

Promoting Enterprise GIS at the Bureau of Street Services, Los Angeles

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Abstract - The Bureau of Street Services (BOSS) mission is to effectively maintain and clean the streets, alleys, urban forest and other landscaped areas within the public right-of-way and enforce street use ordinances. Most of the operational data collected at the bureau, during the normal process of business, inherently has location component that can be managed in a GIS system.

A project to identify business processes at BOSS that can take advantage of GIS was undertaken as a collaborative effort with the author and his students at California State University of Los Angeles (CSULA). This initial evaluation resulted in a proposal for an Enterprise GIS solution to be phased in at BOSS.

Initial steps are now in place to implement the first phase of the proposal at the bureau. The selected project would utilize GIS for re-distribution and on-going code enforcement of newspaper racks throughout Los Angeles.

1 Introduction

The purpose of this project was to identify business processes at the Bureau of Street Services of City Los Angeles that can take advantage of Geographic Information Systems (GIS) and the technology and business processes.

A vision of a comprehensive Geographic Information System based enterprise-computing environment is proposed for the management of the Bureau of Street Services. The current economic conditions dictate the scope of this project and scarce resources limit what can be done in the initial phases of it. Activities will include:

- Evaluation of the existing business environment (including existing GIS capabilities) at The Bureau of Street Services
- Analysis of needs of the Bureau of Street Services that are not satisfied by the existing business environment

- Proposal of GIS solutions that will complement the existing environment and address the identified business needs
- Prioritized GIS solutions list prepared by the bureau management.
- Plan a multi-phased approach to achieve the proposed Enterprise GIS based solution

2 Bureau of Street Services

The Bureau of Street Services' mission is to effectively maintain and clean the streets, alleys, urban forest and other landscaped areas within the public right-of-way and enforce street use ordinances. By nature most of the operational data collected at the bureau, during the normal process of business, inherently has an address element that is equivalent to locational component in a GIS system. GIS tools will help decision makers at the bureau to visualize the business data by linking it with a location, synthesizing and organizing information in such a way that is compatible with the way humans naturally think of the world around them.

Operational division heads have been interviewed as part of the high level business process analysis. Major business processes have been identified. When the project priority list is formed these processes will have to be re-visited and an in-depth analysis will have to be conducted. People who are directly involved in the business process at the lower level of the organization will be interviewed.

3 GIS Based Proposed Enhancements to Business Processes

Bureau of Street Services' Service Request section is a multilingual customer service provider. This section processes approximately 100,000 requests per year for services that come from Council members, city officials such as the Mayor or other department heads, Neighborhood Committees, and the general public. Activities are initiated by service request documents, which are processed by the Service Request section. These documents are generated and forwarded to appropriate operating divisions. Before these documents are forwarded to the appropriate operating divisions the location specified on the request form will be geocoded (mapped – the data will have geographic reference in addition to attribute data).

All of the Operational Divisions refer to service request documents as their primary source for scheduling work. Service Request system could play a major role in classifying, mapping, and

reporting the activities of various operational divisions as they perform their duties in satisfying the needs specified on the request document.

The locational business data can be analyzed to see where the most service requests are coming from, what type of requests are they, mapped data may present obvious patterns of these problems that probably can be addressed by visually inspecting the general vicinity and planning a solution for the affected area. The locational aspect of the data is important because the data analysis will provide the means for operational divisions, which are responsible for certain assets, to proactively plan infrastructure upgrades based on the current conditions and the needs of the community.

3.1 Street Maintenance GIS Enhanced BP

Street Maintenance personnel provides a wide range of maintenance functions, including small asphalt repairs “potholes”, large repairs, water blowouts, crack sealing and slurry sealing. These are activities that are initiated by a service request, which is processed by Service Request section.

When request is satisfied the geocoded services request data table can be updated with the additional information that pertains to the work done. This geocoded table can provide reporting information, mapping data, analysis data, and much more.

GIS Software has analysis component that generates network routing schemes. This capability can be used to enhance the existing motor sweeper cleaning routes. Multiple criteria can be taken into consideration when preparing the sweeping routes such as street type, traffic, and time of day. The goal is to efficiently utilize equipment and human resources.

3.2 Street Use Inspection BP

The Street Use Inspection Division (SUID) has a number of business processes that can be enhanced with Geographic Information Systems such that each section within the division can incorporate its business processes within a GIS database, which will keep track of the location and any attribute data associated with those locations. Table 3 shows some of the SUID’s automated business processes that were mentioned in section 4.2. Their corresponding datasets are maintained as different Microsoft Access databases. A Geodatabase would link all of these databases in one place. Existing tables that contain an address attribute will be

geocoded and the feature data layers can be mapped, analyzed, used in various decision makings. Information from these applications will be readily accessible for one another. Analysis can be performed taking into account for example, the entire permits data. The results may show the impact one type of permit on another or the existence of any conflicts with municipal codes when issuing permits.

Illegal Dumping citations will be noted and mapped. By analyzing the feature data, staff may find patterns or concentrations of these nuisances. GIS data analysis can help to better utilized scarce staff for surveillance and prevention of these nuisances.

General Municipal Code Enforcement incidences can also be geocoded for analysis. When mapped, these feature layers will show Code Enforcement staff which areas have what kind of violation concentration and which areas will benefit from community meetings that Bureau of Street Services personnel uses as a forum to inform and educate the general public about the laws that ensure public's health and safety.

Street Use Inspectors should be provided with access to storm drain network maps and to mapped locations of all of the industrial areas in the City of Los Angeles. These maps will help investigators effectively analyze cases that involve Environmental Hazmat violations. Feature data analysis will quickly isolate the violators.

One of the goals of this bureau is to maintain a clean and hazard free environment all around the city. The creation and the analysis of locational data will cut down on problem investigation time, make bureau employees more efficient and potentially prevent problems occurring.

3.3 Lot Cleaning BP

Lot Cleaning under authority of State and Local law requirements clears weed growth, removes illegally deposited debris and abates potential fire, health and safety related hazards from improved and unimproved public and private properties and from unimproved streets and alleys. The record keeping for this division is done through the time sheets of each employee that performs one task or another at a certain location in the city by adding map book and page numbers to each task performed. When reports are requested a large amounts of papers are shuffled to generate summarized reports of activities. This division will benefit immensely from a geodatabase. The timesheets of this division don't have to be different from the rest of the

divisions in the bureau, which they are now. The locational information can be maintained in a GIS environment and the activities can be presented in a map form, graph format or any other format as needed.

3.4 Street Tree BP

The Street Tree Division with its limited resources takes care of the country's largest urban forest. Throughout the year, street tree personnel are involved in many activities such as tree trimmings, tree removals, new plantings, inspections, community tree planting coordination, enforcement of ordinances regarding tree protection (including oak trees), tree hazards, vegetation management and visibility obstruction, and emergency/disaster/storm response. Preparation and planning work for most of these activities can be done at a desk in an office by analyzing the geocoded tree inventory data and coming up with a plan of action. GIS maps of tree inventory can help see the virtual picture of the trees, instead of driving the streets to observe general tree conditions, which will save time and money.

3.5 Engineering BP

The Investigation Section of the Engineering Division plays an information gathering role concerning the right-of-way, storm drain, sewer lines, any historical data associated with the concerned area. A large number of person hours are spent on running from one city department to another to collect information for analysis. This section of the Engineering division can utilize GIS technology and link to other city entities that are the custodians of this information and view the information on as-needed basis for their investigation. This section's productivity will greatly benefit from the use of GIS technology.

Grant Administration Section handles large street improvement projects. Information, CAD drawings and anything else related to a specific project can be stored in a geodatabase. This way reporting on the status of a project and mapping it becomes very easy and fast. The same thing can be done for Landscape Design Section.

Facilities Maintenance Section is concerned with the proper operability of the Bureau of Street Services facilities. With GIS these facilities can be mapped, and any maintenance record can be associated with the location of a facility. This way different types of maintenance can be scheduled and preemptively taken care of instead of fixing things when they are already broken.

3.6 Resurfacing and Reconstruction BP

One of the primary responsibilities of the Bureau is to properly maintain all streets in a perpetual good to excellent condition. To accomplish this task a variety of minor and major maintenance techniques are employed to repair 6,500 miles of directed public roadways or 28,000 lane miles, and 800 miles of alleys.

The completed and current program locations are mapped and used in City Council and Neighborhood Committee meetings for presentation. Unfortunately none of the locational data is considered when trying to put together a new fiscal year program. Resurfacing and reconstruction programs are put together based on the pavement condition index data available from Pavement Management Section (PMS). The results of analysis from minor street repairs also should be taken into account when scheduling streets for resurfacing and reconstruction. The PMS data geocoded in addition to the minor repairs performed by street maintenance personnel from the service request database may present a different picture of streets condition then the pavement condition index by itself. The more information there is about the streets the more informed decisions can be made concerning the streets infrastructure of the city.

3.7 Special Projects BP

The Special Projects Division is the newest Division in the Bureau of Street Services. It is responsible for constructing all access ramps associated with the American Disabilities Act and the current Sidewalk Repair Program of 74 miles. The access ramps and the sidewalk repairs are mapped but there is no attribute data associated with the mapped point or the line shape files. It would be beneficial to have both the spatial data and the attribute data in a geodatabase so when a spatial data is selected all of the historical attribute data associated with that feature can be displayed as well.

Sidewalk repairs are done mainly because tree roots damage or lift the sidewalk and make it unsafe for the pedestrians. This section could use the street tree data to see what types of trees cause sidewalk problems, what is the age of these trees when sidewalk damages occur, when the root trimming should be done to prevent injuries and potential lawsuits against the city.

3.8 Bureau Wide BP

The Bureau of Street Services has a long history of responding to emergencies such as earthquakes, floods, rainstorms, wind storms, and other disasters. The Bureau's primary responsibilities during an emergency are:

- Immediately assessing condition of major streets used by emergency equipment as well as other specified critical locations.
- Clearing debris and obstacles from streets and public ways
- Closing streets to traffic as required by authorized agencies
- Emergency repair of streets, walks, pavements, bridges, etc.
- Barricading or otherwise restricting access to public rights of way threatened by conditions existing on adjacent private property
- Constructing emergency bulkheads, temporary roads, and other emergency work
- Provide assistance to Police, Fire and other departments with Bureau resources that may be required by the Emergency Operations Board, or requested by other agencies.

The Bureau's emergency response activities have been developed as an integral part of the City of Los Angeles' Emergency / Response Operation and complies with the Mayor's Executive Directive No. 54, which directed all city departments to develop emergency plans, implement employees response training programs and designate alternate work site for department functions.

Emergency / Disaster Response Activities will benefit immensely from a geodatabase. As the requests for action come in for a specific location, the location is mapped and a status is assigned to that location, and the rest of the details on the request form become that locations attribute data. Through a projector this location is mapped as a point on the background of a city map. These points can be colored based on their status, priority level, and so on. This will present the big picture of the events happening in the city and how they affect the overall emergency response operations. Afterwards this database will be the source for various reports that the Bureau is required to present to State and Federal Government entities in order to recover the money and resources expended during the disaster.

4 PROPOSED IMPLEMENTATION STRATEGY / PLAN

Overall implementation strategy is to prioritize the GIS enhancements to business processes in an order that would produce the most benefit in the shortest period of time with expanding the least amount of resources. One area that would provide this opportunity is geocoding Service Request information. Since all of the operational divisions refer to service request documents as their primary source for work scheduling all of the divisions will see immediate benefits of GIS enhancements.

4.1 List of Projects

The projects identified as possible candidates for implementation are listed in table 3 and are ordered by suggested division priority. The first and second columns show the division priority number and the division name respectively. The third column lists the projects and their description.

Table 1 - Bureau of Street Services List of Projects

Priority No.	Division Name	Project / Description
1.	Service Request Information	<ul style="list-style-type: none"> • Geocode the service request locations
2.	Lot Cleaning	<ul style="list-style-type: none"> • Operational activities data definitions and geocoding the activities data
3.	Street Tree	<ul style="list-style-type: none"> • Geocode the street tree inventory • Update the inventory and make the attribute data as complete as possible
4.	Special Projects	<ul style="list-style-type: none"> • Geocode sidewalk repairs • Geocode access ramps • Complete the attribute data associated with the locational data to have accurate data for statistical analysis and reporting
5.	Resurfacing and	<ul style="list-style-type: none"> • Make the small street repair geocoded data available

	Reconstruction	<p>to coordinating section of resurfacing and reconstruction division</p> <ul style="list-style-type: none"> • Have the geocoded completed projects available also to assist in putting together the resurfacing programs
6.	Street Maintenance	<ul style="list-style-type: none"> • Geocoding small street repairs • Create and use street sweeping routing
7.	Engineering	<ul style="list-style-type: none"> • Create street improvement project related geodatabase with geographic locational data, and design drawings (CAD) • Acquire access to other city entities GIS data for investigation purposes.
8.	Street Inspection	<ul style="list-style-type: none"> • Geocode all permits databases • Geocode municipal code violation citations
9.	BOSS-wide	<ul style="list-style-type: none"> • Have a small stand alone geodatabase that would have the fundamental feature data files available such as the L.A. city centerline, freeways, city boundary, schools, government buildings, hospitals, fire hydrants, maintenance districts, bureau's yard facilities and any other feature layer that could be of use in emergency situations

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In Phase I of implementation process some existing database tables will be geocoded and these feature data will be incorporated into a Geodatabase. This Geodatabase will contain locational and non-locational data pertaining to different information systems in the bureau. During Phase I the existing data layers will be cleaned up. Designated key people will be trained in the use of GIS software and have capability to produce maps, graphs, reports based on the information in the geodatabase.

4.2 Recommendation and Next Steps

The assessment process revealed some facts:

- GIS utilization at the bureau is at the level of cartography only (creating paper maps)
- Very few feature or shape (locational) files are used (centerline, council districts, community planning areas, neighborhood councils, resurfacing completed projects, parcels, and map book). Most of these shape files are created at the Bureau of Engineering (BOE) and passed to BOSS to be used as source to create subset feature files and as backgrounds on a paper map created for presentation meetings.
- Some of the identified business processes are automated, but it is at the level of a transaction processing system that is only keeping electronic version of daily activities.
- There is no documentation describing the business processes.
- There is no integration of data even within the same division.
- When it comes to actual community service there is mutual cooperation between the bureau's operational divisions, but when it comes to bureau's information systems each division acts like a separate entity within the bureau. There is no integration of information systems.

Recommendations:

1. Identify a business process to be used as GIS pilot project.
2. Create or acquire locational data that supports this particular business process
3. Implement the GIS pilot project
4. Look into other emerging GIS and global positioning systems (GPS) technologies including location based services (I-commerce)
5. L-commerce provides location-based services requiring location-based and network technologies. This technology consists of groups of servers that combine the position information with geographic and location-specific content to provide an I-commerce service
 - Position Determining Equipment (PDE). This equipment identify the location of the mobile device (GPS)
 - Mobile Positioning Center (MPC). The MPC is a server that manages the location information sent from PDE
6. Consider mobile commerce for future enhancements of business processes. Mobility implies portability based on the fact that users carry a mobile device that is GPS enabled everywhere they go and can collect locational data on the go.

The next steps should be:

- 1 Formulate an overall vision of GIS information needs of the bureau based on this report
- 2 Plan a phased approach to achieve the vision identified
- 3 Acquire necessary data either by building it or from existing sources
- 4 Train users in the use of GIS software and analytical tools as projects are implemented