Facilitating HOA Asset Management Using Geospatial Data Management Methods

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Introduction

Each decade brings a continued proliferation of common interest developments (CIDs) and the homeowner associations (HOAs) which govern them. Advances in computer science and location-based technologies like global positioning systems (GPS) have made it possible for small real estate entities like HOAs to improve their operations.

This project uses the Upper Westwood Homeowner's Association (UWHA) in Pomona, CA as a case study (Figure 1). The purpose of this project was to develop a methodology for managing HOA geospatial data, and demonstrate the the feasibility and application of the system to the HOA board of directors. Objectives were achieved through the creation of a single geodatabase feature class and supporting basemap.

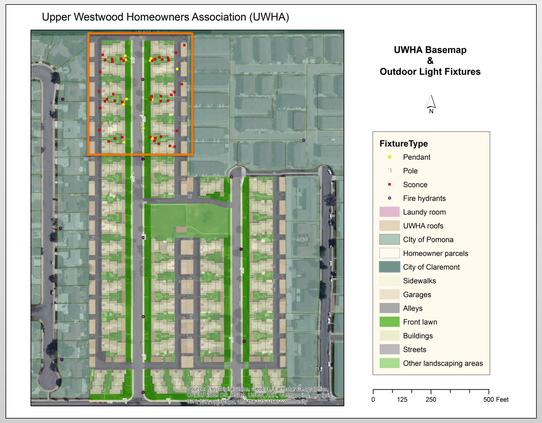

Figure 1. *UWHA basemap featuring outdoor light fixture point locations*

Data and Data Sources

This project's data (Table 1) were retrieved using two methods. A feature class of points containing outdoor light fixtures was collected within the UWHA domain through the use of a global positioning system (GPS) receiver while another point feature, hydrants, was obtained via file transfer from the Los Angeles County GIS Data Portal (LACDP).

The remaining polygon features, also downloaded from the LACDP, include assessor parcel data, a city boundaries file, and building footprint information supplied by the Los Angeles Region Imagery Acquisition Consortium.

All data were projected to the NAD 1983 State Plane California V FIPS 0405 feet geographic coordinate system and a Lambert Conformal Conic projection. In addition, an aerial image (raster) basemap downloaded from Esri was used during field data collection.

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

Dataset	Source
Building Footprint	LARIAC; LA County Data Portal
Parcels	LA County Data Portal
City Boundaries	LA County Data Portal
Fire Hydrants	LA County Data Portal
Aerial Image Basemap	ArcGIS Online
UWHA Outdoor Light Fixtures	Collected in-situ by author

Methodology

A needs assessment determined that outdoor light fixtures within the UWHA would be the common area component for which data was to be collected in the field. Once identified, the following steps were taken (Figure 2):

1. An empty file geodatabase was created in ArcGIS with manually configured specific feature class domains.
2. A feature class labelled 'UWHA_lights' was created and given an appropriate symbology before being published as a feature service to Esri's ArcGIS (AGO) Online cloud platform.
3. The feature class was then downloaded to Collector for ArcGIS on-board an LG G Pad 7.0 Android tablet for data collection within a subset of the study area.
4. The feature class containing the collected data points was re-uploaded to the CSULB AGO organizational account and was immediately accessible to ArcMap via internet connection.
5. Polygon features downloaded from the LACDP underwent standard geoprocessing and editing operations to create a series of basemap layers to which appropriate symbologies were applied.
6. Ground truthing of the 'UWHA_lights' feature class was conducted the field using a tape measure and compared with the Collector app result to determine the positional accuracy of the data.

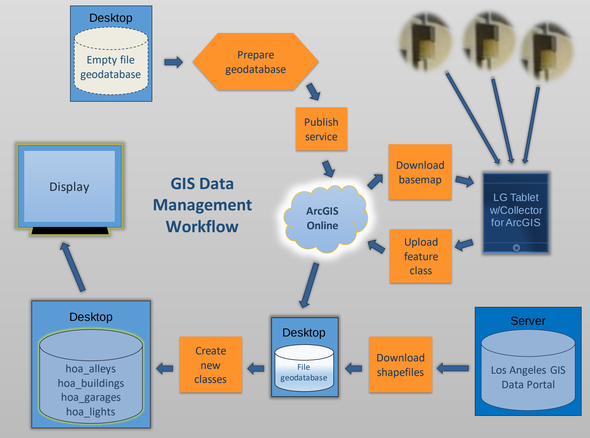

Figure 2. *GIS data management workflow*

Timeline

Date	Task
April 7 – April 30	Develop research question/explore data
April 15 – April 29	Conduct needs assessment/survey study area
April 24 – May 7	Develop or adapt information model
May 7 – May 21	Design and populate geodatabase
May 10 – May 27	Research hardware/software requirements
May 10 – May 27	Acquire necessary hardware/software
May 31 – June 12	Collect data in the field
June 6 – June 12	Conduct spatial analyses
June 9 – June 25	Begin project paper
July 2 – July 17	Generate map displays/write paper
July 18 – August 6	Complete paper/begin poster design
August 8 – August 2	Practice slide presentation/complete poster
August 13	Present project deliverables to MSGISci faculty

Results

The 'FixtureType' field domain in the 'UWHA_lights' feature class allowed for the 66 points representing light fixtures to be categorized during data entry using the Collector app drop down menu while in the field (Figure 3). Also, an additional 20 polygon feature classes were created and of these, 14 were instrumental in the creation of a basemap that distinguishes residential buildings from garages, landscape areas, paved surfaces, and a single HOA structure (Figure 4).

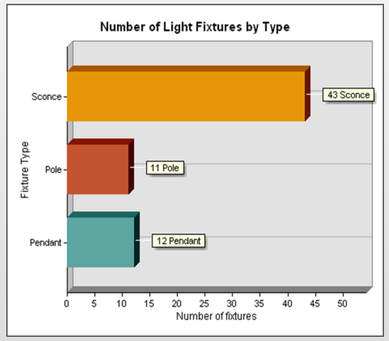

Figure 3. *UWHA outdoor light fixtures categorized by type*

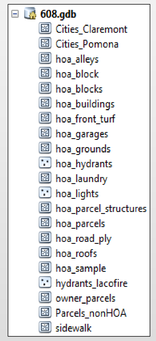

Figure 4. *Resulting feature classes*

The positional accuracy of the data points varied (Figures 5 and 6) but it was decided that these differences were not enough to warrant expenditure on an external GNSS receiver that could be paired with Collector on the tablet device.

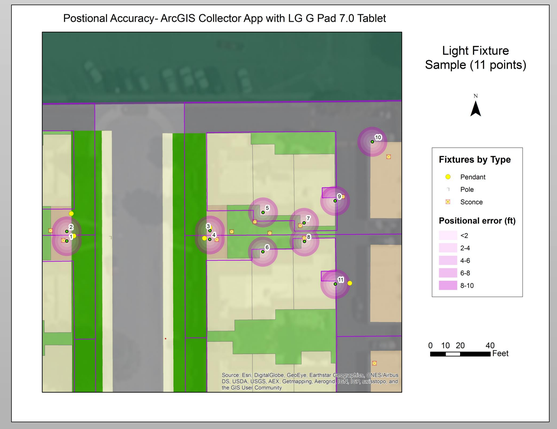

Figure 5. *Range of positional accuracy in feet for a sample of 11 light fixture points*

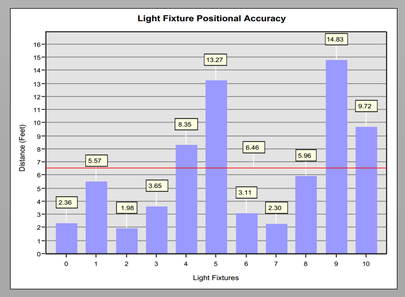

Figure 6. *With the Collector app and tablet device, the light fixture positions were observed to be an average of 6.46 feet from their actual locations.*

Discussion

This project demonstrated the viability of a GIS-based asset management system for the UWHA, using the single light fixture feature class as a prototype. The cost, efficiency, and quality of the methods used support the aim of this project. The value of the resulting data that was generated greatly exceeds the time and expense required to procure it given the non-critical nature of the light fixture locations.

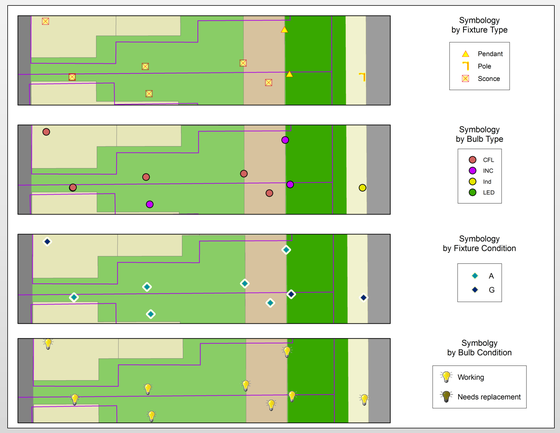

Figure 7. *Even with diminished accuracy many visualizations can be generated which illustrate how GIS can be used by an HOA.*

Conclusion

The results to satisfy three of the project's objectives:

1. A well-conceived attribute table with a small number of domains and field types yielded useful information even when the positional accuracy was compromised. Moreover, the depth and breadth of the attributes collected determined the richness of the information gleaned (Figure 8).
2. Cartographic choices for each feature class layer are important in communicating an asset management theme. The time, cost and quality efficiencies that are inherent in data collection were achieved based on the availability of student access to free Esri software and online web hosting services as well as the nominal cost of the data collection device.
3. The third objective was to balance the time, cost and quality efficiencies that are inherent in data collection.

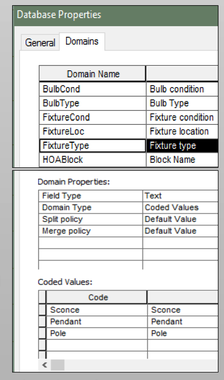

Figure 8. *Database properties- 'FixtureType' is just one of six domains and coded values created*

Future project related work could include the collection of additional data characteristics that facilitate systematizing of the UWHA light fixtures or other HOA controlled assets so that the it can implement a predictive maintenance regime that is both cost efficient and environmentally friendly.

Submitted in partial fulfillment of the requirements of the Masters of Science in Geographic Information Science(MSGISci), August 13, 2016.

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I would like to acknowledge Michael Shensky, fellow cohort members and my wife, children for their guidance, patience and support throughout the applied thesis project and the MSGIS program overall.