Annotation to Attribute Conversion

David Updike | Source Gas LLC
Bridgette Anderson | Source Gas LLC
Ishu Wadwani | Applied Field Data Systems, Inc.
Sridhar Devineni | RMSI
Presentation Outline

- Introduction
- Business Need
- Methodology
- Benefits
Hello
Introduction

- Natural gas distribution utility headquartered in Golden, CO
- Serves nearly 413,000 customers and 18,019 miles of distribution and transmission pipelines in Arkansas, Colorado, Nebraska, and Wyoming
- SourceGas purchased Arkansas Western Gas in July of 2008
- Based in Houston, Texas.
- Over 50 years of experience in offering total solutions in field data collection systems. We also offer application development and data management services for GIS.
- Serves utilities, oil and gas, cities and municipalities, forestry, industrial, natural resources, environmental, GIS and mapping markets.
- Best in class GIS Services and Solutions, since 1992.
- RMSI manages landbase, network database and GIS applications to provide real-time unified network information for utility industry.
Description

- Convert annotation feature class into gas pipeline attributes.
- Transfer incorrect features into appropriate features class.
- Quality control checks on historical CAD files for distribution gas mains and gas services.
- Applying geometric network corrections when pipeline segment changes are required.
The geographical area encompassed Arkansas which covered 19 counties. The snapshot below depicts the project scope of work to be completed. Marked in red is the pilot area.
Project Plan Requirements

Project was to be completed in two phases-

Pilot:
Approximately 2 weeks to complete these services for the town of Eureka Springs.

Main Roll Out:
After Pilot approval by SourceGas these services were to be performed for the remainder of the Company’s Arkansas territories.

Anticipated completion time: Approximately 5-6 months.
Project Deliverables

- An updated ESRI ArcGIS 10 File Geodatabase, including provided inputs for review and acceptance.

- Geodatabase to include anomalies identified during consolidation and final formatting.

- Delivery log with towns, numbers of edits performed, an exceptional log detailing anything that cannot be attributed in GIS and their justifications.
Business Need

Assess Data Integrity
Intelligent database development for GIS team.

Internal Business Analysis
Support analytics and capital planning needs.

External Customers
Analyzing expansion potential.

Comply to Regulations
Better meet state and federal regulatory compliance.
Business Need

- Better GIS Analysis to support company operations and make educated business decisions.
- Engineers need data for hydraulic modeling and project planning. Provide rapid turn around on expansion analysis.
- More accurate PHMSA Annual Reports, and rate case justifications.
- Would have taken 3 years for one internal FTE. No personnel available to dedicate full time. Completed in 8 months with RMSI.
Methodology
Methodology

Before A2A

After A2A

Identify

- Distribution Line
- HereRic1

Location: 677,175,709 733,628,387 Feet

Field | Value
--- | ---
NOMINALDiameter | <null>
Material | Unknown Pipe
INSTALLATIONYEAR | 0
REPLACEDYEAR | <null>
WALLTHICKNESS | <null>
WEIGHTPERFOOT | <null>
PRESSUREGROUP | HP
MACP | <null>
MAXUNITS | <null>
MINIMUMMAOPDESIGNED | <null>
BLANKETNUMBER | <null>
Outside Diameter | Unknown

Attributes

- Distribution Line
- HereRic1

Field | Value
--- | ---
NOMINALDiameter | 4"
Material | W
INSTALLATIONYEAR | 0
REPLACEDYEAR | 1993
WALLTHICKNESS | 0.156
WEIGHTPERFOOT | 7.25
PRESSUREGROUP | HP
MACP | 315
MAXUNITS | PSIA
MINIMUMMAOPDESIGNED | <null>
BLANKETNUMBER | <null>
Outside Diameter | 4.5"
Methodology
Methodology

- Establishing of two way replica
- Rule base finalization
- Feature class cleanup
- Network cleanup
- Annotation to Attribute
Quality Assurance & Quality Control

<table>
<thead>
<tr>
<th>Checks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling</td>
<td>Generates a statistical sampling of features or records from one or more layers or tables.</td>
</tr>
<tr>
<td>Execute SQL</td>
<td>Finds features based on SQL query WHERE clause. (Ex. Where are NULL values.)</td>
</tr>
<tr>
<td>Subtype</td>
<td>Searches for feature classes with improper null subtypes.</td>
</tr>
<tr>
<td>Invalid Geometry</td>
<td>Multiple nodes at same coordinate.</td>
</tr>
<tr>
<td>Multipart lines</td>
<td>Pipe merging or splitting issues.</td>
</tr>
<tr>
<td>Relationship checks</td>
<td>Connectivity of the pipe before and after attribute update.</td>
</tr>
<tr>
<td>Duplicates</td>
<td>Duplicate feature one over other.</td>
</tr>
<tr>
<td>Intersections</td>
<td>Self intersecting linear features.</td>
</tr>
<tr>
<td>Topology</td>
<td>Overshoots and undershoots of the linear features.</td>
</tr>
<tr>
<td>Orphan network</td>
<td>Set of network feature without connectivity with main network.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OBJECTID</th>
<th>SUBTYPE</th>
<th>CHECKTITLE</th>
<th># Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>76058</td>
<td>Unknown</td>
<td>Multipart Line Check (Service)</td>
<td>0</td>
</tr>
<tr>
<td>32722</td>
<td>PE</td>
<td>Invalid Geometry Check (Distribution Main)</td>
<td>0</td>
</tr>
<tr>
<td>32722</td>
<td>PE</td>
<td>Geometry Check Dist Main</td>
<td>0</td>
</tr>
<tr>
<td>32722</td>
<td>PE</td>
<td>Duplicate Vertex Check Dist Main</td>
<td>0</td>
</tr>
<tr>
<td>97625</td>
<td>W</td>
<td>Duplicate Geom Check Dist Main &amp; Service</td>
<td>0</td>
</tr>
<tr>
<td>106884</td>
<td>W</td>
<td>Geometry Check Dist Main</td>
<td>0</td>
</tr>
<tr>
<td>106884</td>
<td>W</td>
<td>Duplicate Vertex Check Dist Main</td>
<td>0</td>
</tr>
</tbody>
</table>
Data Benefits

Percent of Data Populated
Medium & Low Pressure Distribution Lines

- Material
- Nominal Diameter
- Year Installed
- Year Replaced

- Before Project
- After Project
Data Benefits

Percent of Data Populated
High Pressure Distribution Lines

- Material
- Outside Diameter
- Nominal Diameter
- Year Installed
- Year Replaced
- Weight Per Foot
- Wall Thickness
- Fieldbook Number
- Blanket Number
- MAOP
- MAOP Design
- MAOP Units

Before Project
After Project
Data Benefits

Percent of Data Populated Service Lines

Before Project
After Project
Data Benefits

- Segments are now merged to the least number possible, and are geometrically connected.
- Merged segments allows for more accurate PHMSA reports on the number of services in our system.
- Total service mileage is 19 miles lower post-project because numerous invalid segments were deleted.
- Over 820 additional fittings and Cathodic Protection assets were identified.
- Over 250 invalid job separators were deleted.
- Over 45 miles of inserted service lines were identified.
Companywide Benefits

Availability of Data
1. No more DGN (CAD) referencing.
2. Field Crews, Operations
3. Codes & Standards
4. Integrity Management
5. Emergency Response

Safety and Reliability
1. Effectively manage asset data.
2. Query, track, and analyze pipeline data.
3. Reporting for regulatory.

Customer Satisfaction
1. Analyze and assess safety trends.
2. Network design to suit internal and external customer demand.
3. Capital Planning

Benefits of Annotation to Data