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Oakland Citywide Sidewalk Condition Survey / ADA Inventory:

Introduction

In response to numerous lawsuits related to trip and fall accidents, and an unexpected ruling in the ADA-related *Barden vs. The City of Sacramento* case, the City of Oakland decided to take proactive steps to reduce its legal liability related to the condition of city sidewalks. City officials estimate that approximately $130 million would be needed to repair all the damaged sidewalks in Oakland. This figure is based on a backlog of more than 15,000 locations that City inspectors have reviewed in recent years.

The City chose TranSystems as Prime Consultant to create an inventory of approximately 1,500 miles of street centerline in this city of more than 400,000 residents, perhaps the first *geospatial inventory* of its kind. The TranSystems team includes a Landscape Architect for tree species identification, and an ADA consultant who will address detailed ADA issues and prepare the ADA Transition Plan.

The inventory will document the type, severity, and area of sidewalk damage in all seven City Council districts individually, and for the City as a whole. TranSystems' inventory will enable the City to switch from a complaint-driven system of sidewalk repair to a more cost-effective prioritization method using this damage management database / repair program. Upon completion of the project, the City will send out letters to property owners to make them aware of their potential responsibility to repair damaged sidewalks. The data collected will also include statistics on ADA compliance that will aid in the preparation of a PROW (Public Right-of-Way) Transition Plan as required by the Barden decision.

Project Scope of Services:

TranSystems will conduct a Citywide Sidewalk Damage Inventory and create a geospatial database from the data collected. This geospatial database must be compatible with the City's current GIS.

In general, the inventory will include the development of seven different GIS layers, including sidewalk damage, curb damage, trees, ADA, bus stops, curb markings and signs. The attributes / characteristics of these layers will be determined through an in-depth, comprehensive ground inventory.

The project was conceived and developed as a sidewalk project, therefore all data collected is associated with city sidewalks. The actual physical parameters of the collection are from the **curb and gutter to the back of the sidewalk**.

The most important task is to photograph each piece of damage and link that photo to the geospatial database and Assessor's Parcel Number (APN).

The following is a list of the general collection stipulations:

- Location and condition of all damaged sidewalks
- Location of all non ADA-compliant sidewalks / and obstructions
- Location of all street trees / tree species / vacant tree wells
- Location / condition of regulatory and street signs
- Location / condition of all bus stops
- Information for the ADA Transition Plan
- Summary report of the findings
- Geodatabase containing all collection data

Basic collection database criteria are based on predetermined standards set by the City's Public Works Agency. The primary collection choices were "Type" of damage, and "Degree" of damage. "Type" of damage was stipulated as one of the following categories: *Faulting, Cracks, Uplift, and Depressions*. Each type of damage was to be evaluated by field collection staff as:

1. Low : >¼" – ½"
2. Moderate: >½" – 1½"
3. High: >1½" – 3"
4. Very High: >3''

Project Development

Months of planning, deliberation and collaboration between the City and the consultants were invested in the design and creation of an overall database that would encompass all of the relevant information requested by City stakeholders. Those stakeholders included the Public Works Agency's Pavement Division and Sign Department, along with the City's Tree Department and the City's ADA Coordinator. The culmination of all of this interaction and brainstorming of design and development was the completion of the Metadata Master Plan (MMP). This document contains relevant information on every piece of data in the project. In the information technology field, "metadata" is defined as "data about the data." Thus, the MMP is the road map for overall project delivery; all project data is defined here. The final MMP contains more than 90 different collection fields for the seven layers mentioned previously.

The TranSystems team worked jointly with the City and our own programmers to develop the database design, and to solidify the context and parameters of the study. Navigational ease through the menu of selections was a priority. Logical task progression and visual ease of selection were extremely important factors.

The menus on the PDAs (Personal Data Assistants) were designed to enable field techs to collect data in a detailed, but expeditious manner.

GIS / DATA COLLECTION TECHNOLOGY

The City's existing GIS resources included an engineering quality base map, and an orthophoto of 1' +/- accuracy. TranSystems' innovative project solution took full advantage of these existing GIS resources to collect all the required data without using a labor intensive hand-held GPS (Global Positioning System). By utilizing a feature of ESRI's ArcGIS 9, **Dynamic Line Segmentation**, which facilitates collecting *line and point* data, we were able to draw "line segments" over each sidewalk in the city, then collect data along those line segments.

Field data was collected with the PDAs, using ESRI Mobile software, ArcPAD 6. Collected data was downloaded daily from the PDAs to the desktop computers running ArcGIS 9. In addition to ArcPAD, field technicians employed other tools such as digital levels, a measuring wheel, and digital cameras to perform collection tasks. The final geospatial database will be usable in all scales, from individual parcels to citywide summaries. The geodatabase will facilitate a spatial (visual) detection of damage locations at the parcel level, and a direct link to damage for each parcel APN (Assessor's Parcel Number) and street address.

Each individual segment would have a *unique identifier*, *land use type*, *length of segment*, *date collected*, *curb type*, *sidewalk width*, and *field tech / collector ID*. This structure proved to be a wonderful tool for making revisions to specific segments, updating incorrect or incomplete information, or reviewing each tech's work for accuracy and consistency.

Project Implementation

Our initial step in project implementation was to hire and train two team leaders to work with the GIS Lead and Project Manager in developing project criteria. Our contract with the City of Oakland stipulated that we execute a full sample collection of a specific geographic area of the city, including all of the designated criteria. This effort would be called a **prototype**. The purpose of creating the prototype was to determine test our methodology on a small scale without a large financial commitment. The final prototype would include the layers mentioned previously: sidewalk damage, curb damage, curb markings, ADA, trees, signs, and bus stops.

Settling on actual collection criteria proved to be difficult; as a result, much re-collection took place until the prototype was finalized. The key application of the entire project was the linking of each damage incident and photo to a parcel. The real challenge was to make sure that damage was assigned to the correct parcel.

In many cases the *spatial join* of parcels to sidewalk damage in ArcGIS 9 would still link two pieces of damage to the same parcel even though the damage was broken at the PL, and collected as separate damage incident.

TranSystems' GIS Analysts were able to rectify this situation by running a command that would find the center of every damage incident and relate that to the center of the corresponding parcel. Once this routine was run, a check found that all damage was linked to the appropriate parcel.

Collection Methodology

Once the final database and programming were in place, TranSystems brought on a team of Field Survey Technicians who were charged with completing the actual data capture in the field. The field team consisted of a Field Supervisor / QA/QC lead and two team leaders, who worked jointly with six (6) other technicians in daily data collection duties. The final field collection programming also included more than 100 tree species, and more than 250 sign types. With such a large volume of data to collect, TranSystems developed a detailed training manual, and conducted on-going field and office training for the team.

In addition to producing routing maps each morning, Team Leaders worked with and supervised techs in their daily collection duties. The team's GIS analysts pre-measured each block, using the "line segmentation" process. Field staff would start collection measurements of segments by estimating the intersection perpendicular sidewalks' centerlines in the field as starting points. This method is consistent with the process in which the segments were digitized by the GIS Analysts in the office. This process also allows the field staff to validate the accuracy of the overall segment distances by comparing the actual field end of segment distance with that listed on their routing map.

The QA/QC supervisor worked closely with Team Leaders to ensure the accuracy of data collected. Our Quality Assurance Work Flow Plan dictates regular random checks of our field technicians. Our QA/QC Lead, or other designated staff, consistently re-inventoried work on a random basis. The QA/QC Lead, using a hardcopy map and a PDA, performed random checks on each tech. Those findings were uploaded to our GIS in the office, and compared with the initial inventory. This process revealed obvious discrepancies. Inconsistencies were changed at that point in the field, or reassigned for collection and validation at a later date. Likewise additional training was set up for techs who were misinterpreting collection criteria.

The field team was equipped with specific tools for the job: a PDA (Personal Data Assistant) or handheld computer, a digital camera to photograph instances of damage, a pedometer to measure the distance to collection features, a digital level to measure sidewalk slopes, and a pocket tape to measure gutter widths, tree wells, etc.

Full Field Collection

After the acceptance of the prototype, full field collection began. This effort will take approximately 9 months. Full field collection is a detailed undertaking, requiring continual training and re-training for our staff to understand the collection requirements fully.

The project is currently about 70 % complete and on course for full completion, with specialized mapping, analysis, Transition Plan and geodatabase delivery scheduled for November / December 2006.

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