Integrating GIS and Mobile Technology into the Workflow

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Intermec CN3 Mobile Computer

- Windows Mobile OS
- Rugged (6’ Drop)
- Bluetooth Enabled
- GPS Enabled
- Color Camera
- Wi-Fi Or Docked Data Synchronization
- Cell network capable (3G or Edge)
- Long-lasting battery
CN3 Peripherals

Mobile Printer

Bar Code for internal Scanner

RFID Tag and Scanner
Two Mobile Initiatives

- Same device
- Different peripherals
- Different use of GIS
- One to write tickets
- One to maintain pole data
S.W.E.E.P. OVERVIEW

- **Streets and Sidewalks Enforcement and Education Program**
- Program created to educate Philadelphia citizens about their responsibilities under the Sanitation Code.
- Enforces the law against violators through intensified street patrols by uniformed litter enforcement officers.
- SWEEP supports and enhances individual and community efforts to maintain a clean City.
The Challenge

- Hand written tickets
- No address validation
- Paper tickets required sorting and delivery
- Data entry backlog
- Hearings delayed 6 to 12 months
The Solution

- Electronic tickets printed in the field
- Direct export to ticket processing and collection system
- Standardized ticket writing
- Electronic data is collected using GPS point locations and GIS mobile map cache
- Photo capture adds further validity to violation.
- RFID scanning technology provides instant access to dumpster license data
- Ease of use increases ticket output
SWEEP - Business Process Flow

On the Street

Issue citation
- Recognize Infraction
- Educate citizen/business
- Issue Warning or Citation

Beginning-of-day synch
Download updates from city-wide violation history

At Field Office

End-of-day data synch
- Upload ticket records and photos to master database
- Download mobile map cache (monthly)

Data QC by Field Manager
2 Day Window (Custom App)

In Central GIS Office

Data export to ticket processing agency (automatic, nightly)

Report and map creation for analysis

In Central Business Office

Complaint Response
SWEEP - System Architecture

Sweep Mobile Application

- SQL Mobile
- Application Data
- File(s)
- Mobile Map Cache

Download Mobile Map Cache (Monthly)

Synchronize CVN & Application Data (Daily)

CVN Export

CVN DB & File

Division of Technology

Ticket Processing Agency
Traffic Signal LED Replacement Project
LED - OVERVIEW

- Traffic Signal Replacement Project
- Incandescent bulbs replaced by Light Emitting Diodes (LED) modules
- Save energy at 2700 intersections
- Save $1,000,000 per year on electricity
- Rebates offered by electric company
LED - The Challenge

- The City received funds from the American Recovery and Reinvestment Act (ARRA) to convert all Traffic Signals to Light-Emitting Diode (LED) modules.
- No plan to handle the data
- No accurate inventory at the intersection level
LED - The Solution

- ArcGIS Mobile Application
- Pole Data maintained at Signalized Intersections
- LED data associated to Pole features Barcode scanning for LED modules
- Intermec Devices
- Nightly Synch to mobile edit version in SDE
- Post Processing links poles to Control Box at each intersection
LED - Business Process Flow

On the Street while installing LEDs

Data Entry
- Add Control Boxes
- Add or Edit Poles
- Add Traffic Heads
- Scan Barcodes on LEDs

At Field Office

End-of-day synch
Upload Data (ArcGIS Mobile)

Nightly synch
Download Updated Mobile Cache (ftp)

In Central GIS Office

Post processing
Associate Control Boxes to poles

In Central Business Office

Data QC by Field Manager (ArcMap)

Report and map creation rebates, bill reduction and project status
LED - Data Entry Samples

Scan Barcode

Point the top of the mobile device at the barcode to be scanned and press the 'Scan' button or select a pre-installed fixed type below.

12 inch Green

- 8 inch Red: 911720000
- 8 inch Yellow: 911920091
- 8 inch Green: 925200047
- 12 inch Green: 929060077
- 12 inch Yellow: 9300010166
- 12 inch Red: 929200162

Number of LEDs: 6
LED - ArcMap Quality Control Tool
LED – ArcMap Quality Control Tool Data View

Controller Heads and LED Information

Control Box 416005 at MANATAWNA AVE & RIDGE AVE
Control Box Control Type: 303, Manufacturer: Crouse Hinds

Summary

14 Heads
- 8 in - 3 Sect (6)
- 12 in - 3 Sect (6)

42 LEDs
- 8 in Red (10)
- 8 in Yellow (8)
- 8 in Green (8)
- Total 8 in = 24
- 12 in Red (6)
- 12 in Yellow (6)
- 12 in Green (6)
- Total 12 in = 18

Update Database

<table>
<thead>
<tr>
<th>Project Name</th>
<th>LED Conversion Date</th>
<th>QC Date</th>
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<tbody>
<tr>
<td>ARRA LED CONVERSION</td>
<td>9/29/2010</td>
<td>10/1/2010</td>
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</table>

Current data for Controller 416005. To update make necessary changes to the current data then click Update.
## Comparison

<table>
<thead>
<tr>
<th>Item</th>
<th>SWEEP</th>
<th>LED</th>
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<tr>
<td>Use of GIS</td>
<td>Reference</td>
<td>Data Editing</td>
</tr>
<tr>
<td>Business Data</td>
<td>SQL Database</td>
<td>GIS Feature Classes</td>
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<tr>
<td>Synchronization</td>
<td>SQL Replication &amp; file ftp</td>
<td>ArcGIS Mobile with SDE Versioning</td>
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<tr>
<td>GPS</td>
<td></td>
<td>Zoom to Location</td>
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<tr>
<td>Device</td>
<td>Intermec CN3 Mobile Computer</td>
<td></td>
</tr>
<tr>
<td>Peripherals</td>
<td>Camera, Printer, RFID Reader</td>
<td>Barcode Scanner</td>
</tr>
</tbody>
</table>
Lessons Learned

- Careful what you synch
- Use muti-versioned views for external reporting
- Feature classes replaced tables (tables not supported in ArcGIS Mobile)
- Test within your environment
- Involve end users throughout project
- Plan for on-site support afterward
- Create an archiving plan in the beginning
- Using mobile editing complicates SDE management
- Restart handheld devices regularly
SWEEP Application
Demonstration
Additional Information

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- Marion Storey – marion.storey@phila.gov
  215-686-5031
- Streets Department Web Site
  www.phila.gov/streets
- The Recovery Act is "Lighting Up" the streets of Philadelphia
  www.youtube.com/watch?v=NH7CsnkA0RI
- SWEEP Web Site
  www.phila.gov/streets/SWEEP.html