

# Using ArcGIS Collector for Infrared Scanning and Tracking

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# ArcGIS Collector for IR Scanning and Tracking

## Presentation agenda

- History of the Infrared (IR) Project
- How we are using ArcGIS collector
- Setup options
- Reporting
- Next steps
- Conclusions



# History

- Started in 2005
  - IR sites list
    - Reported out of our asset management system
    - Resulted in a 3” binder full of printed information
    - Scan details were recorded by hand in this book
  - IR maps
    - Initially used a large printed transmission wall map for tracking
    - Highlight the substations and switch location when complete
    - Used GRE printed map book for navigation



# History, continued

- IR reports
  - IR camera's reporting software
    - Only for equipment that was running hotter than the acceptable range
    - Reports were printed and routed to transmission maintenance
  - Sites completed
    - The IR sites list was hand reconciled with open preventative maintenance work orders
    - Created missed locations paper reports for follow-up



# History, continued

- 2009
  - Investigated using ESRI ArcPad
    - Too small of a screen
    - Navigation not quite there
    - Not easy to update data
      - Dump of many GIS layers and sync back and forth



# History, continued

- 2010
  - Started using ESRI ArcMap
    - GPS puck for navigation and locating
  - Created a simplified “Location / Asset” data model
    - Made updating of data easy
  - Backup/copy of personal geodatabase
    - Used for reporting and tracking
  - Background GIS data
    - Aerials and GIS landbase
    - ESRI USA basemap and geo-coded locations
      - Used for navigation



# History, continued

- ArcMap IR tracking issues
  - Not intuitive to use
    - Lots of training and tech support for the field
    - Lost edits due to not saving or crashes
  - Synching of data
    - Didn't work well for a multi-user setup
  - Laptop issues
    - GPS puck didn't always work
      - Recreate the connection often
    - USB slot wore out/wouldn't stay plugged in
    - Cold weather issues



# History, continued

- IR points were not always updated at the time of the scan
  - GIS staff still performed updates on scans completed
  - Date time stamp could be a couple months off
- Reports
  - Preventative maintenance closeouts still a manual process...





# Current IR Process

- 2013
  - Started Using ArcGIS collector
  - Using on iPads with mobile data plans
  - Data resides within an enterprise SDE database
    - Continue utilizing simplified “Location / Asset” dataset
    - IR data updates are captured real time
  - Easy setup
    - Didn’t have to load landbase data and aerial photography
      - Utilized ESRI basemap services
    - Consumed existing standard GIS services from GRE



# Current IR Process - Data Model

- Initial Generation of IR Sites
  - All site layers in GIS were merged into an IR location point
    - Includes all substations, generation, switch sites, etc.
    - All contain a unique identifier of “Location” and a “X,Y” position
    - Geoprocessing tool of “Append” to create
  - All asset IR points were created based on the X,Y coordinate of the IR Location point
    - Joined asset points table to IR site points to generate point table



# Current IR Process

- Yearly start of project
  - Preventative maintenance (PM) work order generation
    - Export of IR locations and assets from asset management
    - Excel file
  - GIS verification
    - Verify all IR locations match new PM location report
      - New sites get added
      - No sites get removed (just definition queried out)
    - Verify all IR points match PM asset report
      - New assets are added, none are removed
      - Migrate last years IR scan data



# IR Locations Table

NAME	ALTNM	FACTYPE	DESCRPT	LOCATION	IR_SITE_COMPLETE	IR_SITE_DATEIN	IR_SITE_COND	IR_SITE_COMM	SITELOCK	LOCKINFO	OWNER	OWNERA	FACCODE	LOCKBOX	Shape *	Last Years Notes
SS3040	Fergus Ethanol Switch Site	Switch Site	FERGUS ETHAN	168421	C	3/2/2016 9:51:57 PM	31 degs overcast	<Null>			Great River Energy	GRE	SS3040	0	Point	<Null>
SS3080	Shell Lake Distribution Sub Tap Switc	Switch Site	SHELL LAKE, Dis	169698	C	1/26/2016 1:12:20 PM	18 degs overcast	<Null>			Great River Energy	GRE	SS3080	0	Point	<Null>
Hugo	Hugo SS	Switch Station	HUGO, Switching	166243	F	<Null>	<Null>	<Null>			Great River Energy	GRE	S115	0	Point	<Null>
SS3043	West Becker Distribution Sub Tap Swi	Switch Site	WEST BECKER, D	168543	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS3043	0	Point	<Null>
Pine City	Pine City	Transmission Substation	PINE CITY, Trans	165868	F	<Null>	<Null>	<Null>			Great River Energy	GRE	S004	0	Point	<Null>
SS2746	Sobieski Distribution Sub Tap Switche	Switch Site	SOBIESKI, Distrib	166421	X	2/10/2016 5:47:18 PM	3D cloudy	<Null>			Great River Energy	GRE	SS2746	0	Point	<Null>
SS2841	New Ulm Distribution Sub Tap Switch	Switch Site	NEW ULM, Distrib	166484	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2841	0	Point	<Null>
SS2587	River Hills Distribution Sub Tap Switch	Switch Site	RIVER HILLS, Dist	166332	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2587	0	Point	<Null>
SS2528	Litchfield Distribution Sub Tap Switch	Switch Site	LITCHFIELD, Distri	166296	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2528	0	Point	<Null>
SS2558	Schroeder Distribution Sub Tap Switc	Switch Site	SCHROEDER, Dis	167328	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2558	0	Point	<Null>
SS2820	Blackhawk-Cliff Rd Distribution Sub T	Switch Site	BLACKHAWK &	167428	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2820	0	Point	<Null>
SS2593	Dakota Heights Distribution Sub Tap S	Switch Site	DAKOTA HEIGHT	166337	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2593	0	Point	<Null>
SS2514	Dewing Distribution Sub Tap Switche	Switch Site	DEWING, Distribut	167309	C	1/20/2016 4:40:44 PM	16 degs overcast	<Null>			Great River Energy	GRE	SS2514	0	Point	<Null>
Miesville	Miesville SS	Switch Station	MIESVILLE, Switc	167230	F	<Null>	<Null>	<Null>			Great River Energy	GRE	S178	0	Point	<Null>
SS2807	Artichoke Distribution Sub Tap Switch	Switch Site	ARTICHOKE, Dist	166467	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2807	0	Point	<Null>
SS2711	Lake Mary Distribution Sub Tap Switc	Switch Site	LAKE MARY, Dist	166402	C	3/3/2016 5:22:43 PM	35 degs overcast	<Null>			Great River Energy	GRE	SS2711	0	Point	<Null>
SS3064	Woodland Distribution Sub Tap Switch	Other	WOODLAND, Dist	169356	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS3064	0	Point	<Null>
SS2806	Akron Distribution Sub Tap Switches	Switch Site	AKRON, Distributi	167421	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2806	0	Point	<Null>
Dickinson	Dickinson	Transmission Substation	DICKINSON, Tran	166850	F	<Null>	<Null>	<Null>			Great River Energy	GRE	S062	0	Point	<Null>
SS2523	Keewatin Distribution Sub Tap Switch	Switch Site	KEEWATIN, Distri	166293	C	1/11/2016 6:49:02 PM	-4 degs overcast	<Null>			Great River Energy	GRE	SS2523	0	Point	<Null>
SS2557	Sandstone Distribution Sub Tap Switc	Switch Site	SANDSTONE, Dis	166311	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2557	0	Point	<Null>
SS2973	Crystal Lake Distribution Sub Tap Swit	Switch Site	CRYSTAL LAKE,	166959	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2973	0	Point	<Null>
Le Homme Dieu	Le Homme Dieu SS	Switch Station	LE HOMME DIEU,	166263	C	3/3/2016 4:40:01 PM	30 degs overcast	<Null>			Great River Energy	GRE	S163	0	Point	<Null>
SS2741	Grove Distribution Sub Tap Switches	Switch Site	GROVE, Distributi	166418	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2741	0	Point	<Null>
Blaine	Blaine	Transmission Substation	BLAINE, Transmi	165944	F	<Null>	<Null>	<Null>			Great River Energy	GRE	S023	0	Point	<Null>
FE-FD C182	FE-FD C182 SS	Switch Station	FE-FD LINE SWIT	167528	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2993	0	Point	<Null>
SS2944	Delano Tap Switches	Switch Site	DELANO, Tap S	166541	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2944	0	Point	<Null>
Kettle River/Cap Bank	Kettle River SS/Cap Bank	Switch Station	KETTLE RIVER, S	166227	F	<Null>	<Null>	<Null>			Great River Energy	GRE	S097	0	Point	Change locks to new style G
SS2544	Pennock Distribution Sub Tap Switche	Switch Site	PENNOCK, Distrib	166305	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2544	0	Point	<Null>
SS2945	Silver Creek Distribution Sub Tap Swit	Switch Site	SILVER CREEK, D	166542	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2945	0	Point	<Null>
SS2881	Willow Creek Distribution Sub Tap Swi	Switch Site	WILLOW CREEK,	167367	F	<Null>	<Null>	<Null>			Great River Energy	GRE	SS2681	0	Point	Switch 1/2 mile south

InfraredPoints Locations (0 out of 671 Selected)



# IR Point Table

Location Name	LOCATIONTXT	Asset Number	WONUM	Name (CKT_POS_LO)	Name (Asset Desc)	IR_YN	IR_PRIO	IRDATEIN	IRCOND	IRCOMM	IRPhoto	PRI_2010	PRI_2011	PRI_2012	PRI_2013	PRI_2014	PRI_2015	Shape *	Retired	ASSETYPE	
DEER RIVER, Tran	185937	14045	M97203	REV METERING	Instrument Device, CURRENT, 200.0, 400.0, 5	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	
DEER RIVER, Tran	185937	14046	M97203	REV METERING	Instrument Device, CURRENT, 200.0, 400.0, 5	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	
DEER RIVER, Tran	185937	14047	M97203	69KV BUS PT	Instrument Device, POTENTIAL, 350.00, 600.	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	
DEER RIVER, Tran	185937	14048	M97203	69KV BUS PT	Instrument Device, POTENTIAL, 350.00, 600.	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	
DEER RIVER, Tran	185937	14049	M97203	69KV BUS PT	Instrument Device, POTENTIAL, 350.00, 600.	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	
DEER RIVER, Tran	185937	15092	M97203	21NB3	Coupling Capacitor, 4CD31D06S1N6, CD31D,	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CCVT	
DEER RIVER, Tran	185937	15093	M97203	21NB2	Coupling Capacitor, 4CD31D06S1N6, CD31D,	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CCVT	
DEER RIVER, Tran	185937	26516	M97203	21WSM6	Switch, Group-Operated, AIR BREAK, H1156	Y	4	1/13/2016 6:	9 degs ov	Center ph	2152/2153	4	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	26517	M97203	21NS1	Switch, Group-Operated, SPST, 69.00 kV, 6	Y	4	1/13/2016 6:	9 degs ov	North pha	2156/2157	0	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	26518	M97203	21NS2	Switch, Group-Operated, SPST, 69.00 kV, 6	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	0	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	26519	M97203	21NS3	Switch, Group-Operated, SPST, 69.00 kV, 6	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	3	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	26520	M97203	21NS4	Switch, Group-Operated, SPST, 69.00 kV, 6	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	0	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	309172	M97203	21WCS5	Breaker, 2030, 115,000.00 Volts, 1,200.00 A	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	BKR
DEER RIVER, Tran	185937	309213	M97136	T1	Transformer, AUTOTRANSFORMER, 115,000	Y	0	1/13/2016 6:	9 degs ov	<Null>	2154/2155	-1	-1	-1	-1	0	0	0	Point	N	TR
DEER RIVER, Tran	185937	314665	M97203	21NB5	Breaker, SPS2-72.5-40-2, 69,000.00 Volts, 2	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	BKR
DEER RIVER, Tran	185937	315600	M97203	No Name CAP	Capacitor, EX7L, 9,600.00 KVAR, 9.96 kV	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	CAP
DEER RIVER, Tran	185937	317439	M97203	CAP BANK - C PHASE	Instrument Device, POTENTIAL, 3.20, 1.00, V	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	CT/PT
DEER RIVER, Tran	185937	317443	M97203	CAP BANK - A PHASE	Instrument Device, POTENTIAL, 3.20, 1.00, V	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	CT/PT
DEER RIVER, Tran	185937	317444	M97203	CAP BANK - B PHASE	Instrument Device, POTENTIAL, 3.20, 1.00, V	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	CT/PT
DEER RIVER, Tran	185937	351804	M97203	BOSWELL/NASHWAUK	Line Tuner, 4CL02B1G1NL	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	TRAP
DEER RIVER, Tran	185937	355606	M97203	BOSWELL/GREENWAY	Coupling Capacitor, DDB-123, 115,000.0 Volt	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	CCVT
DEER RIVER, Tran	185937	356234	M97203	21NA2	Switch, Hookstick-Operated, SPST, 69.00 kV	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	356235	M97203	21NC2	Switch, Hookstick-Operated, SPST, 69.00 kV	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	4	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	356236	M97203	21NA3	Switch, Hookstick-Operated, SPST, 69.00 kV	Y	3	1/13/2016 6:	9 degs ov	West and	2150/2151	4	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	356237	M97203	21NC3	Switch, Hookstick-Operated, SPST, 69.00 kV	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	4	0	0	0	0	3	0	Point	N	SW
DEER RIVER, Tran	185937	356238	M97203	21NA4	Switch, Hookstick-Operated, SPST, 69.00 kV	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	4	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	356239	M97203	21NC4	Switch, Hookstick-Operated, SPST, 69.00 kV	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	4	0	0	0	0	0	0	Point	N	SW
DEER RIVER, Tran	185937	356240	M97203	21NA5	Switch, Hookstick-Operated, SPST, 69.00 kV	Y	0	1/13/2016 6:	9 degs ov	<Null>	<Null>	-1	-1	-1	-1	0	0	0	Point	N	SW
BLAINE, Transmiss	185944	13973	M97162	69KV BUS	Instrument Device, POTENTIAL, 350.00, 600.	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	
BLAINE, Transmiss	185944	14061	M97162	69KV BUS	Instrument Device, POTENTIAL, 350.00, 600.	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	
BLAINE, Transmiss	185944	14062	M97162	69KV BUS	Instrument Device, POTENTIAL, 350.00, 600.	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	-1	-1	-1	-1	0	0	Point	N	CT/PT	

(0 out of 6113 Selected)

InfraredPoints



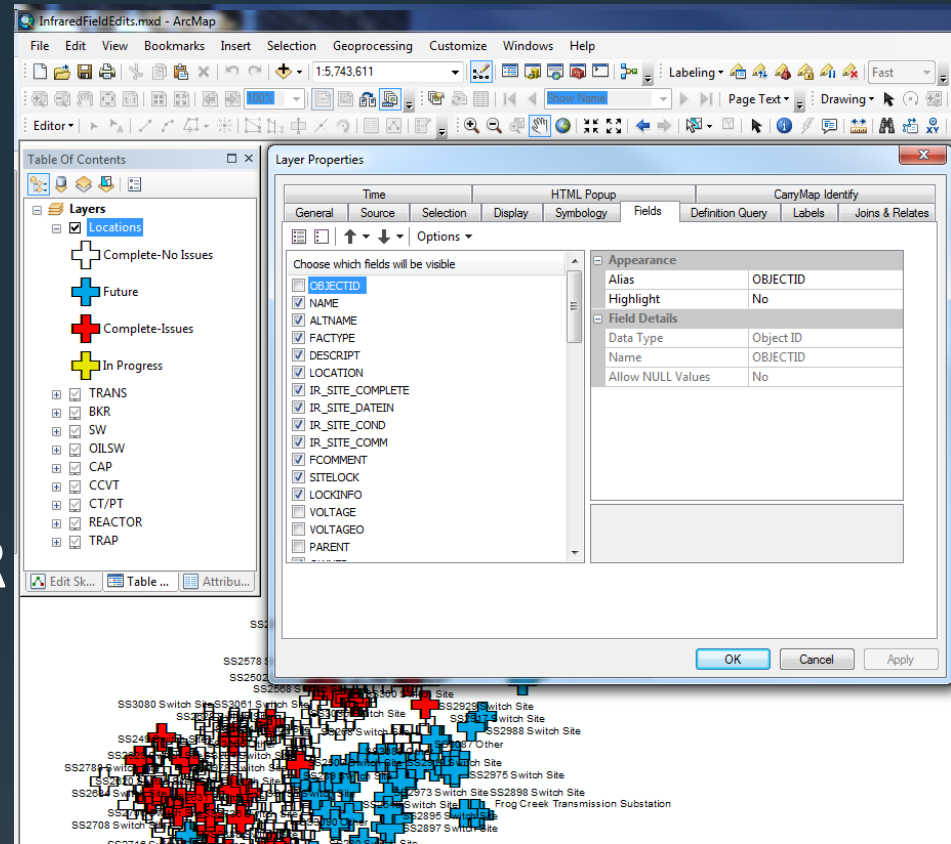
# IR Hosted Services

- Infrared Field Edits
  - Feature access for query and update only
    - Locations
    - IR Points
      - Definition query to layers of transformers, breakers, switches, ...
- Mapping access layers (view only-reference)
  - GRE and foreign transmission layers
  - Service areas
  - Cooperative areas



# Setting up the ArcMap Project

- Set attributes to display – field on/off
- Set desired attributes to read only
- Break IR points into types using definition queries
  - Simplifies finding the IR point





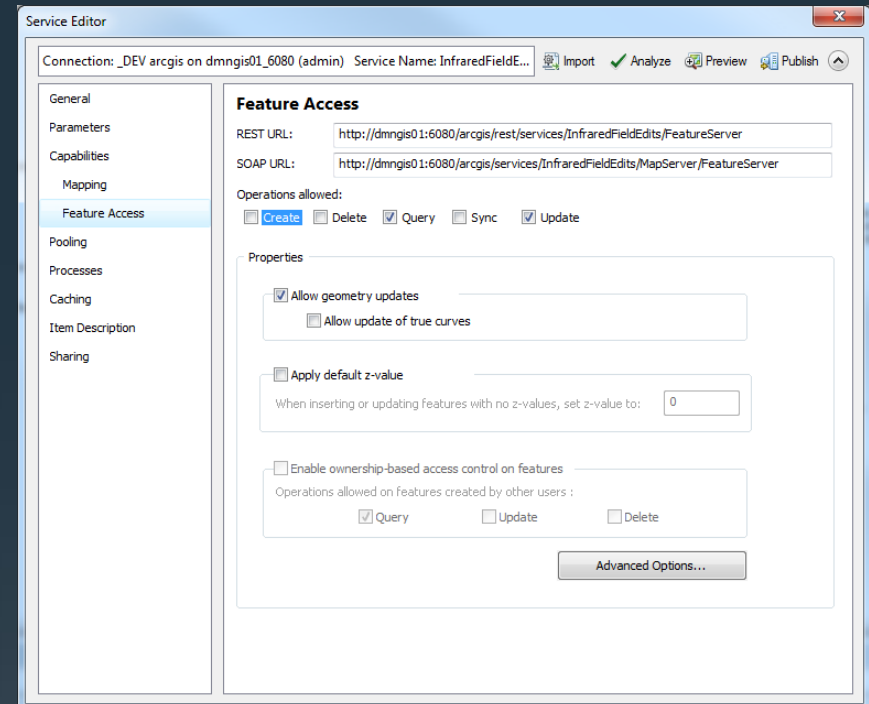
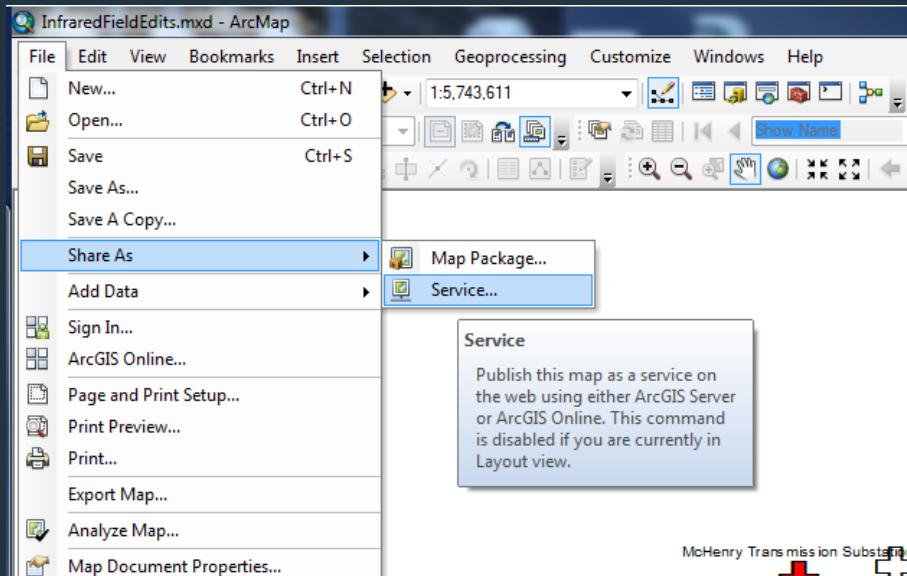
# Creating the service

## Create services in ArcMap

- Share as a service
- Set the parameters
- Publish

## Service properties

- Feature access
  - Only query and update
  - No insert or delete







# ArcGIS Online


http://gre.maps.arcgis.com/home/index.html

Great River Energy Online

File Edit View Favorites Tools Help

Home Gallery Map Scene Groups My Content My Organization

Andrew GRE...

 **Great River Energy Online**

Great River Energy is a G&T Cooperative based in Maple Grove Minnesota. We provide whole sale power to 28 distribution cooperatives serving two thirds of the state.

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# Create the Map

- Add layers from server

The screenshot displays the ArcGIS web map viewer interface. The browser address bar shows the URL: <http://gr.maps.arcgis.com/home/webmap/viewer.html?webmap=fa893723d24d486599fd3b377c2d12c>. The page title is "GRE Infrared Collector". The user is logged in as "Andrew GRE-MG".

The interface includes a search bar at the top right with the text "Find address or place". Below the search bar is a toolbar with icons for Save, Share, Print, Directions, Measure, and Bookmarks. The main map area shows a geographic view of the Great Plains region, including North Dakota, South Dakota, and Wisconsin. The map is overlaid with a red line and numerous red and blue cross markers.

On the left side, there is a "Search for Layers" panel. The "Find:" field contains "(e.g., parcels, fire...)" and the "GO" button is highlighted. The "In:" dropdown is set to "A GIS server". The "URL:" field contains <http://gis.greenergy.com/arcgis/rest/services>. Below this, it states "66 Results Found".

The list of results includes:

- EnvironmentalLandBaseSoils Folder: Landbase Add
- LandbaseFeatures Folder: Landbase Add
- PLS Folder: Landbase Add
- CoopWorkArea Folder: PreventativeMaintenance Add
- InfraredFieldEdits (Feature Service) Folder: PreventativeMaintenance Add
- InfraredFieldEdits Folder: PreventativeMaintenance Add
- InfraredTracking Folder: PreventativeMaintenance Add
- GREAVL (Feature Service) Folder: RealTimeFeed Add
- GREAVL Folder: RealTimeFeed Add
- ClearanceNotesEdit (Feature Service) Folder: Schematic Add
- ClearanceNotesEdit Folder: Schematic Add

At the bottom of the search panel, there is a blue button labeled "DONE ADDING LAYERS".

The bottom of the page contains the Esri logo and copyright information: "Esri, DeLorme, FAO, NOAA, USGS, EPA, NPS | United Service Group - Great River Energy".



# Create Pop-up's for Layers

## Configure Pop-up

### InfraredFieldEdits - Locations

Show Pop-ups

#### Pop-up Title

Locations: {NAME}

#### Pop-up Contents

Display: A list of field attributes

These field attributes will display:

NAME {NAME}  
ALTNAME {ALTNAME}  
DESCRIPT {DESCRIPT}  
LOCATION {LOCATION}

#### Configure Attributes

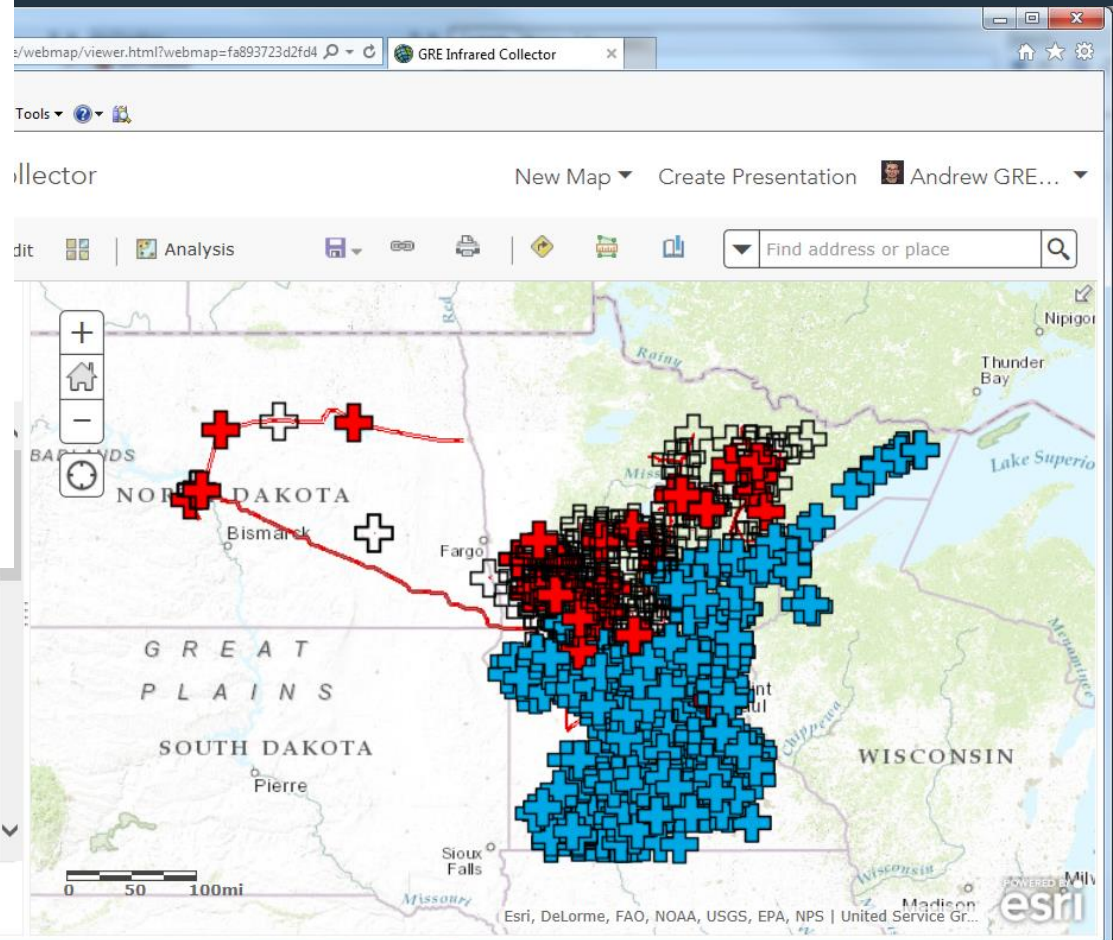
Show feature attachments as links

InfraredFieldEdits - BKR

InfraredFieldEdits - SW

InfraredFieldEdits - OILSW

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# Setup Search Queries

Application Settings Select the tools and capabilities to enable in applications that access this web map

- Routing
- Measure Tool
- Basemap Selector
- Find Locations [-]

Hint text

- By Layer

Layer	Field	Condition	
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="NAME"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>
<input type="text" value="InfraredFieldEdits -"/>	<input type="text" value="Name (CKT_POS_LC)"/>	<input type="text" value="Contains"/>	<input checked="" type="checkbox"/>

[ADD LAYER](#)

- By Address



# Share the Map

The screenshot shows a web browser window with the URL <http://gre.maps.arcgis.com/home/webmap/viewer.html?webmap=fa893723d2fd4>. The browser title is "GRE Infrared Collector". The "Share" dialog box is open, displaying the following options:

- Choose who can view this map.**  
Your map is currently shared with these people.
- Everyone (public)
- Great River Energy Online
- Members of these groups:
  - GRE Land Rights
  - Great River Energy Mobile Mapping
  - Infrared
  - System Operations

**Link to this map**  
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Share current map extent

**Embed this map**  
[EMBED IN WEBSITE](#) [CREATE A WEB APP](#)

Note: To embed your map, you must share it with Everyone.

At the bottom of the browser window, there is a footer with the text: "Esri, DeLorme, FAO, NOAA, USGS, EPA, NPS | United Service Gr..." and the Esri logo.



# Collector Notes

- Runs on mobile devices
  - Tablets, phones, Windows 10 computers/tablets
  - Apple, Android, Windows 10
- Requires
  - One layer must be a Feature access type
    - Editable
  - A named user in a ArcGIS organizational account
- Free app
- Install from the app store's



# Collector

- Log in to ArcGIS collector
- Open up the GRE infrared collector map
- Pan / zoom to the area you intend to do work in
- Search for an IR site
  - Use the navigation to get to the desired site
- **Blue plus sign symbols = remaining sites**
  - Typically do northern system in the winter
  - Metro system in the summer
  - Southern system in the fall
  - Generators when active



# Collecting IR Data

- Perform IR Scans
  - If no issues found only update the IR site attributes
    - Status Complete - No Issues
    - IR Date choose today's date
    - IR Site Condition – log the current weather at the location
    - IR Site Comments – log any notes about the site
  - If issues are found
    - Do above but mark as Status **Complete-Issues**
    - Find IR point of device with elevated reading
      - IR Priority range: 1- Critical 70° over to 4- low 20° over ambient
      - IR Comment – Information on the probable cause
      - IR Photo – photo number for the report



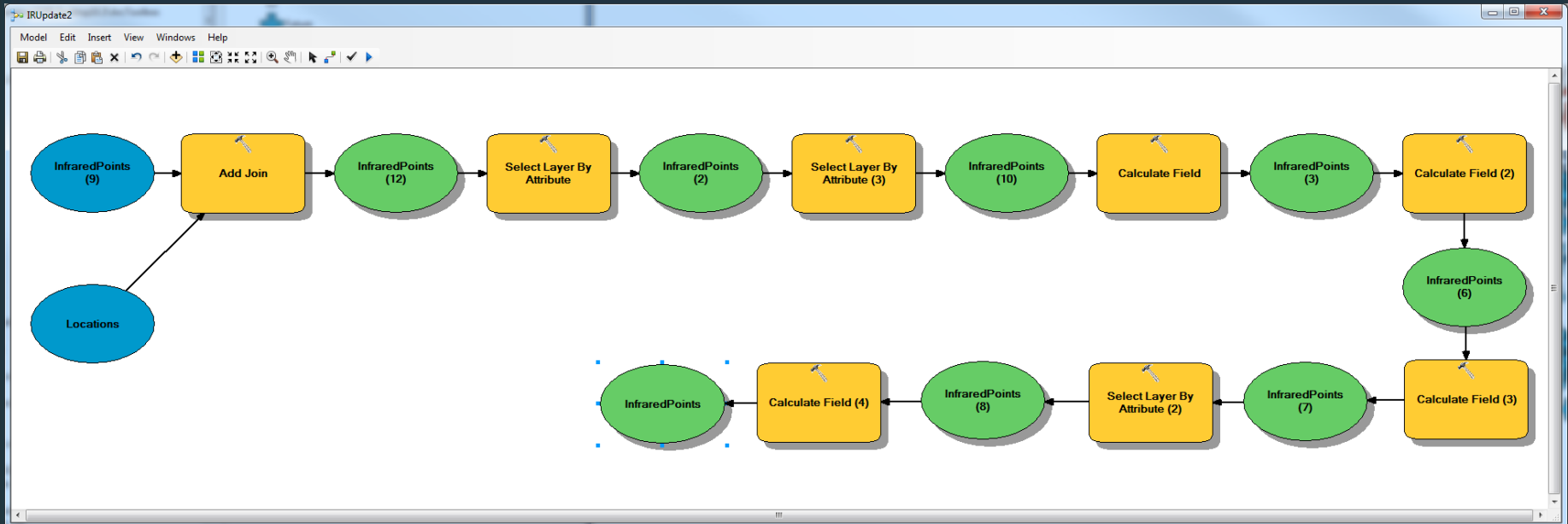


# ArcGIS Collector Demo



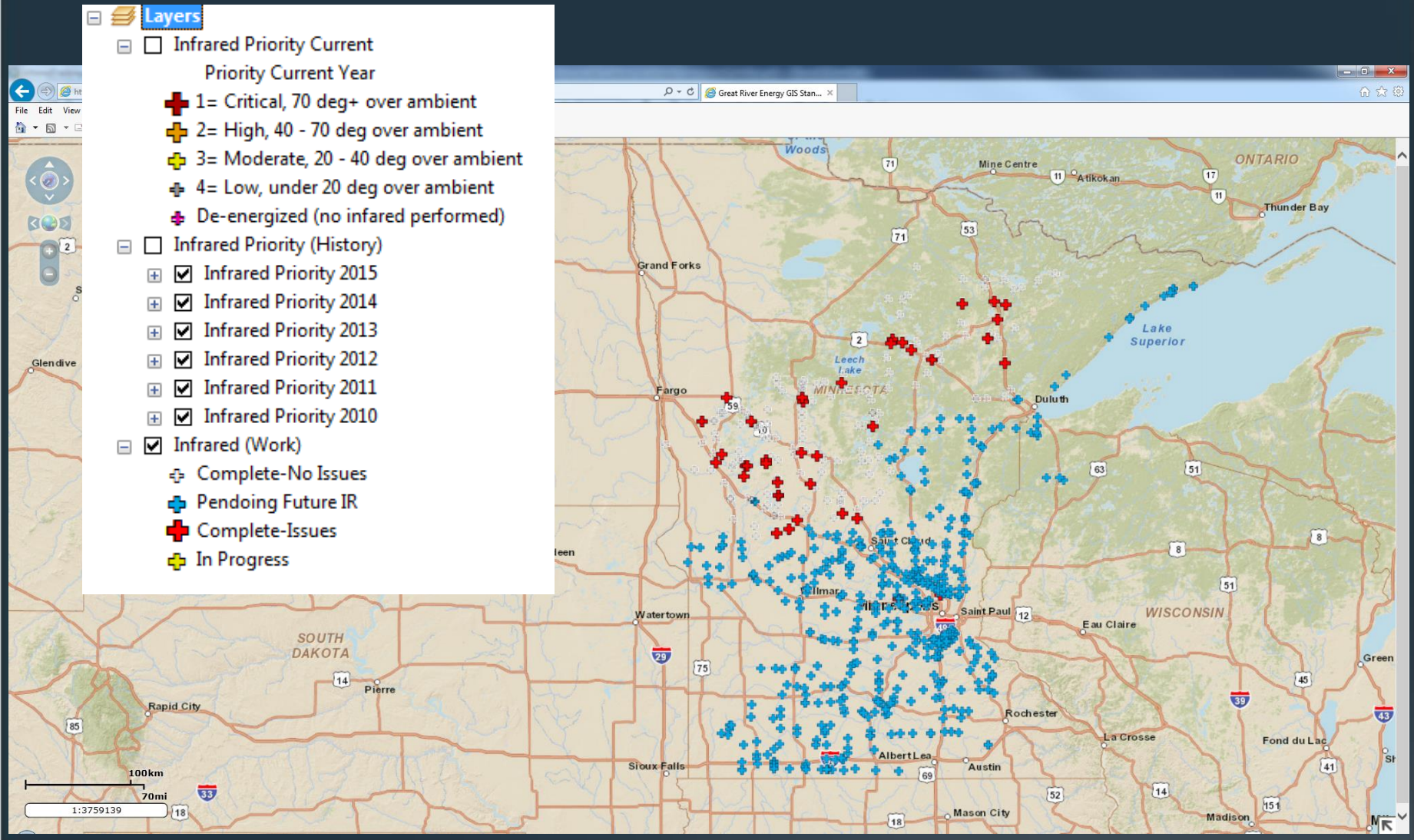
# Server geoprocessing

- Used to attribute IR points data based on the IR location's attributes
  - Assets that have no issues
  - Saves time by not having to fill information on each piece of equipment






# IR Tracking View






# IR Reports

**INFRARED ELECTRICAL SURVEY**



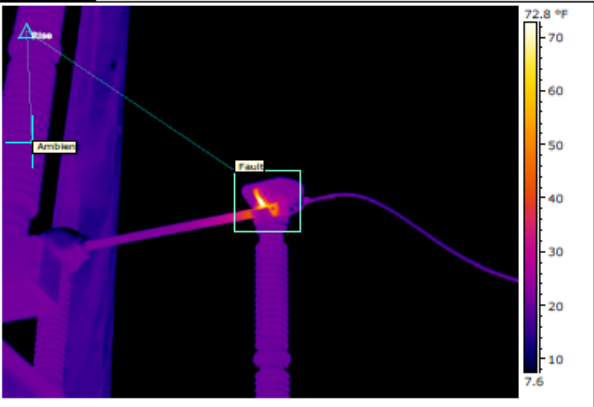
**CUSTOMER:**  
GREAT RIVER ENERGY

**Photo and Identification**



Location	Coal Creek Yard
Equipment	6THC19
Possible Cause	Loose/Dirty Connection
Repair Priority	Critical
Filename	IR_2375.jpg
Fault Max. Temperature	99.9 °F
Ambient Temperature	20.2 °F
Rise Value	79.7 °F

**Thermogram** 2/23/2016



**Comments:**

South Phase West Side

Repaired by: ..... date: .....

Comment: .....


Location of Fault - Top Phase Bolted Pad

**INFRARED ELECTRICAL SURVEY**




**CUSTOMER:**  
GREAT RIVER ENERGY

**Photo and Identification**



Location	Coal Creek
Equipment	Trans 71 - 28665
Possible Cause	Information
Repair Priority	N/A
Filename	IR_2381.jpg
Tank Max. Temperature	67.0 °F
LTC_or_Tank Temperature	27.1 °F
Rise Value	39.9 °F

**Thermogram** 2/23/2016



**Comments:**

All other equipment checked OK in substation, variations between bushings and tanks were 1-4 degree's F difference on any one piece of equipment.

Repaired by: ..... date: .....

Comment: .....



# GIS Reporting

## Infrared Issues February 2016

Description: COAL CREEK, Transmission, S061, Owned By GRE Location 166083  
 Conditions 35d sunny Date Inspected 2/23/2016 5:05:05 PM

CKT_POS_LOC	IR Priority	IR Comments	Photo #
61RSM1	4= Low, under 20 deg over ambient	South phase.	2399
61RSM3	3= Moderate, 20 - 40 deg over ambient	South phase.	2377
ZA.Z1.ZHP	1= Critical, 70 deg+ over ambient	Phase 3, bank 1, row 1, cap 5.	2397
61RSM21	3= Moderate, 20 - 40 deg over ambient	West phase, south side.	2393
P2U1QEN1	4= Low, under 20 deg over ambient	N/A	2403
61RC16	3= Moderate, 20 - 40 deg over ambient	East phase, south side.	2395
61RC9	1= Critical, 70 deg+ over ambient	East & west phase, north side.	2383, 2385
61RC19	1= Critical, 70 deg+ over ambient	South phase, west side.	2375

Description: MCHENRY, Transmission, S032, Owned By GRE Location 166008  
 Conditions 45d sunny Date Inspected 2/22/2016 5:03:04 PM

CKT_POS_LOC	IR Priority	IR Comments	Photo #
32RC3	1= Critical, 70 deg+ over ambient	South and north phase west side	2343, 2345, 2347
32XA1	1= Critical, 70 deg+ over ambient	All three phases	2361
32WA1	2= High, 40 - 70 deg over ambient	West phase north and south side	2363, 2365
32WC1	2= High, 40 - 70 deg over ambient	East and center phase phase	2357, 2361
32RSM3	2= High, 40 - 70 deg over ambient	North phase east side south phase east side and center phase west side	2349, 2351, 2353
32WC2	3= Moderate, 20 - 40 deg over ambient	West phase	2367

## Infrared Sites Completed February

NAME	Location
<b>Balta</b> BALTA, Transmission, S209, Owned By GRE Site Status Complete-No Issues Date Inspected 2/22/2016 8:48:13 PM Site Conditions 42d sunny Comments <null>	166206
<b>Cambridge</b> CAMBRIDGE, Generation/Transmission, S002, Owned By GRE Site Status Complete-No Issues Date Inspected 2/29/2016 5:27:34 PM Site Conditions 15d windy Comments <null>	165855
<b>Coal Creek</b> COAL CREEK, Transmission, S061, Owned By GRE Site Status Complete-Issues Date Inspected 2/23/2016 5:05:05 PM Site Conditions 35d sunny Comments <null>	166083
<b>Compton</b> COMPTON, Switching Station, SS171, Owned By GRE Site Status Complete-No Issues Date Inspected 2/10/2016 2:07:05 PM Site Conditions 0d cloudy Comments <null>	166734
<b>Eagle Bend/Cap Bank</b> EAGLE BEND, Switching Station, SS162, Owned By GRE Site Status Complete-No Issues Date Inspected 2/10/2016 3:34:31 PM Site Conditions 0d cloudy Comments <null>	167214
<b>McHenry</b> MCHENRY, Transmission, S032, Owned By GRE Site Status Complete-Issues Date Inspected 2/22/2016 5:03:04 PM Site Conditions 45d sunny Comments <null>	166008

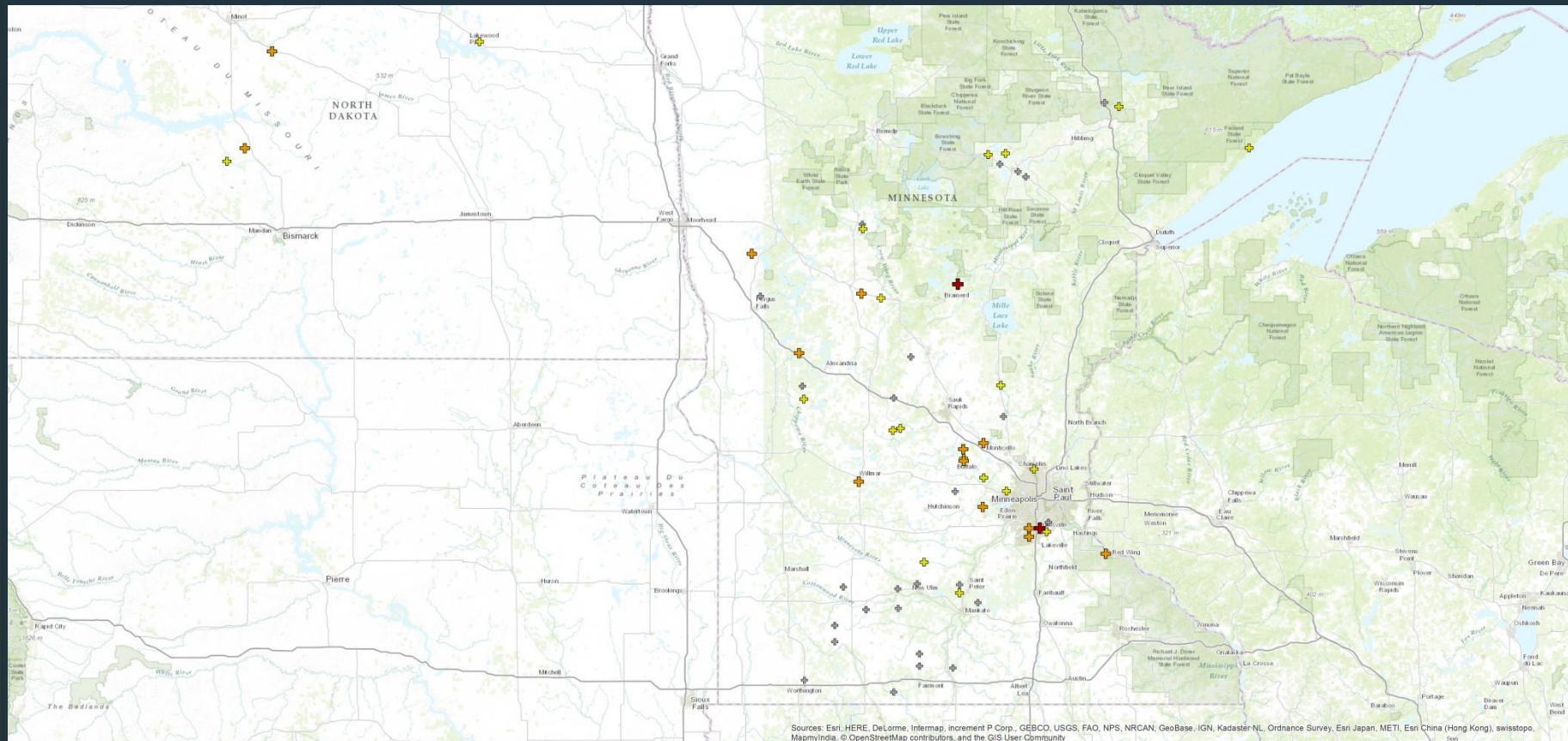


# Future Tasks

- Synch complete in asset management
  - Close PM work order if site is scanned and no issues found
  - Auto generate of maintenance WO's of sites with issues
- Equipment replacement recommendation
  - Analyze six years worth of IR data
  - Trend analysis
  - Aging infrastructure

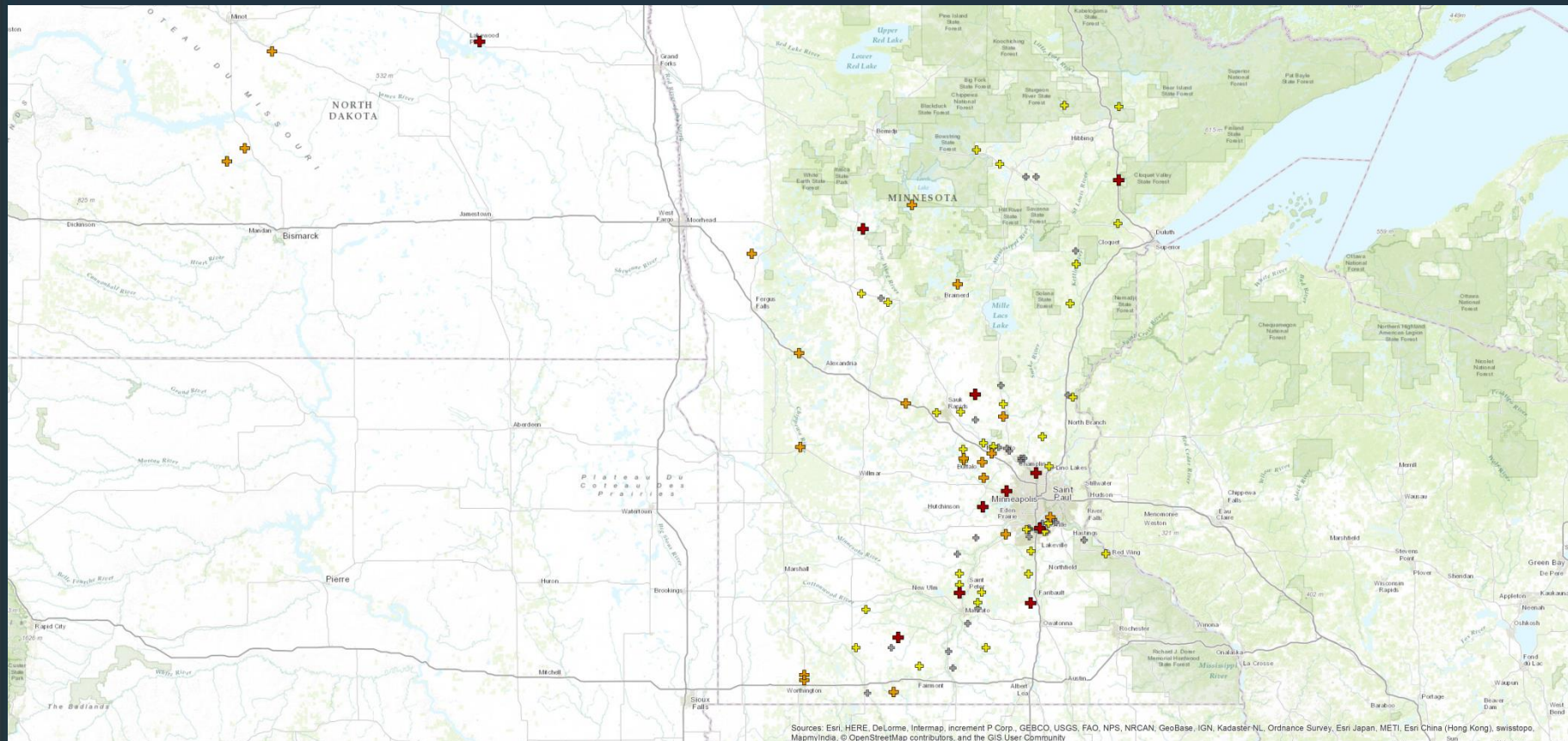


# IR Past Status 2010





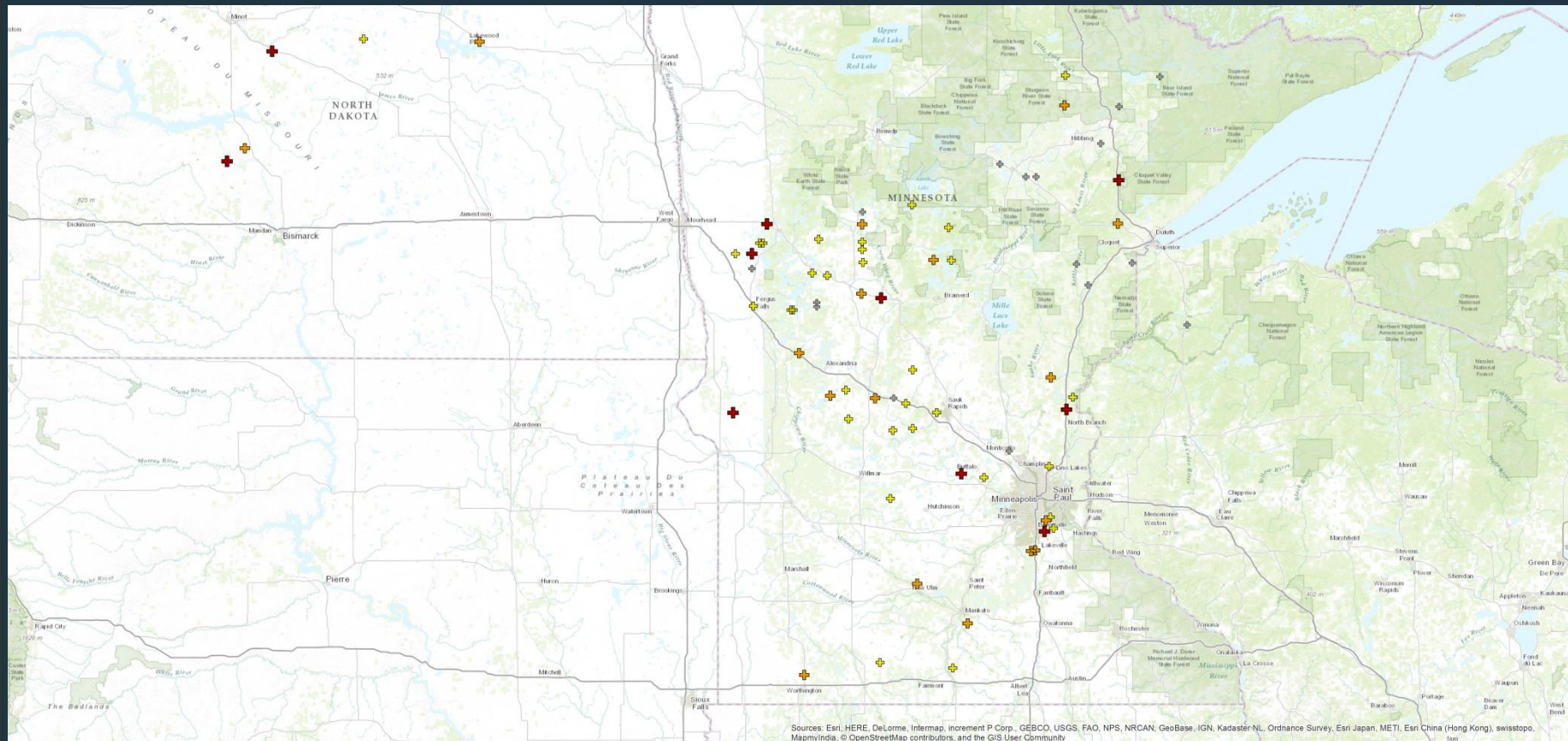
# IR Past Status 2011





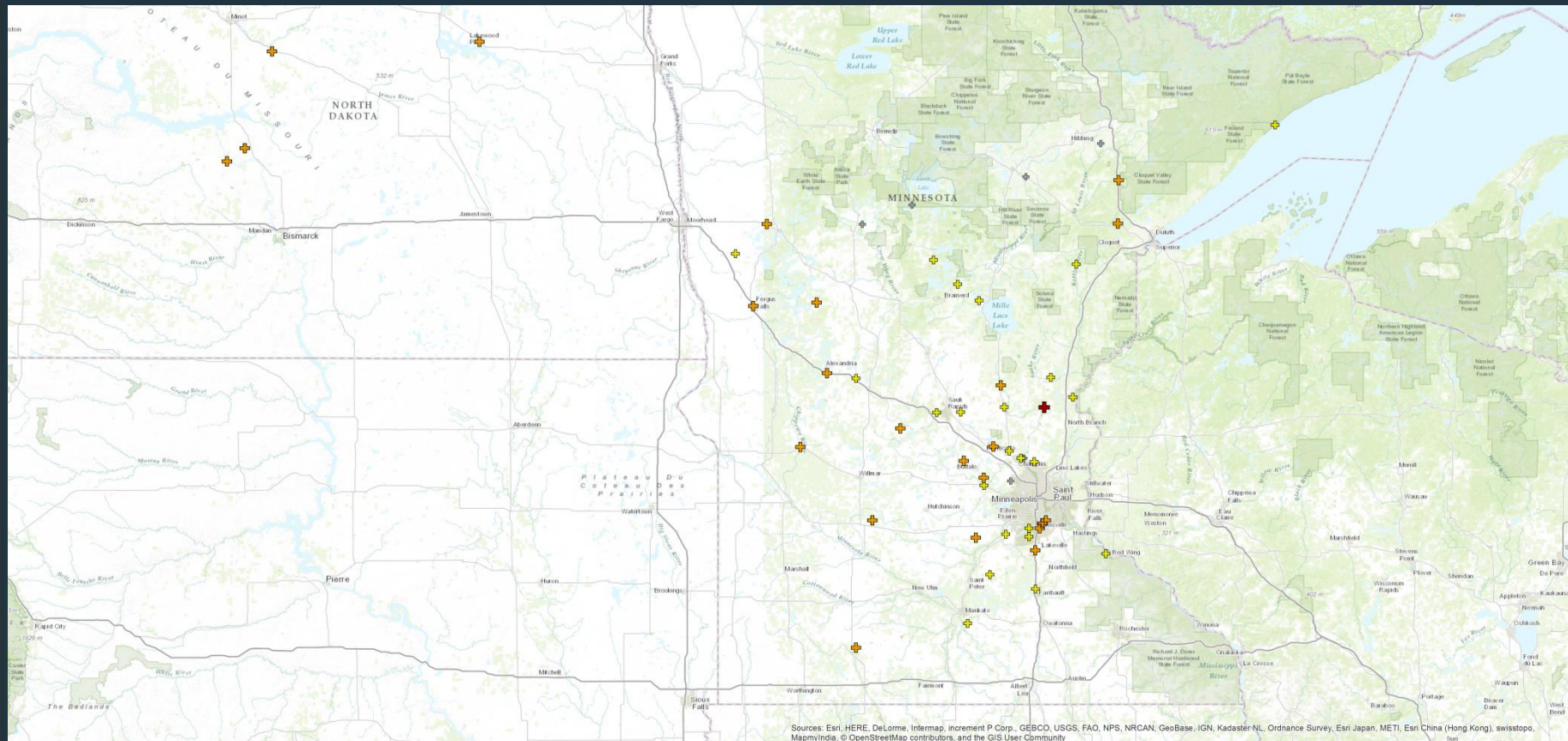


# IR Past Status 2012



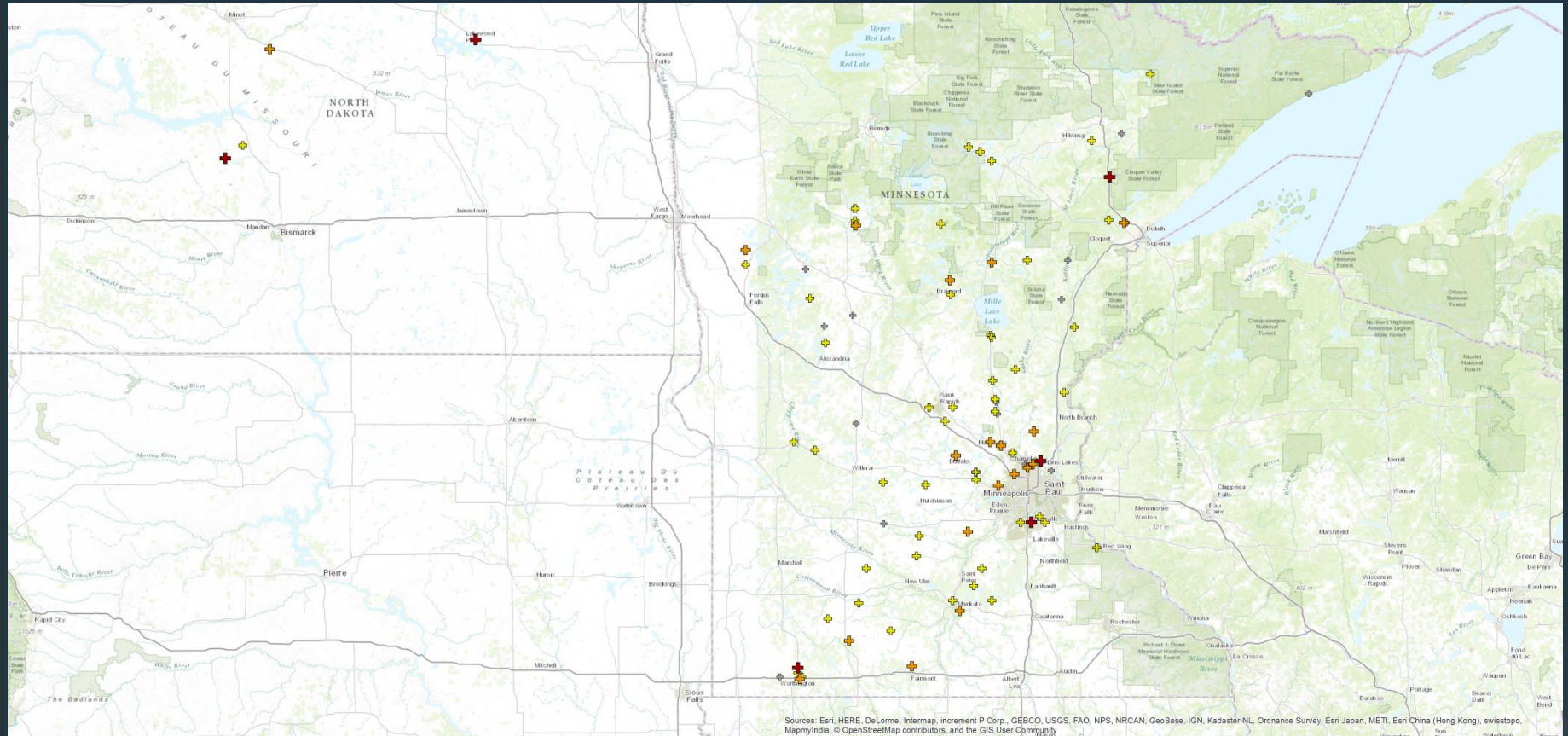


# IR Past Status 2013



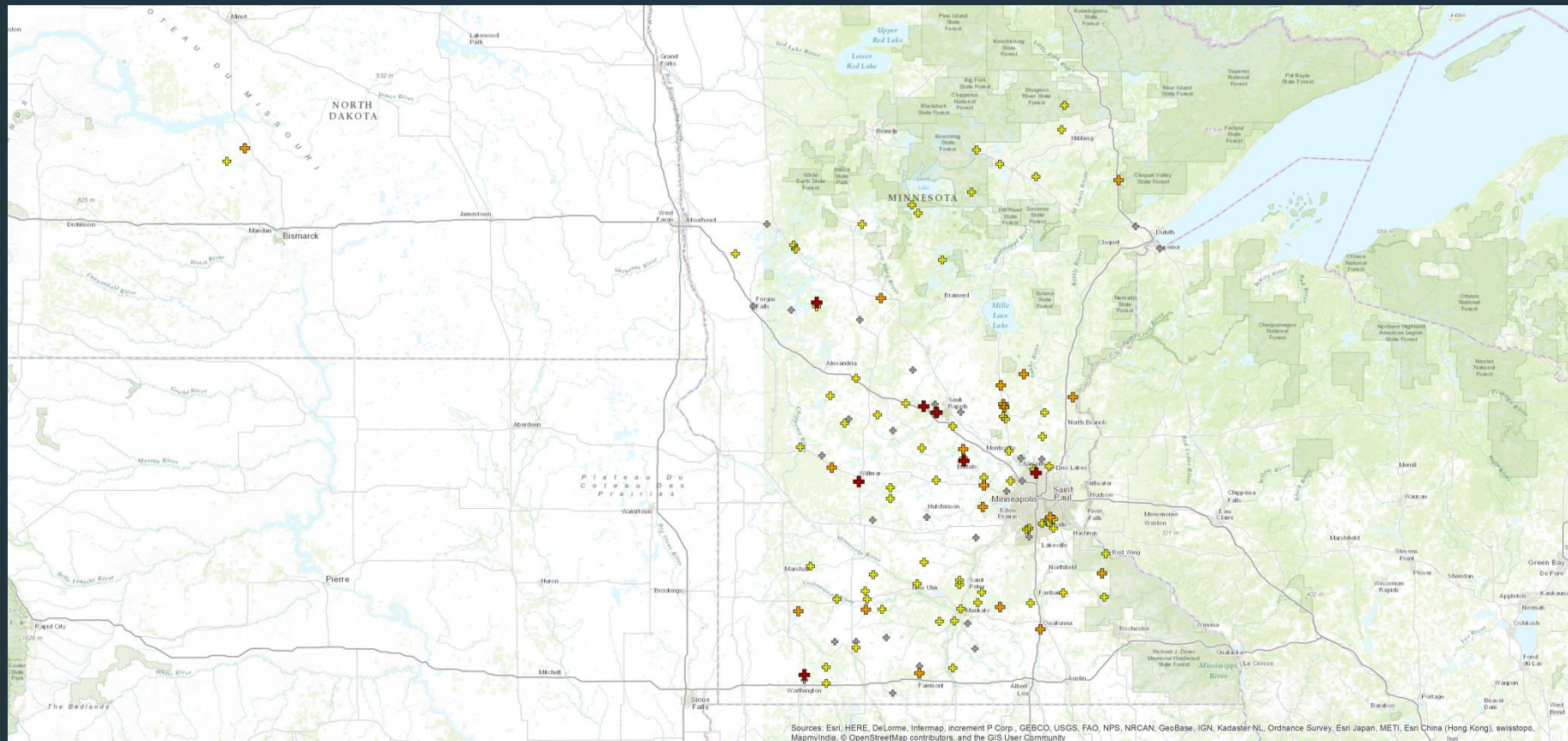


# IR Past Status 2014



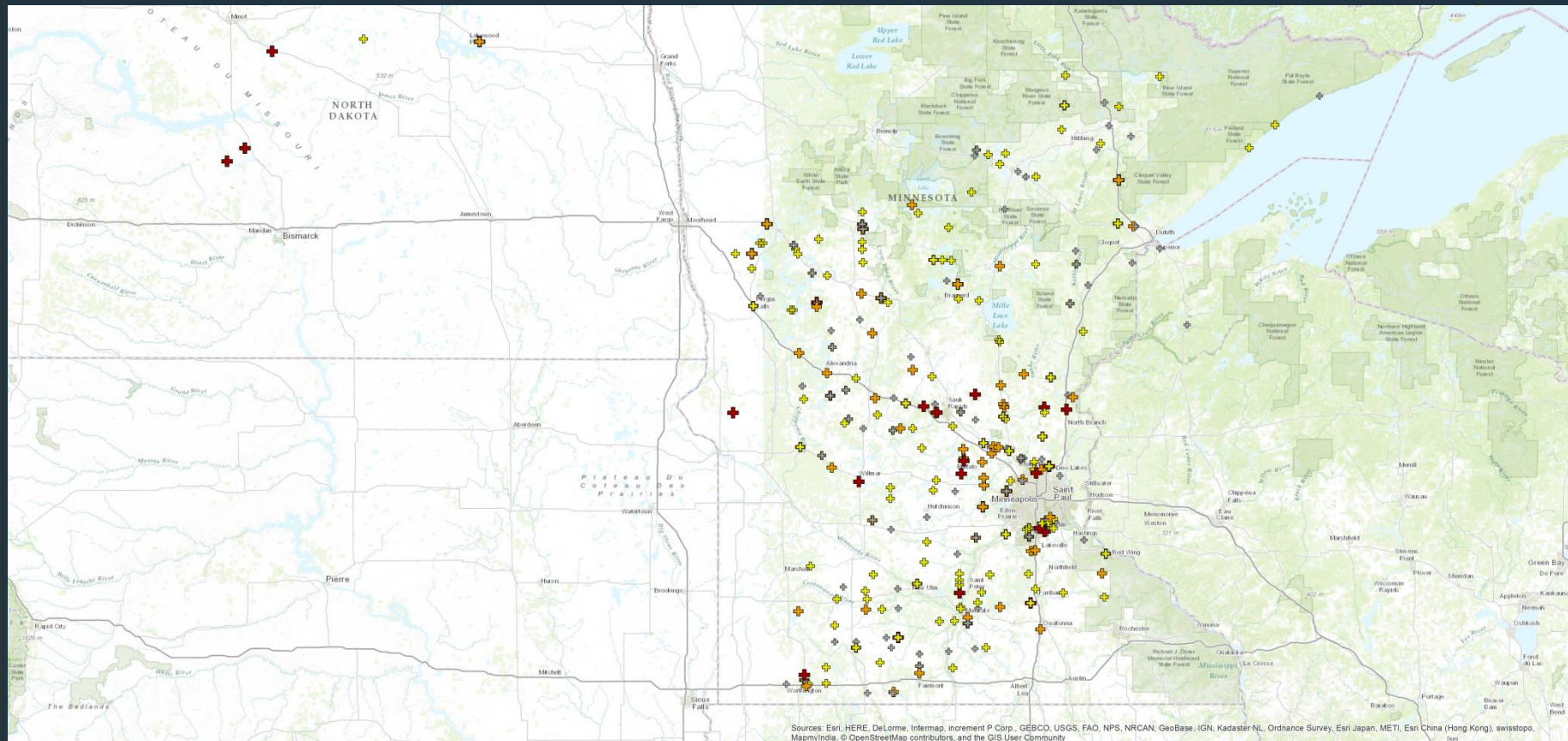


# IR Past Status 2015





# IR Past Status All Years





# Conclusions

- Application is easy to use
- Setup and deployment is fast <8 hours per year
- Keep field data updating to a minimum
- GIS tech maintenance and updates is minimal
- Data is always current for multiple users with no overlap
- Other benefits
  - Project tracking, mission planning, optimized travel between sites, verification of work, no paper produced, history of IR scan results, site access notes



# QUESTIONS?

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