Geo-referenced Construction Information Management System (GCIMS)

BY:
Ahmad Salah, Ph.D., GISP
Kurt Miller, P.E.
Stanley Consultants
Introduction

The Need

The Resources

The Application

The Benefit

The Future
Observation Points
Attributes

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test_ID</td>
<td>08</td>
</tr>
<tr>
<td>Sample_ID</td>
<td>070909BW-1</td>
</tr>
<tr>
<td>Test_Date</td>
<td>7/9/2009</td>
</tr>
<tr>
<td>Test_Type</td>
<td>T-138</td>
</tr>
<tr>
<td>STA</td>
<td>0</td>
</tr>
<tr>
<td>Test_Pass</td>
<td>Fail</td>
</tr>
<tr>
<td>Forms</td>
<td>C-111, T138</td>
</tr>
<tr>
<td>X</td>
<td>1533274.653503</td>
</tr>
<tr>
<td>Y</td>
<td>7430626.165766</td>
</tr>
<tr>
<td>Picture</td>
<td>C:\Ahmad\Projects\GIS\Sample Files\Pictures\DSC3891.jpg</td>
</tr>
<tr>
<td>Station</td>
<td>1028+55</td>
</tr>
<tr>
<td>Offset</td>
<td>24' LT</td>
</tr>
<tr>
<td>Alg</td>
<td>180</td>
</tr>
<tr>
<td>Elevation</td>
<td>4262</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test_ID</td>
<td>11</td>
</tr>
<tr>
<td>Sample_ID</td>
<td>071409BW-2</td>
</tr>
<tr>
<td>Test_Date</td>
<td>7/14/2009</td>
</tr>
<tr>
<td>Test_Type</td>
<td>T-138</td>
</tr>
<tr>
<td>STA</td>
<td>0</td>
</tr>
<tr>
<td>Test_Pass</td>
<td>Pass</td>
</tr>
<tr>
<td>Forms</td>
<td>T-138</td>
</tr>
<tr>
<td>X</td>
<td>1534120.928745</td>
</tr>
<tr>
<td>Y</td>
<td>7430567.430196</td>
</tr>
<tr>
<td>Picture</td>
<td>C:\Ahmad\Projects\Prospective\GIS\Sample Files\Pictures\DSC3891.jpg</td>
</tr>
<tr>
<td>Station</td>
<td>1037+99</td>
</tr>
<tr>
<td>Offset</td>
<td>24' RT</td>
</tr>
<tr>
<td>Alg</td>
<td>180</td>
</tr>
<tr>
<td>Elevation</td>
<td>4266</td>
</tr>
</tbody>
</table>
Field Pictures
Inspection Forms
Base Maps
Key Features

- Real-Time Synch.
- Easy Data Entry & Retrieval
- QA/QC
- "Geo"-DATABASE
- Existing Software
- Picture & Forms
- Client Databases
- Web Reporting
- Existing Software
- Web Reporting
GCIMS in a Nut Shell

- GIS for construction management data.
- It is a “data model”
- Transparent to field technician
- Automated navigation to previous sites
- Nodes, lines and polygons are auto-symbolized
- Four tiers:
  - Data Collection
  - Desktop Application
  - Integration
  - Reporting
- GCIMS may be referenced as an electronic construction management “eCM” system.
System Description

- Data Collection
- Geo-database
- Desktop Application
- Integration
- Reporting
Data Collection

• Hardware:
  ► Rugged hand-held GPS receivers.
  ► GPS assisted point reference and collection.
  ► GPS accuracy: 1-3 meter, upgradable to sub foot accuracy.
  ► Built-in camera (3.0 MP)
  ► MiFi Connectivity – real-time synchronization

• Software:
  ► ArcPad 8.0 (very soon 10.0)
  ► ArcPad StreetMap
  ► Customized forms for easy data collection.
  ► Drop-down menus for selected attributes.
  ► Pre-defined selections.
Desktop Application

- Geo-Database
  - Includes various CM.
  - Each layer has unique set of attributes stored.
  - Attributes have domains attached.
  - Scalable: can include additional layers as needed.
- Base maps
  - Aerial: 25 cm resolution.
  - Street map.
  - Project-specific layers from CAD (eg. ROW, striping, ..etc).
- QA/QC: Field data are synchronized, real-time, to a replica geo-database.
- Management and update of the main geo-database including required layers, tables, forms and pictures.
• Custom user friendly forms for easy data entry.
• Automatic extraction of CM field data from geo-database.
• Automatic generation of client-required inspection forms in Microsoft Excel and PDF formats.
• Minimizes office time for report generation and eliminated typos.
• Replace conventional reporting system (weekly/monthly CD/paper)
• Timely, electronic and convenient reporting
• GCIMS reporting includes:
  ► Forms
    • No need for data re-entry.
    • Client forms are easily exported from the system.
    • Automated client-required form generation
  ► KML clients
    • Balloon popup
    • Pictures & PDF’ed forms – hyperlinked
  ► Web portal
    • Real-time for up-to-date field inspections
    • Web security
• **Initial Cost:**
  - **Hard Costs:**
    - GPS Units: $1,000-$3,000/each
    - ArcGIS Server: $8,500 (one time)
    - Training & References: $2,500
  - **Labor Cost:** including system design, implementation and initial feedback.

• **Operating Costs**
  - **Labor:**
    - GIS system analyst
    - Web portal administration
GCIMS Components

- Inventory Setup
- Analysis & Planning
- Management & Monitoring
GCIMS Benefits

- User friendly, reliable and cost effective
- Customizable & scalable to **client needs**
- Increase safety & maximize performance
- Can be survey-accurate

- Using **existing** client software/platform
- Change detection maps – track construction progress
- Interactive and real-time maps, queries, reports.
- **Integrated with client databases**
- Web-based interface

- Return on investment
- Inspection time to be cut, Go Green
- Reduces the chance of error
- Accelerate delivery (data collection, processing), Innovation, Minimize MOT and get a good price