GAS UTILITY DATA COLLECTION IN A DISCONNECTED ENVIRONMENT

Tales From the Far North

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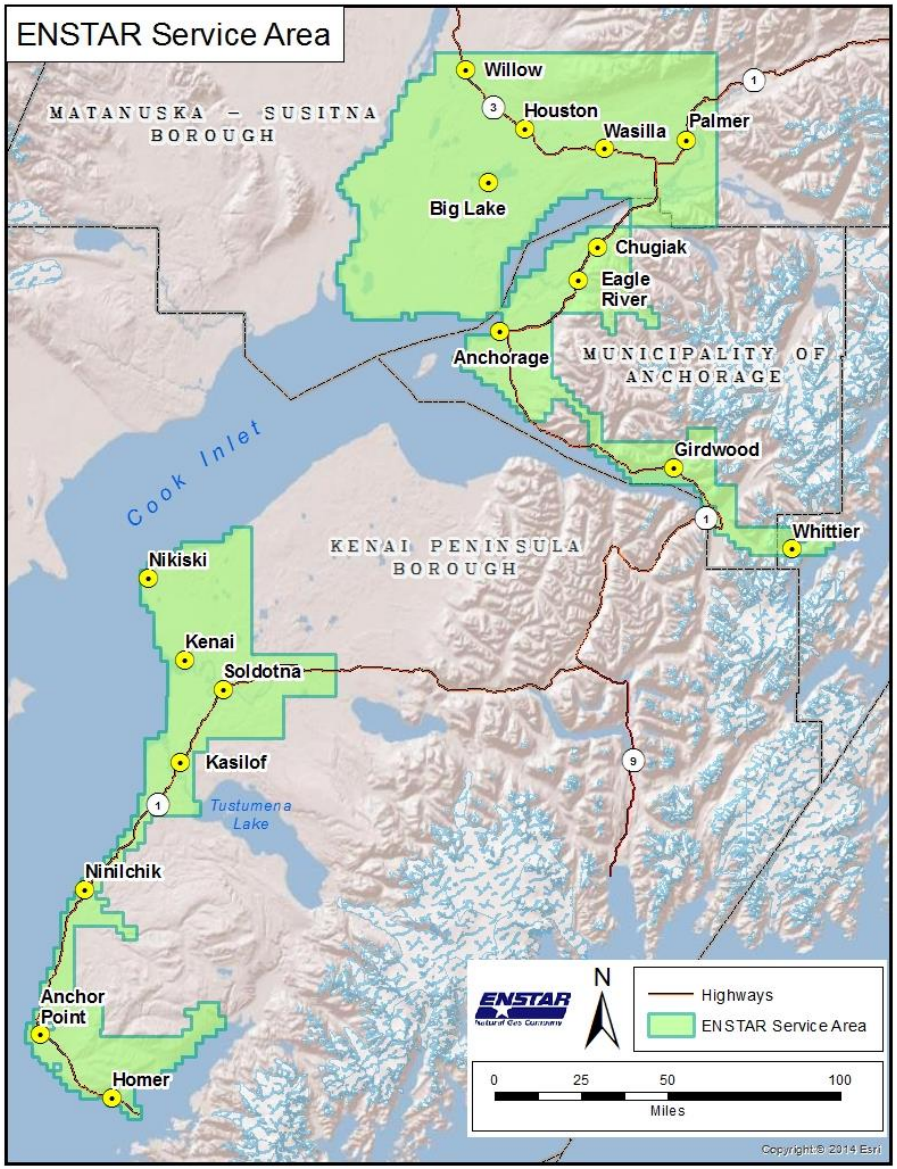
ENSTAR Natural Gas Company

2014 Esri Electric and Gas GIS Conference

ABOUT ENSTAR

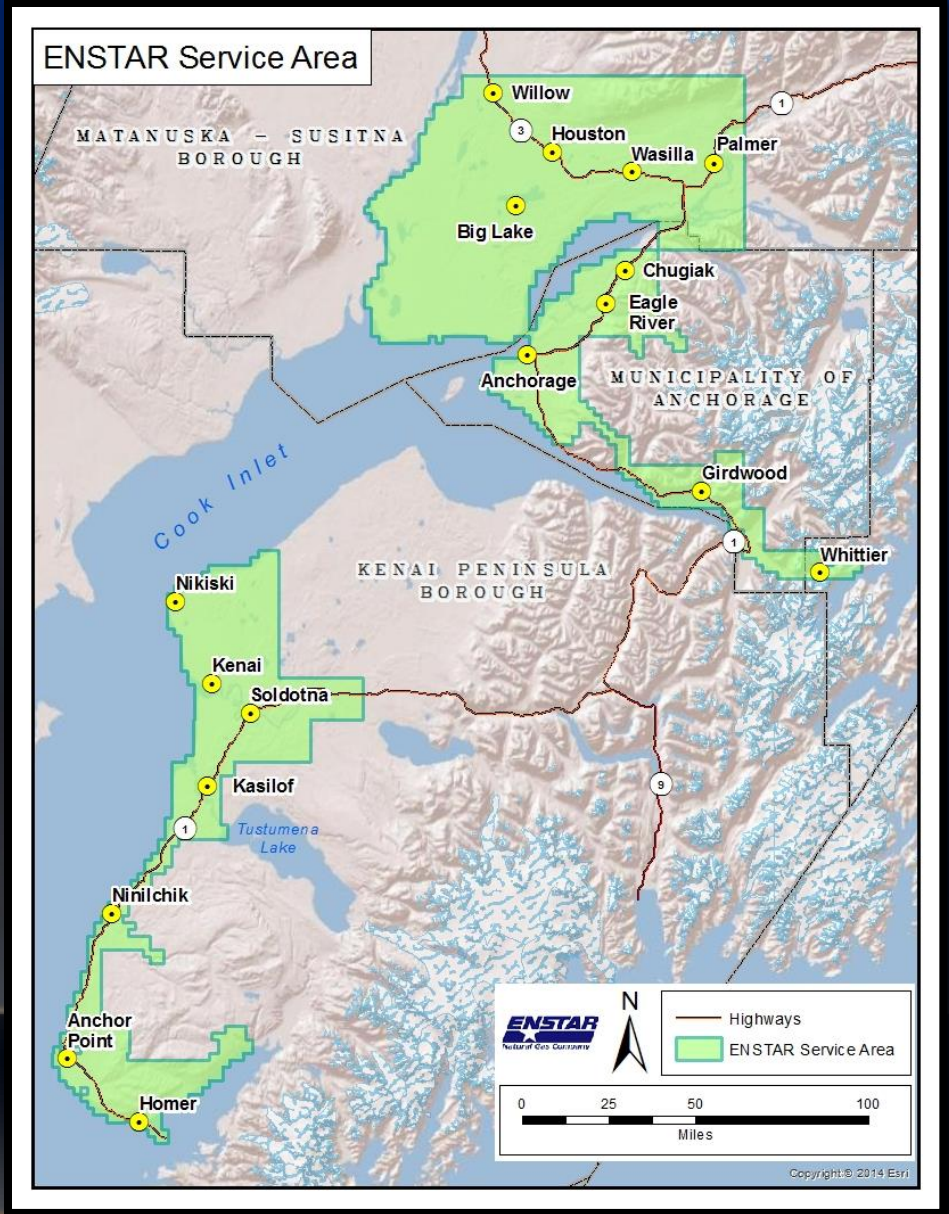
About ENSTAR

- An AltaGas Company
- Subsidiary of SEMCO Energy (Michigan)
- 195 full time employees
- Serving south-central Alaska since 1960
- Service territory is over 2759 square miles
- Population in service area 423,700
- Over 450 miles of transmission main
- Over 2900 miles of distribution main
- Approximately 137,000 customers



About ENSTAR GIS

- Dual ESRI / AutoCAD shop
- ESRI customer since 2007
- Staff:
  - 1 GIS Specialist
    - (web, SDE, Mobile, mapping and analysis, GIS data maintenance, planning, budgeting, etc.)
  - 1 Full time drafter
    - (GIS data entry and construction drawings)
  - 3 “surveyor / drafters”
    - (surveying and pigging in summer, drafting in winter)



PROJECT BACKGROUND

Project Background

- Inspections were paper based
- Inspections conducted in summer (May – September) with temporary employees
- As-built books updated once a year
- Meter information missing from GIS
- Desire to speed up as-built updates, improve accuracy, reduce paper use and document scanning
- GIS field data collection called for in GIS strategic plan
- Migration from AS400 mainframe to Oracle Customer Care & Billing (CC&B) and Oracle Mobile Workforce Management (MWM)

Project Background

- First data collection effort utilized ArcPad and Trimble GPS units for atmospheric corrosion data collection
  - Utilized in 2010 and 2011
  - There were issues
- Service Department was using an ArcGIS Engine – based mapping application
  - Licensing costs limited expansion
- Decision made to develop an ArcGIS Mobile SDK application
  - Unlimited licensing included with ArcGIS Server Advanced
  - Development flexibility
  - Runs on Windows PC's

Project Background

- Contracted with Anchorage – based Resource Data, Inc. (RDI) to build a mobile mapping and data collection application
  - Leverage work processes and applications originally designed for the previous Trimble data collection effort
  - Pilot project would be atmospheric corrosion inspections / meter data collection
  - Initial application framework for service line and main completion report data gathering
  - Would eventually replace paper as-builts
  - Would run disconnected from the network
  - Would update enterprise GIS daily
  - Easy to learn

- First version of ENSTAR Mobile Maps implemented April 2012

ENSTAR Mobile Maps

Technology

- ArcGIS Runtime for Windows Mobile 10.2 (Windows SDK)
- Microsoft .NET Framework 4
- Windows Presentation Foundation (WPF)
- Visual Studio 2010 CAN be used for development (contrary to what ESRI says)
- Mobile and tile caches
  - Mobile maps uses multiple mobile and tile caches

System Requirements

- Windows XP or Windows 7
- Intel Core i5 processor
- 80 GB storage for caches
- Additional 105 GB for external documents

Optional Components depending on operating mode

- GPS, camera, barcode scanner, document viewer

Cache Update Options

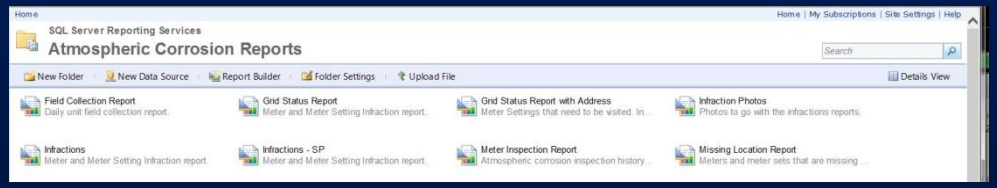
- Mobile caches updated through Mobile Maps or file synchronization program
- Tile caches updated through manual file copy from portable hard drives

ENSTAR Mobile Maps Modules

- As-Built mode
- Atmospheric Corrosion mode
- Cathodic Protection mode (under development)
- Electronic Completion Reports mode (under development)

Atmospheric Corrosion Module Components

- Mobile Work Assignment tool
- ENSTAR Mobile Maps editing tools
- Data processing app
- SQL Server reports

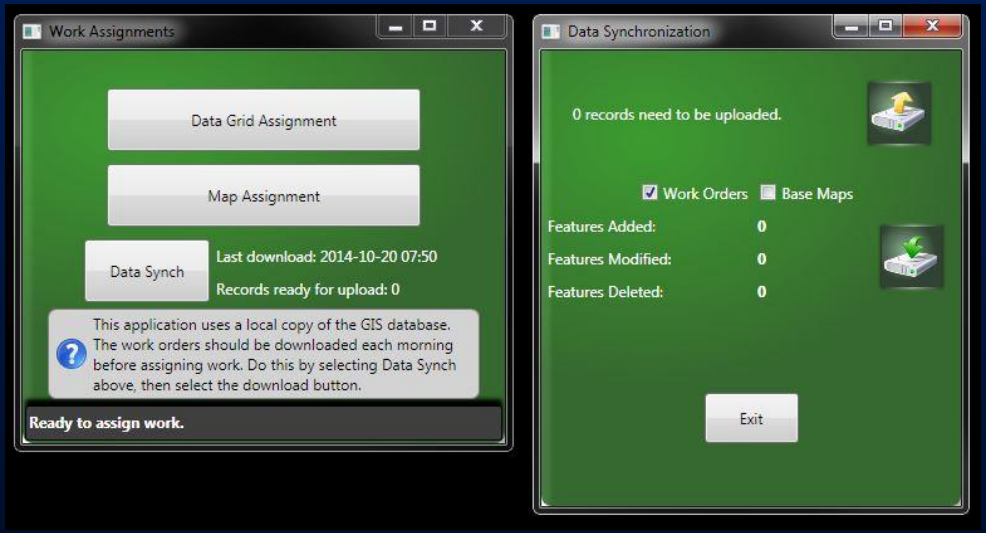


Mobile Work Assignment Tool

Used for atmospheric corrosion

Data Synchronization

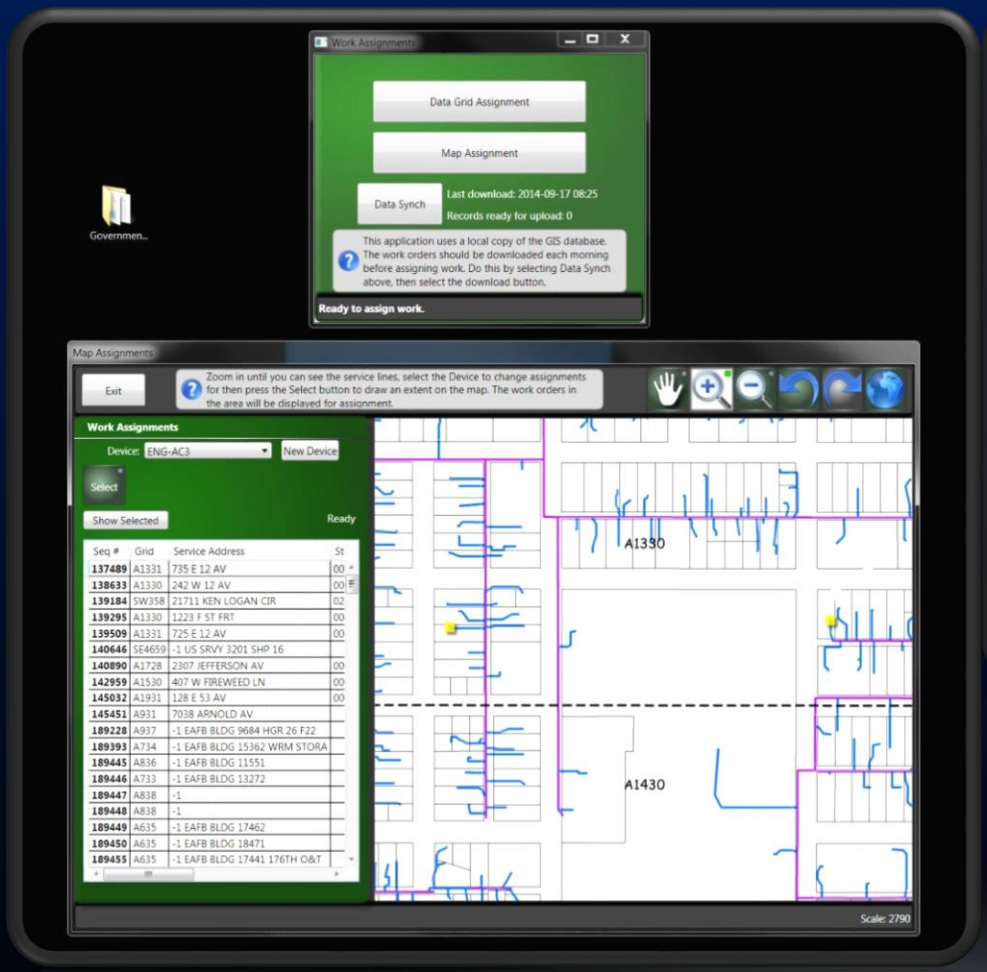
1. Supervisor synchronizes local cache with server
2. Supervisor makes assignments
3. Supervisor synchronizes new assignments with server



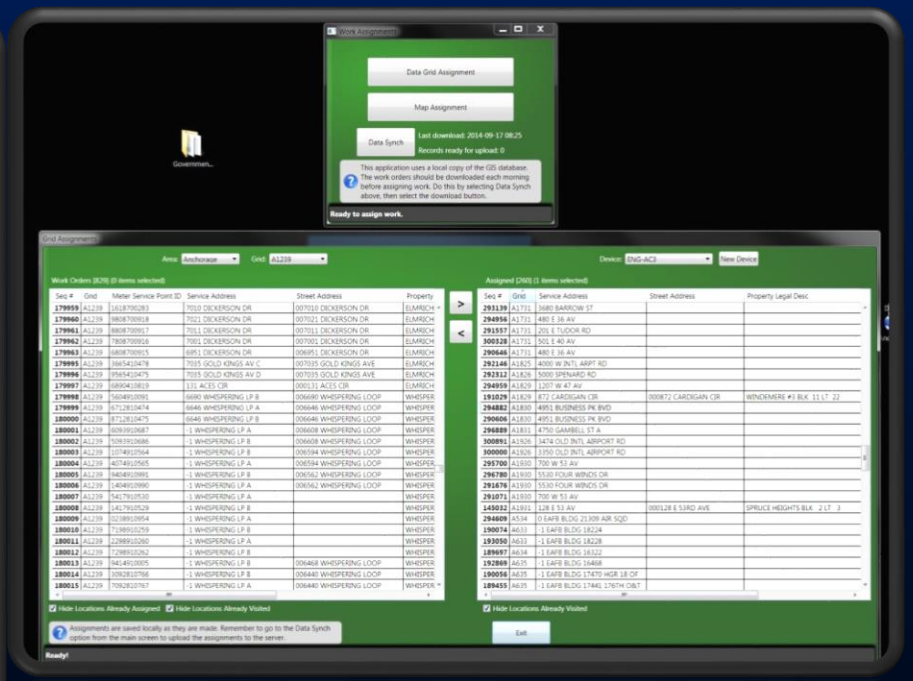
Field workers download the new work assignments to Mobile Maps. The work is stored in a mobile cache.

Mobile Work Assignment Tool

Map Assignment

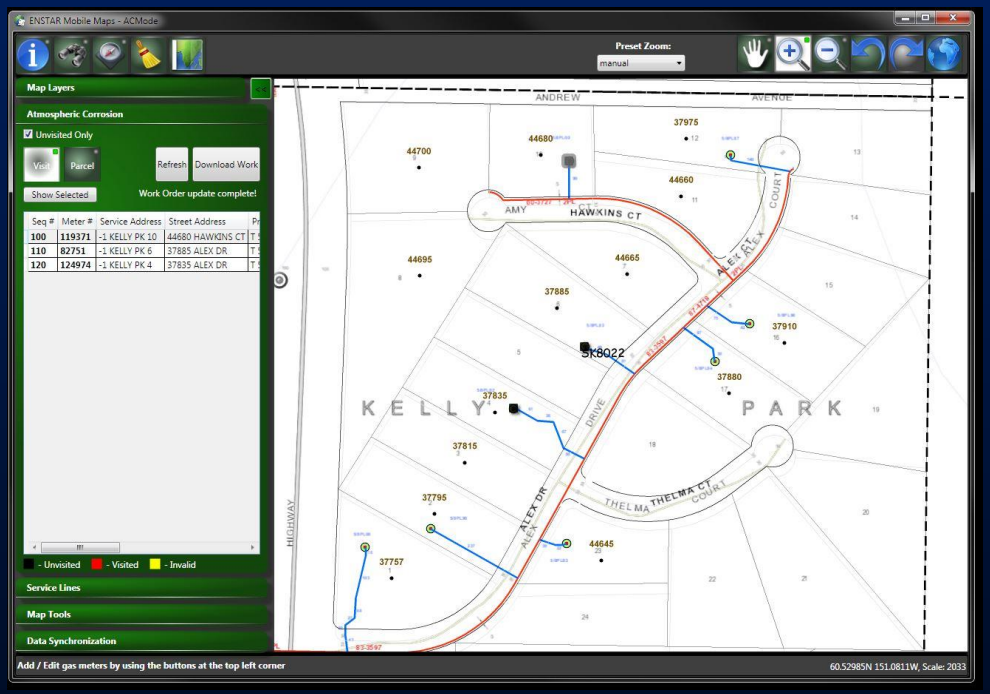


Grid Assignment



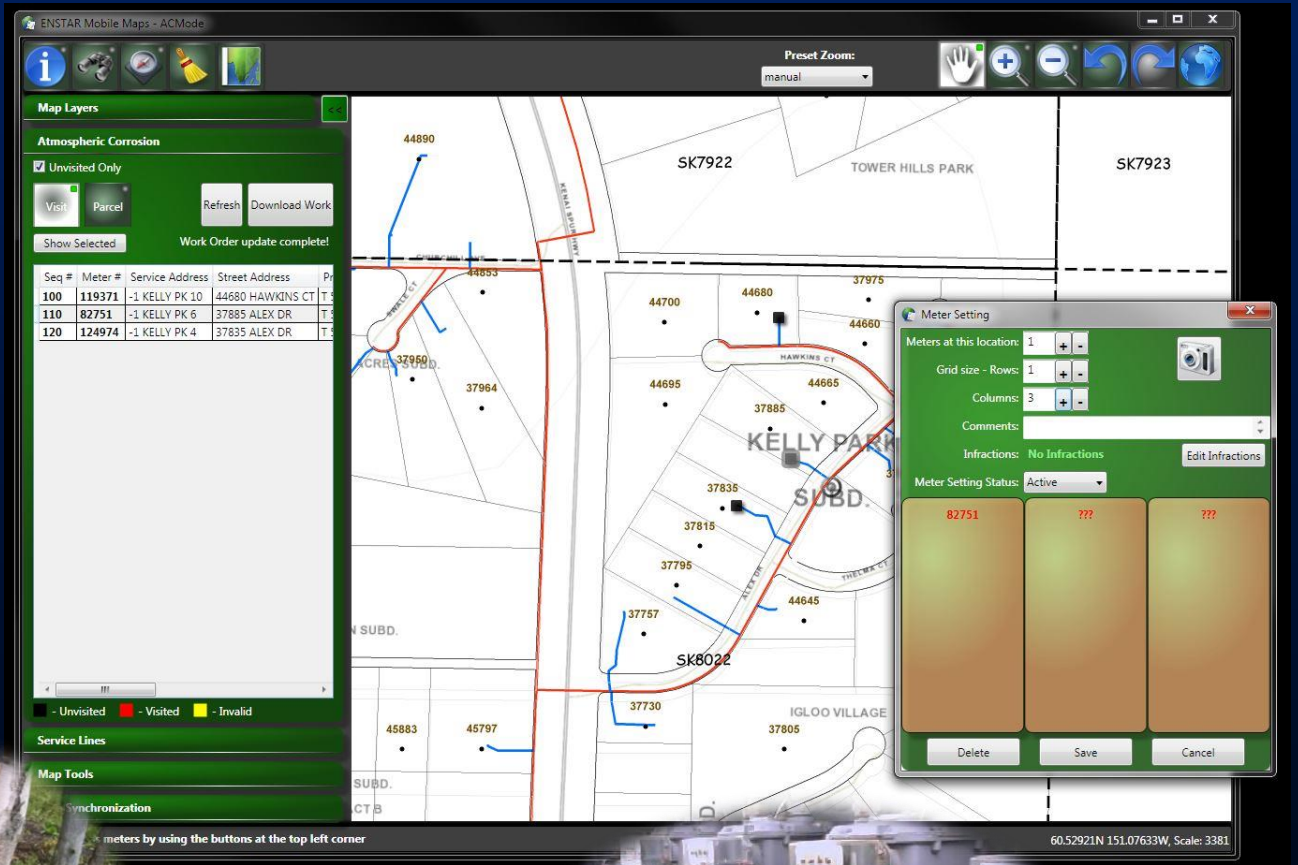
ENSTAR Mobile Maps Atmospheric Corrosion Module

- Field worker downloads work before leaving office
- Sortable work order list displayed in data table
- Work order locations shown on map
- GPS shows current location for navigation purposes only
- At work site field worker clicks “visit”, then draws a box around the meter set on the map.
- Field worker enters meter information, infractions, records the meter reading, scans the ERT and takes a picture.
- Field worker paints the meter, installs anti-theft seals, etc.
- On return to the office the field worker goes to the Data Synchronization tab and uploads the completed work.



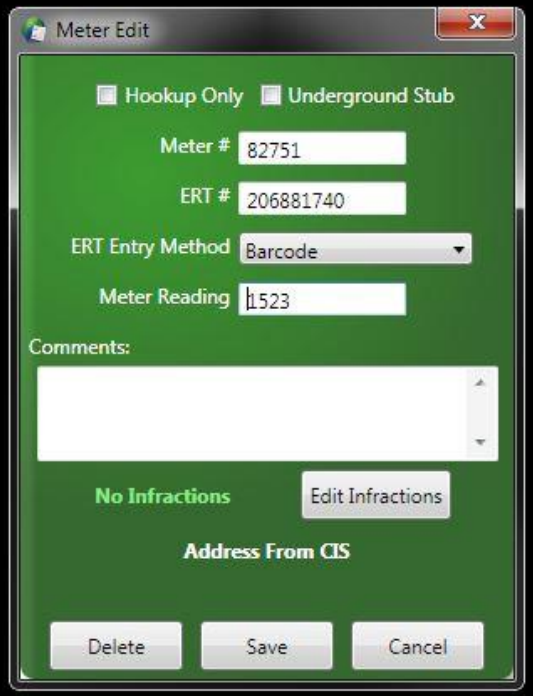
ENSTAR Mobile Maps Atmospheric Corrosion Module

- "Visiting" a site brings up a dialog box for the meter setting
- Meter grid (brown boxes) laid out according to the number of rows and columns in the meter set
- Each box is clickable to enter information for each meter.
- A picture of the meter set must be taken before the information can be saved.



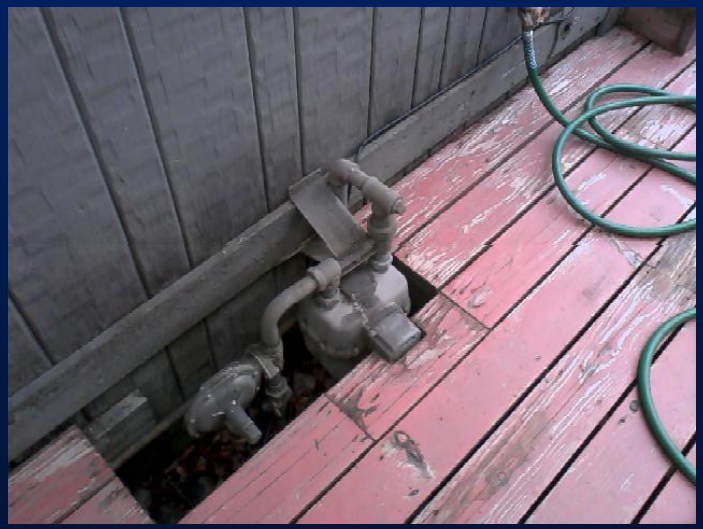
ENSTAR Mobile Maps Atmospheric Corrosion Module

- Meter edit window accessed by clicking brown boxes
- Enter:
  - Meter badge number
  - ERT number (scan barcode)
  - Meter reading (enter right to left as read – program reverses number on screen)
  - Meter infractions



ENSTAR Mobile Maps Atmospheric Corrosion Module

Infractions logged for individual meter and entire meter set



Infractions

- [ ] No Infraction
- [ ] Gas leak / 103B
- [ ] Applied Paint
- [ ] Need Reg Elbow
- [ ] Loose guard rail
- [ ] Need bollard/guard rail
- [ ] Rubber hose
- [ ] Fuzz Leak / 1053
- [ ] Xtrube riser needs wax coating repair
- [ ] Xtrube needs wrap
- [ ] Severe Riser pulled
- [ ] Corrosion for Eng.
- [ ] Meter Access impeded
- [ ] Cathodic problem
- [ ] Spiral wrap riser
- [ ] Install reg elbow
- [ ] Misc. Infractions

Save | Cancel

Infractions

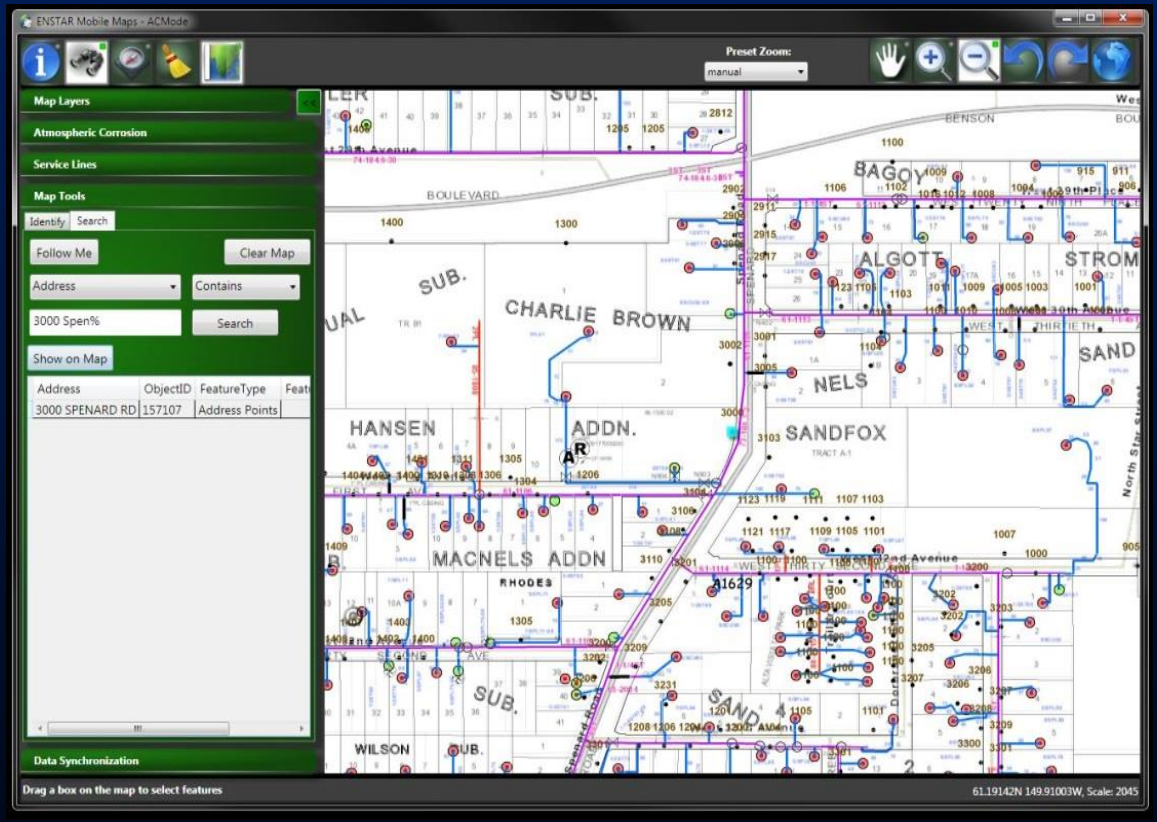
- [ ] No Infraction
- [ ] Gas leak / 103B
- [ ] Meter tilted
- [ ] Broken meter bar
- [ ] Noisy meter
- [ ] Missing anti theft seals - seals installed
- [ ] Meter/cock impeded
- [ ] Enclosed meter
- [ ] Fuzz Leak / 1053
- [ ] Meter Support
- [ ] Missing reg cap
- [ ] Missing reg vent screen
- [ ] Meter loose
- [ ] Locate wire missing
- [ ] Oil pot
- [ ] Damaged/broken index
- [ ] Damaged/index cover
- [ ] Misc. Infractions
- [ ] Meter at wrong parcel
- [ ] Bottom of meter buried

Save | Cancel

Other Mobile Maps Features

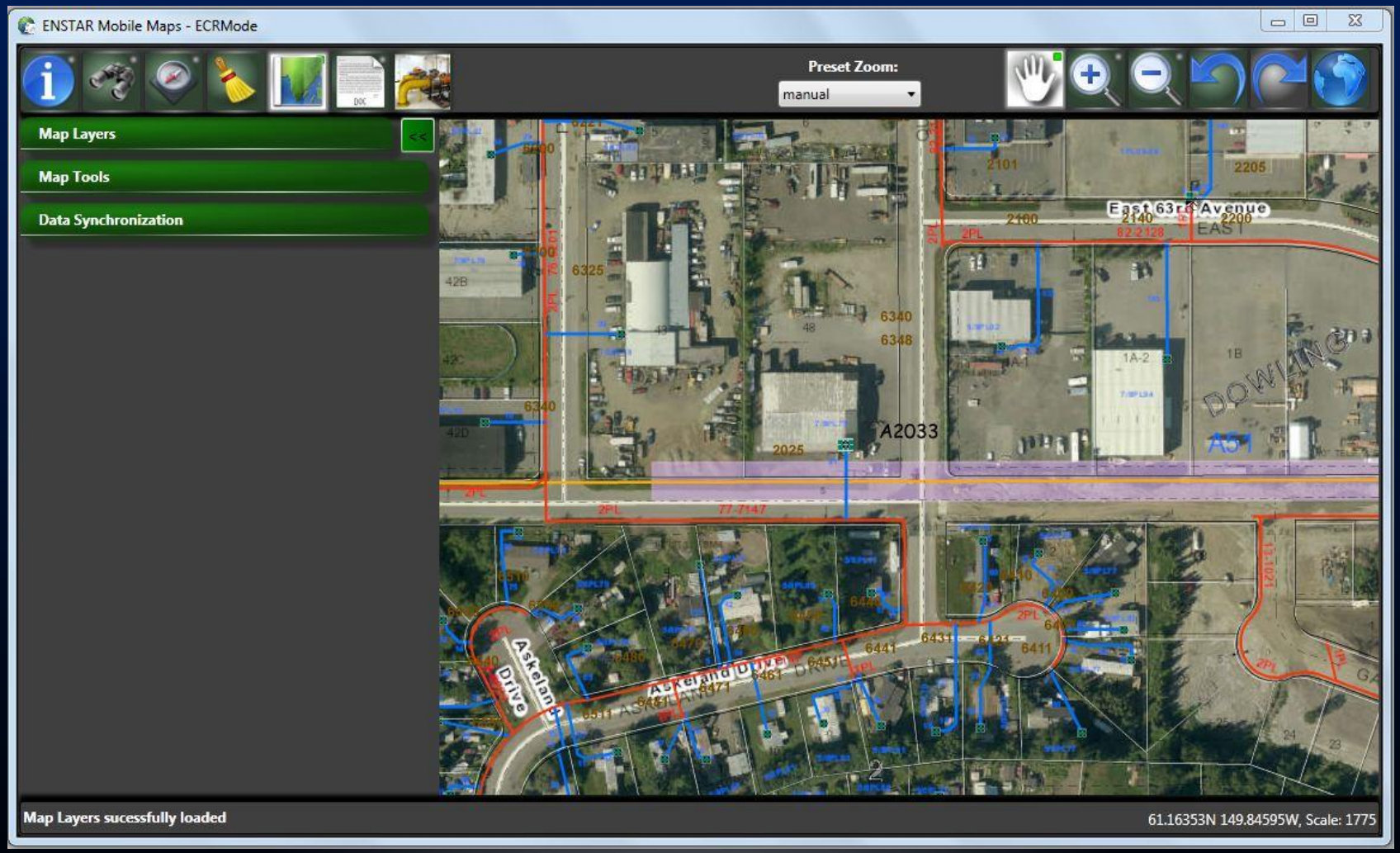
Identify and Search

- Identify returns all features in chosen location
- Can search by address, subdivision / lot / block, location ID, or service point ID
- Search takes wildcard characters
- "Follow Me" feature shows user's location and location of feature chosen from search results



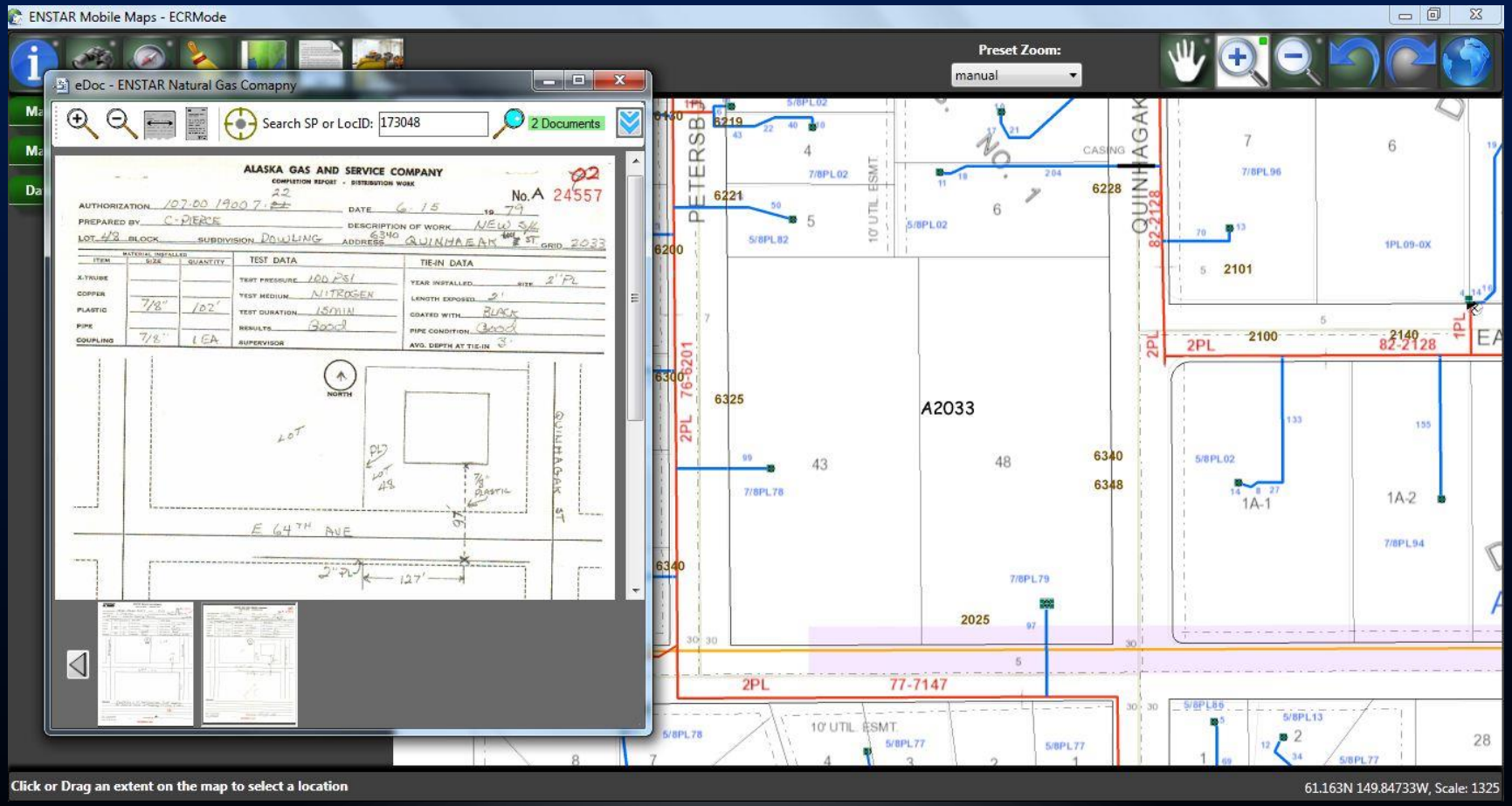
Other Mobile Maps Features

Aerial imagery



Other Mobile Maps Features

Scanned completion reports and regulator station drawings



LESSONS LEARNED

Lessons Learned - Pitfalls

- Lots of bugs!
  - Year 1: troubleshooting major bugs
  - Year 2: troubleshooting smaller bugs
  - Year 3: ArcGIS 10.0 – 10.2 migration, more bugs
- Synchronization of work assignments difficult to figure out.
  - Gotchas: work assignments (edits) being overwritten or duplicate records getting inserted into the work assignment feature class.
  - Solution: more refined programming; mobile work assignment tool cache must be synchronized with SDE before AND after work assignments are made.
- Bad X/Y location data from CIS causes user confusion.

Lessons Learned – Pitfalls (continued)

- Sometimes edits are “lost”
  - ArcToolbox mobile cache tools used to recover data
- Manual cleanup necessary for records where meter badge numbers / and or ERT’s changed, user error, other goofiness
- No connection to MWM
  - Searches for MWM orders must be done manually
- No connection to CC&B
  - Field Activities for infractions must be entered manually into CC&B from reports

Lessons Learned – Pitfalls (continued)

- Limited support for annotation, no support for dimension layers in mobile cache
  - Must be in a tile cache
- Panasonic Toughbook CF-H2 short battery life
  - Change batteries every 2 hours
  - Carry extra batteries and chargers
- Application and end user support is constant

Lessons Learned – Successes

- First year: Over 34,000 meter set inspections completed, over 37,000 individual meters added to GIS
- Infractions recorded in GIS for the first time
- Meter Set Assembly photos available in GIS desktop and web applications
- Meter locations searchable in GIS applications
- Atmospheric corrosion pilot led to the development of other modules
- Requests for new features have been made
- Paper as-built books are starting to be replaced with computers
- Many users like it once they get used to it

Lessons Learned – Costs & Benefits

- Cost to date:
  - Application development and support: $250,000
  - Electronic Completion Reports module (under development): $145,000
  - Panasonic Toughbook computers: $100,000
  - Non rugged laptops: $14,000

Lessons Learned – Costs & Benefits (continued)

- Benefits:
  - 5500 GIS data entry hours saved by (roughly $550,000 in contract labor) by collecting meter points electronically
    - Net ROI for atmospheric corrosion to date roughly $80,000
  - Accurate GIS data
  - Work assignment flexibility
  - As-built data updated more often
  - Access to aerial imagery and scanned completion reports
  - Mapping system is 100% self contained – no Internet connection required
  - Inspection records can be used for threat analysis in GIS
  - Saves paper and scanning time

QUESTIONS?

Contact Information

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