# Local Government Implementation of Geospatial Technology: Creating Technology-Enabled Field Crews for the City of Whittier


## Julia Brown

### Masters of Science in Geographic Information Science (MSGISci)

### Department of Geography, California State University, Long Beach


## Introduction

The main objective of this project was to provide a mechanism to transition field crews from reporting repairs via paper forms, to collecting data using tablets and Esri applications. In addition, the last phase of the project concentrated on using the data collected with the tablets and apps for analysis. The resulting spatial analysis focused on highlighting potential Public Works capital improvement project locations in the City of Whittier.

Whittier, California is a small college town located on the edge of Los Angeles' suburban sprawl, on the border of Los Angeles and Orange County. At roughly 15 square miles and a population of 87,000, Whittier is often thought as one of the biggest small towns in LA County (Figure 1). Whittier's GIS personnel consists of one full time employee and an occasional intern who is incorporated into the IT and City Records Department. In spite of its small size, the GIS team is not without resources with two Esri ArcGIS Desktop software licenses and five ArcGIS Online user accounts. This project represents the team's overall goal of ensuring that the City of Whittier utilizes its GIS technology to the fullest.

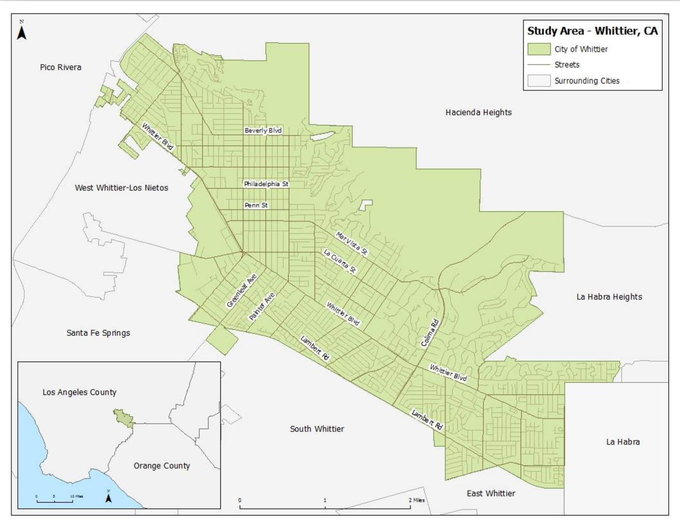


**Figure 1.** *Map of project study area – Whittier, CA*

## Data and Data Sources

While creating the new Water Leaks dataset, precipitation and average temperature data from 2007 to 2017 was added by request. All previous records have been assigned the rainfall and average temperature recorded on the day repair work was completed. The weather data was collected by weather stations in Fullerton and Whittier. The datasets were found on NOAA's website.

In addition, the Street Pavement Condition data is based on a survey completed in 2015 by a third-party firm called StreetSaver.

All other datasets were either pre-existing Whittier GIS data or were created by the GIS team for this project.

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

| Dataset | Source |
|---|---|
| **Precipitation Data** | National Oceanic and Atmospheric Administration |
| **Average Temperature Data** | National Oceanic and Atmospheric Administration |
| **Street Pavement Condition Data** | StreetSaver |
| **Parcel Data** | City of Whittier |
| **Zoning Data** | City of Whittier |
| **Sewer Spot Repair Data** | City of Whittier |
| **Sewer Overflow Data** | City of Whittier |
| **Whittier Water Department Jurisdiction Boundary Data** | City of Whittier |

## Methodology

This project first focused on producing a water main/lateral line leak dataset and map for the Public Works Water Division for the city. A data schema based on a potential attribute list was designed and recorded in an Excel table. The final version data schema was approved by the Water Division manager and a new file geodatabase and point feature class layer was created using the schema.

It was decided that this process of enabling field crew workers with geospatial technology would also be applied to the Street Maintenance Crew, who are split into three teams: Sidewalk Grinding, Asphalt Overlays, and Graffiti Abatement. Their supervisor decided they should use Survey123.

Collector and Survey123 training for the Water Division and Street Maintenance field crews respectively was scheduled. Instructional manuals for each application were made, including one for using ArcGIS Online for the Water Division field crew supervisor to help him access the web map application for the water leak dataset.

The Sidewalk Grinding and Asphalt Overlay crews were unsatisfied with the speed of the Survey123 application when they were working offline. The crew and their supervisor decided that they would like to work with Collector for ArcGIS. After deleting unneeded fields and adding the data that had been collected over the past couple of weeks, the datasets were exported to ArcGIS Online, added to a web map, configured with new symbology, and made available for the Collector application.

The last phase involved creating a map that used public works GIS data to help identify potential capital improvement project locations. A combination of editing existing data and digitizing new datasets made it possible to perform a spatial analysis using the *Near Tool* in ArcGIS Desktop.

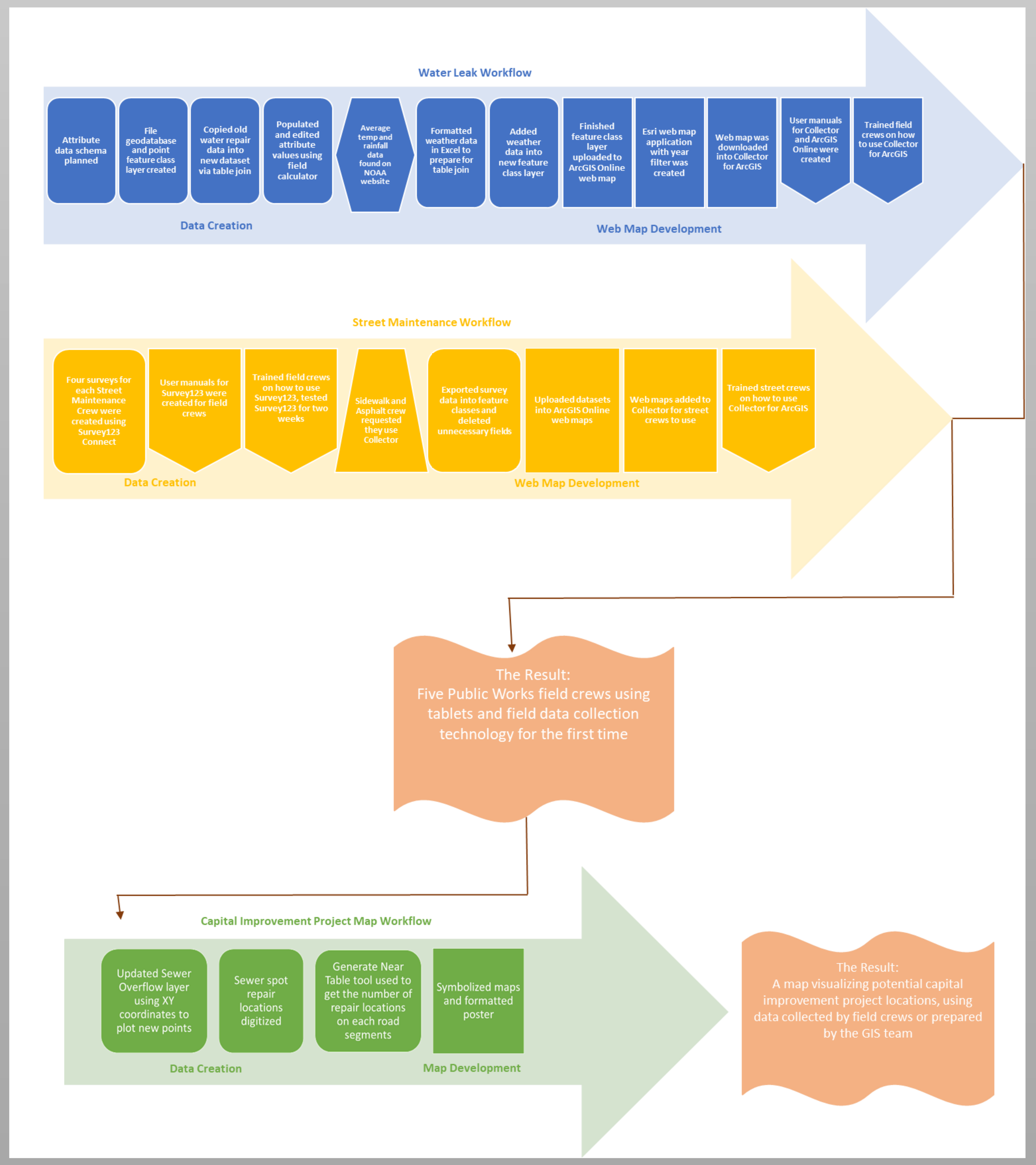



**Figure 2.** *Flowchart visualizing the methods completed for this project*

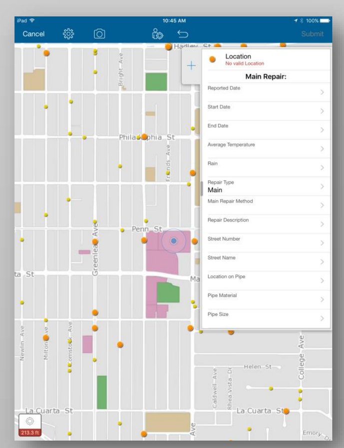
## Timeline

| Actual Timeline |
|---|
| Week of January 9th – Determine potential attributes and domains |
| Week of January 16th – Create data scheme rough draft |
| Week of January 23rd – Make final edits to data schema, create dataset |
| Week of January 30th – Find weather data and add to dataset |
| Week of February 13th – Create web map application for dataset |
| Week of February 20th – Tasked with creating 4 surveys |
| Week of March 6th – Finished surveys for Street Maintenance |
| Week of March 13th – Scheduled training sessions |
| Week of March 20th – Conducted training sessions |
| Week of April 10th – Began working towards CIP map |
| Week of April 17th – Street maintenance to use Collector |
| Week of April 26th – Transferred datasets to Collector |
| Week of May 29th – Sewer overflows layer edited and updated |
| Week of June 5th – All sewer spot check repairs digitized |
| Week of June 12th – Continue editing sewer spot check repairs |
| Week of June 19th – Conduct near analysis process |
| Week of June 26th – Begin formatting maps for poster |
| Week of July 3rd – Finish formatting map poster and present to Public Works director |

## Results

The results of this project are six datasets, one survey created in Survey123, two ArcGIS Online web map applications for the Water and Street Maintenance supervisors, user manuals for Collector and Survey123, and a final map poster. The poster primarily displays a large map that shows street segments with failing pavement conditions scores and those affected by multiple water and sewer main repairs between 2010 and 2017. Visuals and short descriptions for the results of this project are shown in Figures 3 and 4.

A



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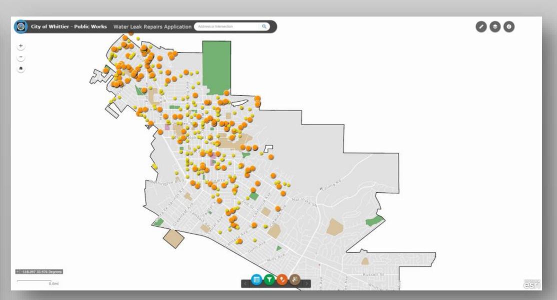

**Figure 3A and B.** *Screenshots of the Water Leaks dataset in Collector for ArcGIS and in a web map application*

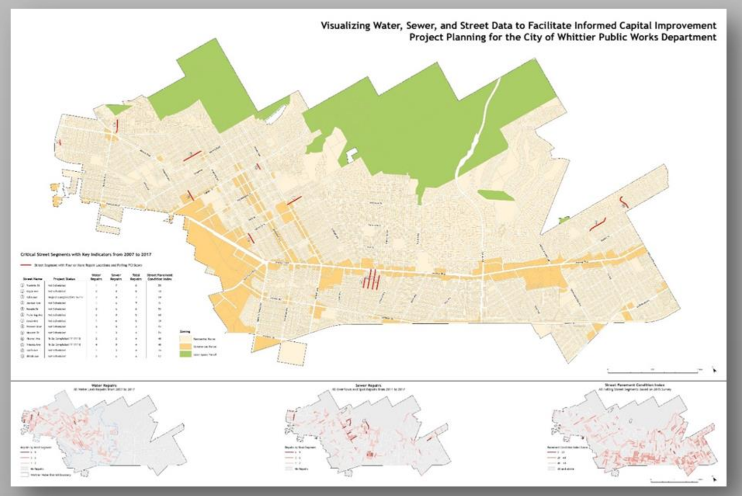


**Figure 4.** *Final map visualizing water, sewer, and street condition data to inform capital improvement project decisions*

| Dataset Name | Number of Fields | Number of Domains |
|---|---|---|
| Water Leaks Repairs | 28 | 6 |
| Asphalt Overlays | 12 | 3 |
| Sidewalk Grinding | 8 | 1 |
| General Maintenance | 7 | 1 |
| Graffiti Abatement | 12 | 4 |
| Sewer Spot Repair | 9 | 0 |

**Figure 5.** *List of all datasets created in this project*

## Discussion

Despite the rushed nature of the project timeline, I believe the datasets, survey, web map applications, and final map poster were created methodically and with the input of relevant managers. They were each approved and I would not change anything about them at this moment.

It should be mentioned that hesitation toward using the tablets and geospatial technology was a reoccurring theme throughout this project. The decision to make the transition from paper to digital repair log forms was not made by managers, not crew members. While they were all polite and willing to give this transition a try, it was clear throughout our training sessions, that some of the crew employees were very uncomfortable with learning to use Collector or Survey123. This ultimately resulted in the rejection of Survey123 by the Street Maintenance crews.

The rushed nature of the project timeline, prevented us from scheduling more than one training session with the crews. If I were to conduct this project again, I would insist on having two to three training sessions with each crew, one of which would be held out in the field to practice using the app offline.

## Conclusion

The conversion from filling out paper reporting forms to collecting repair data using tablets and geospatial applications was successful overall. However, if this project were to be carried out again in the future, improvements could be made to the project design. The most important change would be extending the project timeline. In hindsight, it is clear that the field crews would have benefited from another day or two of training, particularly a training session that took place out in the field to practice using the applications offline. Knowing where improvements could be made to the project is crucial if this workflow is to be repeated in the future.

It should be mentioned that the City of Whittier is in the process of integrating and implementing new asset management software called Accela. This is a city-wide implementation process, meaning nearly every department will use Accela to store, view, and keep track of their records. This program will also include assigning work orders digitally and has its own data collection applications. While some field crews will continue to use Esri data collection applications, most will use Accela's applications.

Despite potentially moving to a different data collection application, the feedback from the Public Works field crews has been positive overall. Public Works managers have already stated that this project has saved them time, money, and paper. Lastly, the most significant result of this project is its success in bringing Whittier closer to fully embracing GIS.


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For additional information please contact: Julia Brown – juliabrown.gis@gmail.com