accessible for day-to-day use for City, regional, and public purposes. Access should be tailored to ensure that application functions and complexity are matched to the users.

- **External Partner Coordination (Regional/State/Federal/Utility):** Sustain and improve existing partnerships in the region and the nation. Identify new partnership opportunities**.**
- **Support for Emergency Management and Homeland Security:** Ensure that spatial data and GIS application resources are accessible in emergency situations that threaten the health, safety or welfare of Alexandria and the region.

B. Relationship to Council's Strategic Plan

As GIS is a City support function, its Strategic Plan must feed into the goals and objectives of City Council's Strategic Plan. GIS solutions do not independently address any of Council's Strategic Plan initiatives, but they help inform thinking about the solutions and improve operations in the delivery of many of the proposed initiatives and objectives. Specific examples of direct GIS support opportunities can be found in every goal, which include the following:

- Analyzing the relationship between land use and transportation to assist planners in ensuring tight integration between the two (Goal#1)
- Studying and measuring changes in canopy and open space (Goal #2)
- Leveraging GIS for effective prioritization and management of preventive infrastructure maintenance and repairs (Goal #3)
- Identifying spatial trends to help most effectively locate and target youth populations for specific types of support to ensure programs and users are spatially aligned (Goal #4)
- Identifying the geographic characteristics in revenue and expense patterns can help the City identify changes and trends to better predict future revenues and expenses, as well as target efforts to improve both (Goal #5)

Figure 4. GIS addresses many interdependencies amongthe City's many diverse functions

- Developing systems that bring emergency-related information together from all areas of government in support of an "all hazards" approach[1] to public safety (Goal #6)
- Inventorying, mapping, and analyzing the distribution of historic properties and public art to help focus preservation efforts and identify deficiencies (Goal #7)

As Council's Strategic Planning initiatives come to the forefront and the City begins to investigate the ways to implement them, GIS must be at the ready with the raw data and analytical tools and skills to develop the right information to help senior leadership and elected and appointed officials make the most informed decisions.

[1] FEMA promotes the "All Hazards" approach to state and local governments, encouraging emergency planners to prepare generically for any type of hazardous event, not just specific types of events.

4. GIS History

A. Phase I - Launch

Alexandria's GIS function began in 2000 under the Development Division of Planning and Zoning (P&Z). Because GIS is an enterprise technology function, its appropriate organizational location was an issue of debate at the outset. It was determined that its best fit was with P&Z. First, new development originates within P&Z, enabling GIS to play a "gatekeeper" role with respect to data maintenance and map accuracy. Second, the greatest need for the geospatial information and analysis was within P&Z, at that time. To better serve its enterprise obligations, it became its own Division in P&Z in 2002.

Milestone	Year	
GIS program initiated	2001	Phase I
Basemap completed School Board redistricting analysis completed	2002	
Parcel conversion completed Address inventory completed GIS training program established	2003	
All addressing responsibilities assumed GIS public and internal web applications deployed	2004	Phase II
Spatial Database Engine (SDE) implemented Residential Parking District Viewer deployed	2005	
Emergency facilities allocation study completed Extensive analytical support for Braddock Plan provided	2006	
Police SRS Viewer (crime analysis application) developed Pictometry deployed Automated Vehicle Location (AVL) solution developed	2007	
GIS Portal developed (later combined with AlexNet) Document imaging integration developed School enrollment projections study completed	2008	Phase III
Building Model developed Cityworks collaboration initiated	2009	
Geographic Analysis and Research Interface (GARI) developed Service Oriented Architecture (SOA) implemented	2010	

Figure 5. GIS Division Milestones

Early visions of the enterprise GIS assumed a largely decentralized structure. Departments were stewards of their own data, performing routine maintenance and sharing with other departments via the GIS. GIS staff maintained the basemap, managed the clearinghouse of GIS data, and addressed other City GIS needs on an ad hoc basis. The GIS Division Chief and GIS Specialists coordinated activities under the direction of the GIS Steering Committee (GISSC).

B. Phase II - Centralization

As Geospatial approaches and solutions became more integrated with City processes and the technology more complex, the decentralized approach became less effective. The inefficiencies of the decentralized approach included data duplication, data gaps, and uneven data reliability and quality. Within a local government, with so many diverse needs, data can have many owners (e.g., road data is owned by those who plan it, those who maintain it, and those who use it). Furthermore, the specific ways in which data come together geographically have a multitude of implications in how they relate spatially (*What is inside what? What is adjacent to what? What overlaps with what? What contains what? What shares an edge? What intersects what?*). This shared ownership has significant impacts on the way that geospatial data is modeled and maintained. The need to take a more centralized approach emerged with the recognition that an urban GIS requires a tightly managed large-scale data enterprise.

By moving data responsibilities to dedicated analysts who can (1) ensure data integrity, access, and universality and (2) design optimal ways to leverage this investment in the form of GIS applications and analyses, a true geospatial infrastructure began to develop. The Division's new goal was to generate data that would be the

most flexible, reliable, and applicable to the most common City problems, and publish this data for whatever unanticipated uses the users could create.

GIS activities, outside of data maintenance and management, focused on training departmental users to explore data, create maps, and perform basic analysis. The Division also took the lead on assisting agencies in the acquisition of GIS-related hardware and software, including a survey- and GIS-grade Global Positioning System (GPS), the Computer Aided Dispatch application's mapping front end, Looking Glass, and the City's enterprise Document Imaging System, Laserfiche. Also during this time, the number of indirect consumers of GIS grew, and project requests became increasingly complex and wide-ranging.

C. Phase III – Specialization and Expansion

During this period, the technology had grown to a point where it was now beginning to present itself in many core Commercial Off-The-Shelf (COTS) applications. It had also grown in sophistication and complexity with regard to deployment models and analytical methods. The GIS core database had also matured to a point where it could meet a much greater array of needs. Given these conditions, the Division recognized a need to change how it was using its staff resources, which were scarce, in order to continue to grow with the City and the industry while sustaining the mission-critical operation it had become.

The staff was reorganized into two closely aligned but discrete operations: *Data* and *Applications*. The two highest graded non-management GIS staff persons were given supervisory responsibilities and an emphasis was placed on specialization in various aspects of GIS to create a greater breadth and depth of expertise within the Division.

These changes led to several positive outcomes:

- **Better management of core GIS data:** A team with a dedicated lead and a more comprehensive focus was now managing the data. The results were meaningfully modeled data, the transfer of a few key layers back to departments, and a new database architecture.
- **A clearer application mission:** The Applications team moved from a reactive position of supporting COTS and a handful of targeted GIS-developed applications to a more proactive role with respect to the City's GIS applications landscape. This more complete model broke GIS application deployment into four categories: (1) COTS integration; (2) a single all-purpose multi-configuration GIS; (3) desktop training; and (4) service oriented architecture.
- **More robust analytical functions:** During this period, there was an acknowledgment that, with rare exception, teaching City staff to perform complex analysis was neither yielding good analysis nor efficiently using non-GIS staff time. It was a shift in focus to having higher end analytical tasks addressed by experienced GIS staff and, to the extent possible, pushing all basic mapping back to end users. As a result, the Division was taking on fewer overall projects, but those that were coming in were of greater value.

5. Current State

The GIS Division is still working under the organizational model described in *Section 4C*: *GIS History, Phase III: Specialization and Expansion.* As geospatial technology continues to evolve, staff continues to refine specializations. With the economic downturn, City agencies needed to look internally for resources that had previously been outsourced and, as a result, the need for GIS assistance has grown. This inward reliance has helped accelerate the Division's organizational impacts by bringing more people to the table and raising the level of expectations. The need for more relevant and informative analyses continues to grow.

A. Workload

The GIS workload is divided into *Operations* (maintaining the system), *New Initiatives* (improving the system) and *Ad Hoc Projects* (unplanned needs). GIS resource planning is mostly balanced between operations and new initiatives. Ad hoc projects pose the biggest workload planning challenge, as they need to be prioritized, resourced, and ideally folded into the larger program within a short time.

Table 1. GIS Resource Allocation Overview

	Operations	New Initiatives	Ad Hoc Projects
Governance	GIS Division Chief	GIS Steering Committee (Formalized by the Work Plan)	GIS Division Chief (Guidance from Department Director)
Staff Resources[2]	2.4 FTEs (48%)	2 FTEs (40%) Average of 5-7 projects / year	0.6 FTEs (12%) Average of 60 projects / year
Examples	Troubleshoot applications Training programs Data maintenance Standard map production GIS Helpdesk	Building model GARI web-based GIS Regional routable centerline COTS applications Walkability modeling	New floodplain evaluation Mosquito trap site selection King Street frontage and restaurant uses Fire protection systems map
Value	Sustain the status quo. Ensure that the system provides what it is expected to provide and protect the long-term viability of the large investments that have been made in the GIS.	Long-term program benefits. They typically add an application, data set or analytical capability to improve business processes for a large group of people or support high impact decisions.	Present opportunities for significant ROI. They represent an unforeseen decision point or operational need with current and often significant financial consequences for the City.
Challenges	Steady growth has been reducing capacity to address operational needs. Over the last 3 years, data update effectiveness has dropped from 90% to 75%. These reductions threaten to erode the reliability of the GIS.	Often require significant additional resources and dedicated 'buy in' from partner agencies.	Take resources directly from planned operations or the new initiatives and can impact the success of either. In addition, they are frequently less effective and not sustainable, because of the tight deadlines.

[2] Staff resource breakdowns are from an evaluation of the allocation of staff resources over a 4 month period from January to April 2010.

Operations

"Operations" refers to all continuing obligations (which grow as the GIS Division implements new projects). These can take the form of keeping data current, performing recurrent analysis projects, updating software versions, assisting COTS application users in evolving systems, maintaining geoprocessing models, providing training programs, and producing annual standard maps and data DVDs. It also includes unplanned items such as troubleshooting system breakdowns and providing technical support.

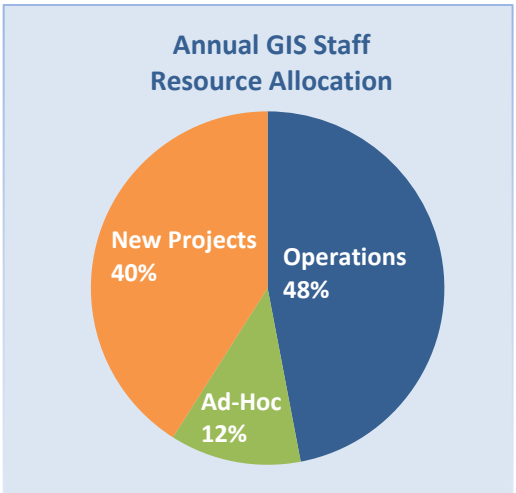

Figure 6. Annual GIS Staff Resource Allocation

However, even with nearly half of staff's time dedicated to current operations, the Division has seen a reduction in its data and application maintenance effectiveness over the last 4 years. For example, on-time delivery of layer maintenance work has decreased from 95% to 75% over this time period. This performance decrease is due to an increase in the number and complexity of the layers in the system, coupled with a decrease in contract hours, which had traditionally augmented staff capacity. In addition, the maintenance of data continues to grow more complex as new enterprise applications with more sophisticated GIS integrations come online, and the GIS data maintenance requirements and specifications expand. The same dynamic exists in the applications work, as the number of supported applications has grown from 9 to 17 while at the same time increasing in complexity. As new initiatives are pursued, the current operations workload will continue to expand because successful GIS initiatives result in some additional operating burden. Several of the *Common Solutions* identified in *Section 7C* seek to mitigate this effect. These solutions, while not eliminating growth in current GIS operations, will help slow the service reductions:

- **All-purpose situational awareness resource (Common Solution #1**): The framework by which GIS will facilitate comprehensive internal information sharing through a single resource.
- **End-user data maintenance (Common Solution #16):** A framework for allowing end users to take on some data maintenance responsibilities while striking a balance between data integrity and end user data maintenance.
- **Service Oriented Architecture (SOA) (Common Solution #2):** A framework of reusable components that provide a specialized GIS functions as interfaces to external databases and applications.

New Initiatives / Annual Work plan

"New Initiatives" are defined in the annual GIS Work Plan. These can be additional data layers, COTS application implementations, system modifications, development of additional capabilities (as outlined under *Common Solutions* in *Section 7C* of this Plan), or a significant but discrete analytical project need (i.e. developing a methodology to support school enrolment forecasting.) New initiatives generally account for 40% or 2 FTEs of staff resources. However, the amount of work defined in the Work Plan may vary greatly from year to year depending on the availability of additional funding. This Strategic Plan places a significant focus on

how to best develop the annual Work Plan to ensure that it addresses the most significant strategic goals of the GIS.

It is important to consider that unplanned initiatives are not uncommon and can (and in the past have) quickly exhaust resource capacity dedicated to advancing new initiatives. This problem can occur when an unplanned need arises unexpectedly (e.g., support for a reevaluation of the snow removal plan, in light of the winter 2010 snow storms) and sometimes cannot be avoided. However, these initiatives more often arise from the failure to recognize the need for significant GIS support at the outset of a planned project. The incidence of these unplanned GIS needs can be reduced going forward through better and more consistent education of decision makers. In this way, the needs for GIS resources can be established and vetted much earlier in the process, leading to better planned GIS initiatives and more significant ROI from GIS involvement.

Table 2. FY2012 GIS Work Plan

GIS Program Projects	GIS Application Development, Support and Integration
Orthophotography / planimetric update	Computer Aided Dispatch and Records Management System (CAD/RMS) - Support for acquisition and implementation of new system
Demographic updates based on 2010 Census	Geographic Analysis and Research Interface (GARI) 2.0 development
Regional routable centerline	Migration to Cityworks Server
Measuring and modeling walkability	ArcGIS 10.0 rollout
Building model finalization; update process for office and residential uses	Permitting –Electronic plan submission acquisition and implementation of new system

Ad Hoc Projects

"Ad hoc Projects" often represent an urgent need related to a pending decision or recommendation. They can be data, mapping or analytical projects, and account for about 12% of staff time. Accepting ad hoc projects allows the GIS Division to be responsive within the City's dynamic environment. However, although they are typically short in duration (4-40 hours), they can quickly consume capacity dedicated to new initiatives in the Work Plan. These projects are accepted or rejected at the discretion of the Division Chief, or if needed, the Planning and Zoning Department Head. Planning and Zoning's role as a citywide coordinating agency is a great asset in evaluating these projects. Planning's senior management is usually aware of the issue that generated the ad hoc request and can help provide additional context when weighing the organizational value of the request. In the absence of a formal mechanism for accepting ad hoc projects, a loose set of evaluation standards is generally applied:

- **Simple cost-benefit:** Since the only cost variable in most ad hoc projects is staff time, the project duration and staff capabilities needed comprise the first evaluation criterion. Projects needing lesser GIS abilities and little time commitment are often accepted. This approach is generally used on projects requiring less than 8 hours of staff time.
- **Organizational value of the project:** Identifying how important the project is to the overall organization often requires a discussion with senior management from the requesting department.
- **Ability to address the need:** Because of the short turn-around usually associated with an ad hoc project, sometimes a very beneficial GIS request must be rejected because there simply is not enough time or staff capacity to pull together the information or analyses with the expectation of generating reasonable or defensible results.

- **Future value to the program:** Because GIS is always striving to improve its overall infrastructure, projects that provide an opportunity to address part of a more comprehensive need receive greater consideration.

Over the last several years, the GIS Division has made a concerted effort to reduce the number of ad hoc project requests by improving the array of self-service GIS resources. As evidence of the success of this initiative, the average number of annual requests over the last three years (FY2009-FY2011) has decreased to 60, down from an annual average of 135 over the previous three year period (FY2006-FY2008). The reduction is attributable mostly to adjustments in training programs and on-line resources, which better help department staff address simple ad hoc requests without the assistance of GIS staff. This shift of the resource burden has also helped improve outcomes of the projects that are accepted, by ensuring that the Division's dedicated analysts are focused on the more challenging GIS projects. Ad hoc projects will never be eliminated, as the more complex analysis requires a skilled professional GIS Analyst. The goal is to ensure that they continue to decrease while those that are completed have the most significant organizational impact.

B. Guidance / Governance

GIS "governance" is the mechanism that determines what gets done within the GIS Division. In contrast to the early days of Alexandria's GIS when the project activities were mostly related to growing the new system and needs were clear and universal, advancing a mature GIS is much more complex. This section of the Plan examines the current structure, while *Section 8B* lays out a path forward for improving the governance model.

GIS Steering Committee

The current GIS Steering Committee (GISSC) is comprised of representatives across a range of City functions, with the focus on land development, property assessment, public safety and technology. Committee meeting schedules vacillate between quarterly and semiannually, with various committee members and GIS staff meeting more frequently as project needs dictate. The meeting agendas span a range of topics and go through periods of general discussion, project planning, budget request and information sharing.

Table 3. FY2011 GIS Steering Committee

Name	Title	Department
Steven Chozick (Chair)	Division Chief, GIS Division	Planning and Zoning
L. A. McCracken	Information Technology Coordinator	Transportation and Environmental Services
Suellen Savukas	Division Chief, ITS Project Management	Information Technology Services
John Noelle	City Arborist	Recreation Parks and Cultural Activities
Peter Watkins	Communications Systems Architect	Electronic Government
Vacant	Vacant	Alexandria Police Department
Ryan Davies	Appraiser Supervisor	Real Estate Assessments
Jim Burke	Information Technology Director	Alexandria Fire Department

The committee was originally chartered at the outset of the GIS in 2000. The GIS Division reorganized it in 2008 to acknowledge the completion of the initial charter objectives, and to reevaluate the GIS service model to better serve the changed needs of the City. A key element to the reorganization was an attempt to ensure that committee members had the authority to commit their organizations to a course of action and provide a broader view on City needs. Unfortunately, the committee is not nimble enough to manage changing circumstances in this regard. The makeup of the committee has continued to be slanted toward technical

project management professionals or niche users. The committee is not represented by senior management and most members have too tight a sphere of responsibility to fully represent or commit their departments, let alone overarching lines of business that might straddle several departments.

Role of the Information Technology Steering Committee (ITSC)

The Information Technologies Steering Committee (ITSC), including representatives from senior management and user agencies, was established in 1987 to advise the City Manager on the prioritization of city information technology systems and services, and to coordinate all major computer hardware and software acquisitions[3]. The GISSC through the GISSC Chair (the GIS Division Chief) presents annually to ITSC to report on the progress of initiatives funded through capital money, and to request additional funding for new initiatives. Projects that require only GIS staff resources or are funded through other means are generally not presented to the ITSC.

Departmental Guidance

To the extent possible, significant projects are scoped and prioritized annually through the GISSC. Most of the Planning Department's specific needs are also vetted during this process. However, during the course of a year, new analytical needs that require the use of GIS resources do arise. The GIS was initially aligned with Planning and Zoning because many significant citywide analytical needs either originate within Planning and Zoning or it would be a participant in processes and projects that could benefit from GIS capabilities. As such, senior management within Planning and Zoning occasionally offers GIS resources outside of the established plan when a significant need dictates.

Regional Coordination

Need for GIS data and analysis often extends well beyond Alexandria's official boundaries. Lead GIS staff, primarily the GIS Division Chief, coordinate regularly with counterparts outside the City on extra-jurisdictional initiatives and ad hoc projects.

Metropolitan Washington Council of Governments (MWCOG)

Alexandria GIS is a member of the MWCOG GIS Committee (a subcommittee to the MWCOG Chief Information Officer Committee). MWCOG is the regional organization of the District of Columbia and surrounding local governments, plus area members of the Maryland and Virginia legislatures, and members of Congress. The GIS Committee is comprised of GIS representatives from these entities and helps coordinate GIS activities among local agencies and spearheads regional initiatives such as the current *NCR Geospatial Data Exchange*.

Northern Virginia Regional Managers

This informal committee made up of the GIS managers for local governments in the northern Virginia region meets quarterly to discuss common needs and share ideas. The group focuses on regional policy issues, opportunities for collaborative projects, and collective coordination with our partners at the state.

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[3] "Information Technology Steering Committee (ITSC)", alexnet.alexandriava.gov. Alexnet, n.d. Web. 19 July 2011

Commonwealth of Virginia – Virginia Geographic Information Network (VGIN)

Over the last 8 years, VGIN has taken an active role in the collection of data at the state level; in particular, road centerlines and aerial orthophotography. Alexandria GIS is an active participant in these initiatives, believing that this partnership and mutual support will result in long-term cost savings and better overall outcomes for the City and the State. Alexandria used state contracting and project management for the collection of orthophotography in 2009 and hopes to repeat this project in 2012. In 2009, Alexandria staff also actively participated as stakeholders in the development of *VGIN's GIS Strategic Plan*[4]. Key objectives of this plan that will have a direct, positive impact on Alexandria include a statewide geospatial clearing house and geospatial training initiatives.

[4] Source: Virginia Information Technology Web Site: http://www.vita.virginia.gov/

C. Resources

Staffing

The most important part of any GIS program is the staff that is dedicated to it. GIS software, on its own, is little more than a collection of tools built to help more readily bring concepts of Geography to bear on solving a problem. The staff gives the system life. The extent and depth of their knowledge and capabilities largely determine what impact GIS and geography will have on the organization. The GIS analyst must master geographical and spatial concepts so that (s)he can undertake a diversity of specialized tasks. (S)he must understand the roles and functions of all the parts of the local government "system" to devise the right, usually uncharted, solutions to the issue at hand.

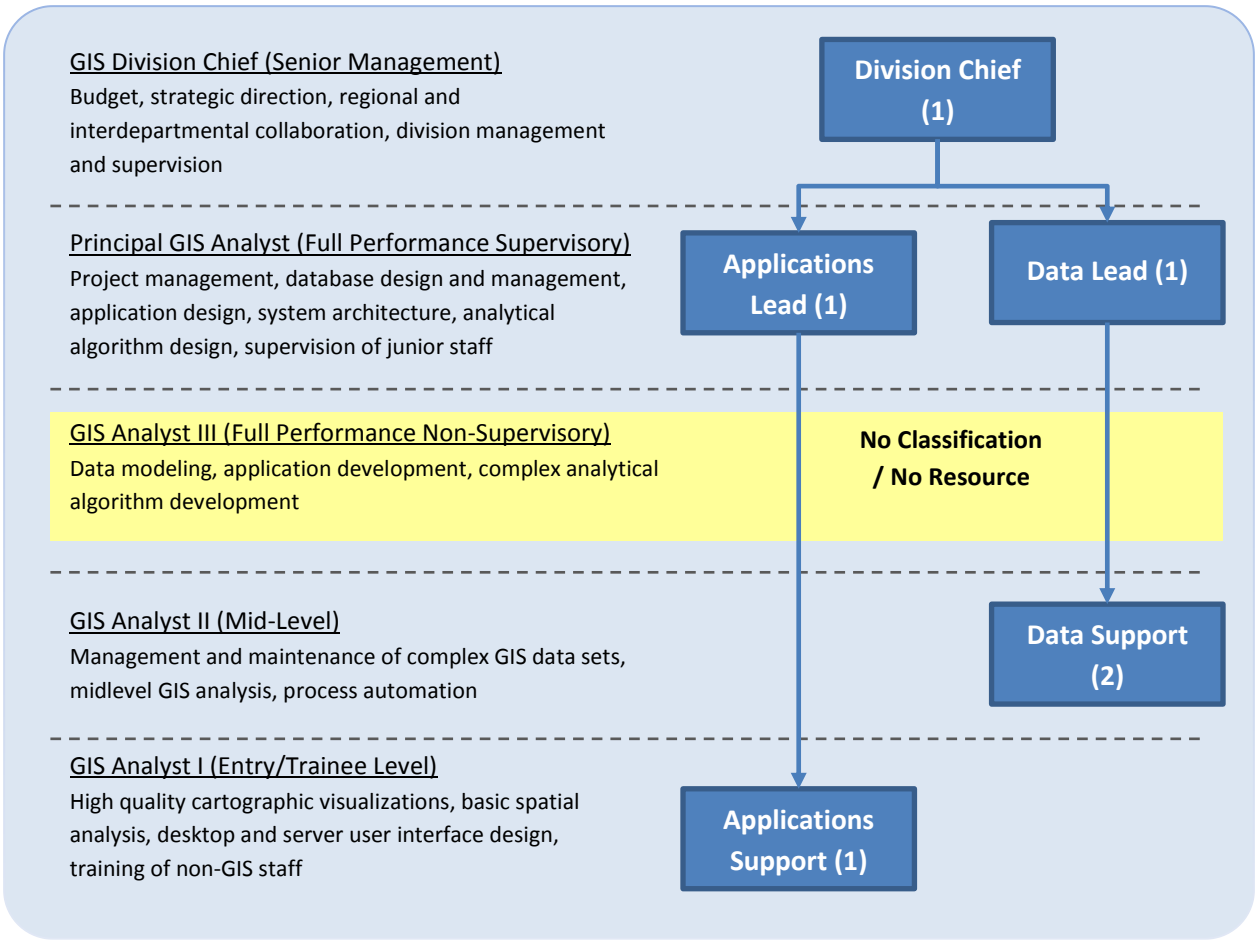

Figure 7. GIS Division Organizational Chart

Alexandria's GIS Division is made up of a Division Chief and five permanent full-time staff. Most of these individuals have been operating together as a team for the eleven years that the Division has existed. For the first nine years, the GIS staff did not have GIS classifications; they were given an assortment of unrelated classes varying from *Planning Technician* to *Customer Support Engineer*. Over the last two years, these titles have been replaced with professional GIS series titles, but the proper qualifications, grades, and the development of a career ladder have not been addressed. Regionally competitive salaries for high end staff, a full range of

classifications, and development of a professional career ladder are essential to the long-term success of the GIS program. While acquiring new staff always has significant cost considerations and is highly competitive with other City organizations, developing an internal structure for encouraging and rewarding professional growth can produce a very high return in improved capabilities at a nominal cost.

System Resources

Since 2001, GIS has matured from a desktop-based map and data production shop into an enterprise operation supporting the City's critical infrastructure. Today, the division maintains 9 servers, 24 GIS applications, 15 data models, over 230 data layers, and 21 AVL devices. This geospatial infrastructure supports all City GIS operations, in the intranet, web and desktop environments. With respect GIS-specific software, the GIS Division maintains the following licenses:

Table 4. Core GIS Software

Application	License Count	Deployment	Use
ArcInfo	5	Desktop (standalone) GIS staff	High end analysis, complex data development and management, map production
ArcEditor	2	Desktop (standalone) T&ES Engineering staff / Sewer & stormwater mapping	End-user software; focus on multi-user enterprise geodatabase editing capabilities
ArcView	17	Desktop (standalone) citywide GIS end users	End-user software; basic analysis and map production, editing personal databases
Network Analyst	2	Desktop (extension) Any user, as needed	Development of complex routing, travel cost and service area analysis
Spatial Analyst	2	Desktop (extension) Any user, as needed	Raster-based spatial analysis, development of accumulated cost surfaces and site suitability studies
3D Analyst	2	Desktop (extension) Any user, as needed	Analysis and visualization of data, development of perspectives, animations and fly- throughs
Tracking Analyst	1	Desktop (extension) Any user, as needed	Analysis, visualization, and animation of time series data
ArcGIS Engine	30	Desktop Cityworks users	Licensing to run developer-compiled ArcGIS components for targeted GIS functionality (deployed in this case to GIS-enable Cityworks)
ArcGIS Server Enterprise Standard	3	Server All City staff	Management of the enterprise GIS database and development and deployment of web based of GIS services and applications
Feature Analyst	1	Desktop GIS staff	Monitoring of tree canopy and vegetation
ERDAS Imagine & Leica Photogrammetry Suite	1	Desktop GIS staff	Processing of remotely sensed images (aerial photography and satellite imagery) for data manipulation and extraction

With respect to the Intranet and the Internet, the system includes the deployment of interactive maps, embeddable maps, and services for mapping, geocoding and geometric operations. It was designed to maximize sustainability through the following goals:

- **Ensure failover in case of primary server failure:** There are two redundant sets of servers, and geodatabases for each employment environment.

- **Create separate, realistic test environments:** To reduce the potential for application and server failure, we use servers in the Internet and Intranet environments to deploy test geodatabases, applications and models to work out bugs and resolve issues, before deployment to a production environment.

The GIS architecture is a system of servers, applications, and data that centralizes the maintenance and citywide distribution of geographic information. It improves services and decision making throughout the City by integrating data from different departments, and ensuring that these data layers are accessible, accurate, and up-to-date.

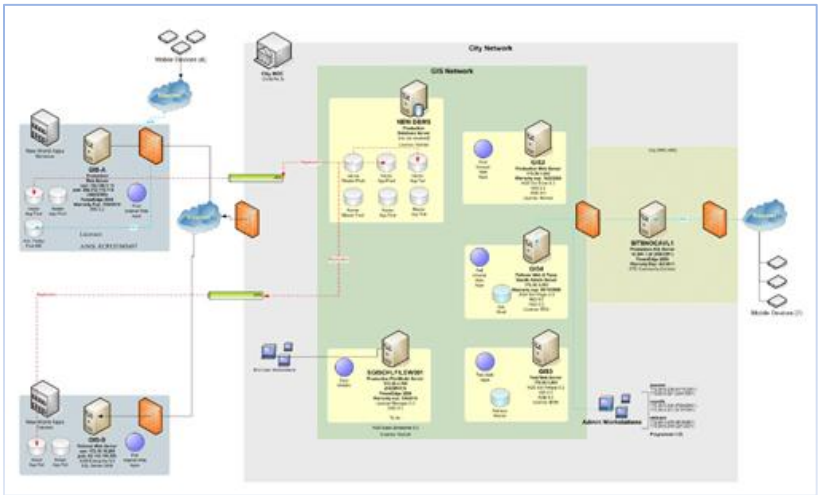

Figure 8. GIS system architecture

As Alexandria GIS continues to mature with the industry and the Division begins to incorporate emerging technologies and concepts such as cloud computing, crowdsourcing and other Government 2.0 concepts, evolving the system architecture will be an important consideration.

Applications

GIS applications are the tools that provide City staff at all levels of operations and decision making and the public with key location-based information and visualization, data exploration, situational awareness, and analysis capabilities. Broadly speaking, a GIS application is spatial software. It is most often recognized as interactive mapping, but a GIS application need not have a visual interface. It could be a back end service supplying a parking district for a given address, or it could be a robust analytical decision making tool with a map component that is among a multitude of visualization tools. Some applications are small tools or single-use models, while others are systems, such as AVL, that have multiple hardware and software components.

The most common way users access GIS is through one of the Division's many online interactive mapping applications. For the past few years, the Division has been transitioning from a philosophy of proliferation to one of consolidation and sustainability. Whereas in the past, there was a tendency to identify specific needs and tailor a custom solution, the applications goals have become reoriented around identifying common needs and addressing them with a single application. One system means one code base of reusable components, and that translates to freeing more hours from maintaining the toolset to extending it. As older "viewer" applications (listed in *Appendix B*) are sunsetted, they are folded into a new server application called the Geographic Analysis and Research Interface (GARI).

GARI is a visualization, data exploration, analysis, and collaboration tool. Most users will be able to get both simple and complex information quickly through this single easy to learn web-based GIS resource. For a complete list of existing and proposed GARI features, see *Appendix C*.

The GIS Division supports three general categories of applications:

- **Commercial off-the-Shelf (COTS) GIS Integrations:** The GIS Division works to integrate COTS applications with the existing data and applications that make up the GIS enterprise. These tend to be driven by one or more departments, and are put in place to manage a specific set of mission critical and often complex workflows. Examples include Cityworks for asset management, RealWare/GeoWare for property assessment, and Computer Aided Dispatch/Records Management for public safety.
- **Custom GIS Applications and Integrations:** Many of the City's GIS applications are custom-built and maintained in-house by GIS staff. Often, a COTS application does not have an adequate GIS integration component. Beyond that, custom applications are often needed in a mature enterprise to (1) ensure interoperability among different data sets and applications and (2) meaningfully disseminate the City's vast amounts of information in a centralized, intuitive environment. These applications are either accessible to City staff via the internal City network, or to the public via the City's web pages.
- **GIS Web Services:** The Division develops and maintains GIS-based web services. GIS web services are a means to provide back end access to spatial functions without needing to provide a map or connect explicitly to a GIS. For example, the Division maintains a web service that handles requests to validate and locate an address and return information about the areas it falls inside (e.g., Small Area Plan, Zoning, Parcel). The Finance Department's RevenueOne application consumes this service to validate an address and return its Small Area Plan, while staff responsible for issuing residential parking permits use it to search Residential Parking Districts and Special Use Permit exclusions by address.

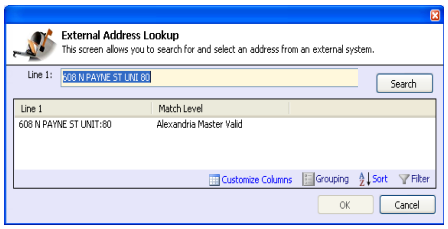

Figure 9. RevenueOne GIS address lookup

Data

The GIS Division is responsible for the design, development, maintenance, and storage of all GIS-enabled data for the City of Alexandria. This work includes management of several servers, ten databases, more than 230 data sets, and hundreds of thousands of independent features, including policy, environmental, demographic, and utility data. GIS data is centrally located in various ArcSDE geodatabases and distributed through data models, scripts, database replication, layer files and other processes to various internal and publicly accessible locations. The following areas are many of the core functions and uses of GIS data:

- **Address management:** In 2004, the GIS Division assumed responsibility for assigning all new addresses within the City. Prior to this transition, the GIS Division developed the City's first official point-based address database, which verified and classified approximately 35,000 address points. These address points are located on the primary entrance(s) to structures and include attributes such as type, status, and date created that track address history and define how the address is used. As new addresses are created, the address database is continuously updated, enabling other City applications to obtain the most current and accurate addresses available.
- **Parcel management:** Since the inception of the GIS program, management of all parcel-related information (cadastral data) has been a key responsibility of GIS staff. The cadastral data, comprised of approximately 20 data sets, includes items such as legal and taxable parcel geography, various

parcel-related annotations, and parcel management feature classes such as blocks. GIS coordinates with the Real Estate Assessments Department on all parcel changes.

- **Visualization:** Visualization products such as orthophotography and oblique imagery are among the most vital data resources in the GIS inventory. Approximately every other year, the GIS Division acquires high resolution orthophotography that is then compiled into a single mosaic image of the entire City. Since 1995, the Division has collected twelve sets of orthophotography and oblique imagery.
- **Base mapping:** Following each orthophotography acquisition project, the GIS Division performs a planimetric (base) mapping and topography update. Planimetric data includes any features that can be captured from the photography such as building footprints, edges of pavement, hydrology, and sidewalks. The Division has captured over 350,000 planimetric features in the past 10 years.
- **Network data:** Network data is a spatial data type designed to emulate connection and flow characteristics of linear systems. The GIS Division has built geometric networks for the City's sewer systems and road centerlines. These networks greatly extend the functionality of the data and the GIS Division uses them for sewer capacity and flow analysis and vehicular routing.
- **Geocoded data:** Enterprise systems and databases maintained outside of GIS often contain address-based data. The GIS Division has developed several custom geocoding services that can transform tabular data into GIS-enabled data. The geocoding services are designed to recognize many of the unique addressing styles within the City, and are used extensively to locate large amounts of data such as public safety calls for service and participants in various City programs.
- **Regional data:** Alexandria's GIS Division is an active participant in several regional data coordination efforts including Northern Virginia Regional Routable Centerlines, National Capital Region's Data Exchange, and the Virginia Geographic Information Network GIS Clearinghouse. The GIS Division proactively shares GIS Data with neighboring jurisdictions to improve information sharing prior to emergency events.
- **Data scripting:** The Division maintains more than 50 scripts that perform data processes to copy, transform, and update data on a regular basis. These scripts are fully automated and run on a schedule designed to limit the amount of lag time between data and electronic map updates.

Training

Since 2002, the GIS Division has continuously offered a series of training classes designed to build basic GIS skills among City staff. These classes began as outsourced standardized training. However, the GIS staff trainers quickly realized that this one-size-fits-all approach did not teach staff in other departments how to access and work with Alexandria's many unique GIS resources. After attending the classes, staff became overwhelmed with general information, but did not have enough specific training to get their particular well-defined and basic needs addressed. In 2003, the GIS Division redeveloped the program, targeting the material to local resources and concerns.

Through the years, the training program has evolved and the Division has regularly adjusted the classes to keep pace with the evolution of the overall GIS program. The core focus of GIS training remains on helping City staff get started with basic skills to access and use Alexandria's GIS resources. These skills are taught through two training classes offered several times each year. They address the differing needs and levels of the students:

- **GIS Orientation:** The Introduction to GIS and GARI class is mostly focused on helping all City staff satisfy basic GIS needs through a variety of online GIS resources and the recently released comprehensive mapping and analysis resource, GARI.
- **Beginning GIS:** An ArcGIS Desktop class for users with more specific GIS or mapping needs is taught as a two-part 7-hour course: ArcGIS Basics. Part I provides the novice user with basic mapping skills. Students are introduced to the ArcGIS ArcMap interface, Alexandria GIS data sources, and basic querying and map interaction tools. Part II of the course covers basic GIS data operations, including interacting with the ArcCatalog interface, creating new GIS data, and performing GIS edits. The course wraps up with a brief survey of map layout design for beginners.

To date, the GIS Division has trained more than 600 members of the City staff. These classes also serve to identify needs that may be developing into GIS projects, but have not come through the traditional channels. This 'accidental' interaction provides GIS staff a chance to offer specific guidance and ensure that the student is leveraging the most appropriate GIS resources.

6. Organizational Evaluation

A critical input to creating a strategic vision is identifying what does and does not work. By emphasizing areas where the organization is succeeding, while remedying those things that hinder it, the organization will have the greatest opportunity to achieve its goals. Relying on staff experience and interaction with stakeholders and committee members, this section of the Plan analyzes the GIS Division's Strengths, Weaknesses, Opportunities and Threats (SWOT) and discusses challenges. The SWOT analysis addresses key areas of the program, while the challenges represent larger overarching organizational issues.

A. SWOT Analysis

Strengths

Vision for interdepartmental sharing and collaboration

The Geographic Analysis and Research Interface (GARI) is the City's new comprehensive online mapping application for internal City use. It consolidates the City's pre-existing interactive mapping applications into a single mapping interface of workflow-driven overlay maps and tools. These so-called 'views' range from emergency operations to urban planning to economic development. At its heart, GARI, is all about analysis and research. For some individuals, this is multiple viewpoint visualization using detailed street maps, aerial photos, oblique imagery from Pictometry, and Google Street View. For others, this is map-driven data exploration with charts and tables. Regardless of how individuals use GARI, and whether they are making decisions or running the City's operations, they will encounter visual insights that would not otherwise be possible.

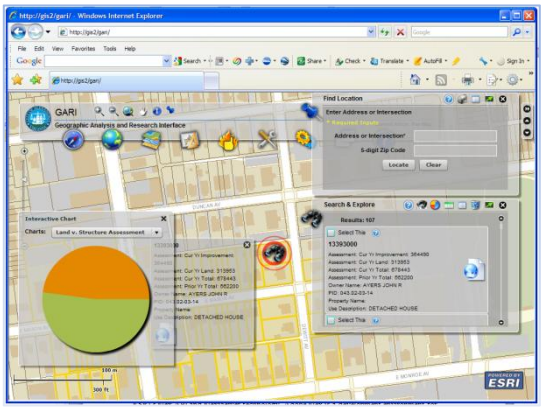

Figure 10. GARI 1.0 - Developed in 2010

GARI is also about data-driven decision making and collaboration of agencies, committees, and stakeholder groups. First, GARI's core map overlay set integrates databases from different departments as layers that can be viewed together through user interaction. Second, there is a feature that allows improvised 'views' configured around a specific workflow, such as an interagency QA/QC review of some map-based information, a shared GIS-enabled database extract, or project-specific GIS analysis results. Third, GARI is a tool for interactive reference and during internal and community meetings, provides decision-makers and stakeholders the benefit of objective data to replace the anecdotes that sometimes end up feeding decisions.

Broadly applicable analytical expertise

Alexandria's GIS prides itself on having strong geospatial analysis capabilities. At the onset of the program, GIS played a critical role in two high-profile, challenging projects: the *2000 Redistricting*[5] and the *Samuel Madden public housing redevelopment*. This analytical focus has continued and, in recent years, Alexandria's GIS

[5] 'Redistricting' is the politically charged process by which electoral boundaries are altered following decennial Census updates.

has been recognized for innovative approaches to several common but complex analytical problems. In 2006, a collaboration with the City's Emergency Planner (part of the Virginia Department of Health) to develop a plan for siting emergency medicine distribution centers was presented at the Esri International User Conference and published in the Esri annual *Map Book Volume 23*[6]. This project has continued to evolve, with the latest iteration presented, by request, at the 2011 Virginia Department of Health *Public Health Preparedness Summit*. In April of 2011, the Division presented its unique approach to measuring walkability at the American Planning Association's annual national conference. An article based on the presentation entitled *Alexandria Takes the Next Steps Towards Walkability* was published in the May 25th 2011 edition of *Sustainable City Network*.

Intelligently designed spatial data

Alexandria GIS has always focused on the development of intelligent geospatial data. All data is developed to meet its potential in ultimately serving many unforeseen analytical needs, while feeding COTS applications and basic mapping purposes. From the beginning, Alexandria established one of the first address data sets in the region to be point-based, as opposed to the less accurate parcel- or range-based standard. This data set also distinguished types of addresses (structures, parcels, bays etc.) and was topologically correct[7], with each point being coincident with the structure boundary and placed at the entryway it references. To ensure the future integrity of this critical data set, GIS assumed responsibility for assigning and managing addresses throughout the data lifecycle, and is one of only two Northern Virginia local government GIS organizations to own this responsibility. In 2009, GIS began developing the *Building Model;* the focus of this project was to better emulate the real world relationships among addresses, buildings, and parcels by moving information specific to buildings from a combination of parcels and address points to the more meaningful structure footprint. Alexandria GIS and its public safety partners have also played a significant role in the development of a regional routable centerline due to be completed early in 2012. This project, which won a 2011 Esri *Special Achievement in GIS* award[8], will help improve public safety response times, routine vehicle routing efficiency, and vehicle service area analysis. Alexandria has fully embraced this project and will be one of the first Northern Virginia jurisdictions to fully adopt the new model upon completion.

Weaknesses

Skills gap in staff/ insufficient staff resources

During the 10 years GIS has been in the City, with the exception of a single entry level addition in 2004, the staff size has remained constant. In addition to staff growth not keeping pace with the growth in obligations, the GIS Division has been unable to develop a professional career ladder. Without a career ladder, GIS staff has had no opportunity for advancement within the Division. The effect of the lack of advancement opportunities is not just one of fairness and morale; it has also presented itself in the area of high-end

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[6] Esri is the world leader in professional GIS software and solutions; it holds an annual conference that attended by well over 10,000 GIS professionals. The annual map book is available in print and online. See this page for the Alexandria GIS presentation: http://www.esri.com/mapmuseum/mapbook_gallery/volume23/safety4.html

[7] Topological correctness is a key component of GIS data quality because it ensures that spatial relationships captured in the data reflect those of the features that they represent, thereby improving the quality and range of analyses they can enter into.

[8] The Esri annual Special Achievement in GIS (SAG) Award recognizes a select set of organizations that "have used GIS to improve our world —and set new precedents throughout the GIS community."

professional non-supervisory skills. These responsibilities include application development, analytical algorithm design, and spatial data modeling. These tasks are often outsourced to contract staff (when funding permits). Not having dedicated staff to address these critical project components greatly increases the management burden and reduces the effectiveness of the GIS Supervisors/Project Managers. The outsourcing of high-end technical work is especially problematic because these projects tend to integrate across departments and systems, and therefore demand a great deal of institutional knowledge. Failure to develop solutions based on an understanding of Alexandria's geospatial infrastructure and the organization it serves puts the success of projects at risk. The difficulty of establishing continuity of project-specific knowledge further jeopardizes project sustainability. Additionally, the lack of staff resources puts the Division at risk because adequate backup does not exist, especially with regard to the more senior positions.

A discussion of FTEs required to fully implement the Plan is addressed in *Section 8C: Budget* of the Plan. However, as described above, significant cost-neutral benefits could be gained from the development of an additional GIS classification and a GIS career ladder. These are therefore listed as part of the Plan's short-term objectives.

Little direct coordination with the public

There is no established model or defined expectation for providing GIS services to the public. Due to resource limitations, the Division provides no custom mapping or data analysis services, except as obligated in cases of FOIA. The Division has several web-based applications to assist the public in researching some very specific information, including Special Use Permits, development activity, property assessment data, and the stormwater and sanitary sewer systems. However, these systems are aging, and the GIS Division has been unable to keep pace with current technology in deploying GIS applications to the public. The guiding principle has been to provide GIS data to the public at a low cost, and allow them to shop the market in the creation of any value-added product. A data DVD with all publically sharable data has been available since 2001. It is updated biannually and sold for $100.

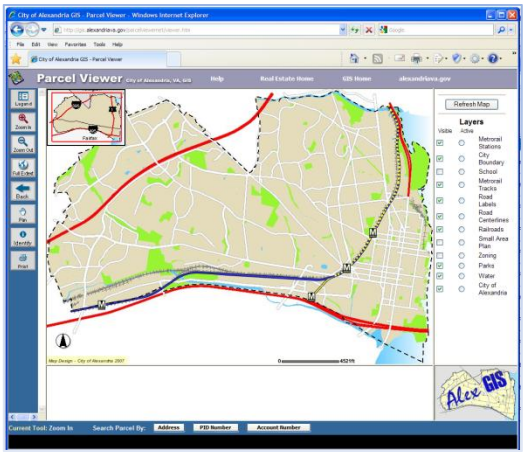

Figure 11. ArcIMS-Based Wed application released in 2004

As the City endeavors to find new ways to keep the public informed and make them part of the process, GIS can be an important resource for public exchange of information. Not only is GIS a useful platform for sharing information with the public, it can also give the public a greater voice within government. Through various crowdsourcing technologies, Alexandria GIS can leverage our many highly engaged constituents to improve the information within the system (especially the more qualitative components).

Weak model for project follow-thru

Although most new initiatives are committed to in the GIS Work Plan and agreed to by senior departmental management, there is little to obligate partner departments (or the GIS Division) to follow through. If a project does not require additional financial resources, then the only mechanism to ensure the project's completion is the desire of the parties involved to see the project through to completion. Changes in

leadership and priorities throughout the organization may impact these agreements, and projects and effort that had been considered important can quickly lose support.

The formation of a higher level GIS Steering Committee established in *Section 8B: Governance* should help ensure that commitments to GIS initiatives are viewed and resourced as City priorities.

Opportunities

A Vision for more unified cohesive City operations

Over the past few years, the City Manager's Office has articulated and strongly advocated for a new vision of how the City of Alexandria operates. This vision promotes a more collaborative work approach and encourages staff to see themselves, above all else, as working for the City of Alexandria. GIS should be a core component to realizing this vision. GIS establishes a platform for maintaining a single authoritative resource for geographic data across the enterprise. It can also capture and standardize analytical processes (e.g., ensuring that open space is calculated in a way that is repeatable and defensible). Finally, GIS can be a powerful platform for collaboration. It offers real-time resources to ensure that facts relevant to a discussion can be easily retrieved during an unfolding decision making process. It also enables passive collaboration among agencies by sharing their information though a common resource, without requiring active participation in every process.

A platform for identifying operational improvements at staff level

A number of participants in the needs gathering meetings expressed a desire to participate more directly in identifying opportunities to use information to improve outcomes. The GIS function could provide a logical platform for staffing an open group comprised of any City staff interested in opportunities to think strategically about the City's use of information. There are likely many opportunities for even small integrations, collaborations, or process enhancements to yield large organizational benefits.

External GIS efforts/partnerships (Public Safety / Homeland Security focus)

There are many external geospatial efforts currently underway from various organizations, including the Metropolitan Washington Council of Governments (MWCOG), the Northern Virginia region, the Commonwealth of Virginia and the Federal Government. These efforts provide opportunities to develop or coordinate data, applications, and analysis on a larger scale. In addition to providing data and tools that help develop the regional context for Alexandria policy, Alexandria can benefit from the economies of scale that come from having a larger number of agencies involved in a comprehensive high value project**.** Many such projects are funded

Regional Routable Centerline Project

- A common regional centerline model to facilitate more efficient routing of emergency vehicles
- $750,000 of grant funding provided through the Virginia Information Technologies Agency's E-911 Services Board
- Collaborative effort between Alexandria, Arlington, Fairfax, Prince William, Loudoun and the Virginia Geographic Information Network
- Winner of ESRI's 2011 Special Achievement in GIS award
- Will have significant benefits for other vehicle routing needs

through public safety initiatives, but can provide direct benefits to other parts of the organization as well. The City can leverage its limited GIS resources by participating in these projects, and taking an active role in defining them. It should be noted that participating in such projects still takes significant GIS resources, but these high value projects could not otherwise be completed with a positive ROI.

Improved technology
As technology continues to advance, opportunities to rethink its application abound. Technical hurdles that have prevented the implementation of various ideas and approaches are continuously falling away. Deploying mapping data and applications from the Cloud and sharing information in real-time from anywhere with mobile devices will provide new cost-effective ways to build solutions and get them to the people that need them where and when they are needed. With COTS applications becoming more GIS-based (e.g., Cityworks, CAD, and Real Estate and Permitting replacements) and offering more service oriented capabilities, new possibilities exist for disseminating information throughout the enterprise, with the public, and in the field.

Threats

No resource capacity available for research and development
The configuration and relationships among geospatial applications, data, and processes in place to support Alexandria are unique to Alexandria. GIS staff has the institutional knowledge to best understand how the pieces come together. However, the need to commit time to staying abreast of emerging trends and new technologies is not well established. This time is treated more as a reward to a staff person than as a benefit to the City. It is critical that this piece become a core component of the program. Without this knowledge, the Division is forced to rely upon outside contractors, who have only a cursory understanding of our needs.

Pressure to support multiple GIS platforms
There is pressure on the program to embrace and support mapping developed by providers such as *Google* and *Bing*. These are often more commonly accessible and perceived as simpler solutions. However, they are only mapping interfaces and not GIS solutions. While they may address a partial need as standalone solutions, they frequently do not integrate well with the rest of the system and can undermine the enterprise benefits and credibility of the GIS. Embracing multiple platforms is not a sustainable approach given the current staffing. Encouraging users to seek these alternatives for projects can greatly impact the GIS Division's ability to provide enterprise wide solutions. A major benefit of an enterprise GIS is the elimination of departmental "information stovepipes." Although there may be an appropriate limited role for these platforms, if not carefully planned, they will re-introduce stovepipe type development into the system. This may return GIS and the City to a place where the answer to a question depends upon the individual (or system) you ask.

Piecemeal funding
Most project requests do not become part of the GIS Work Plan. It is not uncommon for organizations to have funding available to undertake these GIS projects independently, or to offer this money to the GIS Division in hopes of having the project added to the Work Plan. Generally, GIS and these agencies attempt to work together to find the best way to use this money to accomplish the task at hand. However, this approach is often ineffective. There is an unrealistic expectation that the GIS Division will be able offer the

appropriate guidance, given a very limited time commitment, to an outside entity who will use the money to complete the project. Three significant problems are created by this limited GIS Division participation model:

- **Inefficient leveraging of GIS resources:** GIS has a significant amount of technical and data resources to bring to a project. However, use of these resources must be well planned. Each use of a GIS resource creates dependencies within the GIS system. If these dependencies are not carefully planned and managed, they can create significant instabilities in both the specific project being implemented and the Enterprise GIS.
- **Poor project management and guidance:** GIS project managers are not fully engaged in these projects. Critical decisions do not get adequate vetting and advice is given based on GIS staff experience, not necessarily a full understanding of the project specifics.
- **No economies of scale:** As discussed throughout the GIS Strategic Plan, each project should both address a specific need and add to the overall value of the GIS. Not only do these projects typically fail to do this, but they often create duplication and add unnecessary operational overhead.

B. Challenges

Increasing need for enterprise resources/Responding to changing demands

The City is a dynamic organization spread over many lines of business, each continuously innovating to more efficiently and effectively accomplish its mission. There is increasing demand on GIS to support and facilitate these changes, while bridging the gaps among multiple agencies to help them leverage each other's valuable information in meaningful ways. GIS must be nimble and flexible enough to adjust to these changes, and comprehensive and forward thinking enough to anticipate future needs.

GIS receives many requests that are not easily justified as standalone projects, but are expected to be available within an enterprise GIS. To this end, GIS views every project as an opportunity to improve outcomes for the partner departments and add to overall system resources. GIS endeavors to identify ways to generate enterprise benefits from every effort, often working as a broker between agencies in allowing them to collaborate through their information.

Because these smaller projects become components of a larger solution, changing demands may have significant impacts on related commitments and obligations. The *Common Solutions* in *Section 7C* of this Plan seek to address these challenges, by evolving GIS into a system based on core capabilities and standardized analytical methodologies.

Bridging planning and information technology

GIS is a technology-heavy planning function, and the GIS Division deploys and consumes cutting edge technology to create and maintain its solutions. The majority of the GIS physical infrastructure is built on hardware and networks maintained and operated by either the Information Technology Services (ITS) or the Electronic Government (E-Gov) Division. GIS is also a user of ITS helpdesk services, in the same way as any other customer of ITS.

However, the GIS / ITS relationship is different relative to the newly created Enterprise Business Systems Support Division (EBSS). This relationship involves much more interaction and can be thought of as a bi-directional customer support model:

- GIS provides EBSS with much of the base data needed by the many of the various systems supported by EBSS.
- EBSS provides GIS with access to much of the transactional data needed for analysis and visualization.

Traditionally, these have been the two components of the relationship. However, more COTS applications are being deployed as GIS-centric solutions with GIS-based interfaces and GIS capabilities embedded in the business logic. With this trend, comes a greater need for tighter integration and cooperation. The level of GIS capabilities varies from jurisdiction to jurisdiction, and without proper GIS staff involvement, solutions are unlikely to fully exploit Alexandria's GIS. GIS staff involvement from requirements gathering through implementation is essential to ensuring a successful GIS solution.

In addition to greater involvement in COTS acquisitions, the GIS governance model should account for longer lead times on planning analytical projects and other technology implementations, especially where they require significant data access or modifications to ITS' standard system architecture, so that ITS can allocate the right resources to ensure solutions are well designed and sustainable.

Leveraging GIS for decision support

Reliable, actionable information for decision making is a key rationale for local government investment in GIS. Although the GIS Division has strong analytical capabilities, it only coordinates the planning of a few analysis projects each year. These are often ad hoc. GIS analysis is not considered an essential part of many of the City's analytical activities. The extent to which an organization formalizes this role and decides to invest in the decision making support capacity of a GIS largely determines the effectiveness of the GIS in answering questions and providing high value decision making and policy support.

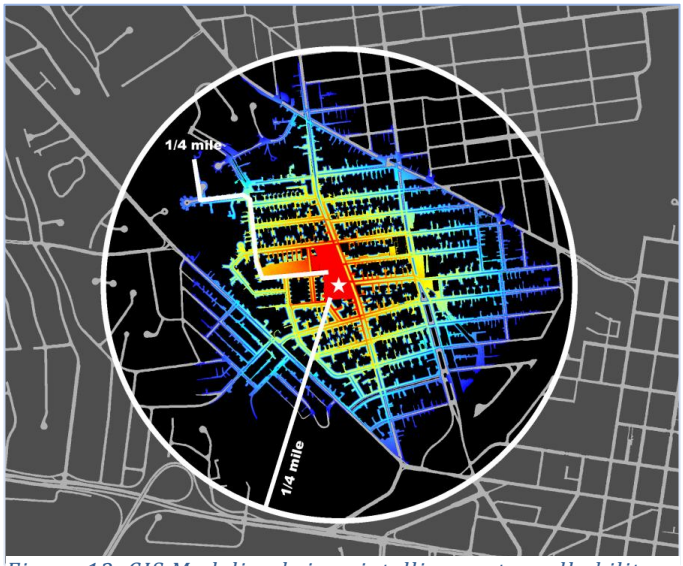

Figure 12. GIS Modeling brings intelligence to walkability studies. Shown here: a straight line distance buffer (the area within a certain distance) contrasted with a surface-derived walkingshed (the area that is actually walkable within a certain distance).

The challenges that determine GIS's ability to impact these decisions are (1) asking the right question, (2) wanting the right answer and (3) committing enough time and resources to derive it.

Additionally, the value of GIS analysis may be less desirable if detailed analysis is seen as complicating simple questions. However, the majority of policy questions are far from simple, and GIS provides unprecedented capabilities to look at data and variables and draw conclusions in addressing complex questions relating to the social and physical environment in which policies are made. The sophistication of these tools continues to grow as both technology and the expertise of GIS professionals continues to improve. However, having access to this kind of analytical information can complicate messages, which in the absence of this detailed information may seem simple and straightforward.

To get the organization fully exploiting spatial analysis capabilities, the GIS Division must do a better job of advocating for these capabilities by taking the following steps: (1) better describing the benefits and the ROI, (2) drawing a clearer distinction between GIS visualization, which is the observation of mapped data and true GIS analysis, which involves the computational modeling of multiple variables and often the generation of "what-if" scenarios, and (3) building specific analytical capabilities into the core GIS deployment model. The opportunity to bring large cost savings to an organization though spatial analysis is enormous, but building a case for it depends upon a greater awareness of what it is.

Commercial Off-The-Shelf (COTS) software integration

COTS programs are billed as the easiest, most efficient means to bring in new large scale applications (enterprise business systems). They are based on standardized methodologies (not custom developed) and often serve several departments. Despite the name, they still require significant implementation and integration efforts by many members of City staff. These systems require GIS resources for implementation and on-going support.

In the past, a COTS application was considered integrated with GIS if it could communicate a location via a map. Today, there are much more significant expectations for GIS integration. COTS systems can leverage GIS capabilities in two ways, each requiring significant GIS implementation considerations: (1) to improve reporting and analysis of the system's data, and (2) to improve application functionality.

As an enterprise system, the GIS is built to be flexible. To keep it reliable and sustainable, the system architecture and workflows are carefully designed and implemented. The design of Alexandria's GIS heavily considers best practices for enterprise GIS and applies an understanding of future trends in GIS and local government enterprise business systems. Even so, COTS systems have their own specific system design rules or expected workflows. When these are not consistent with the design of the GIS, there can be significant integration challenges.

Understanding exactly how a COTS solution leverages GIS determines what modifications to GIS are needed to support the application. The changes need to be identified, vetted and resolved well in advance of the new application implementation. These GIS changes can be significant, and have cascading impacts on current stable workflows. To address these concerns, the GIS Division must be significantly involved in the entire procurement process and any cost for resulting enterprise system alteration must be considered as part of the COTS implementation.

7. Strategic Opportunities Analysis

The strategic opportunities analysis seeks to create efficiencies by addressing needs through a common framework, as opposed to discrete projects. Although the GIS Division has used this principle as overarching guidance in its approach, this section of the Plan formalizes the process. Because geospatial needs are often functionally similar, there are many opportunities to maximize benefits by always looking beyond the current need and identifying much broader opportunities. Coordinating funding, resources and partners who might not otherwise recognize the relationships among their needs can yield a much greater

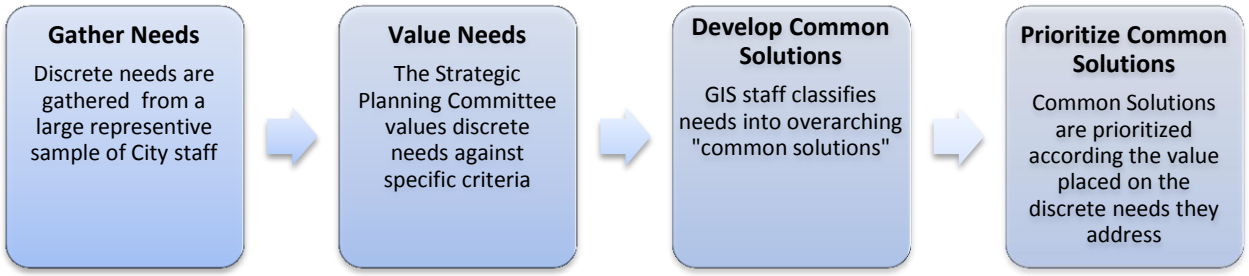

Figure 13. Strategic Opportunities Analysis Process

organizational result than looking at the individual need of each stakeholder or department. This analysis identifies multiple similar projects and combines them into high value strategic opportunities, referred to as "Common Solutions," to create the most cost-effective, comprehensive and sustainable approach.

A. Needs Gathering

Needs gathering for the Strategic Plan was accomplished in two ways: first, the GIS Division conducted a very brief online survey for all City staff; second, the Division facilitated a series of needs gathering discussions.

Online Survey[9]

The GIS Division developed an online needs survey. The survey was posted on the AlexNet GIS page and a link was sent to all staff on City E-mail. There were 68 responses from a total of 14 Departments. The most important parts of the survey asked respondents to provide any specific GIS project ideas or needs, and to rank several GIS program components based on how critical they were to performing their particular function. The project ideas and needs question ensured that everyone had a chance to present ideas and needs for consideration in the Plan. In all, 42 respondents identified a total of 68 GIS projects or ideas; these were considered alongside those collected from the needs gathering meetings during the "Project Valuing Process." The survey also asked respondents about GIS program components to get a better understanding of where users thought general GIS efforts should be focused. Findings from the program components section of the survey are shown below in *Table 5*.

[9] It should be noted that this was not a satisfaction survey. Unlike a user satisfaction survey, respondents were encouraged to provide their names to facilitate follow-up discussion on project ideas.

Table 5. Online survey results summary

Rank 1-5 what you think are the most critical issues facing Alexandria's GIS	Most/More Critical	Neutral	Least/Less Critical
Not enough data in the system	**66%**	21%	13%
Not enough analytical information available	35%	42%	23%
Not integrated with my primary business software application	28%	44%	28%
Not enough standard maps	25%	18%	**57%**
Not enough GIS training available	20%	23%	**57%**

- "Not enough data in the system" was identified as a critical need by 66% of the respondents. This finding was reiterated in the stakeholder meetings as well. However, often, the data being referenced was in fact already available through the GIS, or available, but not updated with a great enough frequency. Although expansion of available data is clearly desired, almost equally important are better update schedules and methods for informing users about data availability.
- "Not enough training available" and "Not enough standard maps" were both identified as less critical or the least critical needs, each by 57% of the respondents. Due to the nature of the survey, it is not clear whether these items are sufficient as is, or no longer needed. In either case, the status quo would appear to be sufficient and these areas would seem the least likely candidates for expansion.

Needs Gathering Meetings

GIS staff facilitated 12 needs gathering meetings with a total of 98 GIS stakeholders. Each session was about 1 hour long. To the extent possible, the GIS Division incorporated these sessions into standing City meetings. This approach helped ensure that stakeholder groups had related responsibilities and therefore potentially similar GIS needs (e.g., public safety, social services, maintenance, etc.). The goal of these meetings was to hear from a representative mix of operations staff and decision makers across a diverse array of City functions. Organizations such as City Schools and Health Department that fall outside the direct responsibility of the City Manager were included, but the many non-profit organizations the City works with closely were not.

The meetings, while presented as "Needs Gathering" sessions, tended to be a mix of educating participants on GIS possibilities as well as gathering ideas. Many participants were interested in knowing what others had said, likely as a way of spurring similar ideas of their own. The meetings produced 126 ideas that stretched over a large range of needs, from simple geographic document search and retrieval capabilities to complex facilities planning to maintenance tracking and vehicle routing. Given the great amount of opportunity for GIS service and the limited time spent with each group, a full exploration of all needs would take many more meetings. For this reason, the needs identified through this process should be viewed as representative and not comprehensive. A more comprehensive evaluation of needs will take a long-term commitment to an education/needs gathering cycle.

Responses from stakeholder meetings fall into two categories: (1) general thoughts or concerns related to overall policy or practice (listed in *Appendix A)*; and (2) specific needs or project requests (listed in *Appendix E*).

B. Valuing Projects

The Strategic Planning Committee evaluated projects for their value to the organization, independent of cost or level of effort to complete the project. Valuing projects is distinct from prioritizing projects, as the goal is to identify clusters of high value projects as opposed to creating a simple ranked list of projects. All projects and ideas that were captured were consolidated into 62 similar needs and organized into six categories. Five categories were based on *Esri's Patterns of Local Government*[10]. A 6th category, "System Integration and Support**,"** was added to ensure special consideration was given to new large system integrations. Because there is generally a large capital outlay, and vetting through ITSC for these projects, it was important that they be evaluated separately.

The project categories:

- **Geographic Data Management:** storing, managing and maintaining accurate records.
- **Operational Awareness:** disseminating knowledge where and when it is needed
- **Planning and Analysis:** transforming information into actionable intelligence
- **Stakeholder Engagement:** sharing information with stakeholders
- **Field Mobility:** getting information in and out of the field
- **System Integration and Support**: integrating GIS data and processes with third party information systems.

The GIS Strategic Plan Committee classified each item as having a *Very High, High, Moderate, Low* or *Very Low* value to the organization, using the following general criteria:

- Improves the scope of service provision or enhances efficiency of service provision for a mandated need, as framed by the Alexandria City Council Strategic Plan
- Improves scope of service provision or enhances efficiency of service provision for an urgent, funded need, as framed by the Alexandria City Council Strategic Plan
- Reduces or eliminates duplication of function, data, or service
- Builds organizational capacity in data-driven decision making
- Improves or enhances regional coordination

C. Common Solutions

The "Common Solutions" are not specific projects, but frame enterprise-wide approaches to like issues. By strategically addressing needs in logical groupings, the Plan will promote economies of scale and project sustainability. By developing a series of common solutions, the GIS becomes a more nimble and responsive City resource. The needs gathered were analyzed for GIS similarities, irrespective of the agency or function from which they originated. These needs were then summarized into a series of 22 similar broad-based

[10] "ArcGIS for Local Government Webinar." Esri. February 2, 2011. Accessed at http://resources.arcgis.com/gallery/video/local-government?page=3&#

approaches, referred to as "Common Solutions" and assigned to one of three categories: *Information Sharing and Collaboration, Core Capabilities* and *Decision making Approaches*. These approaches should not be looked at as completely discrete items; the City is a system in which everything connects in some way to everything else, and GIS is an integrative resource that helps us understand and manage this interconnectedness. It is therefore not necessary to try to isolate each approach, as most will intersect with several others. Drawing lines between where one approach begins and another ends is more appropriately done during actual project scoping.

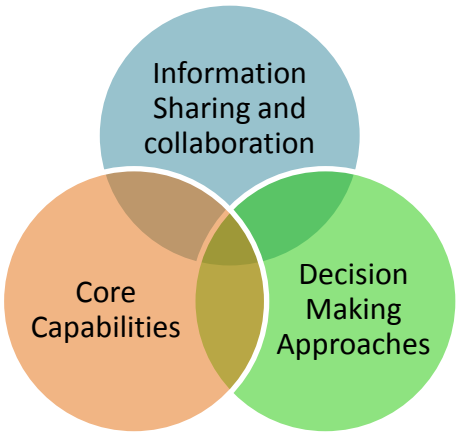

Figure 14. Three Categories of Common Solutions

Table 6. Common Solutions

	Common Solution	Description
Information sharing and collaboration		
1	**All-purpose situational awareness resource**	Creating and evolving a single resource to facilitate comprehensive internal information sharing. City staff can share, discover and analyze information across departments and the region.
2	**Service Oriented Architecture (SOA)**	Library of GIS services to address integration of GIS-driven data in non-GIS enabled applications.
3	**Public facing applications**	Developing solutions to help constituents and visitors to Alexandria better access City services and resources.
4	**Mobile GIS**	Solutions for leveraging GPS and bringing maps, data and applications into and out of the field.
5	**Document storage and retrieval**	Integration of documents, memos, plans and reports via a mapping interface.
6	**Paper maps**	Sharing of data via traditional paper maps and map books or the electronic equivalent.
Decision making approaches		
7	**Facilities and program location evaluation and selection**	Methodologies and analytical tools and data for evaluating locations of new facilities and programs.
8	**Demographics**	Solutions to provide demographic information including day time and night time populations, current development and development projections, and decision support metrics.
9	**Transit and parking**	Solutions that relate transit, parking and land use together for analytical purposes.
10	**Vehicle routing**	Solutions to manage routing of field activities, design fixed routes, optimize routes, and generate vehicle service areas
11	**Walkability and bikeability**	Solutions to measure walkability and bikeability, prioritize walking infrastructure improvements, design fixed and optimal routes, and generate walking /biking service areas
12	**Visualization**	Implementing visualization resources to provide a more comprehensive qualitative view of Alexandria, including oblique imagery (Pictometry), 360 degree street level imagery (Google Street View), 3D models, overhead aerial photos (orthophotography), etc.
13	**Natural resources and the environment**	Integration of key natural resource information and analysis into the GIS infrastructure.

Core capabilities		
14	**Addresses and locations**	Robust tools and processes for finding a location based on many different inputs, integration of unit level address data, and the ability to find an address based on a location identified on a map or in the field.
15	**Integration with regional and external data sets**	Integrate best available public, commercial or external partner regional data with Alexandria's internally maintained data.
16	**End user data maintenance**	Implement appropriate ways to leverage end user knowledge in maintaining GIS data, while ensuring data integrity is maintained.
17	**Standardized spatial relationships**	Identify families of relationships and develop resources to share and apply these under multiple circumstances, including the relationships between who is served, where they are located, and how they access services
18	**Facility management**	Implement capabilities to leverage structure level data for managing internal space, building maintenance activities, energy usage, public safety preplanning, and automated code compliance.
19	**Plan objectives / regulations and implementation tracking**	Develop methodologies and data models to capture the objectives of various City plans. Many have objectives that are either geographically explicit or that upon implementation can be shared geographically.
20	**Real time data feeds**	Develop tools for integrating real-time data, from variety of sources with the GIS (e.g., vehicle locations, stream gauges).
21	**Secure interdepartmental sharing of analytical information**	Access and repurpose data from various systems to a central City information resource. Develop methods to securely share or aggregate confidential data.
22	**Measuring change**	Model data and develop query tools so that both location and time can be captured and analyzed. This can give the City a much clearer understanding of change and trends.

8. Strategic Plan Implementation

A. Priorities

Successful implementation of the Plan requires addressing several organizational issues and a more thoughtful annual Work Plan. This section identifies ten short-term objectives to be addressed during the first year of the Plan. It also offers a framework for prioritizing the GIS Division's obligations during the annual GIS Work Plan development process.

Organizational Short-Term Objectives

- **Develop procedures to better evaluate the relationship between end user data maintenance and accuracy.**
- **Develop a plan to improve senior management GIS education.**
- **Develop a long range view of the City's COTS application resourcing needs, especially focusing on collaboration with the Enterprise Business Systems Support Division and departmental IT functions.**
- **Work with Human Resources to finalize classification issues and get an approved career ladder.**
- **Develop GIS ROI model that must be able to capture broad organizational impacts.**
- **Formalize expectations of responsibilities between the GIS Division and departments; which functions are the responsibilities of the GIS Division, and which functions are the departments' responsibilities with GIS support?**
- **Develop guidance on the development of third party mapping solutions.**
- **Identify ways to tie new GIS initiatives to the Alexandria City Council Strategic Plan.**
- **Develop a policy for resources to be directed at participation in regional efforts.**
- **Develop Strategic Plan indicators.**

Framework for prioritizing work plans

GIS has only 2 FTEs dedicated to fulfilling the obligations in the annual Work Plan. Therefore, all new work must be thoughtfully considered. Traditionally, the critical deciding factors have been the perceived value of the new project to the overall organization's goals and the likelihood for success. However, potential impacts have been difficult to measure and the degree of success hard to predict. To fully realize the benefit of the GIS as a true system, future Work Plans will need to consider both the long-term vision of developing the system's *Common Solutions* as well as current pressing needs.

The design of the Work Plan is divided between and prioritized according the following hierarchy:

1. Changes required due to an existing partner application change
2. Internal business process or system architecture change
3. Development of a *Common Solution*
4. New departmental/City initiative

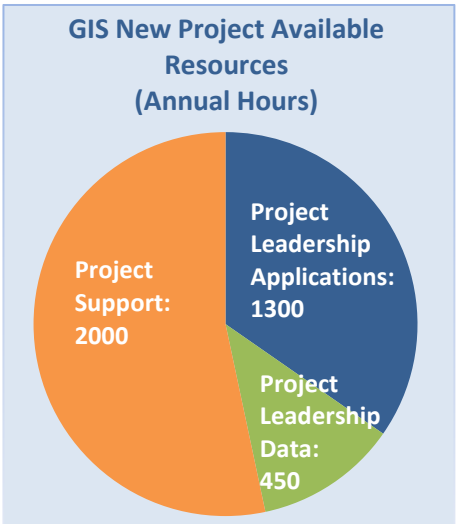

Figure 15. Resources Available for New Projects

Additionally, having the right staff capabilities on the right project is a critical consideration when moving forward with a new initiative. GIS has many areas of specialization and staff abilities can vary greatly and new projects are further constrained by the internal skill capacity to address a particular need. Properly matching resources to projects is a critical project success factor and therefore an important part of the Work Plan development process. *Figure 15. Resources Available for New Projects* provides a generalized breakdown in the resources to distinguish the available project management and leadership capacity from the support capacity (in available hours). The end result is approximately 1 FTE of each to address new needs.

B. Governance

The GIS governance function directs the City's GIS resources to the most pressing City needs. It ensures that GIS is providing staff-level operational efficiency solutions and high level decision making solutions. It provides for the development of long-term sustainable solutions, while remaining nimble enough to address an ever-changing environment.

Structure

Governance will be coordinated between three groups. The groups are to be coordinated; not according to a strict hierarchy, but focusing on different areas of GIS needs. The **GIS Division** will focus on program sustainability, while the GIS **Operational Efficiency Group** will focus on more effective use of information in creating process improvements. Major initiatives will be vetted though and approved by the **GIS Steering Committee.**

GIS Division - Managed by the GIS Division Chief

Role: Management of GIS operations and guidance of the GIS Steering Committee on technical and functional improvement projects

Expertise: Thorough understanding of internal GIS infrastructure and the how geography can inform decisions and processes

Members: Professional GIS staff working in the GIS Division

GIS Operational Efficiency Group - Chaired by Principal GIS Analysts

Role: Identification and execution of minor operational improvement projects and recommendations of new operational efficiency initiatives

Expertise: Knowledge of operational needs and inefficiencies

Members: Open to any staff person interested in improved use of information in operations

GIS Steering Committee - Chaired by GIS Division Chief

Role: Determining the GIS annual Work Plan (the annual Work Plan cannot be altered without the agreement of the committee)

Expertise: Thorough understanding of City's high level decision making and analytical needs, resourcing and budgeting constraints and opportunities

Members: Diverse group of senior City leadership and department heads representing the functions in *Table 7* below and two GIS Power Users who serve for one-year terms. Two new GIS Power Users are appointed each year from departments without senior management representation on the Committee.

Table 7. GIS Steering Committee

Name	Tile	Function
Tom Gates	Deputy City Manager	**City Manager's Office**
Debra Collins	Assistant City Manager	**Community and Human Services**
Faroll Hamer	Director – Planning and Zoning	**Land Development**
Rich Baier	Director –Transportation and Environmental Services	**Public Works**
Tom Trobridge	Chief Information Officer	**Information Technology**
Vacant	Vacant	**Finance**
JoAnne Munroe	Director – Department of Emergency Communications	**Public Safety**
Margaret Byess	Deputy Superintendent of Schools Facilities – Alexandria City Public Schools	**Alexandria City Public Schools**
L.A. McCracken	Information Technology Coordinator - Transportation and Environmental Services	**GIS Power User**
Jim Burke	Information Technology Director - Alexandria Fire Department	**GIS Power User**

Schedule

The GIS Steering Committee will meet three times annually. The GIS Operational Efficiency Group will meet four times annually. While the GIS Steering Committee will follow the budget process in working towards developing and resourcing an annual Work Plan, the Operational Efficiency Group will be working on continuous incremental improvements. Larger projects identified by the Operational Efficiency Group will be shared with the Steering Committee at the beginning of the budget process in September of each year for consideration in the annual GIS Work Plan.

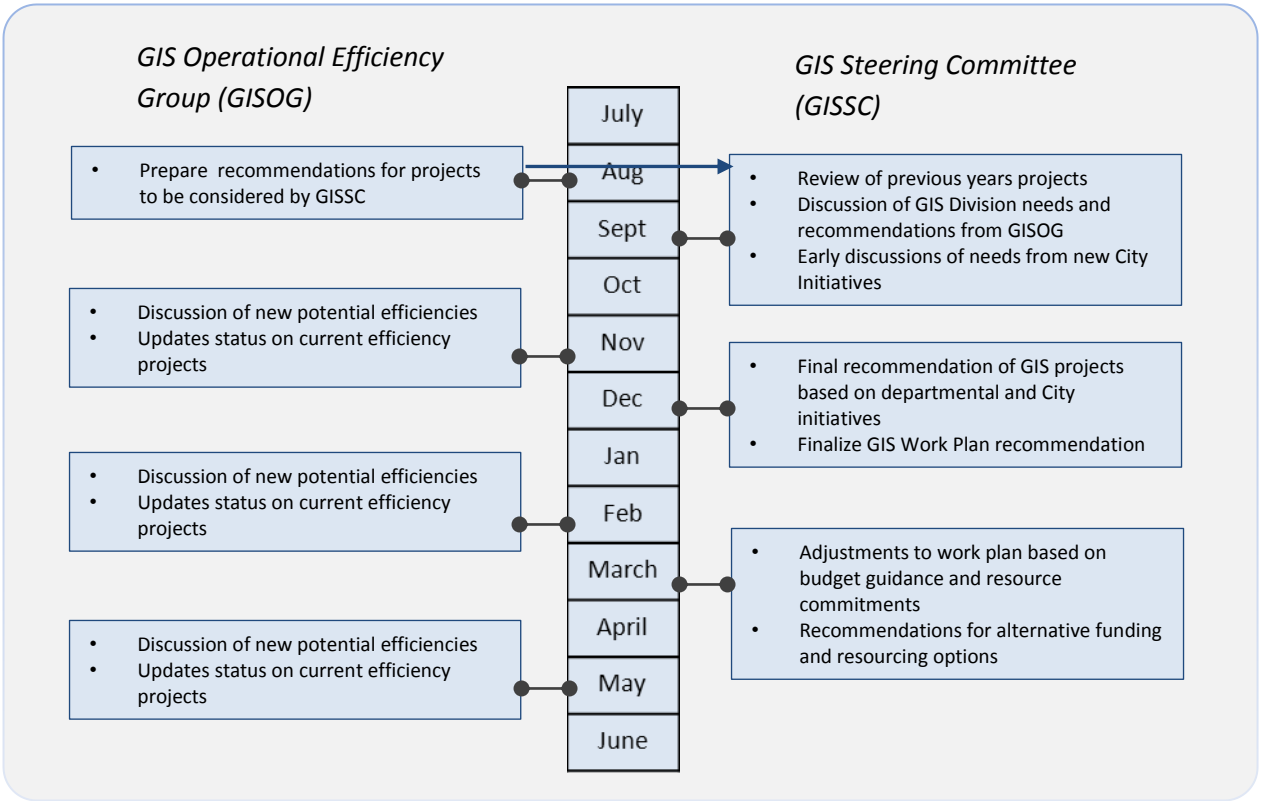

Figure 16. Schedules of GIS Governance Committees

C. Budget

The Plan establishes many expectations and opportunities for GIS. As discussed throughout the Plan, the key to success is having sufficient resources to accomplish the work. At current staffing levels, the GIS Division will not be able to significantly address *Common Solutions* identified in the *Strategic Opportunities Analysis*, or support current or planned COTS applications, and some existing staff resources will need to be redirected to towards sustaining operations. With the full increase in FTEs as proposed below, it is anticipated that GIS could support operational needs, address all current COTS needs, and implement all 22 of the *Common Solutions* during the next five years.

GIS Capital Budget

Table 8. Current GIS 5-Year Capital Budget

FY2013	FY2014	FY2015	FY2016	FY2017
$75,000	$75,000	$75,000	$75,000	$75,000

GIS capital costs are generally attributable to off-the-shelf technical resources such as hardware and software, and contracted base data. Most of these needs have been adequately funded through ITSC as part of the Information Technology Capital Improvement Plan. Implementation of the Strategic Plan will not create significant changes to these costs, which have traditionally been in the $75,000 to $150,000 range annually.

GIS Operating Budget

Table 9. Current GIS annual operating budget

Item	Annual expense	Description
Staff	$652,000	GIS staff provides citywide services that include data maintenance and management, application development and integration, training, and geographic analysis
Software maintenance	$67,000	Annual software maintenance to keep citywide GIS software current; Oblique imagery acquisition
Training and conferences	$3,000	Money dedicated to keeping GIS staff current on trends and technical advances in the GIS industry and the City's various GIS software investments.

The current GIS operating budget is $719,500 and is almost entirely dedicated to funding the Division's six FTEs. It accounts for 13% of P&Z's operating costs. However, the GIS mission is citywide and much of this budget provides direct benefit to other agencies. Staff costs to fully implement the *Common Solutions* and *COTS Implementation and Support* aspects of the Plan would be approximately $400,000 annually.

Common Solutions: Requires 1.5 additional FTEs

The *Common Solutions* are the core strategic fabric of the Plan; they are structured to change the GIS function from a program that answers a discrete number of questions each year to one that brings analytical capabilities and situational awareness to staff and elected leaders when and where it is needed. Are our programs aligned with our clients' needs and locations? Do we need a new school or fire station? How do we efficiently allocate our budget for infrastructure repairs? Can we improve our proactive and reactive public safety response?

COTS implementation and support: Requires 2.5 additional FTEs

Much of the GIS impact on operational efficiency comes from the effective use of geographically intelligent business systems. These systems can be implemented to assign inspection workloads and routes, manage paving projects, create more accurate Real Estate assessments, track the history of maintenance on an asset, or identify the significant hazards during an emergency response. Successfully implementing the GIS capabilities in these applications can be the difference between systems that simply create an electronic file cabinet and systems that help us work smarter. They reduce the time spent figuring out what to do and help us move forward with accomplishing the task at hand.

Table 10. Breakdown of 5-year COTS support needs

	FY2013		FY2014		FY2015		FY2016		FY2017	
Opr = Operating Imp = Implementation	Opr	Imp	Opr	Imp	Opr	Imp	Opr	Imp	Opr	Imp
Cityworks / MicroPaver	.75	.5	.75		.75		.75		.75	
Computer Aided Dispatch / Records Management	.25	1.0	.25	1.0	.75		.75		.75	
Permit Plan / Electronic Plan Review	.25	.25	.25		.25	.50	.25	.50	.4	
RealWare/GeoWare	.25		.25	.50	.25		.25		.25	
WebEOC	.20	.20	.20		.20		.20		.20	
Laserfiche	.20		.20		.20		.20		.20	
Annual Totals	1.9	1.95	1.9	1.5	2.4	.50	2.4	.50	2.55	
	3.85		3.4		2.9		2.9		2.65	
Average Annual Need	**3.1**									

Table 11. GIS staffing needs

GIS program components	Pre Strategic Plan FTE Allocation	Post Strategic Plan FTE Allocation Scenario #1: No Growth	Post Strategic Plan FTE Allocation Scenario #2: Plan Fully Funded
Common Solutions or mission critical projects	1	0.5	2
Operations activities: Data and application maintenance, user training, departmental support, etc.	3	4	4
COTS implementation and support: Maintenance and significant upgrades to current enterprise applications, as well as acquisition and implementation of new applications	1	0.5	3.1*
Leadership: Direction, budgeting, interdepartmental coordination, regional participation and division management.	1	1	1
Totals	6	6	10.1
Net Change from Current FTE Allocation	0	0	+4.1

*Based on the average annual need from *Table 10*

Return on Investment

The specific return on GIS investments can be difficult to calculate, as GIS is critical in making more informed decisions, but does not itself make decisions. GIS is also critical in improving business process even though GIS staff and systems do not perform the specific business functions involved. Although the dollar for dollar GIS ROI is almost impossible to calculate, some reasonable assumptions can be made about avoiding long-term costs and potential service improvement impact of investment in GIS. Some illustrative examples are discussed below:

Example: New Facilities

Whether considering new schools, libraries or fire stations, these investments are driven by need. The City's current Capital Plan calls for construction of several new facilities over the next 10 years. The need for these new facilities and their locations are largely dictated by future land use, transportation and demographics. GIS staff can bring insights not otherwise available to ensure that the most informed decisions are being made about where and when to build these facilities. These investments can be in the tens of millions, with long-term operating costs also running into the millions. If the better use of GIS in optimizing the planning and siting of facilities resulted in the reduction of just one facility in the next 10 years, this could amount to a savings of as much as $20,000,000. [11]

Example: Managing Infrastructure

Streets, bridges, and sewer and stormwater systems are critical City infrastructure. There is a constant City investment in their upkeep. By actively maintaining accurate, detailed, GIS-based infrastructure data and fully exploiting the GIS capabilities of several City systems designed to help manage infrastructure maintenance, GIS can help the City better prioritize urgent repair needs and preventive maintenance. The approximate capital cost of these activities is $13,000,000 annually over the next 10 years. If effective GIS use can reduce these costs or create increased efficiencies resulting in a 5% performance improvement this would be a return $6,500,000 over 10 years[12].

Example: Saving Lives

During emergencies, accurate, real-time geographic route data and ready access to accurate site preplan data can save lives and protect property. By knowing what streets are closed-off, making use of knowledge about time of day traffic patterns and knowing ahead of time where to park and how to access a structure once on scene, GIS can help reduce the total response time. Saving critical seconds in response can translate directly and saving lives and property. In addition, better preplanning will reduce risk of hazards and improve first responders' initial plan of action.

Example: Delivering Human Services

The City's Department of Community and Human Services (DCHS) is charged with developing and delivering programs that provide *effective and essential safety net services that measurably improve or maintain the quality of life for Alexandrians.* Currently GIS provides no service to DCHS. It can be assumed that a better understanding of underserved communities, the absence of program services or geographically overlapping services can help better target and link programs. It can also help identify other service success factors such as access to transit or proximity to non-City service providers. The DCHS budget is $90,000,000 annually. If better use of GIS resources could improve service delivery by 1%, this would translate to a return of $9,000,000 over 10 years.[13]

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[11] (Facility maintenance/year = $1,000,000) * (Number of years = 10) + (Cost to build a facility = $10,000,000) = $20,000,000

[12] (Infrastructure maintenance/year = $13,000,000) * (Number of years=10) * (Performance improvement = 0.05) = $6,500,000

[13] (DCHS budget/year = $90,000,000) * (Number of years = 10) * (Performance improvement = 0.01) = $9,000,000

Example: Protecting the environment

The City has established, through the Eco-City plan, the value that it puts on protecting the environment. The return on a healthier, greener City is among the most difficult to tie back to a dollar value, but the efforts put forth in developing the plan and City Council's commitment to seeing it implemented demonstrate the importance of the plan. GIS can greatly enhance many of the aspects of the plan, especially where it links directly to those areas such as transportation, transit and land use, but also in implementing better ways to measure and improve walkability and bikeability. In addition, GIS remote sensing techniques are used to measure and monitor canopy, vegetation and impervious surface.

Example: Providing City Services

Service activities such as such as leaf collection, snow removal, and tree maintenance cost the City $3,300,000 annually. During years of severe weather, snow removal alone can be in the millions. The total cost for the 2010 snow storms was $7,100,000. If efficiencies gained through more effective use of GIS could reduce these costs by only 5% annually, and we assume just one significant weather event, in the next 10 years, GIS efficiencies could save the City as much as $2,000,000 over the next 10 years.[14]

Example: Good will and public information

Improvements to internal information can translate to improved public information. GIS public-facing applications, visualizations, and maps can help the public better understand complex information. GIS products can effectively communicate the status of current activities and the how and why of decision making processes. A well-informed public with confidence in their understanding of their City Government has enormous, immeasurable benefits to successful government.

[14] ((Annual service costs = $3,300,000) * (Number of years = 10) * (Performance improvement = 0.05) = $1,650,000) + ((Severe weather event costs = $7,100,000) * (Number of years = 1) * (Performance improvement = 0.05) = $355, 000) = $2,005,000

Appendices

Appendix A: Reponses to the Most Common Policy and Practice Questions

Question	Response
How can more data be created? Can end users or the public have a greater role in data? Maintenance? How do we ensure we adhere to maintenance deadlines?	Addressed by Common Solution #16: End-user data maintenance and short-term policy objective: "Develop procedures to better evaluate relationship between end user data maintenance and accuracy"
What solutions can be developed to enable the sharing of confidential data?	Addressed by Common Solution #21: Secure sharing of analytical information across the enterprise
How could we make better use of other (non-Esri) GIS platforms?	Addressed by short-term policy objective: "Develop guidance on the development of 3rd party mapping solutions"
Will GIS be doing more with mobile application?	Addressed by Common Solution #16: Mobile GIS
How will the Strategic Plan and subsequent Work Plans address ad hoc analytical needs that are sure to arise, but are not explicitly addressed in the plans?	The Plan seeks to mitigate these needs by placing a heavy focus on the development of a greater array of sophisticated self-service GIS resources. The Plan also acknowledges that some unplanned ad-hoc GIS requests will always be part of the GIS service model. These will continue to be vetted at the discretion of the GIS Division, per the criteria described in the Plan, but should account for no more than 10% of staff time annually. In addition, any ad-hoc request requiring more than 120 hours will be brought back to the Steering Committee and addressed as a change to the Work Plan.
How will the Strategic plan address the need for more GIS capabilities at the departmental level?	Addressed by on-going training programs and Common Solution #1: All-purpose situational awareness resource (GARI)
What will be the future makeup and role of the GIS Steering Committee?	This is addressed in *Section 8B* of the Plan: Governance
What will the new model for prioritization look like?	Addressed in *Section 8A* of the Plan: Priorities
How can interns be used to increase productivity?	GIS frequently employs interns when there is a good project fit. Often the level of skill required to complete a task is not suited for an intern.

Appendix B: Applications Detail Matrix

Application	Partner Agencies	Type	Data Products and Support	Custom Code	Server Components	Desktop Components
Cityworks	T&ES, Recreation	COTS	X		X	X
CAD/RMS	Police	COTS	X			
Permit Plan	Code Enforcement	COTS	X			
RealWare/ GeoWare	Real Estate	COTS	X		X	
WebEOC	Emergency Management	COTS		X	X	
Laserfische	ITS	COTS		X	X	
RevenueOne	Finance	COTS		X	X	
GeoCast Web R911	Police	COTS			X	
GARI		Custom GIS	X	X	X	
Planning Viewer	Planning	Custom GIS	X	X	X	
Parking Districts Viewer	Finance	Custom GIS	X	X	X	
Parcel Viewer	Real Estate	Custom GIS	X	X	X	
Development Viewer	Planning	Custom GIS	X	X	X	
Document Imaging Viewer	ITS	Custom GIS	X	X	X	
Sewer Viewer	T&ES	Custom GIS	X	X	X	
I-Net Viewer	ITS	Custom GIS	X	X	X	
Refuse Service	T&ES	Custom GIS	X	X	X	
SRS Viewer	Police	Custom GIS	X	X	X	
Power Outage Viewer	Emergency Management	Custom GIS	X	X	X	
Park Maintenance Viewer	Recreation	Custom GIS	X	X	X	
Trolley Viewer	T&ES	Custom GIS	X	X	X	
EDDI	AEDP	Custom GIS	X	X	X	
DASH RTBI AVL Service	DASH	Custom GIS		X	X	
Map Widget	eGov	Custom GIS		X	X	
Pictometry	Real Estate	COTS	X	X	X	X
Leaf Collection Zone Finder	T&ES	Custom GIS	X	X	X	
FireSRS	Fire	Custom GIS	X	X	X	
GeocodeMe	eGov	Custom GIS		X	X	
Snow Reporter	eGov	Custom eGov			X	

Appendix C: GARI Features

Existing GARI Features

Group	Feature	Description
General	Named Views	Ability to open GARI in different named views with workflow-targeted layers and tools. Currently, it's limited to FireSRS, Planning, EDDI [economic development], and Solid Waste, but this list will probably grow quite long as we gain a better sense of user workflows.
General	Basemaps	General reference type maps that act as a pre-designed base for other maps. Choice of street map, aerial, or natural base (vegetation, water features, terrain).
General	Overlays	Maps of different themes that can be displayed together on top of the base. Each cartographically designed to work with each basemap, and alongside other overlays. Organized into intuitively named themes: Building, Planning, Environment, Emergency, Land, Business, Transportation, Demographics [this list will continue to grow, and additional levels of hierarchy may be introduced]
General	Hot features	These are dynamic map features (points, lines, and polygons) that are especially interactive or "hot," - i.e., they respond to rollover with additional information and/or links, and may be updated at regular intervals). Examples include live AVL, geoRSS feeds, and a variety of GIS data sources.
General	Projects	This is a highly dynamic list of certain project data that we use to share information with our partners while a project is in progress. Over time, projects will appear and disappear from this list, and in some cases user access may be limited to certain individuals participating in the project.
General	Map Navigation	Seamless zoom/pan with several ways to navigate: a navigation menu, a shortcuts menu, a slider (for zoom), and mouse scrollwheel functions. This helps to create a very dynamic and expressive interface.
Exploring and retrieving data	Identify Tool	Enables a user to click on a map location, drill down through multiple layers and return details on each feature. Allows us to keep labeling on overlays somewhat light (to avoid clutter), and provides user access to feature-specific resources such as web sites (e.g., hotel web pages) and documents (e.g., Plats and SUPs).
Exploring and retrieving data	Explore Data Tool	Enables users to sweep map features and explore the data behind them – summarizing them as charts, applying different visualization techniques, viewing tables of the attributes they contain, exporting them to excel, applying tabular or spatial filters. The plan for this tool is for it to answer any quick question a user would go to desktop GIS to answer. In some ways, it should replace toolbox for any basic geoprocessing that doesn't involve feature edits (e.g., cracking features for an intersect operation).
Exploring and retrieving data	Buffer Tool	Works to boost the explore data tool, to answer questions that have to do with how many x's are within distance of the selected y's. The buffer feature automatically copies the input features fields into the output buffer – this makes it already a tad more powerful than a desktop buffer tool.
Exploring and retrieving data	Selection Manager	Selections in GARI are much more flexible in the desktop environment. Not only can selections be pulled from almost any tool (Identify, Explore Data, Hot features, Buffer, Find Address), but you can run searches and buffers on these different features simultaneously. The selection manager is something that doesn't exist in the desktop

		environment; it enables users to see what features are selected in one location, regardless of their source. The manager provides direct access to each feature in the selection, enabling users to view them and turn them off individually.
Exploring and retrieving data	Service Area Tool	Allows users to generate service areas based on features in the map, or by manual click. These can then be used to perform additional feature-on-feature selections. An example of an external tool (provided by ESRI) incorporated into the GARI application in the spirit of SOA.
Map production	Doodle Layer	a graphics tool set for sketching on top of the map with points, lines, polygons, and text. Its power as a collaborative tool is in the ability to save these annotations to be called up at will, or shared with other GARI users. The freehand nature of many of these tools allows the user to sketch hastily (for example in a meeting). Although we'll need to find ways to ensure that such "doodle maps" will need to be used responsibly (i.e., not presented as official in any way), this functionality should replace the use of the desktop environment for graphic generation. This will help to create a clearer demarcation between doodles and real data.
Map production	Print	Enables the user to print the current view as a snapshot. Needs considerably more development to replace the desktop as a map output tool.
Map Interaction	Swipe/Spotlight	Allows user to control sweep on/off an overlay (or basemap) interactively by clicking on the map. Helps resolve situations where it's necessary to see information from multiple layers, but the cartographic effect is noisy.
Map Interaction	Find Address	Hooks into our most comprehensive and stable geocoder. Simultaneously a tool for navigating the map, researching locations, and validating addresses.
Map Interaction	Google Streetview	Allows user a street level vantage on any point on the map. An example of an external resource that we're integrating with local resources.
Other	Help	Highly graphical explanations of how to use each tool. Guidance for interpreting certain results, including caveats and pitfalls – because GARI will empower users to do more analytical tasks, the users need to be well educated on interpreting what they discover.

Scope of GARI Features 2011-12

Group	Feature	Description
Usability	Interface Design	Enhancements to user interface to improve "intuitiveness" and usability.
Usability	GARI Skinning	Branding GARI with a City aesthetic - using styles and custom components as needed
System Architecture	System Analysis and Design	Review samples, revisit usability tests, and develop design
System Architecture	load balanced architecture	split the service load between two servers
Visualization	Base cartographic improvements	Take the base cartography to the next level with these and more adjustments: (1) subtle topographic hillshading, (2) the ability to bring in Esri's basemap and display it at the same time as our own basemap, to provide regional context, (3) much better labeling that doesn't use the labeling engine, but perhaps maplex exported to annotation? labels that curve along the road and don't overlap and repeat.
System Architecture	Flex 2.x API upgrade	Convert functionality to Esri ArcGIS Flex API 2.x and Adobe Flex 4.5 (list the major pieces of this)
Productivity tools	Implement Editing tools	For end user data maintenance - empower users to create their own edits, where appropriate. For example, there are many standalone tables that will relate back to the building facility Id's, for which our partners in different departments will be stewards. These individuals should have the ability to keep these pieces of information up-to-date; that means editing, adding, and removing building details that are relative to the area of their individual purview. Ideally, these tools would be accessible from a mobile device.
System Architecture	Paging capabilities	This is a fix to the 500 record max - users must be able to page through results. This includes some server-side stored procedures as well as the front age paging features
Productivity tools	Error flagging and data tagging	Enable users to tag a feature with a note for review by another indidivual or group. Control access by windows users and groups. Explain to users that the responsibility for keeping the data up to date rests on everyone, perhaps in a FAQ in the help.
Analysis tools	Time-aware layer slider & playback	Enable users to filter events like accidents, foreclosures, incidents during and emergency
Analysis tools	Interactive census/demographic tools	A series of thematic mapping and charting/graphing/trending tools, with links to Census Fact Finder to let the user jump to the census tools from specific geographic areas (http://factfinder.census.gov)
Productivity tools	Map Layout and Printing	Allow users to design their own map layout, placing marginalia, chosing scales, and adding titles and legends. Nice to have: let the user select color themes so that the graphical output is snazzy. Include the ability to export the map to a graphic, or a powerpoint slide. Perhaps even an animation or an interactive map inserted in powerpoint, or the ability to generate a presentation similar to the tool on ArcGIS Online
Data Access	Powerful Data search	Search by keyword for a feature or a theme and get a list of relevant data sets to show - includes viewing metadata
Analysis tools	Analytical Heat Maps	For crime, bike/pedestrian accidents, foreclosures and other incidents, as well as to identify hotspots for program participants.

Analysis tools	Facility Service Area tool	Schools, libraries, parks and rec centers, senior centers, fire service, metro - these could all be canned.
Visualization	Visualization Dashboard	A flexible and reusable set of dockable components for use in data mining and exploratory data analysis. Examples include treemaps, radar charts, ring charts, expanded charting (e.g., interactive brushing - user hovers over pie slice and all records on the map related to the pie slice are highlighted.
Productivity tools	Enhanced selection logic	Drag-and-drop basket concept: user grabs a single item, or group of items, from a window of search results (or identifies, hot features, etc) and drops them into a custom defined basket. The basket can be saved, E-mailed, or exported. This should be more intuitive. This is one idea, the final solution will need to be fully explored
Analysis tools	Walking Tools	point-click walkingshed, walking routes, pedestrian service areas (cost allocations)
Analysis tools	Viewshed tool	Generation of viewsheds - user clicks a point, viewable areas are highlighted.
Visualization	Pictometry Viewer enhancements	Include the zoom slider, and the ability to browse through images.
Desktop integration	Web-to-desktop Layers	Data search and metadata tools should be integrated, alongside a “load this layer in ArcMap” function so that users can use GARI as a way to build an ArcGIS Desktop workspace.
Desktop integration	Web-to-desktop doodles	Doodle maps should be importable to ArcGIS desktop (with ‘responsibility’ controls) - we currently have an import tool, but this could be made more seamless with more capture of things like annotation.
Desktop integration	Web-to-desktop Workspaces	Any user who has ArcGIS access and skills should be able to pick up in ArcGIS where they leave off in GARI. For example, a user generates a buffer around a selected feature and selects some other point features inside the buffer, but then finds they need to do more in-depth geoprocessing. The click the “open this workspace in ArcGIS” and they get the feature, its buffer and the selected points inside, displayed as featureclasses in ArcGIS. Also provide users with the opportunity to select whether they want to copy the data to their user folder as a static snapshot, or maintain a live link to our database.
Usability	Wizard or command line utility	An alternative and "hand holding" means of accessing the content in GARI
Productivity tools	EOC Damage Assessment Tools (mobile)	The ability to enter spatially explicit data and information from the field, including photographs (perhaps geotagged from the android and/or iphone) - this could take the form of a smartphone app, or a web app that is accessible and usable from a smartphone
Productivity tools	"Code SRS"	Tools to help Code Enforcement access sites
Visualization	Incorporate webcams and other real time data, as available	E.g., the torpedo factory camera
Analysis tools	AVL query and playback tools	Enable users to query the location of a vehicle during a selected time frame, and view the vehicle movements through that period (really just a specific instance of the time aware widget)

Analysis tools	Routing Tools (vehicle)	Provide directions between a start and end point, enabling interactive placement of obstacles, potentially also route design
Analysis tools	Police and Fire SRS(?)	Interest in this task is unclear. This would be porting the functionality of the existing IMS application for Police SRS - essentially the ability to search for incidents, calls, and interviews through spatial and tabular queries. Perhaps also include TENS automation.
Analysis tools	Police - Intelligent search grid	To replace a simple radial search, a more intelligent walking model tool that would narrow down the locations where someone could walk/run in the given time period, just by running a very liberal scenario (even more so than the emergency scenario, which assumes no traversal of private property or fences). It could be integrated with sewer analyses that they use to locate discarded weapons and used to help with pursuit, or even perhaps to retrace past steps (the defensibility and validation would need to be much higher than it is right now).
Analysis tools	Closest facility function	A tool to go to the closest facility from a selected address, point on map, or other feature
Etc	Help	Incorporate walk-through videos
Productivity tools	"Watch this Layer" subscriptions	subscriptions that allow users to be notified when an individual feature of a layer is edited, so that they can zoom to the new/changed features. This is especially relevant for highly dynamic layers, such as addresses, and parcels. This could even become a part of the internal address notification process.
Productivity tools	Pick address from map tool	This is just a reverse geocode - but it would be ideal if we could create something as functional as the "address investigator" in 10.x desktop
Visualization	Building Floor Viewer	Sub-building exploration tool: a magnifier type hover tool that allows user to explore buildings (and perhaps details like Fire Pre-plans) at the floor level.

Appendix D: Data Matrix Detail

Group	Feature Name	GIS Maintained	Data Sharing Data DVD	Data Sharing NCR – GDX
Address	Address Points	x	x	x
Address	Address Assignment Zones	x	x	x
Address	Address Aliases	x		
Address	Zip Codes (Analysis)	x	x	x
Address	Zip Codes (Cartographic)	x	x	x
Asset	Fire Hydrant	x		x
Asset	Pier	x	x	x
Asset	Inet Sites	x		
Asset	Recreational Amenites		x	x
Asset	Bike Share	x		
Asset	Park	x	x	x
Asset	Recreation Centers	x	x	x
Asset	Trees			
Asset	Schools	x	x	x
Asset	School Properties	x		
Asset	Recycling Drop Off	x		
Asset	Trash Cans	x		
Base	Building Campus	x		
Base	Building History	x		
Base	Building Uses	x	x	x
Base	City Boundary	x	x	x
Base	City Boundary	x	x	x
Base	Hydrology	x	x	x
Base	Shore	x	x	x
Base	Stream	x	x	x
Base	2001 Orthophotography Index	x		
Base	2004 Orthophotography Index	x		
Base	2009 Orthophotography Index	x	x	
Base	Fences and Walls	x		x
Base	Other Paved Areas	x		
Base	Buildings	x	x	x
Base	Building History	x		
Base	Miscellaneous Buildings	x	x	x
Base	Transportation Line	x		x
Base	Transportation Poly	x		x
Base	Sidewalk	x	x	x
Base	Contour Lines	x	x	x
Base	Spot Elevations	x		
Demographics	Census Blocks 2000 (Base)	x		
Demographics	Census Block Groups 2000 (Base)	x		
Demographics	Census Tracts 2000 (Base)	x		
Demographics	Census Block Group 2000	x	x	x

Demographics	Census Blocks 2000	x	x	x
Demographics	Census Tract 2000 (Education)	x		
Demographics	Census Block 2000 (Household Family)	x		
Demographics	Census Block Group 2000 (Household Family)	x		
Demographics	Census Tract 2000	x		
Demographics	Census Block Group 2000 (Household Income)	x		
Demographics	Census Tract 2000 (Household Income)	x		
Demographics	Census Block 2000 (Housing)	x		
Demographics	Census Block Group 2000 (Housing)	x		
Demographics	Census Tract 2000 (Housing)	x		
Demographics	Census Block 2000 (Journey to Work)	x		
Demographics	Census Tract 2000 (Journey to Work)	x		
Demographics	Census Block Group 2000 (Language)	x		
Demographics	Census Tract 2000 (Language)	x		
Demographics	Census Block 2000 (Population by Age)	x		
Demographics	Census Block Group 2000 (Population by Age)	x		
Demographics	Census Tract 2000 (Population by Age)	x		
Demographics	Census Block 2000 (Population by Race)	x		
Demographics	Census Block Group 2000 (Population by Race)	x		
Demographics	Census Tract 2000 (Population by Race)	x		
Demographics	Census Block Group 2000 (Poverty)	x		
Demographics	Census Tract 2000 (Poverty)	x		
Demographics	Census Block Group 2000 (Residences Previous 5 Years)	x		
Demographics	Census Tract 2000 (Residences Previous 5 Years)	x		
Demographics	Census Tracts 2000	x	x	x
Demographics	Census Blocks 2010 (Base)	x	x	
Demographics	Census Block Groups 2010 (Base)	x	x	
Demographics	Census Tracts 2010 (Base)	x	x	
Demographics	Census Blocks 2010 (Redistrict)	x	x	
Demographics	Census Blocks Groups 2010 (Redistrict)	x	x	
Demographics	Census Tracts 2010 (Redistrict)	x	x	
Demographics	Census Block Group 1990	x	x	x
Demographics	Census Block Group 1990	x	x	x
Demographics	Census Tracts 1990	x	x	x
Demographics	Census Tracts 1990	x	x	x
Parcel	Tax Map Address Annotation	x		
Parcel	Tax Map Block Annotation	x		
Parcel	Tax Map Block Lines	x		
Parcel	Tax Map Blocks	x		
Parcel	Tax Map CUP Annotation	x		
Parcel	Tax Map CUPs	x		
Parcel	Tax Map Dimension Annotation	x		
Parcel	Historic Easements	x		
Parcel	Tax Map Miscellaneous Annotation	x		

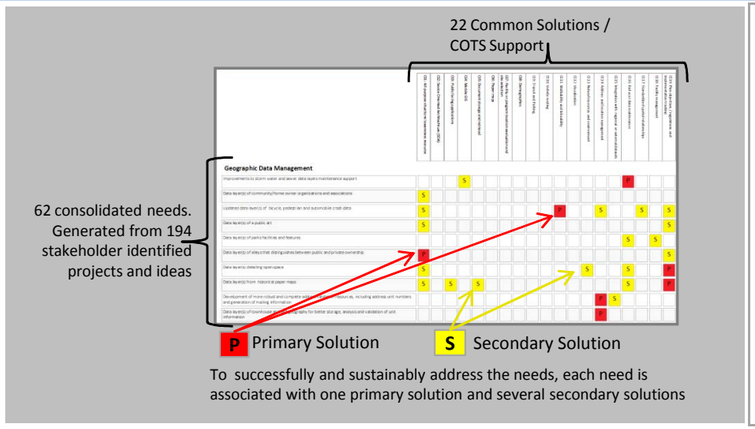
Parcel	Tax Map Planning Overlay Annotations	x		
Parcel	Parcel Lot Annotation	x		
Parcel	Tax Map Index	x		
Parcel	Tax Map Index Annotation (Small)	x		
Parcel	Tax Map Index Annotation (Large)	x		
Parcel	Parcels	x		
Parcel	Parcel History	x		
Parcel	Legal Parcels	x		
Parcel	Proffer Annotation	x		
Parcel	Proffers	x		
Parcel	Tax Map Street Annotation	x		
Parcel	Tax Map Tic Annotation	x		
Parcel	Tax Map Tics	x		
Parcel	Tax Map Zoning Annotation	x		
Parcel	Legal Parcl Annotation	x		
Parcel	Plats	x		
Regulatory	Enterprise Zones	x	x	x
Regulatory	100 Year Buildings	x		
Regulatory	Intermittent RPAs	x		
Regulatory	RPA Line Edits	x		
Regulatory	Resource Protection Areas	x		
Regulatory	Businesses	x		
Regulatory	Fire Box	x		x
Regulatory	Flood Elevation Lines (DFIRM 2010)	x		x
Regulatory	Flood Hazard Zones (DFIRM 2010)	x		x
Regulatory	Flood Insurance Rate Map 1991	x		
Regulatory	Flood Insurance Rate Map Amendments	x		
Regulatory	100 Year Flood Plain	x		x
Regulatory	Parking District Qualification	x		
Regulatory	Residential Parking Districts SUPs	x		
Regulatory	Residential Parking Districts	x		
Regulatory	Central Business District	x		
Regulatory	Coordinated Development Districts	x		
Regulatory	Civic Associations	x		
Regulatory	Height District	x		
Regulatory	Historic District	x		
Regulatory	Jurisdictional Notification	x		
Regulatory	King St Dining	x		
Regulatory	King St Metro Planning District	x		
Regulatory	Mt Vernon Overlay	x		
Regulatory	Mt Vernon Retail	x		
Regulatory	Old Town Urban Overlay	x		
Regulatory	Planning Districts	x		
Regulatory	Small Area Plans	x	x	x
Regulatory	Zoning Annotation	x		
Regulatory	Zoning	x	x	x
Regulatory	Zoning History	x		
Regulatory	Zoning Parking Districts	x		
Regulatory	CSS	x		
Regulatory	Police Beats	x		x

Regulatory	Police Reporting Districts	x		x
Regulatory	Ethanol Evacuation Routes	x		x
Regulatory	Sensitive Locations	x		x
Regulatory	Recreation BID Contract Areas	x		
Regulatory	School Board Districts	x	x	x
Regulatory	Transportation Management Plans	x		
Regulatory	VA House Districts	x	x	x
Regulatory	Polling Places	x	x	x
Regulatory	Voting Precincts	x	x	x
Regulatory	VA Senate Districts	x	x	x
Regulatory	Refuse Day Zone	x		
Regulatory	Leaf Collection Zone	x		
Regulatory	Solid Waste Service			
Regulatory	Spring Clean Up Zone	x		
Regulatory	Solid Waste Service (City Facility)	x		
Regulatory	Refuse Truck Zone	x		
Transportation	Traffic Analysis Zones	x		
Transportation	Traffic Signals	x		
Transportation	Bus Routes	x	x	x
Transportation	Metro Lines	x	x	x
Transportation	Metro Stations	x	x	x
Transportation	Railroads	x	x	x
Transportation	Trolley Routes	x	x	x
Transportation	Trolley Stops	x	x	x
Transportation	Bridges	x		x
Transportation	Road Name Labels	x		x
Transportation	Road Centerlines	x	x	x
Transportation	Street Map Index	x	x	
Utility	D Sewer Network Junctions			
Utility	D Sewer Network Catch Basins		x	x
Utility	D Sewer Network Control Devices		x	x
Utility	D Sewer Network Culvert Points		x	x
Utility	Development Initiatives			
Utility	Development Projects			x
Utility	Development Project Additions			
Utility	D Sewer Network Gravity Mains		x	x
Utility	D Sewer Network Inlets		x	x
Utility	D Sewer Network Manholes		x	x
Utility	D Sewer Network Nodes		x	x
Utility	D Sewer Network Open Channels		x	x
Utility	D Sewer Network Pipe IOs		x	x
Utility	D Sewer Network Sewer Sheds		x	x
Utility	D Sewer Network Storage Basins		x	x
Utility	Sewer Map Sheet Index			
Utility	S Sewer Network Junctions			
Utility	S Sewer Network Combined Catch Basins		x	x
Utility	S Sewer Network Combined Inlets		x	x
Utility	S Sewer Network Combined PipeIOs		x	x
Utility	S Sewer Network Force Mains			
Utility	S Sewer Network Gravity Mains		x	x

Utility	S Sewer Network Manholes		x	x
Utility	S Sewer Network Nodes		x	x
Utility	S Sewer Network Sewer Sheds		x	x
Utility	Miscellaneous Utilities	x		
Utility	Street Lights and Poles	x		
Visualization	Buildings 3D	x	x	x
Visualization	Orthophotography 1995	x		
Visualization	Orthophotography 1998	x		
Visualization	Orthophotography 2000	x		
Visualization	Orthophotography 2001	x		
Visualization	Orthophotography 2002	x		
Visualization	Orthophotography 2004	x		
Visualization	Orthophotography 2006	x		
Visualization	Orthophotography 2007	x		
Visualization	Orthophotography 2009	x	x	
Visualization	Pictometry 2004	x		
Visualization	Pictometry 2009	x		
Visualization	Pictometry 2011	x		

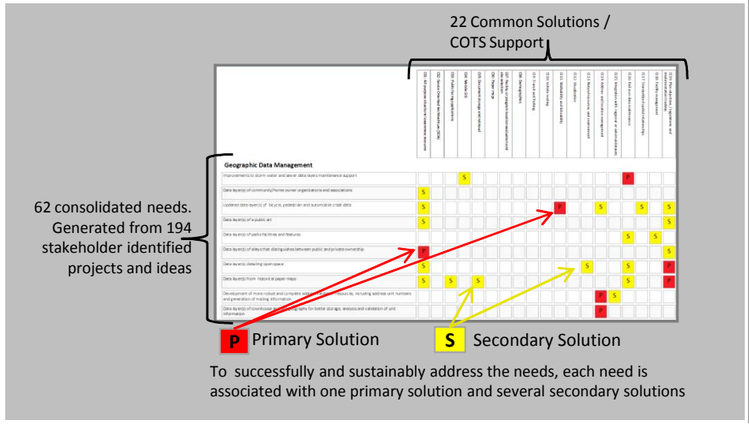
Appendix E: Needs and Common Solutions Matrix

Addressing GIS Needs Through Common Solutions



To successfully and sustainably address the needs, each need is associated with one primary solution and several secondary solutions

	CS1: All-purpose situational awareness resource	CS2: Sevice Oriented Architechture (SOA)	CS3: Public facing applications	CS4: Mobile GIS	CS5: Document storage and retrieval	CS6: Paper maps	CS7: Facility or program location evaluation and site selection	CS8: Demographics	CS9: Transit and parking	CS10: Vehicle routing	CS11: Walkability and bikeability	CS12: Visualization	CS13: Natural resources and environment	CS14: Address and location management	CS15: Integration with regional or external datasets	CS16: End user data maintenance	CS17: Standardized spatial relationships	CS18: Facility management	CS19: Plan objectives / regulations and implementation tracking	CS20: Real time data feeds	CS21: Secure interdeapartmental sharing of analytical information	CS22: Measuring change	CT1: COTS or Busness System Support
Geographic Data Management																							
Improvements to storm water and sewer data layers maintenance support	S		S	S												P							S
Data layer(s) of community/home owner organizations and associations	S	S														P							
Updated data layer(s) of bicycle, pedestrian and automobile crash data	S		S								P			S			S		S				S
Data layer(s) of a public art	S		S													P			S				
Data layer(s) of parks facilities and features	S		S													S		S					P
Data layer(s) of alleys that distinguishes between public and private ownership	S		S													P			S				S
Data layer(s) from historical paper maps	S		S		S											S			P				
Development of more robust and complete address validation resources, including address unit numbers and generation of mailing information														P	S								S
Data layer(s) of townhouse and unit geography for better storage, analysis and validation of unit information								S						P									S
Data layer(s) detailing open space	S		S										S			S			P				
Planning and Analysis																							
Analytical support for infrastructure capital improvement and maintenance plans								S								S		S	S			S	P
Repeatable business process for automated identification changes to structures to better enable Real Estate assessment adjustments	S																					P	S
Analysis of the geographic distribution of the relationship between Health Department client needs and access to public and private health related programs and services	S						S	S									P				S	S	
Analysis of parking and its relationship to land use	S							S	P		S	S					S					S	
Analytical support for specific targeted planning efforts (i.e. Youth Master Plan)	S		S		S			S				S				S			P		S	S	



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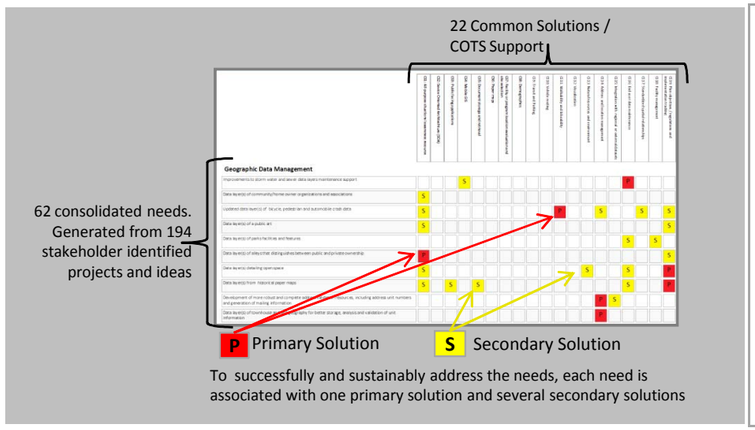
Analysis of transit ridership and demand for improved transportation and transit planning	S							S	P	S	S				S				S			S	
Support for vector-borne disease program and analysis of spatial relationships in tracking communicable diseases				S				S							S		P				S	S	
Analysis of spatial relationships between the cost of City services, private investment revenues and land use.	S							S	S		S						P		S		S	S	
Methodologies for analysis of historical vehicle location data	S									S										S	S	P	S
Analysis of business tax collection trends for identification of audit opportunities		S						S			S			S			P				S	S	
Methodologies for measuring the success of walking or bicycling routes (i.e. network, safety, quality, destinations)	S		S	S				S	S		P					S							
Analysis and management of employee and program space	S															S		P					S
Support for facilities planning (measuring demand and identifying sites)	S						P	S	S		S				S				S		S	S	
Analysis of program user data with geographic demographic profiles to identify and provide outreach to unserved or underserved communities	S							S									P				S	S	
Analysis of most effective bus routing solutions	S							S	S	P	S								S	S			
Analytical support for plans to repurpose facilities for large scale emergencies	S						P	S	S	S	S	S			S			S	S		S		
Assignment of territories and field visits (through the use of customer/service location criteria, Automated Vehicle Location (AVL) and routing logistics)	S			S						P				S			S			S			S
Analysis of the geographic distribution of Community and Human Services clients' needs and the relationship between these needs and access to public and private services	S						S	S	S		S				S		P		S		S	S	
Demographic forecasting, understanding the likely future development mix and its impact on population, employment and city services	S		S				S	P	S		S								S			S	
Methodologies to help integrate and analyze information relating the impact of the built environment on health and behavioral issues	S							S	S		S		S		S		P				S	S	
Support for "Continuity of Operations Plans".	S				S		S	S			S	S						S	P		S		
Field Mobility																							
Mobile technology for accessing City GIS information in the field	S			P																			S



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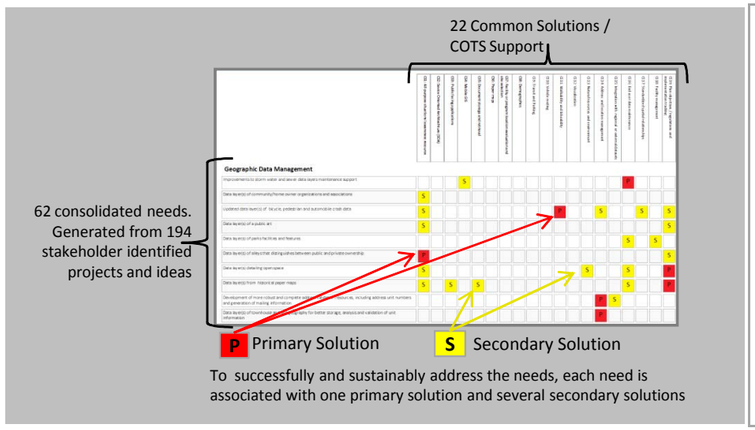
Collection of geographic information in the field via mobile devices	S			P												S							
Publicly available, mobile, location based information and promotion resource	S	S	S	P	S			S	S	S	S	S	S		S								
Operational Awareness																							
Improved parcel level data accuracy and breadth of parcel based information	S				S			S								P					S	S	
Citywide, GIS based, application for "all hazards" analysis, collaboration, and resource planning	P			S	S		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Comprehensive GIS dataset containing a wide breadth of diverse local, regional and national demographic attributes	S				S			P							S								
GIS based interface to store and retrieve documents and photos	S		S	S	P									S									
Map and track the spatial distribution Real Estate assessment appeals	S																					S	P
Geographically organized information from land use regulations and plans	S		S		S											S			P				
GIS Building Model expansion. Expand the core set of attributes maintained at the structure level	S							P								S	S					S	S
Hard copy (back up) maps specifically targeted at Fire and Police needs for use in the field						P									S								
Access to utility data (power lines, gas lines, water lines, etc.)	S			S	S										P						S		
Current sub census tract level demographics (daytime / nighttime population, employment and commuting)	S							P	S													S	
Citywide, GIS based, application for information dissemination, analysis and collaboration	P		S		S			S	S	S	S	S	S	S	S	S		S	S	S	S		
Full Pictometry (oblique imagery) integration with all GIS visualization platforms	S		S	S								P											
Depiction of energy usage in City buildings	S																P					S	
Depiction of the geographic distribution of program monies, inclusive of City money, non-profits and grants	S																P		S		S	S	
Employee home locations for informed decisions on staff resource availability during weather / emergency events	P																S						



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Spatial information on building interiors and exteriors for Public Safety preplanning purposes	S			S	S							S						P					S
Resources to locate places that do not have addresses	S			S										P		S							S
Regional base (streets, buildings, addresses, etc.) and emergency related data	S							S							P					S			
Stakeholder Engagement																							
Technology resources to improve public access to parking	S	S	S	S					P					S						S			
Technology resources for departmental users to publish their own project / event based public facing maps	S		P	S												S							
Eco-City Alexandria data and map series	S		S						S		S	S	P						S			S	
Publicly available all purpose information and promotion resource	S		P	S	S			S	S		S		S		S				S				
Resource to help the public better understand the distribution of financial outlays, both operating and capital.	S		S														S	S	P			S	
Systems Integration and Support																							
RealWare /GeoWare: GIS support for Real Estate's Computer Aided Mass Appraisal System (CAMA)	S		S	S								S				S	S						P
Integration of GIS-driven data in non-GIS enabled applications through development of Service Oriented Architecture (SOA)		P	S		S			S						S			S		S			S	
Cityworks: GIS based asset management and maintenance assignments and accountability	S		S	S						S				S		S		S	S	S		S	P
PermitPlan: GIS and permit process Integration	S		S							S													P
GIS support for new comprehensive Computer Aided Dispatch (CAD) / Records Management System (RMS) replacement.	S			S	S			S		S		S		S		S				S			P

Appendix F: Stakeholder Meeting Notes

GIS Strategic Plan
Needs Gathering Meetings Schedule

	Meeting	Date	Departments /Functions	GIS Staff
✓ 1	Department of Emergency Communications/ IT Group	March 16th 10:00 am	Emergency Communications, Fire, Police (public safety needs)	Steven Chozick Michael Smith
✓ 2	Department of Community and Human Services	March 22nd 10:00 am		Steven Chozick Jason Agatone
✓ 3	Real Estate Department Meeting	April 5th 9:00 am		Steven Chozick Moe Abu-Rabi
✓ 4	Interdepartmental Long Range Planning Group	April 6th 3:00 pm	Planning, RPCA, OHA, T&ES, Housing, AEDP, ACVA, SBDC (long range planning interests)	Karl Moritz Steven Chozick Michael Smith
✓ 5	Library Branch Managers and Department Heads Monthly Meeting	April 11th 10:00 am		Michael Smith Brett King
✓ 6	Schools Maintenance Group	April 13th 10:00 am	RPCA, Schools, T&ES, General Services (citywide maintenance)	Steven Chozick Michael Smith
✓ 7	Alexandria City Public Schools	April 26th 11:30 am		Steven Chozick Karl Moritz Michael Smith
✓ 8	Information Technology Services Department Meeting	April 27th 2:00 pm		Steven Chozick Brett King
✓ 9	Health Department Leadership	May 4th 10:30 am		Steven Chozick Jason Agatone
✓ 10	Financial Interests	May 10th 11:00 am	Finance, Office of Management and Budget	Steven Chozick Karl Moritz Moe Abu-Rabi
✓ 11	City Schools Workgroup	May 10th 2:00 pm	Schools, DCHS, RPCA, Police, Library, Health department, Courts (all services related to children)	Steven Chozick Brett King
✓ 12	Office of Communication and Public Information	May 17th 3:30 pm		Steven Chozick Julie Kanzler

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***March 16, 2011***

Group: ***Public Safety***

Stakeholders:

Henry Lewis	Dale Johnson	Mary Craige	Fulmer Collins
Jennifer Adcock	Heather Reynolds	Brandon Mosoriak	Robert Mains
David Huchler	JoAnne Munroe	James Burke	

GIS Staff:

Steven Chozick	Michael Smith

Needs Summary

This group was a combination of staff from Fire Department, Police Department and Department of Emergency Communications (Sheriff's department was not represented at this meeting). The GIS needs for these organizations were extensive as access to a large diverse amount of location specific information in paramount in emergency response. Support for operational needs which are largely managed within the CAD/RMS system were very important and it was agreed that all CAD system needs gathering (which had been conducted in the weeks preceding this meeting) be incorporated from that procurement document by this reference (and only summarized here), rather than being rewritten in their entirety.

CAD/RMS Summary: Future CAD system will need to be able to import the Geofile directly from GIS, consume the regional routable centerline being produced by GIS for unit recommendations and response routing, CAD and RMS mapping should be able to accept GIS overlays and use them as dynamic spatial analysis both for operational response purposes and for crime and response analysis.

Meeting Notes:

General observations/ thoughts

- As the City continues moving toward more mobile devices such as Smart Phones and access to them is becoming more common, the need for mobile GIS applications are becoming more important.
- Data currency of one year or less is preferred.
- GIS needs to be better integrated into the Emergency Operations Center.
- GIS will need to be heavily involved in the new CAD implementation.

Need ID	Specifically Identified Needs/Opportunities
PS1	Police are collecting a great deal of data such as Automated Vehicle Location (AVL) and License Plate Reader (LPR) with XY coordinates however this data is not being utilized and/or integrated with other systems (such as SRS). More capabilities for effective analytical use of historic data is needed
PS2	A mobile Alexandria application is needed as a one stop shop for accessing City information from the field.
PS3	There is a need for backup hard copy maps in the field. These maps need to be updated on a frequent basis and be portable yet readable.
PS4	Police have a need for Special Use Permit (SUP) data.
PS5	Better delineation, mapping and response tools are needed for non-address identified areas, such as mile markers on bike paths or locations within parks. This will assist in reducing response times by more precisely locating incidents and how they can be best accessed.
PS6	Access to pre-plan data is critical. Pre-plan data could include DSUP drawings (full set) or specific plan pages for specific purposes.
PS7	Utility data (gas, electric, water & sewer) is helpful to better understand sites/incidents
PS8	GPS use should be more integrated into process to more accurately define locations
PS9	Better access to many types of regional data
PS10	Strategic Response Systems (SRS) Police Viewer is ending its useful life and needs to be replaced by either a cots application or integration with GARI; SRS Fire needs to move from beta to full release
PS11	Access to time aware demographic information for emergency response

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***March 22, 2011***

Group: ***Department of Community and Human Services***

Stakeholders:

Mike Gilmore	Lisa Baker	Laura Morrison	Carol Layer
Dennis McKinney	Suzanne Chis	Deborah Warren	Phil Antonucci

GIS Staff:

Steven Chozick Jason Agatone

Needs Summary:

The Department of Community and Human Services is one of the largest departments in the City accounting for 17% of the Cities overall budget. It provides numerous diverse programs focused on providing safety net service to maintain or improve the quality of life for Alexandrians. The department also maintains several service center facilities throughout the City. Despite the size of the organization and many potential opportunities to improve service delivery with GIS there has traditionally been very little collaboration between GIS and the DCHS.

Meeting Notes:

General observations/ thoughts

- Unsure of how to effectively use GIS for their benefit. Need more educational conversations to get specific project with GIS identified.

Need ID	Specifically Identified Needs/Opportunities
HS1	DCHS has several facilities and provides many service out of these facilities, GIS can help connect the dots between locations of services provided location of clients and access (transportation) between them.
HS2	GIS can assist in analyzing appropriate locations for new or relocating facilities or services
HS3	Linking needs with private resources; understanding the dynamic between private uses (medical, food, other services) and a population's needs, could help facilitate more coordination between customers and private services (increase in food stamp users, could be a chance to educate business owners about accepting food stamps). This could also provide the means to understand implication from a private service which ceases operations.
HS4	Support for major initiatives. DCHS is in the process of finishing an aging needs assessment and about to begin a youth master plan. These project target different demographics and these demographic groups different interaction with the build environment.
HS5	Many activities send people into the field to visit clients, most robust routing

	capabilities and an understanding of program and client overlap could make these activities more efficient.
HS6	GIS help coordinate managing maintenance activities through CityWorks.
HS7	A better understanding of interior office and client spaces and exterior spaces also have value in space planning and Fire/Police preplanning. They would also facilitate more efficient use of Cityworks program.
HS8	Coordinating with other agencies and minimizing disruptions in service during an emergency event is very important., mental health, children and the elderly who rely on DCHS service must all continue to receive vital services during an emergency event; snow storms, downed trees, power lines, closed roads, inaccessible facilities etc. and the relationship of these hazards to client locations and services are critical when operating during an emergency.
HS9	Would benefit from access to GARI, given the size of the organization would like to get several on-site DCHS only trainings set up.

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***April 5, 2011***

Group: ***Real Estate Department***

Stakeholders:

Jeff Bandy Ann Radford Michael Slavin Curtis Ney
Bryan Page Cindy Smith
Ted Jankowski (follow-up meeting on April 15th)

GIS Staff:

Steven Chozick Moe Abu-Rabi

Needs Summary

Real Estate Assessments maintains the real property database for the purpose of assessing (and defending assessment on) all real property. Real Estate and GIS have a longstanding history of tight coordination and integration, especially on the maintenance of the parcel tax base. This meeting was held shortly before the addition of a new Director. A follow-up one-on-one meeting was held between the GIS Division Chief and new Director and those needs are included here as well. Needs generally centered improving use of GIS in CAMA, support for RealWare and ways GIS could better leverage Real Estate data for other citywide purposes.

Meeting Notes:

General observations/ thoughts

- Real Estate has very specific GIS and application integration needs, GARI may be too general for those purposes.
- More direct GIS to support to Real Estate CAMA system would be very helpful.
- Concern that GIS resources are limited – Does GIS think that they will get additional resources in the future?
- Visualization products are very important for Real estate.
- Better overall use of GIS (spatial functions) in the CAMA process is needed.

Need ID	Specifically Identified Needs/Opportunities
RE1	Need help with basic, but very useful things, like labeling properties with value per square foot.
RE2	Mapping condo units would help with spatial data management.
RE3	Pictometry should be integrated into mapping interfaces.
RE4	Need to have access to current and future development projects and projections.
RE5	General preprocessing of parcel related data such as slopes, RPAs, sewer access, flood plains and frontage is important.
RE6	Better information about Small Area Plans and CDD's is important in determining

	land values.
RE7	Need business tax information. Can GIS help incorporate finance data with parcel information?
RE8	Address information – need to distinguish between mailing vs. parcel addresses.
RE9	Need tools and equipment (such as Ipads) to collect information in the field. Need to be able to draw sketches, fill out forms and edit or review data from the field.
RE10	Need a process to map and track the spatial distribution and adjudication of appeals.
RE11	Need to develop a more clearly defined and repeatable business process to accomplish “change detection/change review”.
RE12	Stronger GIS/ Real Estate data collaboration/integration to develop detailed land/structure mapping and attributing, with a look towards the secondary benefits of proving a better base to decision makers in other agencies across the enterprise is important
RE13	Need to investigate potential opportunities for mutual benefit by coordinating GIS data collection and Real Estate property sketching.

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***April 6, 2011***

Group: ***Long Range Planning Interests***

Stakeholders:

Steve Kaii-Ziegler	Pat Mann	Nancy Williams	Emily Baker
Suzanne Salva	Jessie Mains	Pierre Holloman	Jeremy Hassan
Stephanie Brown	Jim Maslanka	Fran Bromberg	Sandra Marks
Dana Wedeles	Ron Kagawa	Eric Keeler	Maurice Daly
Mildrilyn Davis	Faroll Hamer	Carrie Beach	Abi Lerner

GIS Staff:

Steven Chozick	Michael Smith	Karl Moritz

Need Summary: This meeting brought together staff with common interests in all things related to long term infrastructure planning, land development and preservation. This included individuals from P&Z, T&ES, RPCA, OHA, Housing and ACVA. Needs ranged from providing better integration and collaboration between agencies in areas of abutting responsibilities, to stronger reliance on the analytical capabilities of GIS and more detailed information to guide decision making in high value / high impact projects, to better communication with the public on issues ranging from parking availability to public art.

Meeting Notes:

General Observations/ thoughts

- Although new data collection is needed, defining a maintenance schedule to keep the existing data current is a critical need.
- How will the Strategic plan and subsequent work plans address ad-hoc analytical needs that are sure to arise, but may not be explicitly addressed in the plans?
- What kind of consideration is there for involving the public in data collection and maintenance? (crowd sourcing)
- How will the Strategic plan address the need for more GIS capabilities at the departmental level? Three suggested possibilities: (1) additional GIS staff; (2) Developing a GIS “point person” in each department; (3) acquiring additional consulting services.
- What will be the future makeup and role of the GIS Steering Committee;
- What will the new model for project prioritization look like?

Need ID	Specifically Identified Needs/Opportunities
LR1	There is a need to formally define community organization areas and to aggregate data to community organization geographies.
LR2	Better management and use of parking related data would be helpful. • More dynamic use of parking data and land use information to inform decision-making processes. • Interactive tools for the public should be available to leverage the advancements of technology in relation to parking uses, tracking real-time capacity, etc.
LR3	GIS **Building Model** database is very helpful; It has been very useful in projecting wastewater; it needs to be completed and maintained; Business turnover data would be very helpful in understanding the business environment; Housing unit information would also be very helpful.
LR4	Having accurate and consistent parcel level data is critical to many planning and other departmental processes, especially demographic forecasting.
LR5	GIS is needed to help organize, visualize and provide public outreach to the Historic Preservation Plan.
LR6	GIS could play a key role in spatially evaluating transit ridership (through surveys, TMD's, onboard counters, etc.) for transit demands and uses.
LR7	Data such as the Pedestrian & Bicycle Survey has been collected, but not put into any type of applicable use or promoted. Evaluating and maintaining data such as this could assist in the strategic look at the needs for existing and future facilities.
LR8	Distance has often been evaluated by straight line proximity, but there are needs to evaluate service areas, with walkability or vehicular routing techniques
LR9	Police crash data would be valuable in planning for pedestrian improvements.
LR10	Additional resources (new tools? protocols?) for publishing things, such as interactive maps are needed; The current CMS system is too restrictive for publishing maps as jpegs.
LR11	There is a need to be able to simply share information such as photographs, documents or plans by a geographic location
LR12	Regional transit stop and transit stop facilities information would be very useful
LR13	A public art layer would be good to have
LR14	A more up to date and detailed parks facilities and features database is needed for maintenance in CityWorks and for projecting long term capital replacement costs is needed.
LR15	Layer with more detailed information the year and make of bus shelters, benches, and bus stop poles would be very helpful

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***April 11, 2011***

Group: ***Library***

Stakeholders:

Rose Dawson	Lynda Rudd	Renee DiPilato	Kyle Maier
Luis Labra	Ashley Jefferson	Mark Schwartz	Joseph Yuen
Linden Renner			

GIS Staff:

Michael Smith Brett King

Needs Summary:

This regular departmental meeting had representatives from all City of Alexandria's Library branches. Also present was the Library department's ITS and Administration. A majority of the conversation focused on a need for better understanding of the City's demographics. The tracking of current library users and program attendance would help. Other needs were also related better servicing the community.

Meeting Notes:

General observations/ thoughts

- Libraries have requested funds for full needs assessment (has not been done since 1995) Need to focus on BRAC and Potomac Yard.
- Past request for remote library branch in King St corridor.
- Need for improved access to City's network. Currently must use Citrix.

Need ID	Specifically Identified Needs/Opportunities
LB1	Overall need for population analysis at sub-tract level
LB2	Need to identify and track and analyze use of libraries and library programs and identify success rates
LB3	Need for improving the relationship with City school system and analyzing data such as ESL students and literacy rates
LB4	Need to identify future residential development in the City
LB5	Siting of new library locations
LB6	Tracking of Library website. Currently 3000 ENews subscribers
LB7	Need help in analyzing where services are underutilized
LB8	Libraries have increased programs from 33/month to 133 /month, better location based tracking would help in ensuring the success of these programs

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***April 13, 2011***

Group: ***Schools Maintenance Group***

Stakeholders

Jeremy McPike	William Chesley	Yon Lambert	Roger Blakeley
Mark Krause	Bill Eger	Lucy Willis	

GIS Staff:

Steven Chozick	Michael Smith

Need Summary: This was a regular meeting of the leadership of RPCA, ACPS, T&ES and General Service to coordinate City-wide maintenance activities. A large part of the conversation centered on the more efficient and expanded use of the City's recently acquired Cityworks maintenance management and tracking application. This application is jointly managed by T&ES, GIS and ITS. This group also has responsibility for coordination of snow removal responsibilities.

Meeting Notes:

General observations/ thoughts

- Cityworks can be used to make operations more efficient and increase transparency with the public.
- GIS has not been able to keep up with demand for new features which drive the system.
- GIS data must be well modeled and managed so multiple departments can share and interact with the same GIS dataset.

Need ID	Specifically Identified Needs/Opportunities
SM1	GIS must help move Cityworks forward • Continue to use Cityworks to improve workflow and coordination between departments. • Leverage the application for more interaction with public service requests. • There is a strong need to continue moving towards tying workorders to more specific asset based features (such as fire hydrants or park benches). This detailed level of GIS data is needed maximize Cityworks potential for helping improve infrastructure maintenance, resource allocation, operational performance accountability and CIP planning processes. • Leveraging the ability to visualize and spatially analyze Cityworks data can provide valuable information to other systems and processes, such as tracking maintenance related activities and their cascading

	effects during an emergency (integration with the EOC) • Use of interior building plans to better track internal building maintenance
SM2	Need improvements to snow removal management systems such as better tracking applications, simplified data maintenance methods, public status sharing, and meaningful use of Automated Vehicle Location (AVL) technology
SM3	Use of AVL to more effectively assign crews to address service requests and workorders.
SM4	Improved used of GIS in energy audits by visualizing energy flows in and out of buildings.
SM5	Improvements are needed in fleet management, such as evaluating the use of pool cars, identifying fuel resources and usage, and capturing a better sense of travel destinations
SM6	In most business processes, there is a need to analyze how data changes over time (trending).
SM7	Better building interior plans/ models for space and energy planning are needed, as well as a way to share them.
SM8	Leverage the technology of the Smart Phones (Droids, IPhones) to assist in field collection & condition assessment of assets through GIS Mobile applications.
SM9	Incorporate Quick Responds codes on much of the City's infrastructure and integrate these codes with internal business processes.
SM10	Integration with Dominion Power GIS resources to improve power outage visibility and response.

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***April 26, 2011***

Group: ***Alexandria City Public Schools Group***

Stakeholders:

Stefanie Karp	David Rose	Mark Krause	Elizabeth Hoover
Michael Darr	Margaret Byess		

GIS Staff:

Steven Chozick	Michael Smith	Karl Moritz	Steve Kaii-Ziegler

Need Summary: The overarching focus of this group is to provide all services related to the effective management of the City's school system. Areas identified as benefiting from GIS services include; enrollment projections, transportation to schools, space planning, facility maintenance, facility planning and coordination with other social service delivery organizations.

Meeting Notes:

General observations/ thoughts

- More formalized data sharing between ACPS and GIS would improve data integrity.
- Identifying mechanisms that enable the City and ACPS to easily share and consume data in a real-time or regularly updated environment are essential.
- Solutions for sharing confidential data need to be address and legal issues resolved. Removing sensitive information or aggregation of data are two possible solutions.
- ACPS is not part of the City's core Information Technology network which create some addition obstacles in information access and sharing.

Need ID	Specifically Identified Needs/Opportunities
AS1	ACPS and the City take a global view on service for children, GIS can likely help tie various programs together and identify similar needs, with like GIS approaches in multiple departments.
AS2	Having access to updated & accurate address and street name information is critical.
AS3	Having the ability to identify where ACPS employees live could factor into the decision making process for weather related delayed openings.
AS4	Using GIS to help with future enrollment projection would be very helpful. This would include, having age and type of all dwelling units and following up on some of the recommendation for additional analysis from the 2009 join City/ ACPS enrollment analysis.

AS5	GIS could be used to improvement bus routes and bus stop locations. Real time travel information from the DASH bush tracking system could help make these results more accurate.
AS6	Identification of dangerous intersections for both pedestrians and vehicular routes are needed.
AS7	The use of BIM models could assist in facility and space planning in the future. Although BIM criteria for schools may be unique, the mechanics behind building a Citywide BIM model might very similar.
AS8	Acquiring additional data from non-census resources that focus on school age children would be beneficial. Specifically, data that looks at school age demographics and poverty and knowing where all of Alexandria's school age children live and attend school
AS9	Analyzing the relationship of routes between the "Saferoutes to School" pedestrian model and ACPS's Edlog bus routing model could provide valuable improvements to both.
AS10	Sharing information between ACPS and City recreation centers regarding various nutritional programs such as the free & reduced meals would be useful to both programs.
AS11	ACPS's data on language spoken at home is an excellent, current source of such information. This information could be useful to many agencies.
AS12	Continued and expanded use of GIS to manage shared maintenance responsibilities, including an evaluation of the City's Cityworks application would be helpful.

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***April 27, 2011***

Group: ***Information Technology Services***

Stakeholders:

Tom Trobridge Vanetta Pledgar Paul Kim Shelly Ryan
Curtis Ney

GIS Staff:

Steven Chozick Brett King

Needs Summary: The City's central Information Technology Services Department is responsible for providing and maintaining the City's technology infrastructure, as well as providing the primary project management on new system acquisitions and operational support for many of the city's core business systems. With regards to hardware support, network services and to some extent helpdesk, GIS functions similarly to other ITS customers. In the area of Business Systems, where the majority of intersecting services exist, the relationship is better characterized as a bidirectional customer relationship with ITS and GIS providing service to each other, as both organizations serve "end user" customers and service providers. Within this relationship GIS often provides much of the systems baseline data such as address, parcel or feature and other geographically preprocessed data, while the user's business process is supported by ITS. GIS also requires access to much of the information within these systems for visualization and analysis purposes.

Meeting Notes:

General observations/ thoughts

- ITS must have plenty of lead time to support new GIS projects which require hardware, network resources or helpdesk support, ITSC provides and important gatekeeper role in ensuring that new application initiatives to do not outstrip ITS ability to provide the needed central support services. Because GIS development often occurs with internal resources and not capital funding, communication about new initiatives (outside of ITSC) is essential to ensuring project success
- It would be helpful if end users could update and maintains more of their own data, GIS standards and QA/QC requirements can create bottlenecks.

- Would like to see more opportunities to leverage more open / non-ESRI GIS products and solutions. More integration of raw data, live services and other vendor solutions such as Google and Bing.

ID	Specifically Identified Needs/Opportunities
IT1	Both GIS and ITS have found a growing need to better leverage the mobile environment. Sharing information and approaches on mobile solutions would be beneficial to both organizations.
IT2	Cityworks requires collaboration between GIS and ITS. Although, not documented, both organizations have a good understanding of their roles in managing, maintaining and furthering this project. However, improved communications would ensure both organizations were working as efficiently as possible in support of this critical application.
IT3	GIS should provide more opportunity for applications to interact with it directly through service oriented architecture.

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***May 04, 2011***

Group: ***Alexandria Health Department***

Stakeholders:

Cyndi Lake	Kristin Binkley	Veronica Aberle	Linda-Lou O'Connor
Stephen Haering	Kirsten Garcia	Carrie Fesperman Redden	

GIS Staff:

Steven Chozick	Jason Agatone

Needs Summary: The Alexandria Health Department is comprised of both City and State employees, and provides a variety of interrelated health services, these include; epidemiology, vector borne disease, facility inspections (i.e. food safety and public pools), emergency planning, and the "Partnership for a Healthier Alexandria Program". These functions work together in the prevention of disease, administration of programs which actively support a variety health related quality of life issues and response to larger health related issues and events as they arise. In addition, the department has a very strong emergency planning and continuity of operations component, as the many of the departments responsibilities must continue to function and at a heightened level, during an emergency situation. Most of the department's programs have significant overlap and a need to share and analyze information both amongst each other internally and with other City and external agencies. Within the City these agencies include; Code Administration, Fire Department, OEQ, Animal Shelter, and DCHS. Much of the information shared among these groups is highly correlated to location.

Meeting Notes:

General observations/ thoughts

- Concerns about who will have access to sensitive data if analyzed and shared via the GIS.
- Help health department would benefit from understanding how other departments are utilizing GIS.
- The Health Department is not part of the City's core information technology network which creates some addition obstacles in information access and sharing.

Need ID	Specifically Identified Needs/Opportunities
HD1	Using data from various program's participants such as WIC and Head Start to map clusters, such as obesity and identify programs to address the causes, including correlating recreational opportunities and spaces.

HD2	Proactive discovery of populations which may have unmet need. Use of census data or other internal demographic data resources to identify high risk groups such low income areas or areas with high immigrant populations. Use of "Behavior Risk Factor Survey" to better focus programs to target at risk children.
HD3	Collaborating to support programs such as Community Youth Mapping, in which youth map many health, safety and quality of life related issues within their own neighborhoods. Information mapped includes; recreational space, employment opportunities, substance abuse and gang activity. Support is needed to ensure this information can be readily shared among the programs that can benefit from it.
HD4	Coordination with Alexandria Police in identifying potential gang activity areas, and potential sites for increased gang activity
HD5	Addressing respiratory health concerns / asthma intervention. • Spatial analysis of increased hospitalizations for asthma. • Coordinating with OEQ in analyzing environmental risk factors for asthma including general air quality and buildings with mold / mildew.
HD6	Understanding service areas and service changes for facility and program locations. • Understanding where target populations and current customers are located and how they access service (mode of transportation) is important in understanding where to place or move a facility or program. • Being able understanding the impact on "customers" when a facility is moved. An increase in customers after location change may not be the whole story, new customers may be gained, but has a newly underserved area been created? Understanding changes and trends in who is using services can help expand service while maintaining continuity for existing customers. • A better understanding of the distribution of customers and non-AHD services, such as healthcare provider locations (facilities, medication dispensing locations) will help to provide a more complete service picture.
HD7	Support is needed for vector borne disease program and analyzing spatial relationships in tracking communicable diseases. • Management of issues related to controlling illness spread by mosquitos, includes support for deploying, managing and analyzing results from trapping programs. larvaside treatment programs could be improved with a geographic feature based plan and map based communication, such as understanding the layout of the storm water system and the flushing schedule could greatly improve the effectiveness of catch basin treatments • Multiple agencies have responsibilities for the management of rodent activity in the City. Mapping rodent activity would facilitate better collaborating in understanding the reality of the situation and mitigating or responding to its impacts • Better information collaboration with the Animal Shelter's animal control function would be useful for understanding the potential for illness spread via sick animals.
HD9	Emergency planning • Using GIS to ensure access to special needs populations during emergency

	events. This could include health needs (medication, dialysis), people with no access to transportation and non-English speakers. • Larger scale event planning includes preplanning distribution sites for medicine or medical supplies or mass fatality planning (must be aware of changes in business uses, in case a designated site become unavailable)
HD10	The health inspections function would benefit from better business turnover information and other activities they regulate. Would provide better accountability and assurances that nothing was being missed. Mapping inspection results and being able to correlate them with current health issues, or initiate inspections based on a current health issue would be beneficial. Understanding what uses are impacted by water or power disruptions would help target follow-up inspections.
HD11	All activities which either visit businesses or customers could benefit from robust routing and more efficient spatial distributions of daily workload.

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***May 10, 2011***

Group: ***Financial Interests***

Stakeholders:

Morgan Routt	Hue Rim	Michael Stewart	Martina Alexander
Chris Bever	Lashonda Mitchell		

P&Z/GIS Staff:

Steven Chozick	Karl Moritz	Moe Abu-Rabi

Need Summary: This group was comprised of staff from the Finance Department and Office of Management and Budget. Ideas centered on the organizations' roles in preparing the City budget, attaining a better spatial understanding of cost of services, and GIS's role in improving revenue collection tools. Finance, also has data that can be analyzed in aggregate to give insight into policy decisions of a variety of other City services.

Meeting Notes:

None

Need ID	Specifically Identified Needs/Opportunities
FI1	It would be useful to better understand the spatial relationship between revenue and expense data. How much is being collected and how much it is costing the city for service delivery (based on the land use mix)
FI2	Integrating revenue data spatially from multiple sources (i.e. real estate, personal property, business tax, trash collection fees) would create a more complete revenue picture.
FI3	GIS should be used more extensively in mapping, sharing and planning long term capital spending. It should also be used in projecting replacement intervals and costs.
FI4	It would be helpful to share with the public history and geographic distribution of capital improvement projects Some projects go unnoticed such as undergrounding utilities which have a high cost compared to a playground that is noticeable, but has a lower cost.
FI5	Standardization of addresses including unit numbers would be helpful in application such as business tax, personal property tax and residential parking permits. Addresses for validation, should also include neighboring jurisdictions such as Fairfax County and Arlington County.
FI6	Vehicle registration information might help Planning & Zoning and Transportation Planning better understand the relationship between automobile ownership and alternative transportation.
FI7	OMB is can benefit from other data of other departments such as Parks &

	Recreation, Police and Fire. This would provide a better understanding in volume and distribution of services being delivered.
FI8	GIS analysis on revenue collection trends can improvement the collection process can helping to flagging areas of concern /and identify opportunities for audits.
FI9	Better business vacancy information would be beneficial. Agency's need to perform their own inspections or see a new business license application before they know of a vacancy
FI10	GIS can help in finding correlation between investments. For instance, how does the investment in Potomac Yard affect the neighboring area to the west Del Ray?
FI11	Using more of GIS's service area analysis capabilities would be very useful in understanding the need for new capital facilities

GIS Strategic Plan Needs Gathering Meeting - Minutes

Date: ***May 10, 2011***

Group: ***City Schools Workgroup***

Stakeholders:

Rose Dawson	Debra Collins	William Chesley	Margee Walsh	Debbie Anderson
Lisa Baker	David Temple	Suzanne Chis	Lillian Brooks	Bill Euille

Abe Fernandez (Children's Aid Society- NYC)

GIS Staff:

Steven Chozick Brett King

Needs Summary

This regular interagency meeting has representatives from Libraries, Schools, Parks and Recreation, Courts and the Department of Human Services. The group's purpose is to focus on coordinating their agencies roles in all things related to youth. Much of the conversation centered on the community schools concept and the role GIS could play in helping locate such a facility. Other needs were related to identifying communities and needs and being able to relate them back to programs to try and better connect service providers with service needs.

Meeting Notes:

General observations/ thoughts

- Can GIS help in analyzing where services can be combined?
- How will GIS prioritize support for future projects?
- Can GIS be used to look at data, such as preschool enrolment, to help predict kindergarten enrolments?

Need ID	Specifically Identified Needs/Opportunities
SW1	Better demographic information would be very helpful in understanding population needs
SW2	More help is needed with predicting future program and school enrollment changes and trends
SW3	Using GIS to help track program users and get a better idea of who is using program services and where services might be underutilized
SW4	Understanding the geographic distribution of financial resources, inclusive of City money, non-profits and grants would help ensure an equitable distribution of program money.
SW5	Better tacking of regional trends will help Alexandria to better understand what might be changing, and adjust the service model accordingly
SW6	Applications which better help the public understand all of the available programs and help them access those closest to their homes would be very useful.
SW7	Having the ability to show detailed participant/student information (to those with appropriate security access) in relation to generalized program participant information would help providers understand the overall service delivery picture, while preserving confidentiality

GIS Strategic Plan Stakeholder Meeting - Minutes

Date: ***May 17, 2011***

Group: ***e-Government (e-Gov)***

Stakeholders:
Craig Fifer Peter Watkins

GIS Staff:
Steven Chozick Julie Kanzler

Needs Summary: The e-Government team is a branch of the Office of Communications that focuses on delivering information to the public via electronic media. It maintains the software and hardware that support the City's web site, and publishes information via the City's web pages in addition to social media such as Facebook and Twitter. Historically, GIS and Web Team have had some difficulties defining their division of labor, as both have roles in delivering information to the public. A better understanding of long term needs should help better frame this relationship.

Meeting Notes
General Observations and thoughts:

- There was an aknowledgement that sometimes we have a tendency to treat each other as customers, "ording things from each other's menus" and expecting a quick turnaround without establishing a foundation of partnership.
- E-Gov sees GIS as the "authoritative source on location-based information"
- E-Gov would like GIS to focus on generating new types of geographic information and making it accessible for consumption by e-Gov developed products
- E-Gov would like the freedom to choose a 3rd party mapping solution where it makes sense.

Need ID	Specifically Identified Needs/Opportunities
EG1	GIS needs to be the source for valid unit-level addresses and to deploy the services to share them
EG2	Focus more on mobile presentation – according to web team's latest statistics, 8% of evening traffic is from mobile browsers, and this will only increase.
EG3	Web team would like some kind of solution to integrate with their public calendar, so that they can build a "what's happening in my neighborhood?" module, i.e., focus our efforts on tagging existing information in City databases with location. Example: keeping track of public hearings

EG4	E-gov is looking at using quick response codes on new parking meters to help share information with meter users on what is nearby. Could partner with GIS for more current or real-time responses.

Appendix G: On Line Survey Form and Results

GIS Strategic Plan - Stakeholder Survey

Employee Department:

Please select one ...

Employee Name:

I would be interested in participating in the Plan as a Stakeholder?

YES NO Comments

My experience with GIS is (select as many as apply):

- User of Maps
- Use GIS based web applications
- Received analytical support from GIS
- User of ArcGIS desktop software
- Other - (please describe in the space provided)

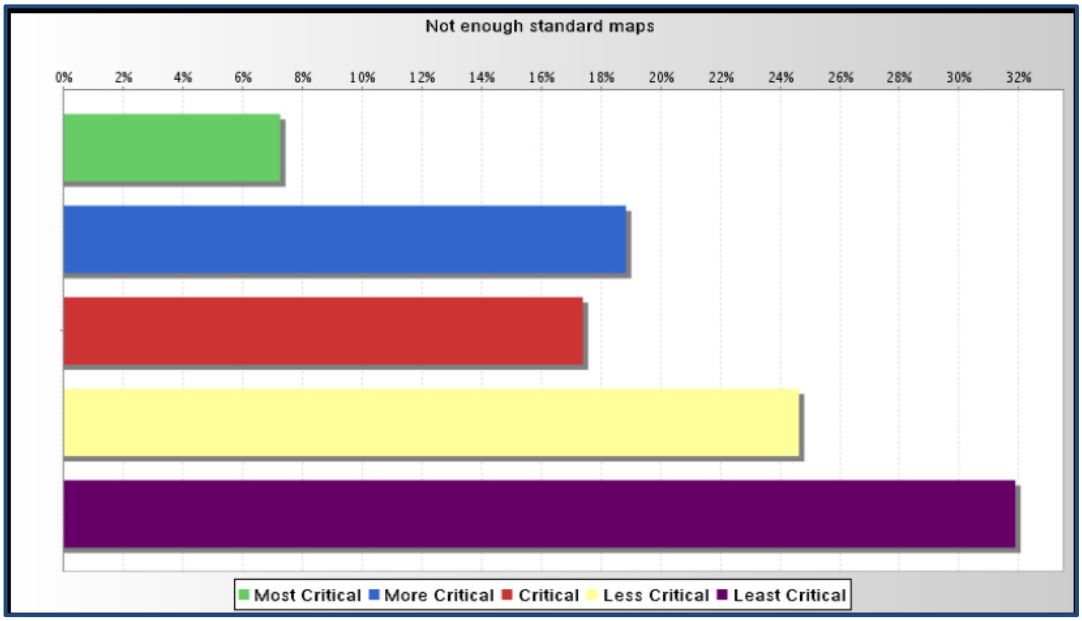
Below is a list of critical issues facing Alexandria's GIS. Please indicate what you think are the most pressing issues by ranking the list from Most Critical to Least Critical (Use each description only once):

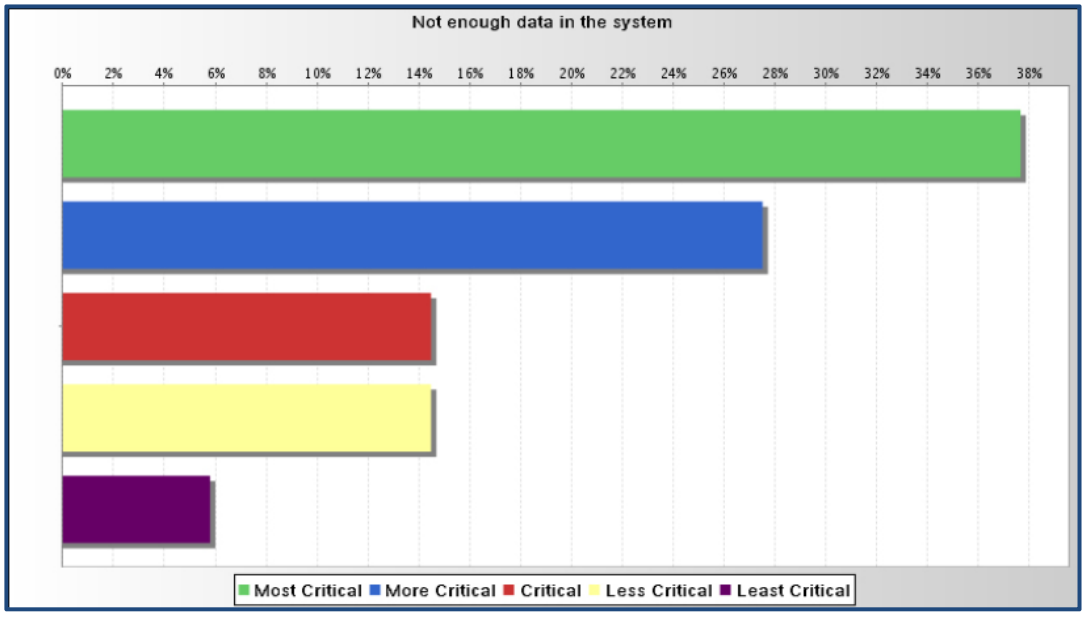
	Most Critical	More Critical	Critical	Less Critical	Least Critical
Not enough standard maps					
Not enough data in the system					
Not enough analytical information available					
Not enough GIS training available					
Not integrated with my primary business software application					

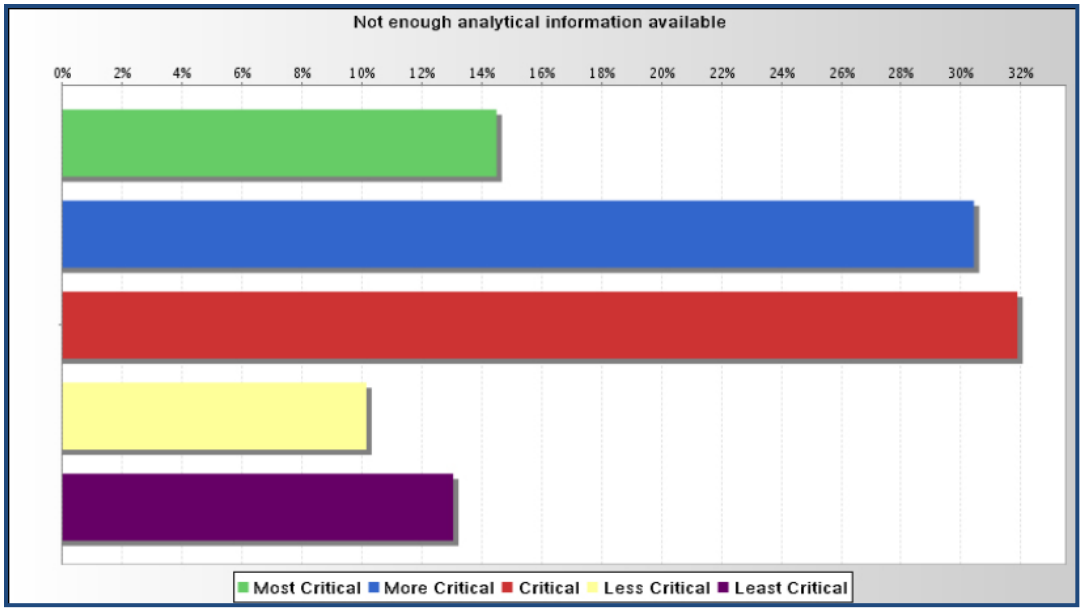
I have a GIS project(s) need or idea and I am describing it below.

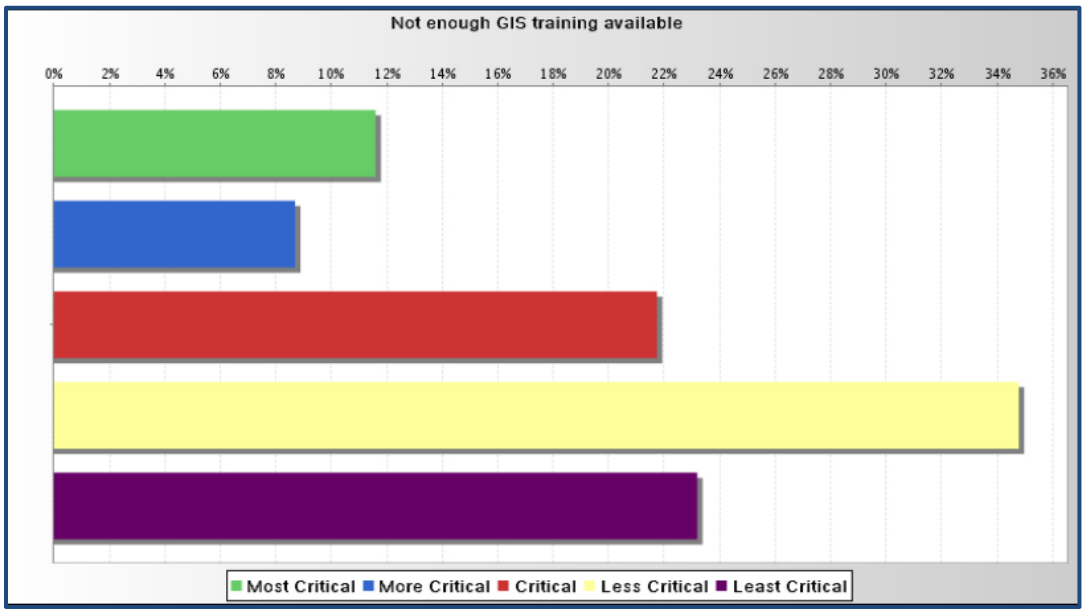
Next

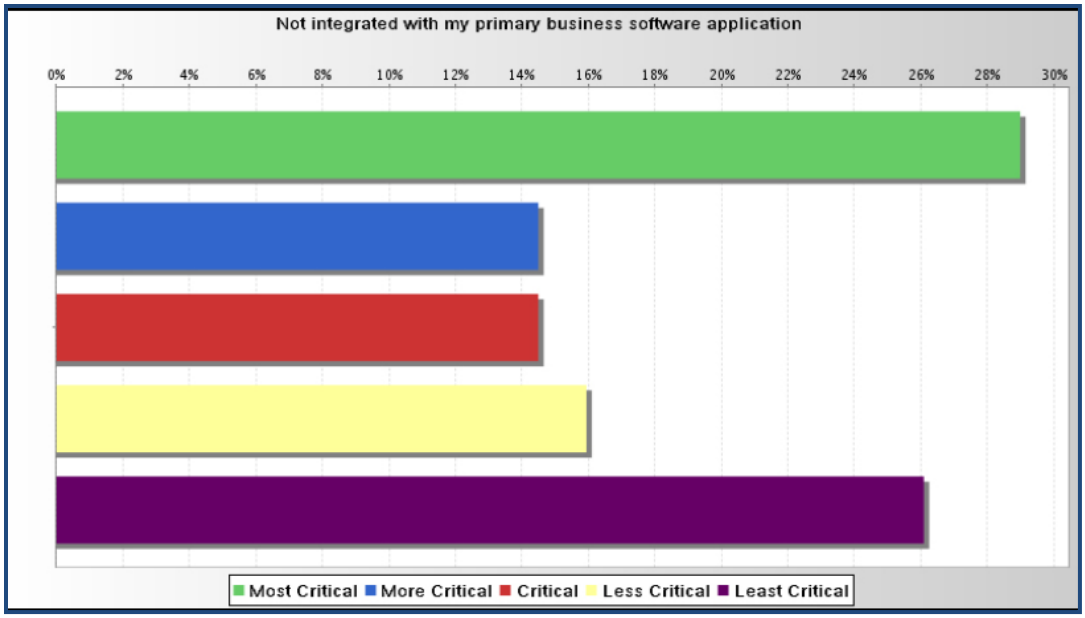
GIS Critical Issues Survey Results






Not enough analytical information available
0% 2% 4% 6% 8% 10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30% 32%
Most Critical
More Critical
Critical
Less Critical
Least Critical


Not enough GIS training available
0% 2% 4% 6% 8% 10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30% 32% 34% 36%
Most Critical
More Critical
Critical
Less Critical
Least Critical


Not integrated with my primary business software application
0% 2% 4% 6% 8% 10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30%
Most Critical
More Critical
Critical
Less Critical
Least Critical

GIS Strategic Plan Needs Gathering – Citywide Online Survey Comments

Date: ***March 2011 – June 20 2011***

Group: ***Citywide***

Summary: In March of 2011, the GIS Stakeholder Survey was sent out Citywide, covering multiple departments. Within the survey, stakeholders were asked if they had specific GIS project needs or ideas. These needs are covered in the table below.

Need ID	Specifically Identified Needs/Opportunities
OS1	I would like to see Public Art added to the GIS.
OS2	I would like to be able to utilize our data on historical EMS call volume and compare that with response times to be able to better utilize our Peak Time Medic Units.
OS3	We have made enormous strides in integrating GIS programs into our resources in the Parks Division. These databases have allowed us to analyze, manage, and track the open space network more efficiently and effectively. We hope to continue to expand our existing projects to include more detailed inventories linked to geographic data for future planning, development and maintenance.
OS4	Database design for a city-wide inventory of Park amenities.
OS5	Would like to integrate more permit and GIS database information for inspectors use and for reporting purposes.
OS6	There is a requirement to assign Code inspectors by census block rather than census tract.
OS7	Having a listing of public art pieces in City, both public and private.
OS8	The FD has a few programs for mapping. The hazmat team uses other programs, cameo, marplot, and aloha. If we could combine the features of the hazmat programs, FD programs, into a the GIS system, we would have a more functional program. Separately these programs allow for plume modeling, census data, target hazards, and simple navigation. Separately they're slow and not user friendly. One good, user friendly program can go a long way.
OS9	We use GIS to determine where to place dispensing sites for potential emergencies but I think we could expand on this in many ways to figure out what methods would be most effective to distribute medications to the community. I also think we could use it to determine where health needs are the greatest in the community and where our most vulnerable populations live.
OS10	Future progression to integrating the GIS system into the new permitting

	system as well as making a great deal of GIS information available to the public as much as possible.
OS11	The arborist section must communicate the needs and work to resolve the need of 17,000 street trees (or assets). 1) On line mapping system is needed to understand the location of the tree (or asset) that needs service. This helps us ensure we are all talking about the same tree (or asset). 2) When the service has been identified to resolve the need, we need a mapping system to communicate with the contractor or crew that will be doing the work to resolve the need.
OS12	We desperately need a way to spatially identify the official staff report/conditions and approved site plan for all current and past development projects. Planners frequently have to rely on someone's institutional memory to identify nearby projects, and then the process to search for the case file # and paper files to find a plan or staff report is time consuming. Given the limited storage space, we frequently have to place an order from Archives. When we are considering new parcels for development, it would be helpful to have easy access to the project history of nearby properties to improve the thoroughness of our research and to anticipate community concerns and desires. This application would also be a tool the community could use, as they frequently call with questions about what is permitted on certain sites, and without knowing the date of the public hearing, it is very difficult to locate the staff report on the web. A map connected to Permit Plan and the new plan storage software that Code Admin is looking to implement is the key to better and faster research and would increase staff productivity.
OS13	GIS maps related to Eco-City Alexandria such as green buildings map, air quality, BMPs, etc.
OS14	It would be helpful to have the ownership of alleys better identified in the City's GIS maps, or at least private vs. public ownership noted.
OS15	Plotting location of clients served or needing safety net services based on income or employers related to current industries in need of workers.
OS16	FEMA Floodplain Map data need to be available to public and city users of Parcel Viewer. Parcel owner information and mailing addresses need to be updated and corrected.
OS17	Fire department apparatus need to develop and update hardcopy maps showing street locations, specific addresses on that street and hydrants on that street. MDT's in apparatus should be able to show the specific dispatched street along with the individual’s addresses (buildings) on that street and the location of hydrants on that street. This should be a one button operation and the graphic should be very large so officers can read the information clearly in the front of moving / bouncing apparatus. Officers do not have the time to hit several icons / buttons to get to this point. Also, hitting multiple buttons / icons are difficult while the unit is moving and the officer has seatbelt on and trying not to block drivers view of mirrors on that side.
OS18	I use the information extracted from the parcel viewer to mail information to the Citizens. The mailing addresses once extracted are not formatted correctly for a mailing label. Also the process for correcting incorrect mail addresses is

	not well established or well known to administrative support staff.
OS19	P&Z Land Use Services division information and process for Zoning and Historic Preservation, Permit Plan (or replacement system), and laserfiche/data storage information needs to be better coordinated and integrated with GIS. I want to ensure that P&Z Land Use Services division priorities are ranked high among the list of priorities for the GIS Strategic Plan.
OS20	Making detailed street maps with buildings, alleys, streets, hydrants, parking lots and other pertinent information for use for responding to incidents.
OS21	Maps & charts showing Potomac river/ shoreline detail. Maps of PG county.
OS22	Fire Department is seeking a program similar to Police SRS so that Fire Department resources can be better focused to areas of the City with unique and with recurring needs
OS23	We have used GIS to assist us with plotting where are clients are located, as well assisting us with demographic information for strategic planning for aging services
OS24	The Fire Department (suppression division), would like to have access to more GIS data on our Mobile Data Terminals in the fire engines, ladder trucks, and Battalion Chief vehicles. Our current MDB system kicks us off the mapping screen whenever someone updates their status (this is probably more an FD IT issue than a GIS concern). We would also like to make better hard copy maps of our response areas.
OS25	Our community services board has used GIS to show our residential programs site locations. We need this updated periodically.
OS26	T&ES has provided GIS with its projects and priorities which include: Firm maps & data, Parking, Leaf collection, Cityworks, Snow, Solid Waste/AVL, S Sewer maintenance, Alley collection, As-builts, Eco City maps, BMP/Cityworks.
OS27	In the next few years we will be implementing a new CAMA system to replace our current Real Ware system. It would be nice to integrate with a very functional GIS application. Some project ideas include the following: Real Estate parcels affected by updated versus old flood maps. Integration of GIS and Real Estate Assessments permit module. Adding condominium layers to GIS. Link to Real Estate Assessment photos and property record cards on GIS Maps. Integration of GIS with Real Estate Assessment Review/Appeal Process. Labeling data and showing calculated values on Geoware maps. Integration of MRIS (MLS) listings with GIS. Add more data to Geoware. Incorporate Geoware as a valuation tool instead of a mapping application.
OS28	Would like to continue rectification of historical maps for use city-wide. Would like to continue web-based applications--history tours
OS29	Fire SRS! All-Hazards SRS. EOC situational awareness.
OS30	1) We need a system in P&Z where the city GIS map stores site plans, conditions of development etc. embedded within each site. So I would just click on the parcel in question and a link to the site plan would be available. 2) Printing from GARI is less straightforward than it should be. And there should be a function that allows users to save/print to a JPEG directly from the GARI screen, so that the map information can easily be transferred into other

	software.
OS31	I would like to see Residential Properties and Commercial Properties in Alexandria clearly differentiated in our GIS system. I would also like to see the Refuse and Recycling collection service data for both containers and locations integrated into the GIS system.
OS32	If this is similar to a GPS system, then what I most need (I am an AFD medic) is a mapping system that includes the individual apartment and townhouse complexes. It is helpful to know that I am in the complex, it would be even more helpful to find the particular building. It is also important to have the information updated frequently. We currently use a commercial GPS.
OS33	Our vehicle personal property tax system should be integrated with GIS in the future along with an online application where taxpayers can register vehicles and create user accounts based on their street address including their zip code. The goal is to have the taxpayer enter their dwelling/business location in the web application before creating a user account. Also if the application can validate addresses including the zip code in postal format, City department can validate address before mailing correspondence which will reduce the amount of return mail and mail can be mailed at a lower rate.
OS34	It would be helpful to have spatial information about the daytime population in Alexandria. We have an idea of how many people live where from the census tracts, but it would be helpful to know the number of people working in different parts of the city and to have more detailed data about residential population densities (perhaps with population numbers linked to zoning). This would support my work in transportation planning by getting a better idea of how people are commuting at a system level (rather than just traffic counts).
OS35	I have two. The first project is an interface to provide pre-plan information to responding emergency units through an interactive map. For this instance, a fire-box map would have a layer containing preplan information for specific target hazards (High-rise buildings, Garden Apartments, Metro Rail facilities, etc.). The second project is to link data form the Fire Department's Fire Manager to build localized incidents statistics and leverage those statistics to allow the Fire Department to respond in a more intelligent manor to future incidents.
OS36	Parking applications (real time and static info) Mode share information as tool for transportation and land use planning Mapping of TMP survey data Updated bike/ped crash maps utilization of bike/ped walkability data in prioritizing CIP projects and as a tool for development
OS37	Would be of use identifying and informing community members impacted by special event programming and in identifying user groups
OS38	GIS plays a significant role in real time decision making during disasters. Links from real time data like Computer Aided Dispatch records and other data sources like automated vehicle locations are critical in presenting information to the senior city official that need to make quick decisions in a disaster. Automated links to any City system that is used in emergency response to any type disaster are needed to eliminate duplicative work and create a situational awareness picture for the decision makers.

OS39	Would like to consider GIS applications for incorporation of data related to hazardous use permits and facilities in the City and promote easier cross-sharing of data for agencies that have a need for this information (Fire, Police, Code, TES, Business License/Finance)
OS40	Integration of land use and development data and documents with the GIS system.
OS41	The most significant need is on the animal control side. • Spatially understanding the universe of pet registration or past incidents: Having the history spatially would help officers better prepare for their own safety when following up on a call. Or might help identify the home location of a stray if not no other information exits. • Both having access to Alexandria Police Department information on possible dangerous situations as well as being able to share dangerous animal information with Police could have many safety benefits to both organizations: This information could help better prepare Animal Control Officers in approaching a potentially dangerous situation, while Animal Control could reciprocate by providing information on dangerous animals to Alexandria Police Department to help them better prepare for an encounter which may end up including a dangerous pet. It would also be useful to have shared information with Child Protective Services so that when a child abuse investigation is underway and there are pets in the home, Animal Control can be alerted, and vice versa. • When tracking an animal understanding the lay of the land is important. Tactical approaches to searches could be better accomplished with more detailed GIS data. GIS base data and Visualization products such as oblique imagery can be helpful to getting an overview of what backyard or wooded area looks like before an officer enters either. Additional, more detailed data such as back yard fences, road and sidewalk networks, topography and vegetation can help animal control officers understand where they can and should search. This can be further assisted by better recording of animal sightings. Mapping the patterns in these sightings may help pinpoint an animal's location. • Having information relating to locations where a sick animal has been reported can be enormously helpful in notifying at risk populations (pets and people), especially after an animal is captured and sickness confirmed.