

USING INTELLIGENT AUTOUPDATERS TO MAINTAIN DATA INTEGRITY

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John Coleman – SSP Innovations



esri Partner Network
Silver



Memphis Light Gas & Water

- MLGW was created in 1939
- Memphis is home to the birthplace of Rock and Roll music, Elvis Presley's Graceland, FedEx World Headquarters, International Paper, Autozone, Ducks Unlimited, and The National Civil Rights Museum
- MLGW is the nation's largest three-service municipal utility
- MLGW is the Tennessee Valley Authority's (TVA) largest customer
- 784 square mile service area
- 421,000 electric customers
 - Nearly 50 electric substations
 - The average MLGW customer uses 14,735 kWh per year
- 320,000 natural gas customers
 - Gas network is 4,650 miles in length
 - Nearly 40 billion cubic feet delivered per year
- 257,000 water customers
 - One of the largest artesian well systems in the world
 - 175 wells
 - 10 water pumping stations



History of MLGW



- 1852 - Memphis Gas Light Company - served 10,000 people and covered just three-square-miles. The city's water supply came from cisterns and the Wolf River.
- 1887 – Memphis Light and Power Company - Drillers unexpectedly tapped into a pure, great tasting artesian water supply lying underneath the city and The Artesian Water Company was created.
- 1902 - Memphis bought the Artesian Water Company and created the Memphis Artesian Water Department, the first city-owned utility.
- 1939 - Memphis Light, Gas and Water was formed, creating what is now the largest three-service public utility in the nation.

SSP Innovations

- Ten year old GIS and WMS consulting company based in Denver, CO area
 - Work exclusively in the United States utility industry
 - Includes Electric, Gas, Water, Wastewater/Sewer, Fiber
- Strong partnerships with ESRI and Schneider Electric
 - Certified to implement/integrate/customize entire ESRI & SE GIS suite
 - Also do GDB consulting & WMS consulting/implementations
- Began working with MLGW in late 2009: Enterprise GIS (EGIS) Project
 - Have since partnered on several projects (Integrations, SSP Nightly Batch Suite, GDB modeling, ArcGIS/ArcFM Server, ArcGIS/ArcFM 10.1 Upgrade, ArcGIS Online for Smart Meter Data Collection, custom support, and more)

Legacy Replacement

- Why did we need ArcFM Autoupdaters?
- CAD based system being replaced by ArcGIS and ArcFM.
- CableCAD used a point connector model...completely logical network, physical connectivity was not required.
- Had to take business requirements from CableCAD and 'convert' them.
- Completely different type of network, editing, and querying environment.

Importance of Good Data

- Field crews can quickly and easily interpret the maps.
- Facilities can be identified efficiently in emergency situations.
- Construction and maintenance costs are calculated more accurately (ie. Span Length)
- Safety is the top priority.

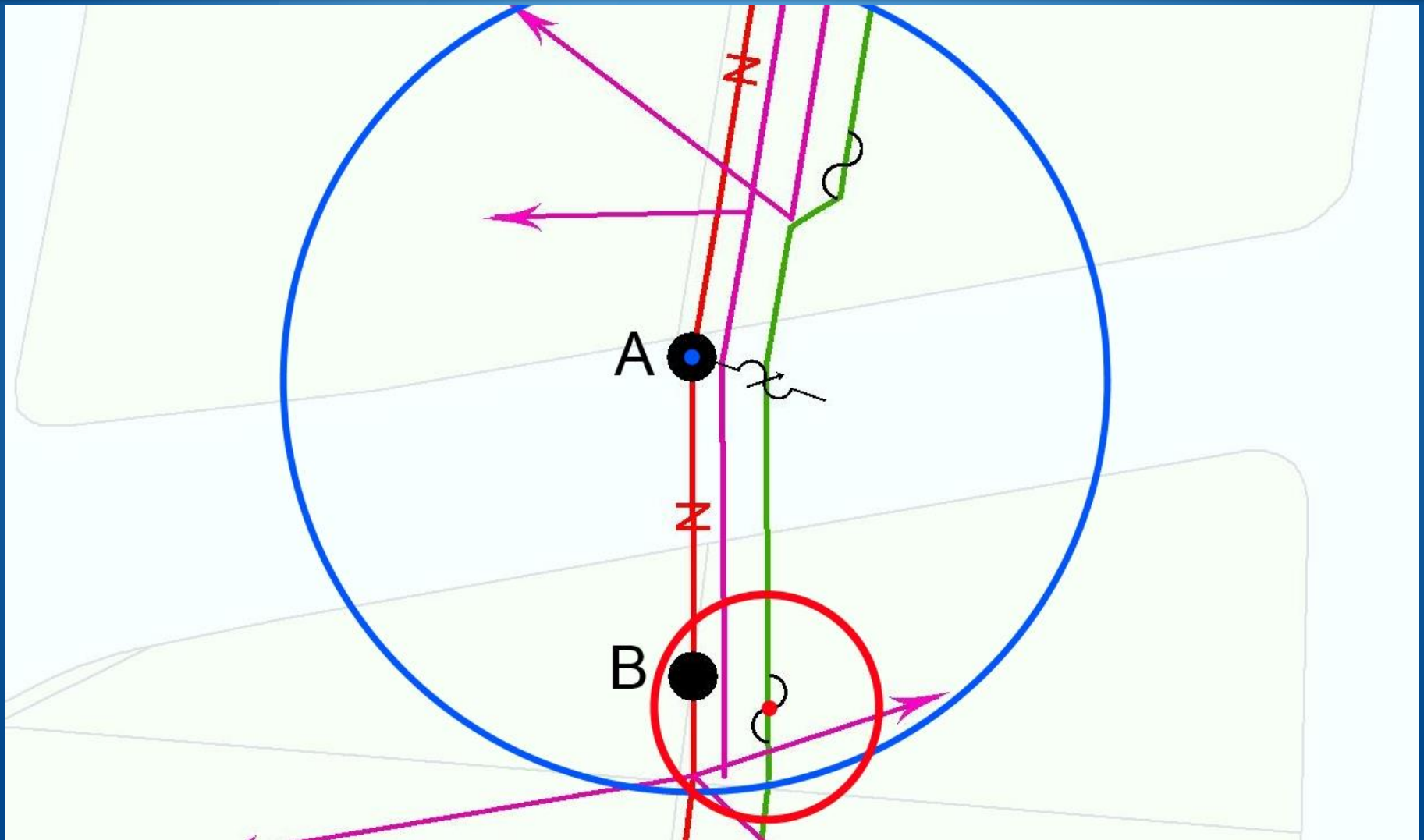
Creating Intelligent Autoupdaters

- In order to keep these problems at bay and sustain the necessary business processes, MLGW needed an implementation that worked well.
- Powerful APIs available in ArcGIS and ArcFM
- Autoupdaters are more than simply updating a field based on another field.
- At MLGW, we implemented spatial, network tracing, finding parallels, and validation algorithms to fulfill business needs.

Spatial Searches

- We can programmatically buffer out to a distance from a feature and find any features within that area.
- We want to use a spatial search to update a Facility ID from a pole to any nearby fuses, reclosers, jumpers, etc.
- This is just one type of spatial search. ArcGIS allows intersects, touches, crosses, and contained in as options to search by.

Spatial Searches

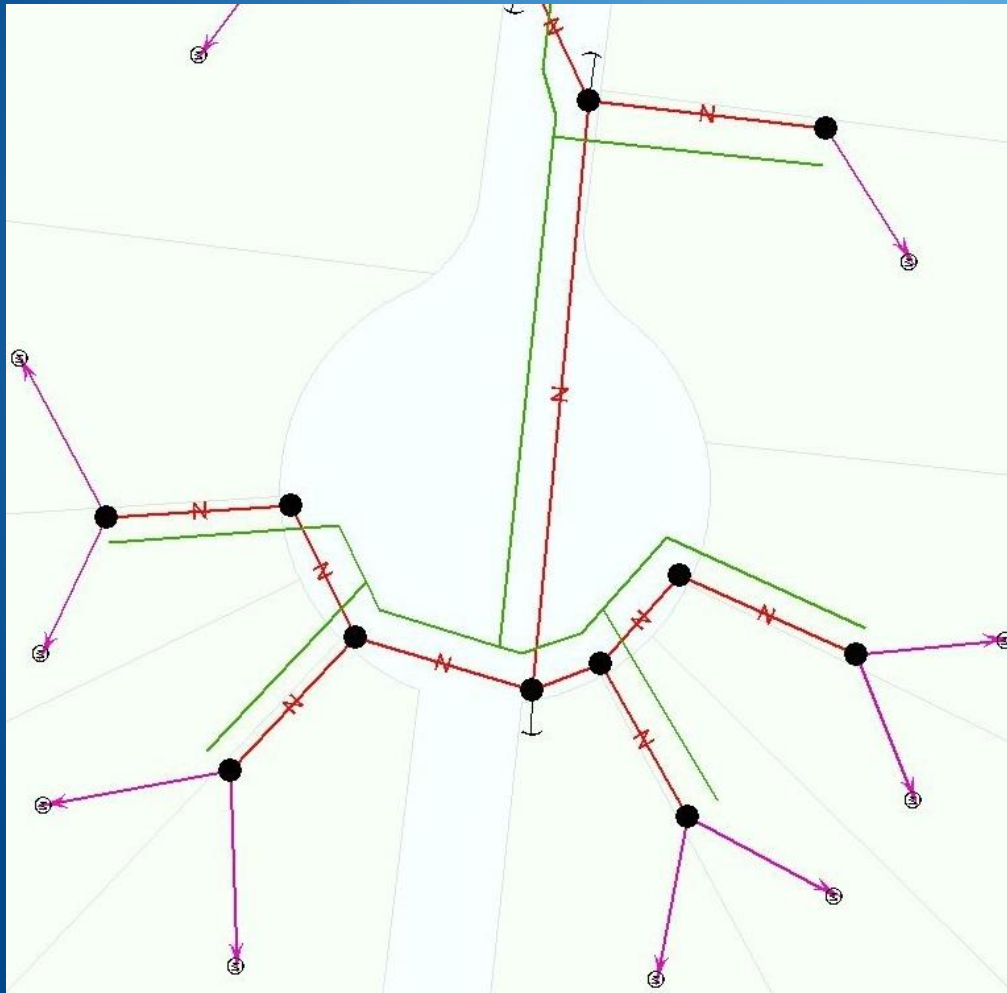


Geometric Network Tracing

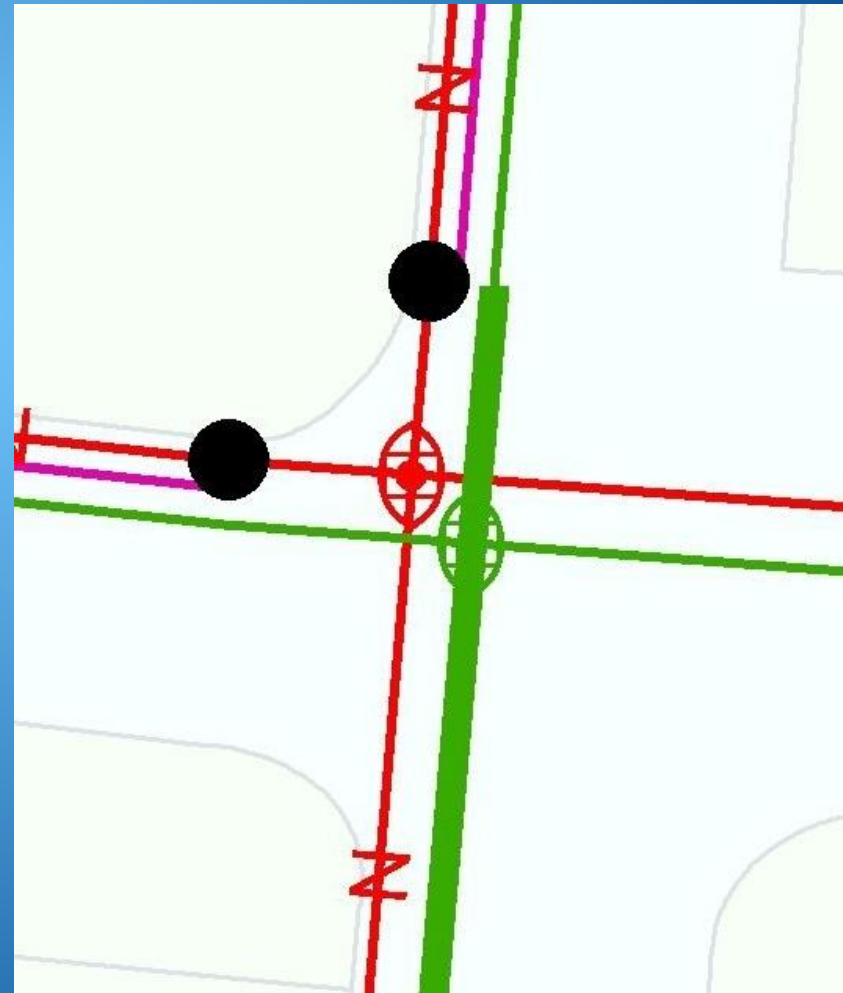
- Maintaining a good utility network is crucial for utilities.
- ArcGIS provides powerful tools that can keep a network polished and correct. We just need to put those tools to work.
- At MLGW, we created tools that would traverse the geometric network on the fly and keep the data in order:
 - **Secondary Voltage Autoupdaters** – Maintains a Secondary Voltage field on the downstream secondary and service lines from a transformer.
 - **Network Autoupdaters** – Maintaining Circuit Number, size of largest conductor, etc. on an aerial tap or jumper from tapped conductors.

Geometric Network Tracing

Meters in a Cul-de-sac



Aerial Tap on primary conductors



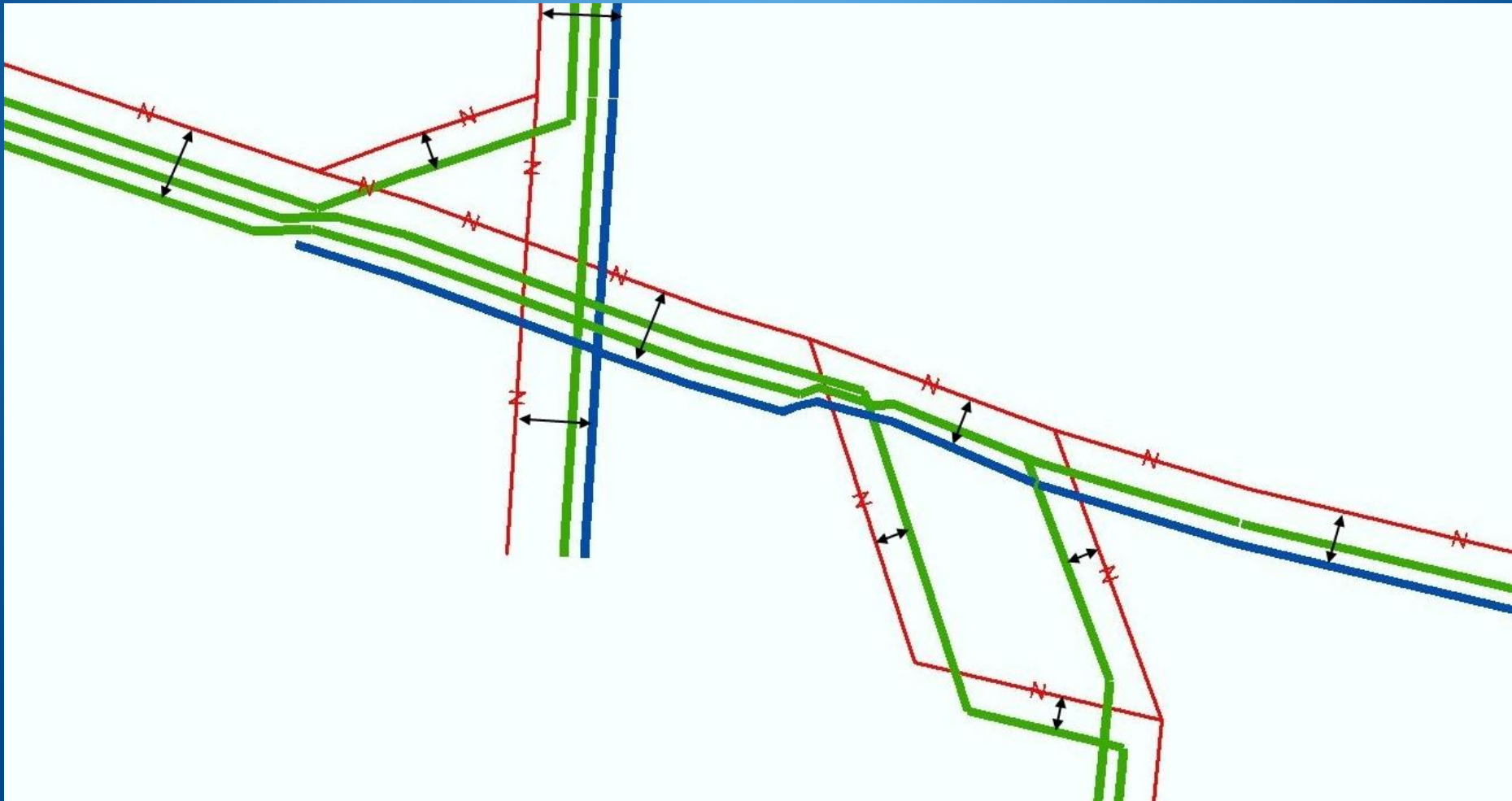
Finding Parallel Lines

- Need to keep the attributes of lines in the same span up to date. (e.g. a neutral line next to a conductor).
- Need to find the correct parallel line in busy areas.
- A new conductor must be placed on a separate plane.
- Must maintain a low margin of error, even in congested areas.



Finding Parallel Lines

Black arrows indicate conductors in the same span



Validation Autoupdaters

Validation AU's are used to validate attribute values at the time of feature placement, in order to minimize error during the editing process.

Switches are placed alone and in conjunction with several other facilities...

- Change Overs
 - PHASE – Default values based on the ArcFM Template or Composite Favorite.
 - PRIMARY VOLTAGE – User can choose 12 or 23 kV.
 - OPERATIONAL ID – User entered.



Validation Autoupdaters

- Switch Gears
 - PHASE – Default values based on the ArcFM Template or Composite Favorite.
 - PRIMARY VOLTAGE – Should match that of the Switch Gear feature.
 - OPERATIONAL ID – G1-G4/D1-D4
- Voltage Regulator Stations
 - PRIMARY VOLTAGE – Derived from the connected Primary line.
 - OPERATIONAL ID – User entered.
- In – Line Switches
 - PHASE – Derived from the connected Primary line.
 - PRIMARY VOLTAGE – Selected from domain values.
 - OPERATIONAL ID – User entered.

Validation

The screenshot displays the ArcMap interface with a map of a power line system. The map shows a network of lines and nodes, with labels such as "P-2223454566", "88226", "2754", "2760", "2770", "88217", "2780", "125", "224", "2", "174", and "24WCU". A "Select OPID" dialog box is open, showing a list of OPIDs: G2, G1, G2, G3, G4. The "ArcFM Attribute Editor" window is also visible, showing a list of targets for the "1 Gang Switch 3 Fuse Switch Gear" feature, including eSwitchGear, eBusBar, eSwitchGearFuse, and eSwitchGearFuse.

Untitled - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:600

Stored Items MLGW Secondary Electric

Editor ArcFM Manual Angle Setter Switch Gears : 3-Phase

Table Of Contents

- System Favorites
 - LOL
 - Gas
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 - Fault Indicators
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 - Guying
 - Risers
 - Voltage Regulator Stations
 - Sectionalizer Stations
 - Recloser Stations
 - Switch Gears
 - 1 Gang Switch 3 Fuse Switch
 - 1 Phase Switch Gear
 - 1 SBD Switch 3 Fuse Switch
 - 2 Gang Switch 2 Fuse Switch
 - 2 SBD Switch 2 Fuse Switch
 - 3 Gang Switch 1 Fuse Switch
 - 3 SBD Switch 1 Fuse Switch
 - 4 Gang Switch 0 Fuse Switch
 - 4 SBD Switch 0 Fuse Switch
 - Change Overs
 - Ground
 - Pole / Poleline
 - Pole / Poleline / Neutral / 1 Co

88226

2754

2760

2770

88217

2780

125

224

2

174

24WCU

P-2223454566

Select OPID

- G2
- G1
- G2
- G3
- G4

Cancel

ArcFM Attribute Editor

Targets Selection QA/QC

- 1 Gang Switch 3 Fuse Switch Gear
 - eSwitchGear
 - eBusBar
 - eBusBar
 - eBusBar
 - eBusBar
 - eSwitch
 - eSwitchGearFuse
 - eSwitchGearFuse
 - eSwitchGearFuse

Create Update Close

782326.473 339619.676 Feet

ELECTRIC.eSwitchAnno: Annotation Placement and Orientation Length: 104.977 ft, Direction: 352.8750, Total Length: 27.068 ft

11:16 PM 10/27/2014

Q & A

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