

# Using Collector for Roadside Feature Inspections and Data Delivery

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# Technology of the Past and Present



# Mobile Data Collection at Iowa DOT

- In 2010, after a request from a field manager, started researching the best way to manage information for field crews. First round of tablets deployed in 2013.

## Initial Guardrail Data

Route 021 Cost Center 552807 County 07 Mile Post 22.8  
(3 digit #) (2 digit #)

Station \_\_\_\_\_ Side (Lt, Rt, Med) Direction (NB, SB, EB, WB) Ramp \_\_\_\_\_  
(Optional)

Street \_\_\_\_\_  
(If none put NO)

County Road \_\_\_\_\_  
(If none put NO)

Protected Item \_\_\_\_\_ Bridge Number \_\_\_\_\_  
(Bridge End Post, Bridge Pier, Sign Support, Box Culvert, RR Signal, Foreslope, Sidewalk, Other)

Rail Type (Cable/Beam) Rail Length 405.2  
(Nearest Foot)

End Anchor 1 RE 53 End Anchor 2 \_\_\_\_\_  
(Approach Guardrail) (End Guardrail)

Post Type (Wood/Steel) No. of Posts \_\_\_\_\_  
(Combination put in Remarks)

Inventory Date 4-21-03 Entered By TW  
(MM/DD/YYYY) (Initials or Name)



# Necessary Mobile Functionality

- Disconnected Editing
- Performance and connectivity
- Cloud based versus transactional databases
- Ability to collect and store photos
- Related table functionality
- Skip Logic – If then questions in form
- Data driven forms
- Multi-User Functionality
- Device Flexibility
- Consistent look and feel over multiple “apps”
- Ease of use

# Mobile Collection Tools Tried

- **Fulcrum App** – Fee for service app with a map interface and geospatial tools – using for short-term projects
- **PDF Maps App** – leverages georeferenced photos and basic pick lists
- **GeoCortex** – An add on to ArcGIS Server – several pilot projects under way – Web-based
- **ESRI Collector App / ArcGIS Online** – Still being developed into a robust application – Fully deployed several applications at Iowa DOT
- **Transcend Spatial** – MAVRIC – customizable COTS app
- **ESRI Survey123** – New to mobile marketplace

# IADOT Field Tablet Deployment

- ❑ Maintenance Tablets in the field = 240 multi-use iPad Gen4/Air2 tablets are deployed to our 109 garages
- ❑ Using for road condition reporting in winter and condition inspections the rest of the year
- ❑ Construction tablets in field = 180 for paperless plan management – using DocExpress and PDF Expert to manage documents in the field
- ❑ An effort to identify devices to be shared between maintenance and construction is underway
- ❑ All have a data plan or mobile Wi-Fi (\$30 - \$80 per device per month)

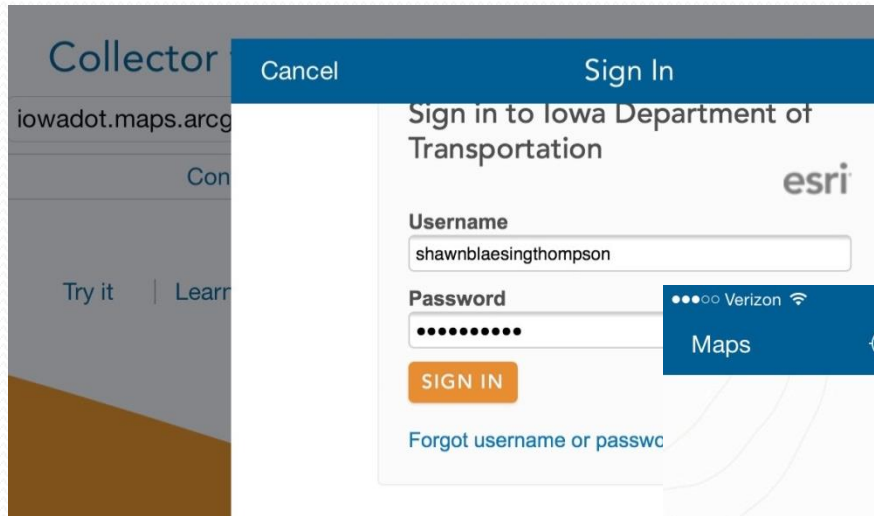


# Field Data Inspections

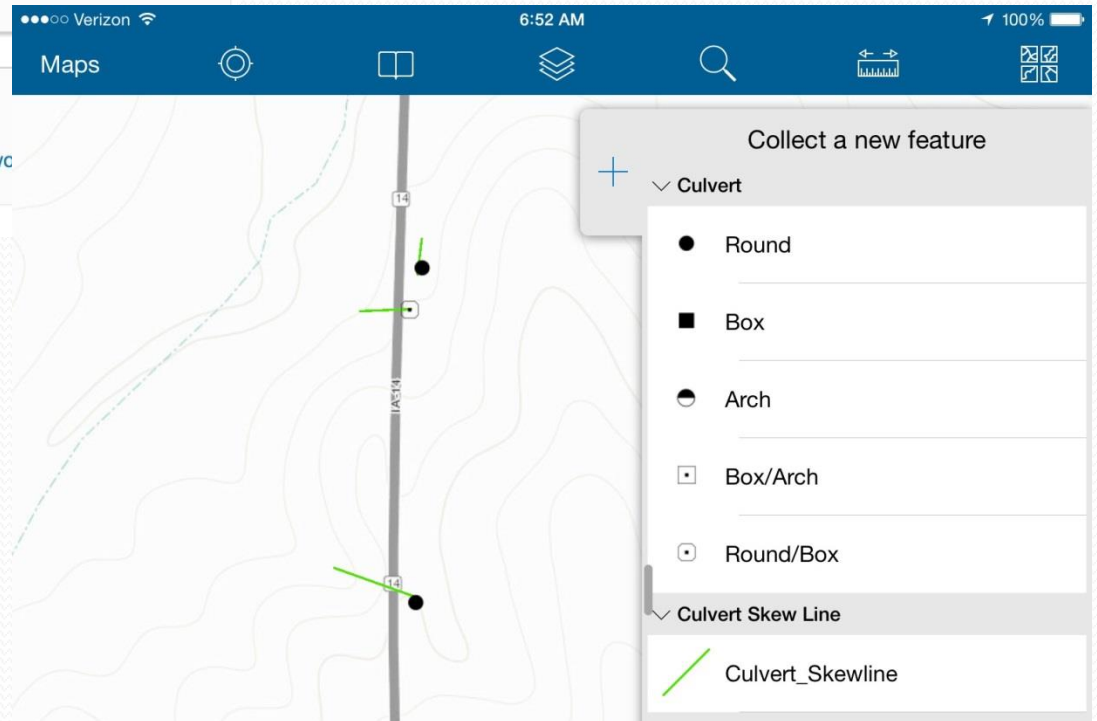
## Production Application Development

- ❑ Contracted with ElecData out of Idaho in March 2014 to develop a production series of ArcGIS Collector Tablet Applications which ties into our Oracle and ArcGIS Server infrastructure
- ❑ The phase one focused on inspection of several roadside features: culverts, signs, guardrail/crash cushions. Phase two covers fence, lighting, and additional features as identified.
- ❑ Tablet testing/support/training is being provided by the Office of Maintenance team and IT staff collaboratively.

# ArcGIS Collector Application



Login to DOT ArcGIS Online Account - View of Culvert Application Start Menu



- Series of similar apps available at login
- Apps use a series of pick list forms



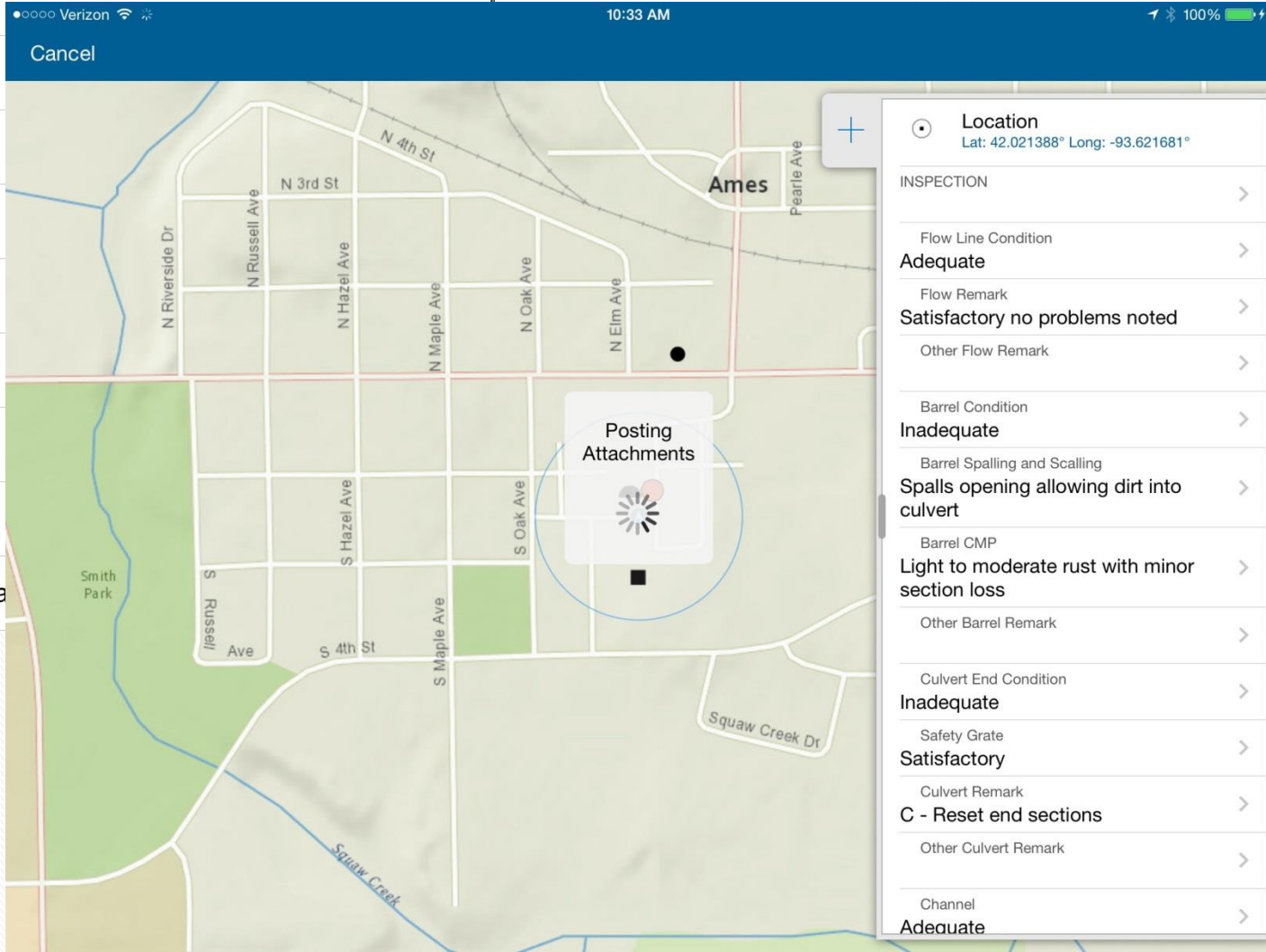
Cancel

Done

Material

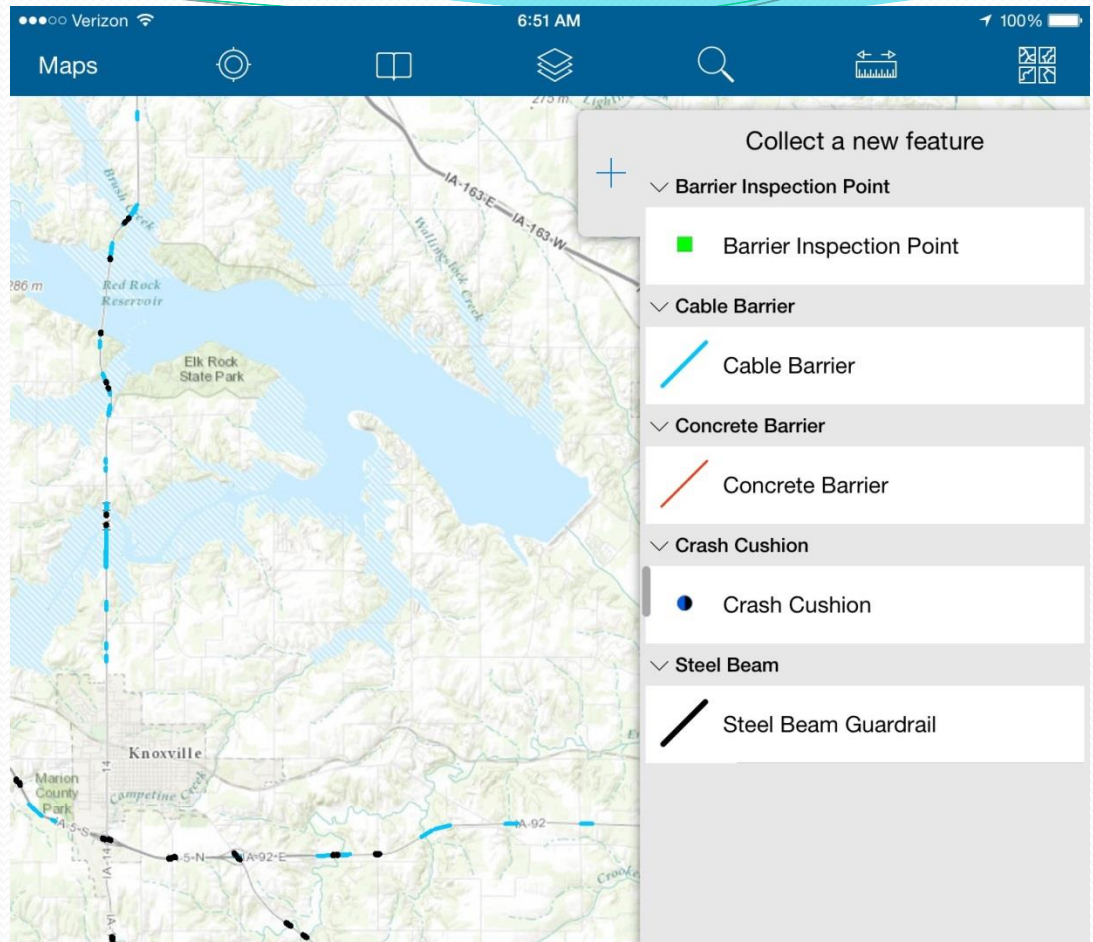
- Concrete
- Concrete Pipe
- Corrugated Metal Pipe
- Metal Sheet Pile
- Plastic
- Steel
- Steel/Plastic
- Wood Walls
- Combination Concrete Pipe/Meta

Menu provides data driven forms to minimize typing

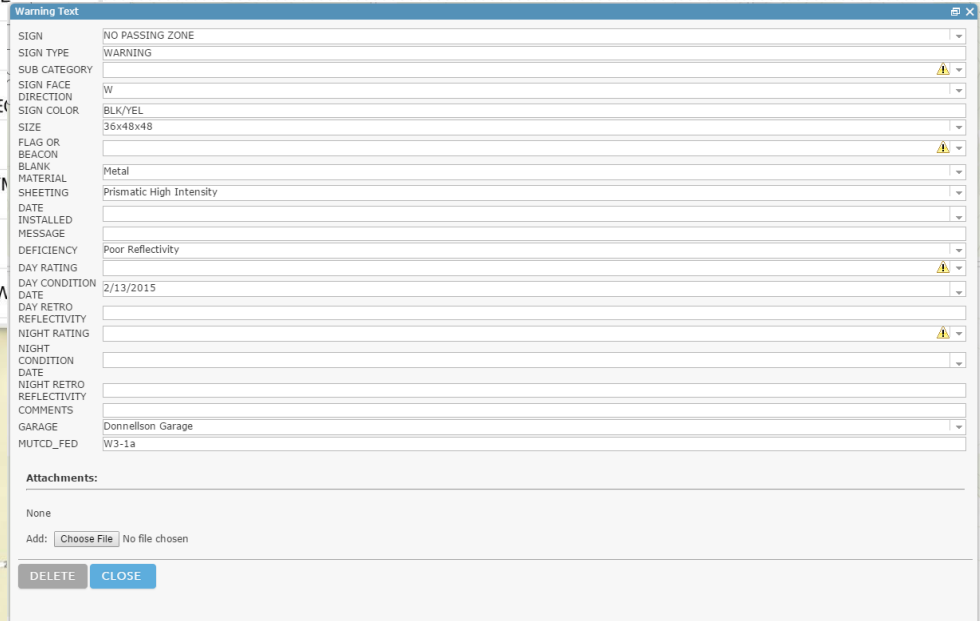
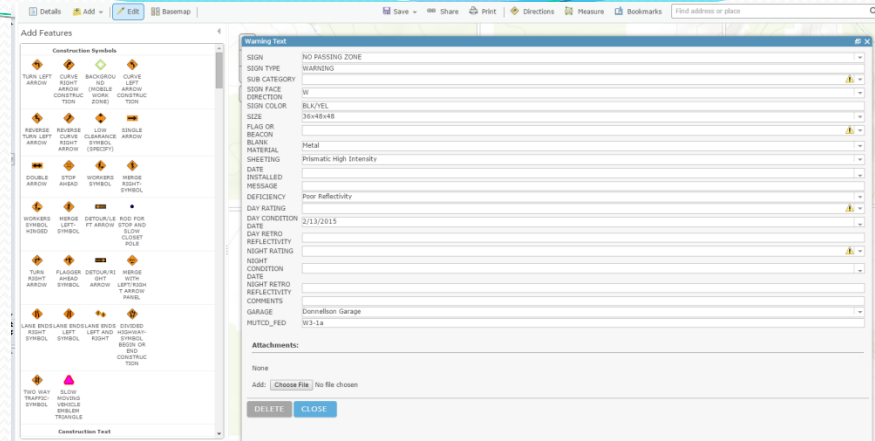
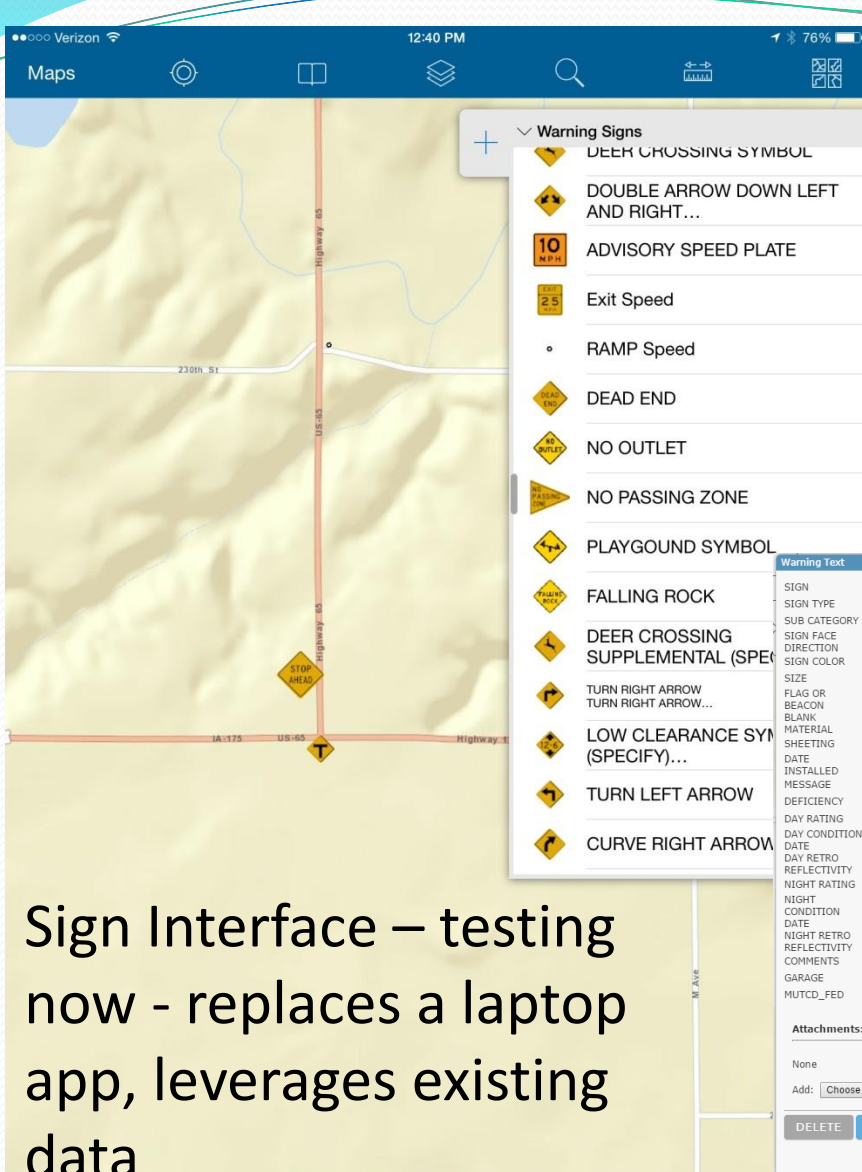


Add a photo to record and submit

As a result of a guardrail lawsuit the inventory of 9000+ guardrails on the primary system was possible in 2015 over two months because this tool was ready.



Guardrail and Crash Cushions Interface



Sign Interface – testing now - replaces a laptop app, leverages existing data

# Data Inspection



# Collector – Lessons Learned

## Setting Up Databases

- Schema is everything: subtypes, domains and custom symbology are really the only way to customize your experience in Collector. Related tables or feature classes do work well for inspections
- Use preexisting database field names with common naming standard for GIMS/RAMS, RMS, etc.
- Should always use FGDBs, not Shapefiles as they limit functionality
- Trying to port an existing dataset (sign inventory) to a new platform for collection/inventory has at times felt a little bit like trying to fit a round peg into a square hole. It has forced the issue of focusing on what is truly important (a good thing) when it comes to field data collection and trim the fat where we need to.

# Collector – Lessons Learned

## Pushing and Pulling Data

- If data is hosted in ArcGIS Online, this is a challenge with datasets this size. Only way to maintain attachments is to download as FGDB or pull using FME. Lots of attachments make this difficult and we've had to work with a few workarounds. Last Edit Date and Last Editor fields are also overwritten every time you push data back to AGOL.
- Fully SDE enabled related tables helps the pushing/pulling of data to honor subtypes and domains
- Pushing data back to source database has been a little painful. Once we work through that process and get it automated like the other asset features, we should be good, but for our first time through, not an enjoyable process.

# Collector – Lessons Learned

## Working with Attachments

- Works great for smaller datasets, but not ideal for datasets with thousands of pictures as it blows up the size of the database until it's almost unusable. Using FME to as a workaround to strip photos weekly based on edit date, but then unfortunately, there is not a good way to view the photos in Collector.
- Using DOT hosted external cloud server to store photos – limitations with hooking up the weblink to the features so the pictures are available through collector after extract
- Carefully set up related tables needed handle the pushing/pulling of data to honor subtypes and domains

# Collector – Lessons Learned

## Working with AGOL

- Configuring popups to reorder fields is buggy and cumbersome, but effective.
- Challenging to juggle updates to formatting with a live production system. Downtime is a bad thing but sometimes necessary when transitioning to the next version of our apps.
- Moving maps and apps from one account to another needs improvement. Experience of sharing data across the DOT organization and with our contractors has been a positive experience.



# Collector – Lessons Learned

## Limitations

- Still waiting for an enterprise AD authentication solution so the transition to editing from a transactional Oracle database still not possible
- With the sign inventory we have 350 different subtypes so identifying the best way to manage this – through multiple Collector updates – has been a challenge. New filter capabilities are a huge improvement in this area.
- Lack of Collector skip logic has forced some creative data management. Leveraging a suite of feature classes to handle different data questions in the forms.

# Collector – Lessons Learned

- Don't build your app in a vacuum. We have teams in IT development, our contractor, our core GIS team, in three business unit offices as well as a core group of field staff for feedback and testing. The best built app will have a lot of stakeholders involved in the process.
- Take your initial timeline and multiply it by three – “plowing the first pass takes time.”
- Leverage other people's knowledge who have gone before you so you can learn from failures and successes
- Once the process is set for one data type setting up the next one goes pretty quickly.

# Collector versus Survey123

- Not every data collection request requires something like Collector. Need to develop a series of questions for users to determine the best solution.
- If you need skip logic (if then form progression) but do not need more than a lat/long location rather than an interactive map, Survey123 is your best bet.
- It is pretty easy to configure after building one and there are great tutorials out there. It is however still in Beta and so not all the functionality is fully built out.

# ArcGIS Online Portal

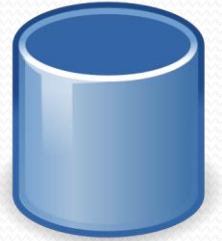
We have several interactive maps available through our ArcGIS Online portal <http://iowadot.maps.arcgis.com/home/>

The screenshot shows the homepage of the IOWADOT Interactive Map Portal. At the top, the text reads "INTERACTIVE MAP PORTAL" and "MANAGING IOWA'S TRANSPORTATION INFRASTRUCTURE". The IOWADOT logo is in the top right corner. Below this is a "Featured Apps" section with four app tiles:

- Turning Movements:** Shows a traffic light and a car at an intersection with arrows indicating movement.
- Track A Plow:** Shows a smartphone screen with a map and a plow icon.
- FY 2014-2017 STIP:** Shows a collage of transportation infrastructure images with the text "STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM".
- Cameras:** Shows a highway with a camera icon and the text "TRAFFIC CAMERAS".

# The Future - Beyond Inspections

- ❑ Collaboration and big picture mindset is key during development
- ❑ Data collected already being used for analysis and planning.
- ❑ Databases are being honed to allow information to be consumed at other points in the data life-cycle.
- ❑ Plans to leverage inventory information stored during design tabulation at letting as well as from as-built updates in the field under development.
- ❑ The Collector Apps being built for inspections can be spun off for use by Construction in their As-built process for the 2016 construction season.



# Transportation Infrastructure Life-Cycle

Planning



Design



Survey



Maintenance



GIS

Operations



Construction



# Groups Sharing Experiences

You are not in this alone!

- GSAM – GIS for Strategic Asset Management – Quarterly emerging technology webinars and information sharing – Next webinar Feb 18th
- GOTUG – Geospatial Online Transportation User Group – AASHTO sponsored – Quarterly webinars – Next one March 2<sup>nd</sup>
- Collector User Group – Mostly DOT and other government sector users interested in or using ESRI Collector – Quarterly Webinars – Kick off Feb 18th

# QUESTIONS?

Thank you!

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Additional Support Slides follow  
Not Included in Live Presentation

# Tablet Criteria

- ❑ Good screen visibility in outdoor situations (using adhesive anti-glare screens)
- ❑ Tablet form-factor in the 7" – 11" size range gives optimal trade-off of screen size and portability
- ❑ Reasonable first cost and life-cycle cost
- ❑ Compatible with the major operating system platforms (ie. iOS, Android, Windows)
- ❑ Compatible w/ Iowa DOT mobile device mgmt. solution (Airwatch)
- ❑ GPS enabled without a network connection
- ❑ Built in camera and microphone
- ❑ Touch enabled
- ❑ Long battery life (min. 6 hours)
- ❑ Wi-Fi enabled and/or mobile broadband enabled



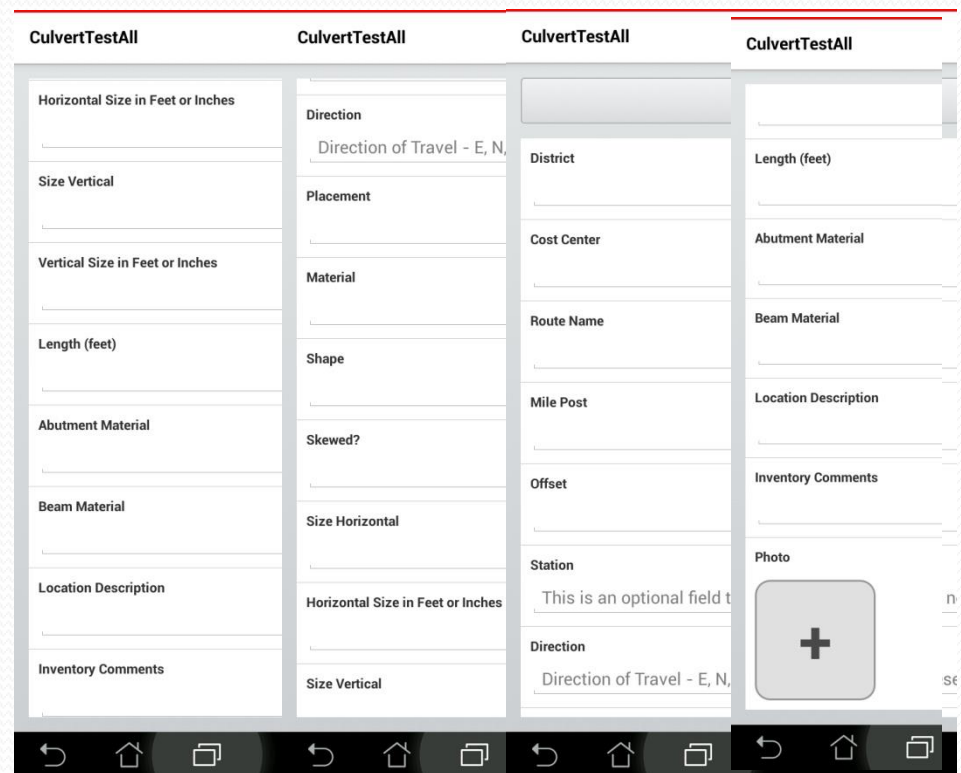
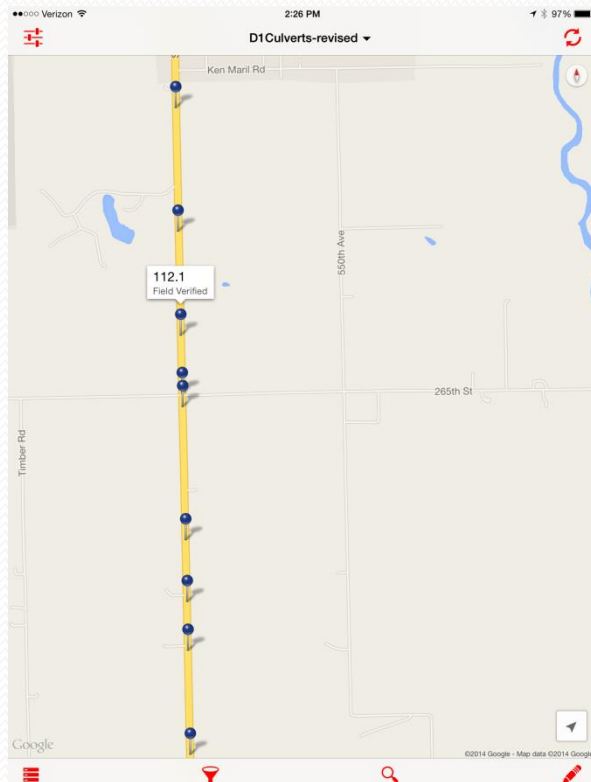
# Data Collection in the Field Supports Asset Management

What is Asset/Feature Management for the Field?

- ❑ Infrastructure Based Assets – Things you can see and touch in the field (roads, signs, bridges, etc.).
- ❑ Things that can impact the safety of the traveling public.
- ❑ Information collected about those features – design data, GPS data, business data such as physical attributes, current condition, etc.

# Past Short-term Solution

-  **fulcrum** – For fall and spring data collection we have an app called Fulcrum being used to collect culvert data.  
mobile location leverage



# Other Information Gathered by Maintenance and Construction Staff

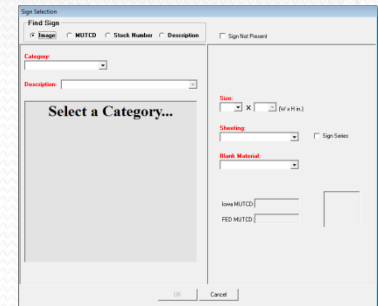
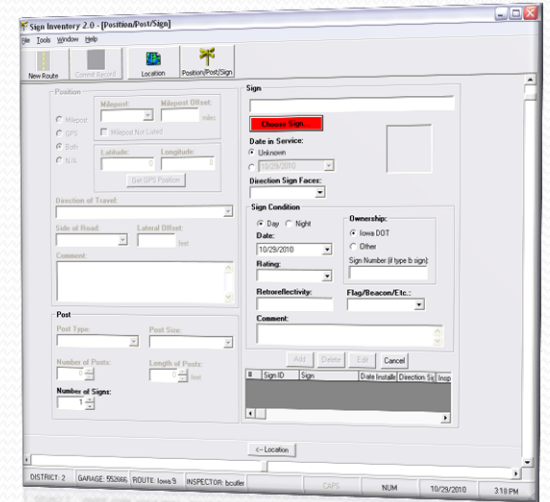
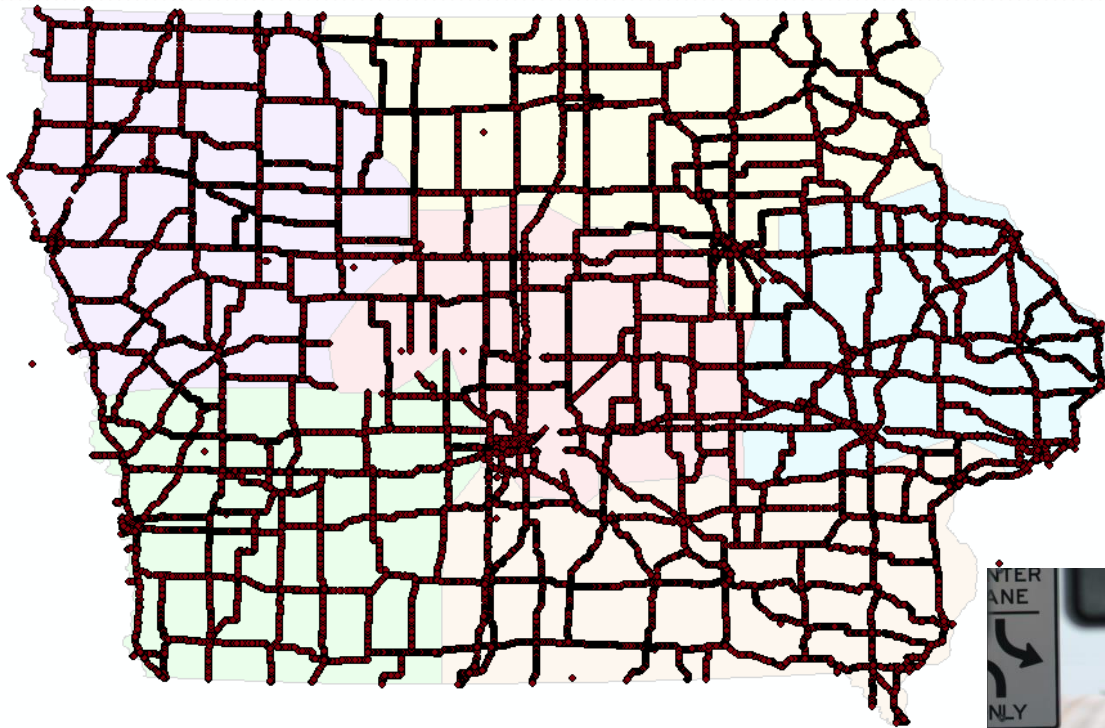
- Culvert Data within ROW (60% collected)
- Guardrail, Crash Cushions (95% collected)
- Signs (95% collected statewide)
- Lighting (45% collected statewide)
- Interstate Crossovers
- Roadway Closure Gates
- Access Locations (60% collected)
- Deer Kill Data (ten years)



# Inventory Versus Condition

- ❑ Potential to leverage a variety of sources for inventory management
  - ❑ Field Inventory – Maintenance and/or Construction Staff
  - ❑ Temp/Intern Roadview Inventory
  - ❑ Future LiDAR Inventory
  - ❑ Design Staff Inventory from Plans
- ❑ Leveraging field crews to manage condition information
  - ❑ Updated Instructional Memorandums
  - ❑ Updated Training Materials and Programing

# Sign Inventory Data



# Trials and Tribulations

- ❑ It is ALWAYS going to be more difficult and take longer than you think it will
- ❑ Hooking Up Oracle
- ❑ Related tables
- ❑ Collector vs a viewer vs reporting and analysis
- ❑ Other Useful Information
- ❑ Make sure you team is complete
- ❑ Engage the stakeholders



# Benefits of Change

- Evolving our processes
- Integration of data
- Updating our workflows
- Better understanding of processes from office to office.
- Efficiencies
- Able to embrace new technologies

# Rest Services Available

## CARS 511

<http://services.arcgis.com/8lRhdtTsQyJpO52F1/ArcGIS/rest/services/CARS511/FeatureServer>

## Snow Plows

<http://services.arcgis.com/8lRhdtTsQyJpO52F1/ArcGIS/rest/services/Operations/FeatureServer>

## Cameras

<http://services.arcgis.com/8lRhdtTsQyJpO52F1/ArcGIS/rest/services/cameras/FeatureServer>

## Local projects

[https://geonexusr.iowadot.gov/arcgis/rest/services/Local\\_Projects](https://geonexusr.iowadot.gov/arcgis/rest/services/Local_Projects)

## Bridge data

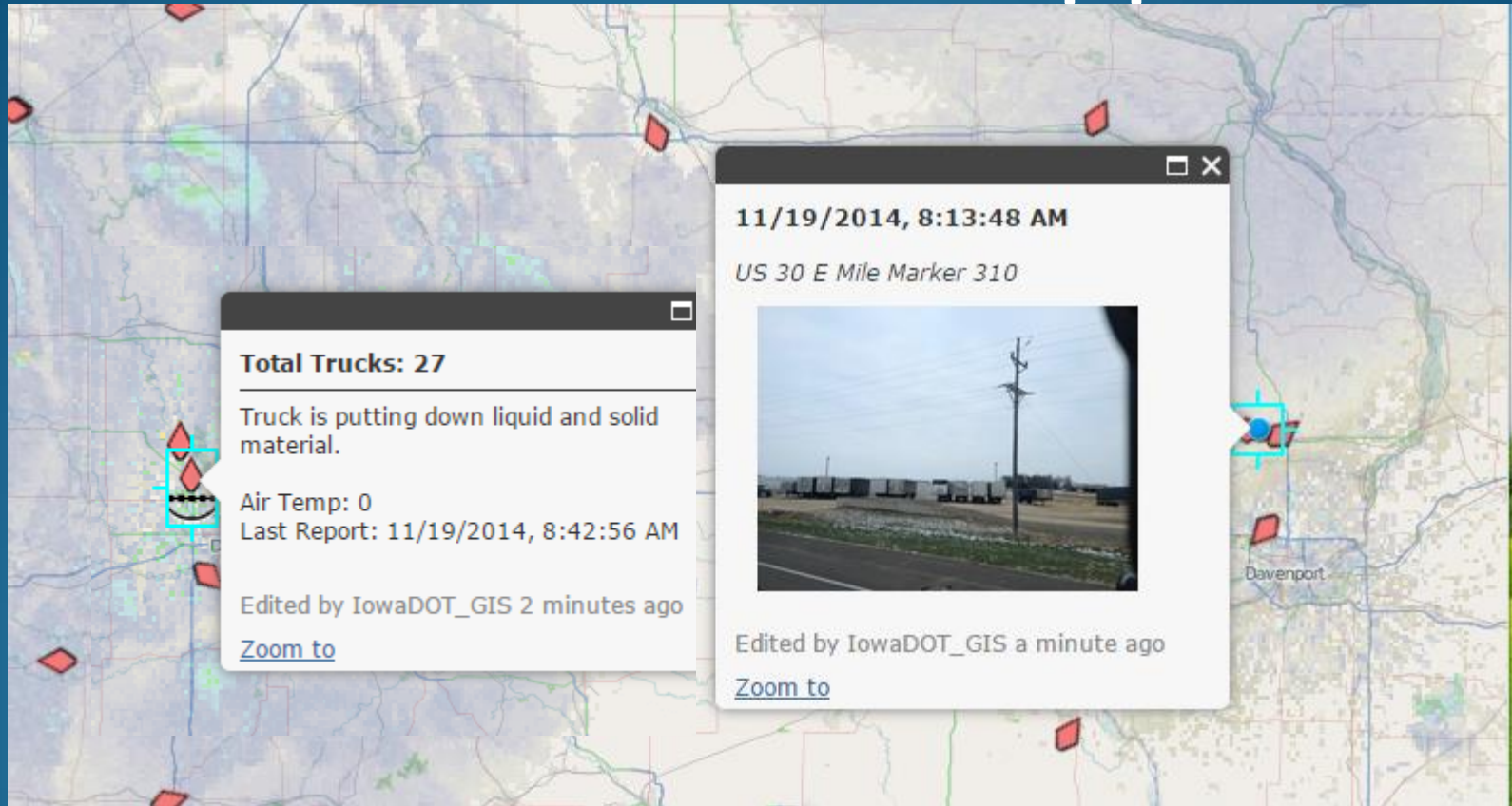
[https://geonexusr.iowadot.gov/arcgis/rest/services/Bridges\\_Structures/NBI/MapServer](https://geonexusr.iowadot.gov/arcgis/rest/services/Bridges_Structures/NBI/MapServer)

## Main Service Links

<http://services.arcgis.com/8lRhdtTsQyJpO52F1/ArcGIS/rest/services>

<https://geonexusr.iowadot.gov/ArcGIS/rest/services>

# Track a Plow App



Shows current plow locations, road conditions, weather and what plows are doing. Some trucks have a photo out the front window of the plow (400 of 900 trucks have cameras)

# GIS Technologies Available

GIS Site has an applications menu on the left and services menu.

<http://www.iowadot.gov/gis/default.htm>

The screenshot displays the GIS Site homepage layout. On the left is a vertical navigation menu with five items: GIS Home (highlighted), About GIS, Applications, GIS Services, and Downloads. The main content area features a header for 'Geospatial technologies' and a sub-section for 'Geospatial data news' containing seven bullet points of news items. On the right, there are two sidebars: 'REST services' with two bullet points and a folder icon, and 'Links' with five bullet points and a globe icon.

**Geospatial technologies**

**Geospatial data news**

- [New 10.22 ArcGIS Server rolled out](#)
- [Iowa 511 Events KML Layer now available](#)
- [Checkout our list of useful GIS services](#)
- [Check out our latest applications utilizing GIS that we have built](#)
- [Low distortion projections now available for download](#)
- [Iowa DOT projections now available for download](#)
- [2014-2018 Program Management \(five year\) in shapefile and KMZ formats](#)

**REST services**

Representational State Transfer (REST)

- [Iowa DOT REST directory](#)
- [DNR REST directory](#)

**Links**

- [Iowa DOT Interactive Map Portal](#)
- [Iowa Geographic Map Server](#)
- [The Federal Geographic Data Committee](#)
- [Geodata.gov](#)
- [Quick GIS task sheets](#)