Creating a Sign Catalogue and Inventory in El Segundo, California

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Introduction

Signs are intimately related to the safety of public streets and to the efficient operation of public services. They are managed by the Federal Highway Administration's Manual on Uniform Traffic Control Devices, which dictates proper placement, construction and maintenance.

Management of sign assets in a local government setting benefits significantly from a location-accurate inventory system. In El Segundo, California, a sign inventory and catalogue were created from the ground up. The project encompassed data collection, storage, organization, management, and visualization.

This applied thesis charts the methodologies used in El Segundo's sign inventory project and assesses their general effectiveness.

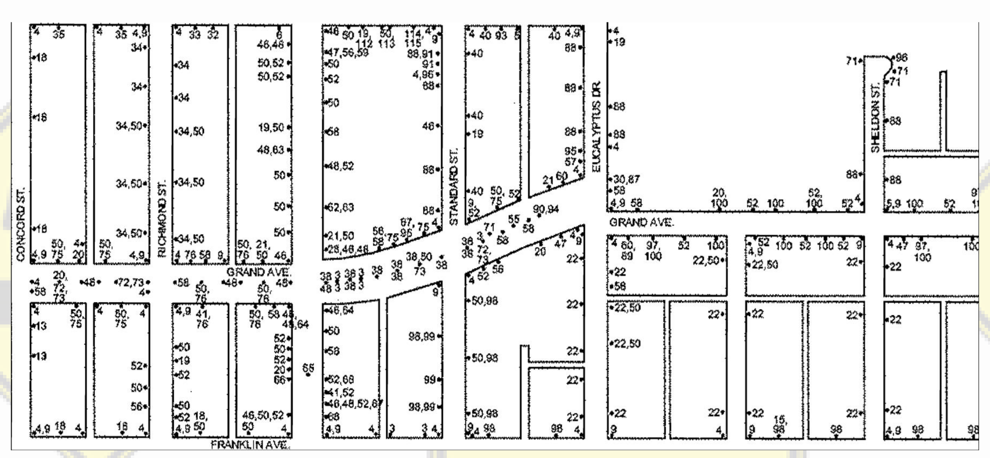

Figure 1. *CAD drawing of signs produced by City of El Segundo engineers*

Data and Data Sources

The project was focused on data collection, so the data needs were few. Table 1 displays the data and sources. An existing Street Signs CAD drawing (Figure 1) was used as reference during data collection and in the creation of a sign catalogue.

2011 LAR-IAC orthoimagery at 4-inch resolution was used as a basemap and as an additional reference when manually correcting feature locations. Along with Google Street View, it provided a means to digitize some signs without capturing their locations in the field.

A Street Areas polygon feature class was used to test data accuracy by ascertaining that features were not improperly placed within streets.

The main output of the project was a Signs point feature class containing unique sign and pole IDs, sign type information, comments on sign condition and links to photographs. These points were primarily collected in the field using a Trimble GeoExplorer unit.

Dataset	Source
Street Areas polygon shapefile	City of El Segundo
LAR-IAC orthoimagery	City of El Segundo
Street Signs CAD drawing	City of El Segundo
Signs point shapefile	Personally collected and digitized

Table 1. *List of data and data sources used in the project*

Methodology

Figure 2 displays a spatial model of the project. Table 2 contains the project timeline.

Sign data was collected over a period of five months. Field data collection utilized Trimble GeoXH and Trimble Geo7X units with Terrasync software and attached Tornado antennas. Images of signs were taken using an IPhone, a RICOH Caplio 500SE, and the Geo7X's built-in camera (Figure 5).

The project scope encompassed city-maintained signs or other signs of note within El Segundo. Signs located on private property or inaccessible medians were omitted or digitized by hand using LAR-IAC orthoimagery and Google Street View.

Route planning was accomplished using the Street Signs CAD drawing as a guide and foundation. Blocks were the primary unit of coverage, and signs were approached from their facing directions. Differential correction was handled using three base stations in Trimble Pathfinder Office. The Geo7X used real-time differential correction based on a MiFi device's link to cell towers.

Data was uploaded, corrected, projected and merged with a master copy. Sign pole features were separated into individual signs. Unique sign and pole IDs were generated from a grid.

A sign catalogue was created by adapting the State of California's Manual on Uniform Traffic Control Devices and associated identification codes. The master copy was joined to a table containing the sign catalogue. Ultimately the data will be migrated to the Local Government Model of data structure.

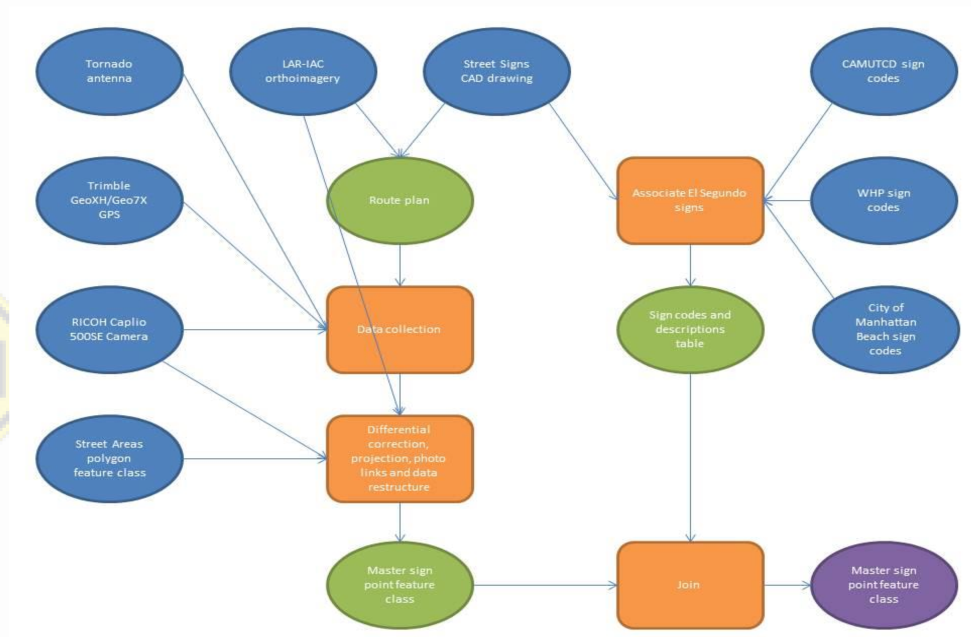

Figure 2. *Spatial model displaying the project's general processing workflow*

Timeline

Dates	Activity
2/12/2014 – 5/29/2014	Acquire sign data
2/12/2014 – 6/5/2014	Process and organize sign data
5/22/2014 – 6/5/2014	Create sign catalogue
6/16/2014 – 7/10/2014	Analyze methodology
6/27/2014	Test methodology

Table 2. *List of project tasks and milestones in timeline form*

Results

A total of 6342 signs were added to the signs point feature class by the conclusion of the project. Each feature contains information regarding the sign type, a field containing image paths for signs, and comments on sign conditions. Visualizing signs by type, as in Figure 3, provides an accessible and useful cartographic output. Grid information, sign pole identifiers, and sign positions on their respective poles are also recorded.

The other outputs are the methodological improvements made and lessons learned over the course of the project. These include route planning standards, equipment and equipment settings usage, and data management workflows.

Route planning guidelines for single collector data acquisition suggest several rules. The collector should always remain on walkable paths where possible, follow direction of traffic, complete blocks one at a time, and minimize path overlap by planning an order of block coverage which returns to the starting point at the end of the collection session. These guidelines are apparent in route decisions (Figure 4).

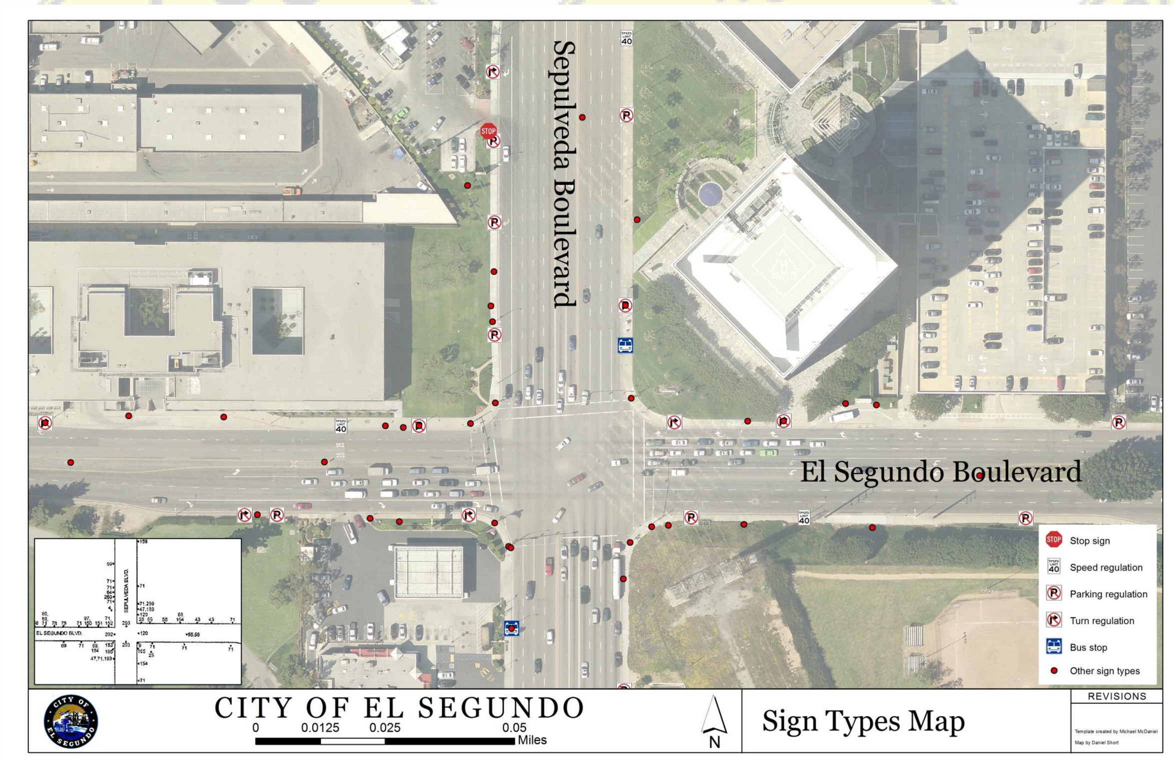

Figure 3 Map displaying sign data and symbolized by sign type

It was necessary to manually edit most feature locations for internal consistency, matching the orthoimagery and street area layers. Processing towards the conclusion of the project minimized the time spent on this step in favour of completing the inventory's coverage.

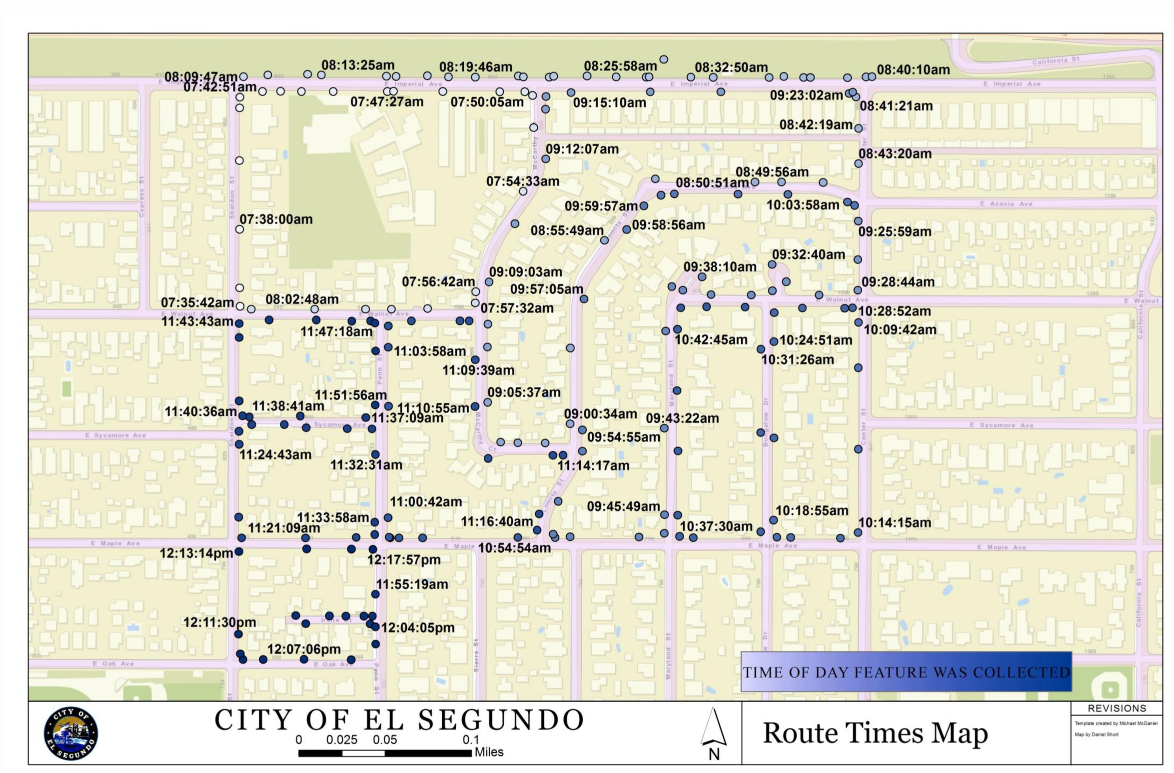

Figure 4 Map displaying a day's route and timing intervals

Discussion

The replacement of the Trimble GeoHX unit with a Trimble Geo7X and switch to real-time differential correction significantly improved the rate of individual feature collection and processing. However, the real-time differential correction process used only by the Geo7X decreased the positional accuracy of the data relative to using a set of three base stations.

The sources of inaccuracy in the data are not known comprehensively. As we were unable to test the two units side-by-side with the same differential correction method, it is unclear how much of an improvement in positional accuracy either unit might hold over the other. The laser rangefinder and faster satellite orientation of the Geo7X, however, justified its purchase, given that it will also be used in future work.

Further progress must be made in the types of information collected for each feature. The scope of the project was set early on such that sign retroreflectivity, size, and materials were omitted from our purview. Photographs were not taken for every sign and there was no general field for sign condition.

Conclusion

The results and suggestions provided through this applied thesis report can be used by other cities as a model. The refinement of the data dictionary and data structure are the main obstacles to improving sign inventory creation for anyone following this model. In reality, however, the greatest challenge the project faced was the early lack of a clearly defined scope, a robust data dictionary and a team that fully understands the location and the information to be collected will be the assets of a successful sign inventory project.

This work was not unproductive for the City of El Segundo. Using approximately 250 hours of intern labor, a cost of $3750, the City was able to collect and process data on 6234 sign features. Omitting the minor costs of the project, this equates to $0.60 per sign feature. The sign inventory and catalogue are usable to El Segundo as a foundation for other projects as well as building on sign data itself.

Figure 5. Photo taken in El Segundo by Daniel Short using a RICOH Caplio 500SE

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