Material Tracking & Traceability Inspection Reporting, and Enhanced GIS Data Collection

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Atlanta Gas Light

SUBURBAN CONSULTING ENGINEERS, INC.

Presentation Goals

- Familiarize the Pipeliners Association on Current Inspection Reporting and Material Traceability Procedures and GIS Technology being used in the Natural Gas Industry
- Demonstrate the Current & Long Term Value of Material Tracking & Traceability and Enhanced GIS

Presentation Summary

Summarize PHMSA Motivation & Upcoming Requirements for Tracking & Traceability

Discuss Potential Current Issues & Identified Goals

Review Inspection Reporting, Material Tracking & Traceability, Material Labeling and Enhanced GIS Data Collection Procedures

Present the Development of the Data Dictionary, the Scope of Data Collection, Data QA/QC

Discuss Data Submission Procedures and direct import to Data Model

Show Previous Enhanced GIS Data Projects & As-Built Drawings

PHMSA 192.63

Pipeline and Hazardous Materials Safety Administration

Motivation for new requirements:

Assistance with determining the cause or origin of an incident. **Numerous accident investigations** conducted by the National Assoc. of Pipeline Safety Representatives (NAPSR) where **insufficient data had proved to be an obstacle**

Minimize excessive excavations due to an inability to locate assets when responding to manufacturer recalls and/or improper installation

Enable operators to **accurately and quickly identify the installed pipe and components in their systems** when handling DIMP and TRIMP for the life of the asset

Regulatory objectives:

All material (gas main, fittings, etc.) to be **identifiable for the life of the asset**

Document location, manufacturer, lot, size, material, pressure rating, grade and SDR

Track people associated with installation & inspection (welders, fusers, inspectors, etc.)

Marking of all pipe and components to ensure legible, visible and permanent identification/markings for a **period of 50 years**

All facilities should be moving to **barcodes**, 2D data matrix, or conventional print lines

Recommends **using GPS** with barcode readers to mark location and identify component features

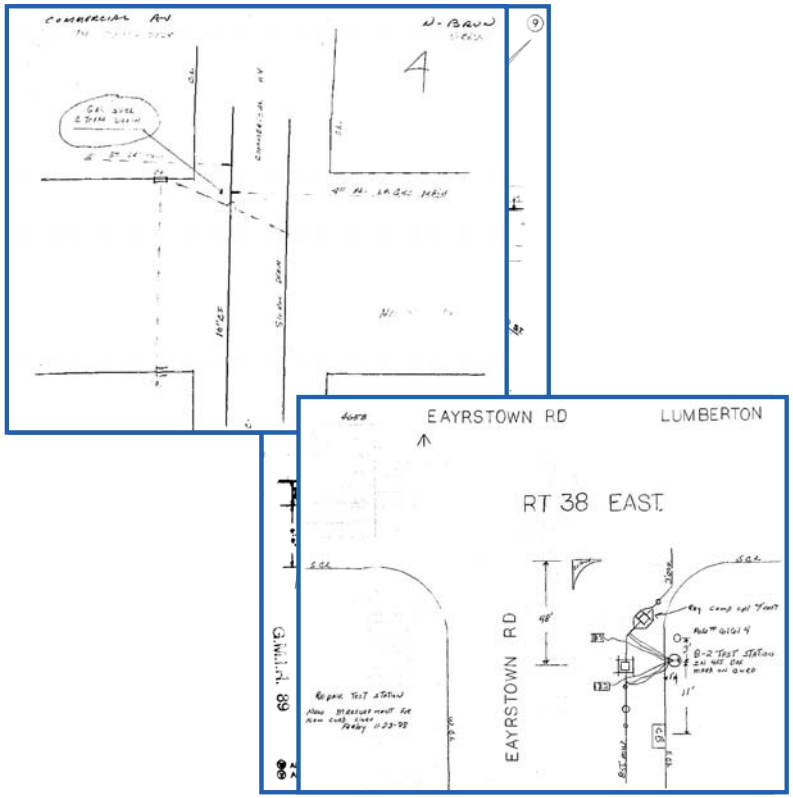
Potential Current Issues & Identified Goals

Potential Current Issues

- Illegible as-built drawings
- Inaccurate as-built measurements/missing data
- Relocation of surface conditions used for measurements
- Gap from project milestones/completion to GIS input
- Investment in GIS drafting and upkeep

Identified Goals

- GPS field as-built data collection for accurate asset locations
- Accurate “who, what, where and when” on all features
- Comprehensive Material Tracking & Traceability
- Centralized location for all reliable as-built data
- User-friendly access to all information through GIS Mapping



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Enhanced GIS Viability

- Recent improvement in geospatial accuracy and decrease in cost of GPS equipment
- Manufacturers providing more accurate and thorough Material Data and Mill Test Reports
- ESRI ArcGIS and Trimble support for Enhanced GIS Field Data Collection
- Regulatory requirements for better material tracking & traceability and location
- Streamlined and automated processing, QA/QC and submission to client

Benefits to Enhanced GIS Data Collection

"traceable, verifiable, and complete."

- Increases consistency in data collection
- Increases GIS updating efficiencies
- Reduces duplicate effort & human error
- Reduces time to collect and share as-built information
- Increases accuracy & organization of as-built data
- Supports the generation of as-built drawings
- Improves accuracy of infrastructure location & feature attributes
- Better way to locate facilities & safer mark-outs
- Fast response to leaks with accurate information

Benefits to Enhanced GIS Data Collection

FIELD MEASURED AS-BUILTS & AS-BUILT DRAWINGS	NEW PROCESS	BENEFIT
○ Time delays of installation work	➢ Weekly updates of job progression	✓ Increased safety and visibility of pipeline assets
○ Material reports submitted at the overall job level	➢ Each facility captured with specific relevant material information	✓ Component-level material tracking and traceability
○ Generic curb and centerline measurements used	➢ Sub-centimeter GPS location collected for all facilities	✓ Improved locating ability
○ No visual evidence of installation	➢ Photos created for all facilities and construction activities	✓ Increased visibility into construction practices, facility installation, and data verification
○ Multiple applications used for asset & compliance tracking	➢ Future integration into Asset Management system	✓ More reliable compliance tracking for pipeline assets

Enhancements to GIS Data Model

More thoroughly captured field data presented to GIS department to improve the data model

- Created new feature class for welds and fusions
- Added new date tracking methodology
- Increased data capture of non-standard material information
  - Field coatings, segment by segment length, inspector information

Location capture of existing facilities used to update spatial accuracy in GIS

Receiving Materials & Typical Material Tracking

GIS Standard Feature Codes

Name	Value	Example	Description
Abrasive Resistant Overlay	ARO	6-ARO-22	6" 22nd Joint ARO Pipe
Actuator	ACT	16-ACT-1	16" 1st Actuator
Anchor Flange	AFLNG	24-AFLNG-2	24" 2nd Anchor Flange
Bare Pipe	BP	¾-BP-1	¾" 1st Joint Bare Pipe
Blind Flange	BF	1-BF-1	1" 1st Blind Flange
Blowdown Valve	BDV	6-BDV-5	6" 5th Blowdown Valve
Bypass Valve	BPV	6-BPV-2	6" 2nd Bypass Valve
Cathodic Protection Sta.	CPS	CPS-1	1st Cathodic Protection Sta.
Casing	CAS	12-CAS-1	12" 1st Casing
Closure	CLO	2-CLO-1	2" 1st Closure
Coupling	CPLG	3-CPLG-1	3" 1st Coupling
Coupon Test Station	CTS	CTS-2	2nd Coupon Test Station
Cross	CR	4x4-CR-1	4" 1st Cross
Elbolet	EOL	½-EOL-1	½" 1st Elbolet
Elbow	ELL (Angle)	8-ELL90-1	8" 1st 90° Elbow
End Cap	EC	6-EC-3	6" 3rd End Cap
Field Bend	FB	FB	Field Bend
Filter	FIL	8-FIL-1	8" 1st Filter
Flange	FL	4-FL-4	4" 4th Flange
Full Encirclement Tee	STEE	12x4-STEE-5	12" by 4" 5th Split Tee
Fusion Bonded Epoxy Pipe	FBE	12-FBE-100	12" 100th Joint FBE Pipe
Heater	HTR	24x8-HTR-1	24" by 8' 1st Heater
Insulator	IN	4-IN-2	4" 2nd Insulator
Junction Box	JB	JB-1	1st Junction Box
Kicker Valve	KV	4-KV-1	4" Kicker Valve
Latrolet	LOL	¾-LOL-9	¾" 9th Latrolet
Locate Station	LS	LS-3	3rd Locate Station
Main Line Valve	MLV	16-MLV-1	16" 1st Main Line Valve
Monitor Control Valve	MCV	6-MCV-2	6" 2nd Monitor Control Valve
Nipolet	NOL	¾-NOL-7	¾" 7th Nipolet
Pig Launcher	PL	20-PL-1	20" 1st Pig Launcher
Pig Receiver	PR	20-PR-1	20" 1st Pig Receiver
Pilot	PIL	½-PIL-1	½" 1st Pilot
Plain Nipple	PNPL	¾-PNPL-50	¾" 50th Plain Nipple
Plug	PLUG	¾-PLUG-25	¾" 25th Plug
Powercrete Pipe	PC	16-PC-75	16" 75th Joint PC Pipe
Rectifier	REC	REC-1	1st Rectifier
Reducer	RED	12x6-RED-6	12" by 6" 6th Reducer
Regulator	REG	3-REG-1	3" 1st Regulator
Regulator Sta. Valve	RSV	6-RSV-4	6" 4th Regulator Sta. Valve
Segmentable Elbow	SEL	8-SEL45-20	8" 20th 45° Seg. Elbow
Sleeve	SL	10-SL-8	10" 8th Sleeve

- Contractor required to deliver all material to laydown yard
- SCE GIS Field Technicians on site during material delivery
- Materials labelled by SCE GIS Field Technician
- Materials inspected and confirmed by AGL's Material Coordinator
- Material Tracking Spreadsheet developed
- Material delivery and MTR Tracking coordinated with Supply Chain

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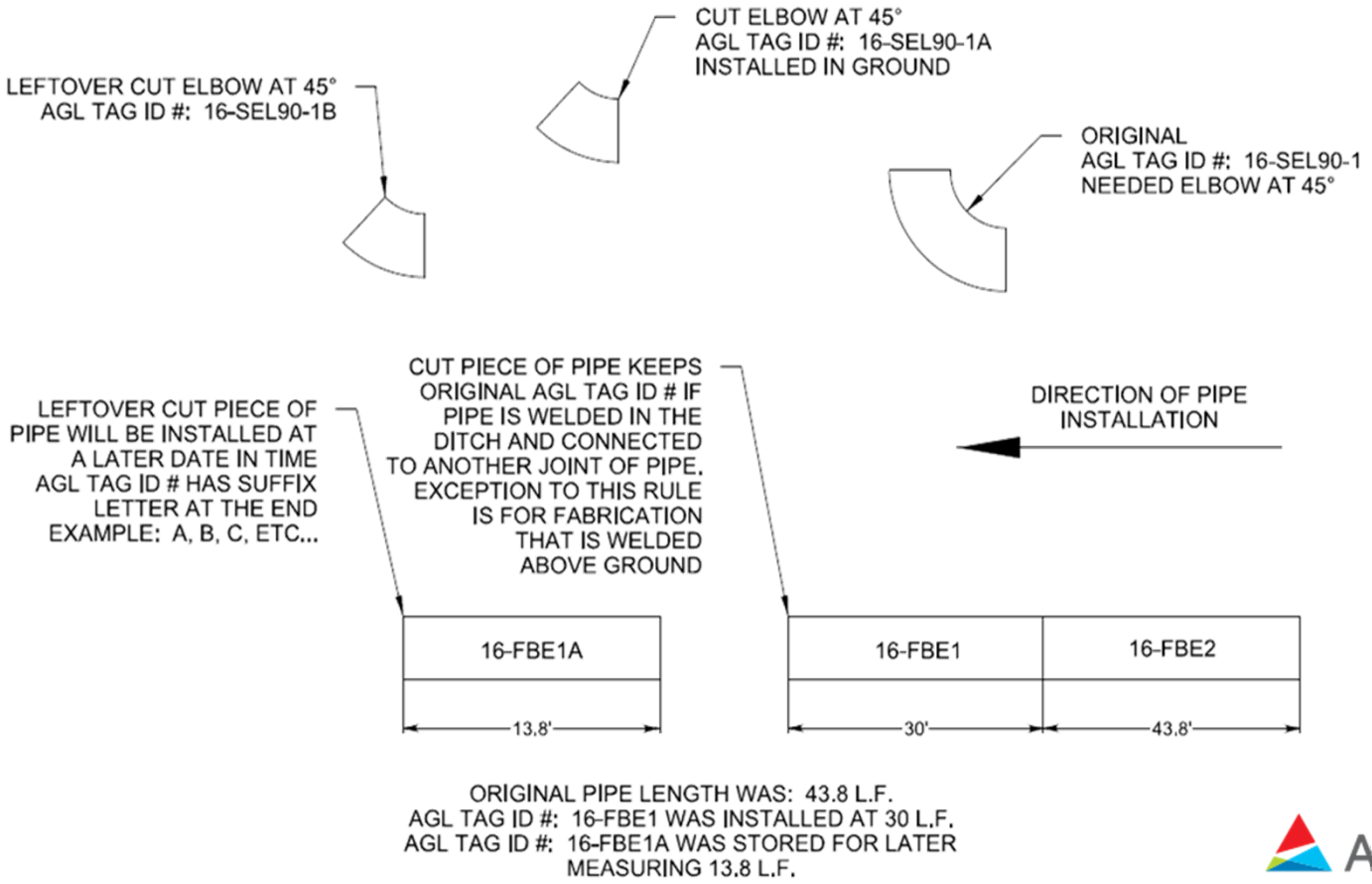
Receiving Materials & Typical Material Tracking

Joint # / AGL Tag ID #	GIS Joint # / AGL Tag ID #	Heat #	GIS Heat #	Heat # Verificatio	Measured Length	Installed Length	GIS Installed Length	Length Verificatio	GIS Elev. Avg. Verificatio	Pipe & Coating Specifications	Coating Date	Grade	Steel Manufacturer	Pipe Manufactu	Coating Supplier	Coating Manufactu	Coating *	Coating Thickness (mil)
16-FBE1233	#N/A	253675	#N/A	#N/A	51.6	-	#N/A	#N/A	#N/A	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1234	YES	253675	YES	YES	51.6	51.3	51.3	0.3	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1235	YES	253675	YES	YES	51.6	51.0	51.0	0.6	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1236	YES	253675	YES	YES	51.6	51.0	51.0	0.6	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1237	YES	253675	YES	YES	51.6	51.5	51.5	0.1	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1238	YES	253675	YES	YES	51.6	51.6	52.0	-0.4	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1239	YES	253675	YES	YES	51.5	51.0	51.0	0.5	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1240	YES	253675	YES	YES	51.6	47.8	47.8	3.8	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1241	YES	253675	YES	YES	51.6	51.0	51.0	0.6	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1242	YES	253670	YES	YES	51.6	51.6	52.0	-0.4	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1243	YES	253674	YES	YES	51.6	51.0	51.0	0.6	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1244	YES	152467	YES	YES	51.6	51.0	51.0	0.6	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1245	YES	253674	YES	YES	50.7	50.7	51.0	-0.3	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1246	YES	253674	YES	YES	51.6	16.0	16.0	35.6	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1247	YES	253674	YES	YES	51.5	51.0	51.0	0.5	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1248	YES	253674	YES	YES	51.6	51.6	51.6	0.0	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1249	YES	253674	YES	YES	51.6	51.6	52.0	-0.4	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1250	YES	253674	YES	YES	47.9	48.0	48.0	-0.1	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1251	YES	253674	YES	YES	47.9	44.8	44.8	3.1	0.0	API 5L/FBE 6233	12/7/2015	X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14
16-FBE1251A	YES	253674	YES	YES	3.1	2.0	2.0	1.1	0.0	API 5L/FBE 6233		X65	NUCOR Steel	Tenaris	Consolidated Pipe Supply	3M	FBE	14

- Material tracking spreadsheet updated when material installed or altered
- Enhanced GIS Data hyperlinked to spreadsheet and manufacturer's MTR and shipping reports
- Mapping to Purchase Orders and Bill of Materials

Material Labels



Weld Number Labels

- Weld Numbering Scheme
  - Weld names should be an eight (8) digit number consisting of only numbers. No dashes or letters should be used.
  - Example: 01100013
- Weld Number Breakdown
  - Numbers 1 & 2 = X-ray Rig #
  - Numbers 3 & 4 = Type of Weld
  - Numbers 5 – 8 = Sequential Weld #

Breaking Down the Weld Number

- X-ray Rig #:
  - No X-ray = 00
  - First X-ray Rig = 01
  - Second X-ray Rig = 02
  - Etc.
- Type of Weld:
  - Mainline = 10
  - Tie In = 20
  - Fab Welds = 30
  - Bore Pipe = 40
  - Mag Particle = 50
  - Procedure = 60
  - Temporary = 70
- Sequential Weld #:
  - First Weld = 0001
  - Second Weld = 0002
  - Third Weld = 0003
  - Etc.

01100013

X-ray Rig #01

Mainline Weld

Weld #0013

02300382

X-ray Rig #02

Fab Weld

Weld #0382

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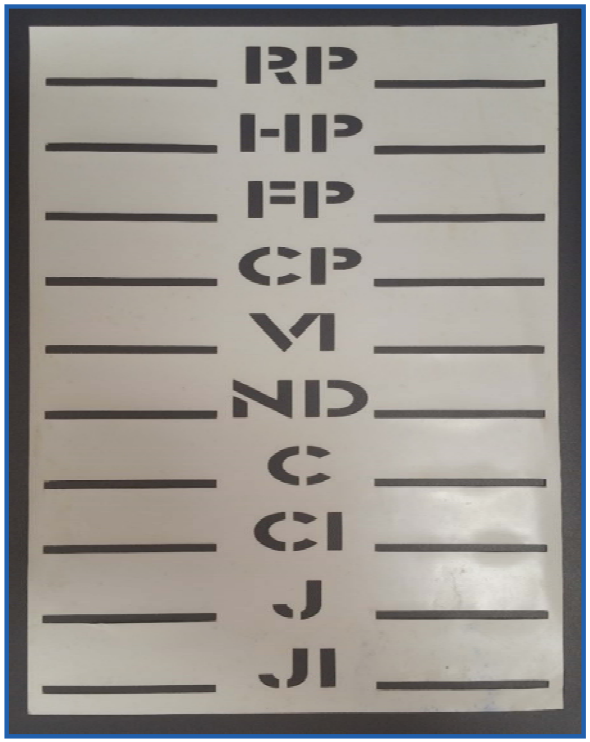
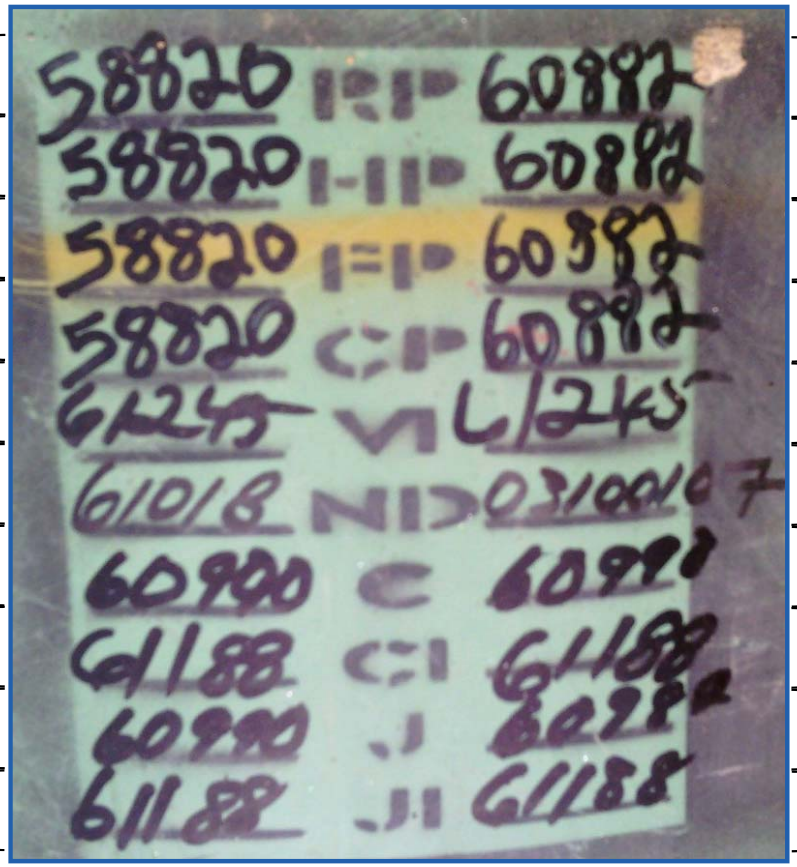
Weld Stencils



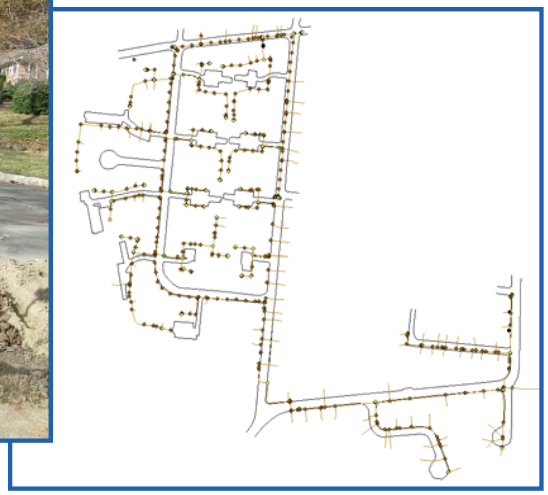
Magnetic Stencil

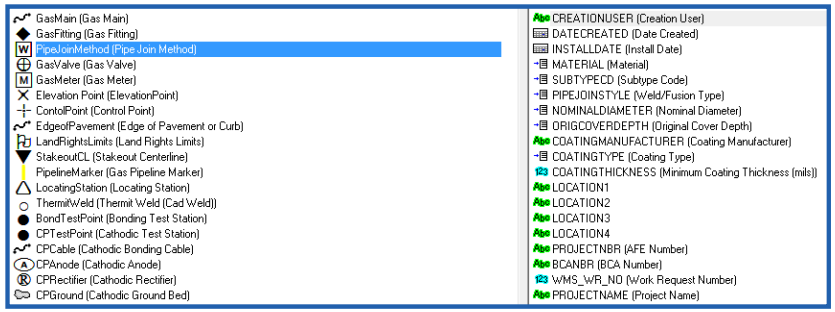
- Weld Stencil applied and painted by Visual Weld Inspector
- Welders apply Employee ID #s after the completion of each welding pass
- Visual Weld Inspector applies Employee ID #s after completion of visual inspection
- Level II X-ray Technician applies Employee ID # and Weld # after completion and certification of X-ray
- Coating Technicians apply Employee ID #s after application of coating
- Coating Inspectors apply Employee ID #s after completion of coating inspection
- Jeeping Technician applies Employee ID # after jeeping weld coating
- Jeeping Inspectors apply Employee ID #s after completion of jeeping inspection

Breaking Down the Weld Stencil



Pilot Program Data Dictionary Development





Using Atlanta Gas Light's existing GIS Schema & OPM Requirements for as-builts and develop data dictionary for:

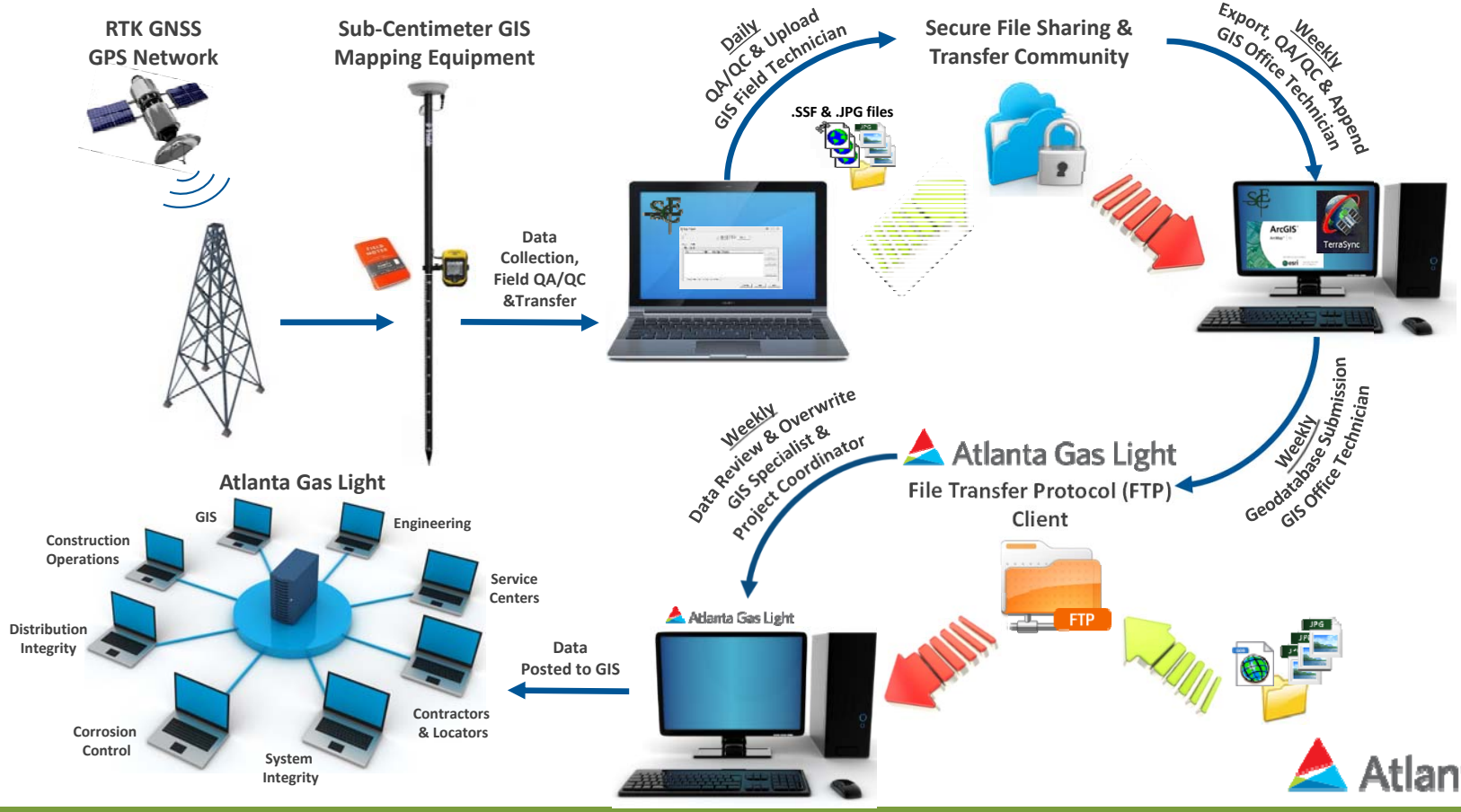
- Mains
- Fittings
- Welds / Fusions
- Valves
- Cathodic Protection
- Casing Pipes & Vents
- Gas Meters / Regulators
- R.O.W. & Easements
- Existing Infrastructure
- Edge of Pavement
- Subsurface Conditions
- Etc.

Document, survey and photograph construction during the installation

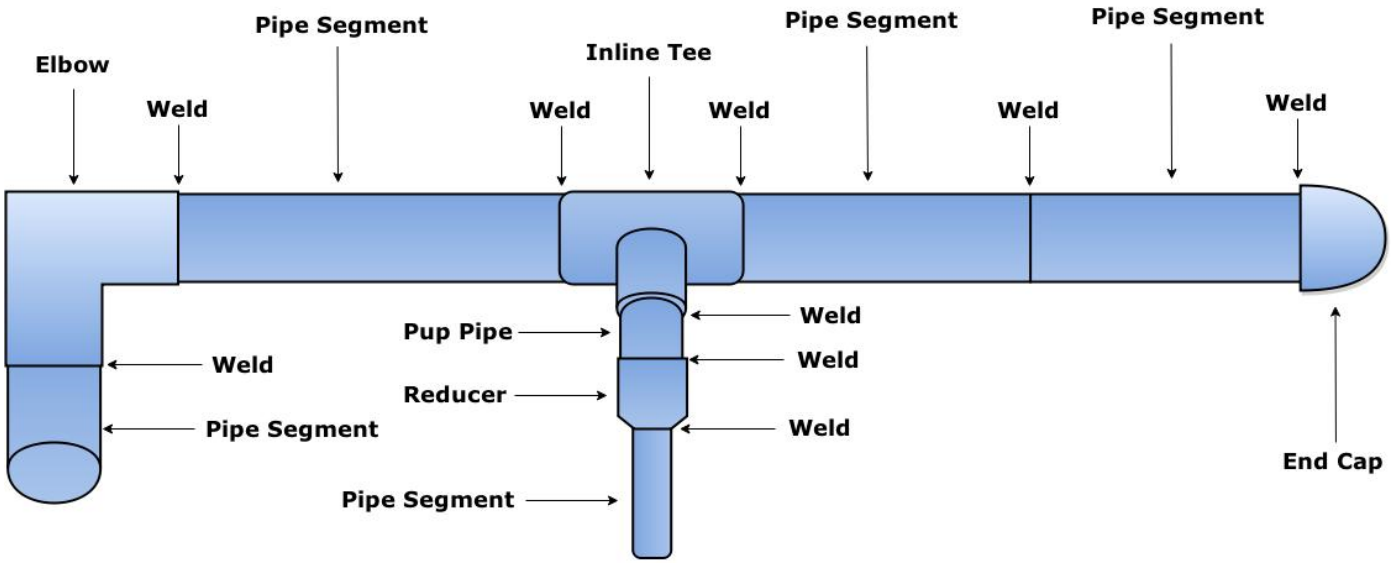
Export field data and perform QA/QC

Refine data collection procedure and data files during Atlanta Gas Light's pilot program

Enhanced GIS Data Collection Process



New Construction Enhanced GIS Data Collection



- Attribute information and GPS location captured for each component

Typical Feature Attributes

- GIS Technician
- Date of Survey
- Project Name
- Project Budget Type
- Project Work Request # / Notification #
- Date of Install
- Gas District
- Gas Inspector
- Contractor
- Supervisor
- Foreman
- Fuser/Welder
- Installation Method (Open Trench, Insertion, Etc.)
- Installation Depth
- Normal & Max Operating Pressures
- General Notes (Service Addresses, Etc.)
- Object (Gas Main, Fitting, Fusion/Weld, Valve, Etc.)
- Diameter & Wall Thickness
- Barcode (ASTM 2897)
  - Manufacturer & Manufacture Date
  - Model # & Lot #
  - Material
  - Type of Component
  - Nominal Size
- SDR/Grade
- Part #
- Serial #
- Connection Type (Electro Fusion, Butt Fusion, WXW, WXF, Etc.)
- Pressure Test Data & Photo
- Stencil Photo or Fusion Text Photo
- X-Ray Data & Photo
- Location Photo

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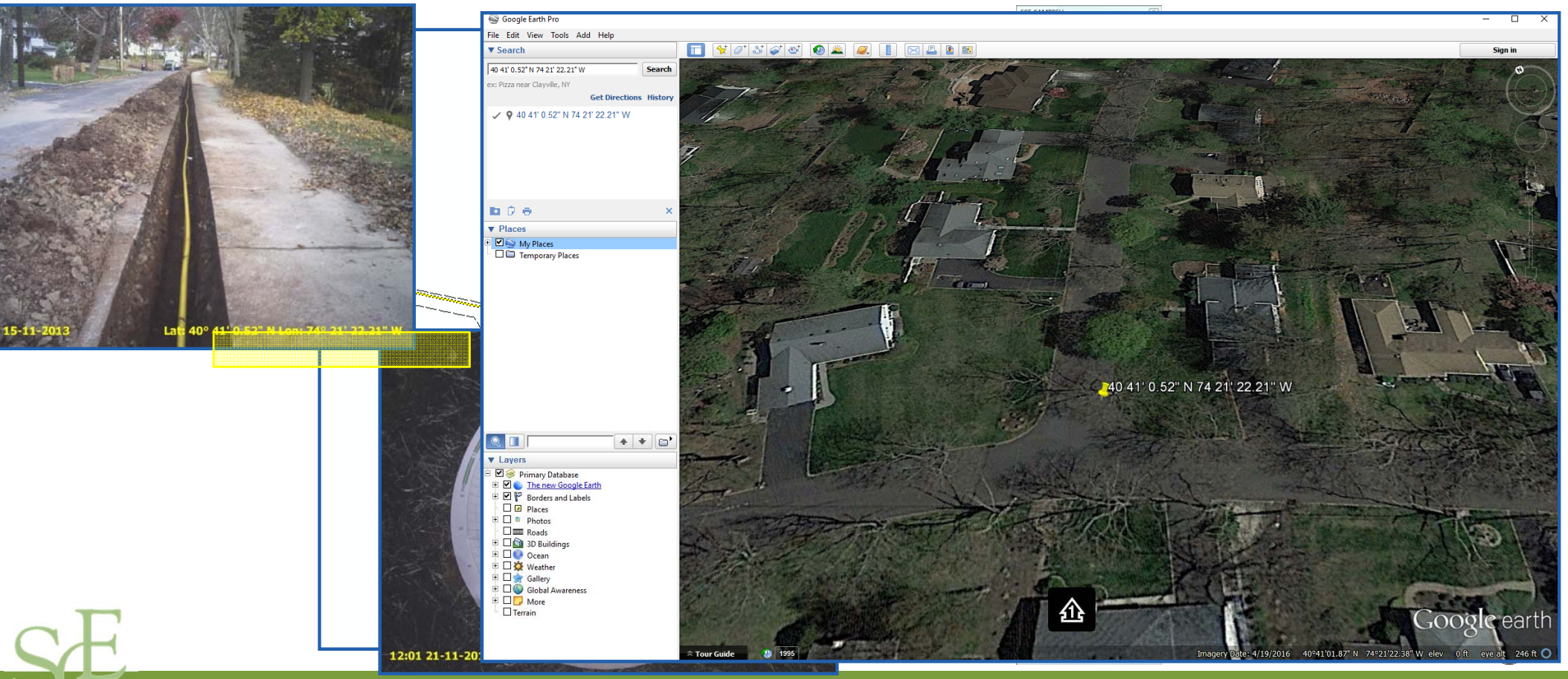
Barcode Feature Attributes (ASTM F2897)

- Characters 1-2 – Manufacturer
- Characters 3-6 – Model # & Lot #
- Characters 7-9 – Production Date
- Character 10 – Material
- Characters 11-12 – Component
- Characters 13-15 – Nominal Size
- Character 16 – Reserved

Feature Attributes & Geospatially Referenced Photos



Data QA/QC

Contractor	Date	WELD ID #	Welder ID	PV (Y/N)	Welder ID	PV (Y/N)	Welder ID	PV (Y/N)	Welder ID	PV (Y/N)	Welder ID	PV (Y/N)
			RP		RP		HP		HP		REPAIR	
SEC	4/12/2016	RP/HP	40434	Y	54344	Y	40434	Y	54344	Y	N/A	N
SEC	4/19/2016	RP/HP	54344	Y	20970	Y	54344	Y	20970	Y	N/A	N
SEC	2/27/2016	RP/HP	40472	Y	40434	Y	40472	Y	40434	Y	N/A	N
SEC	3/5/2016	RP/HP	40472	Y	40434	Y	40472	Y	40434	Y	N/A	N
SEC	3/5/2016	RP/HP	40472	Y	40434	Y	40472	Y	40434	Y	N/A	N
SEC	4/19/2016	RP/HP	54344	Y	20970	Y	54344	Y	20970	Y	N/A	N
SEC	4/16/2016	RP/HP	40289	Y	54344	Y	40289	Y	54344	Y	N/A	N

- Weekly Submission and Data Review
  - QA/QC Scripts written in ESRI Data Reviewer for Automated Geospatial and Attribute Completeness and Accuracy
  - Enhanced GIS Data compared against the Material List, Weld Log & Inspection Reports
  - Any attribute discrepancies in the data analyzed using the Feature Photos to verify data
  - Discrepancies addressed

Deliverables & Schedule

- Initial Asbuilt Deliverable
  - Retrofit or Repair Work Complete (10 days)
  - Mainline Gas On (10 days)
  - Station Gas On including SCADA / Electrical / CP / AC (20 days)

- Inspection Report Deliverable
  - Retrofit or Repair Work Complete (5 days)
  - Mainline Gas On (5 days)
  - Station Gas On including SCADA / Electrical / CP / AC (5 days)

- Weld Log Deliverable
  - Inspection Report Deliverable (5 days)

*Once each of the following schedule items is complete, the responsible party will have the time allotted in parenthesis for their project final deliverable.

- GIS Review
  - Mainline Install / Retrofit / Repairs (10 days)
  - Station including SCADA / CP / AC (20 days)

- Final Asbuilt Mark-ups
  - All GIS Reviews Complete (10 days)

Tracking Construction Progress

Field

- GPS Location
- Data Documentation
- Bar Code Scanning
- **Daily** QA/QC and Data Download

Office

- Data Set Integration
- Review and QA/QC
- **Weekly** Submission to Atlanta Gas Light

Additional Benefits

Sub centimeter Accurate Survey

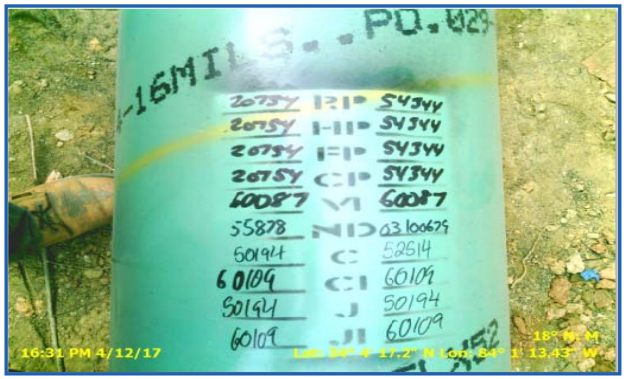
Continual Data Dictionary Development and Improvements Version 10.4.2 (over 50 iterations)

Additional Data Collected – Cathodic, Existing Facilities, Trenches, Utility Crossings, ROW, Edge of Pavement

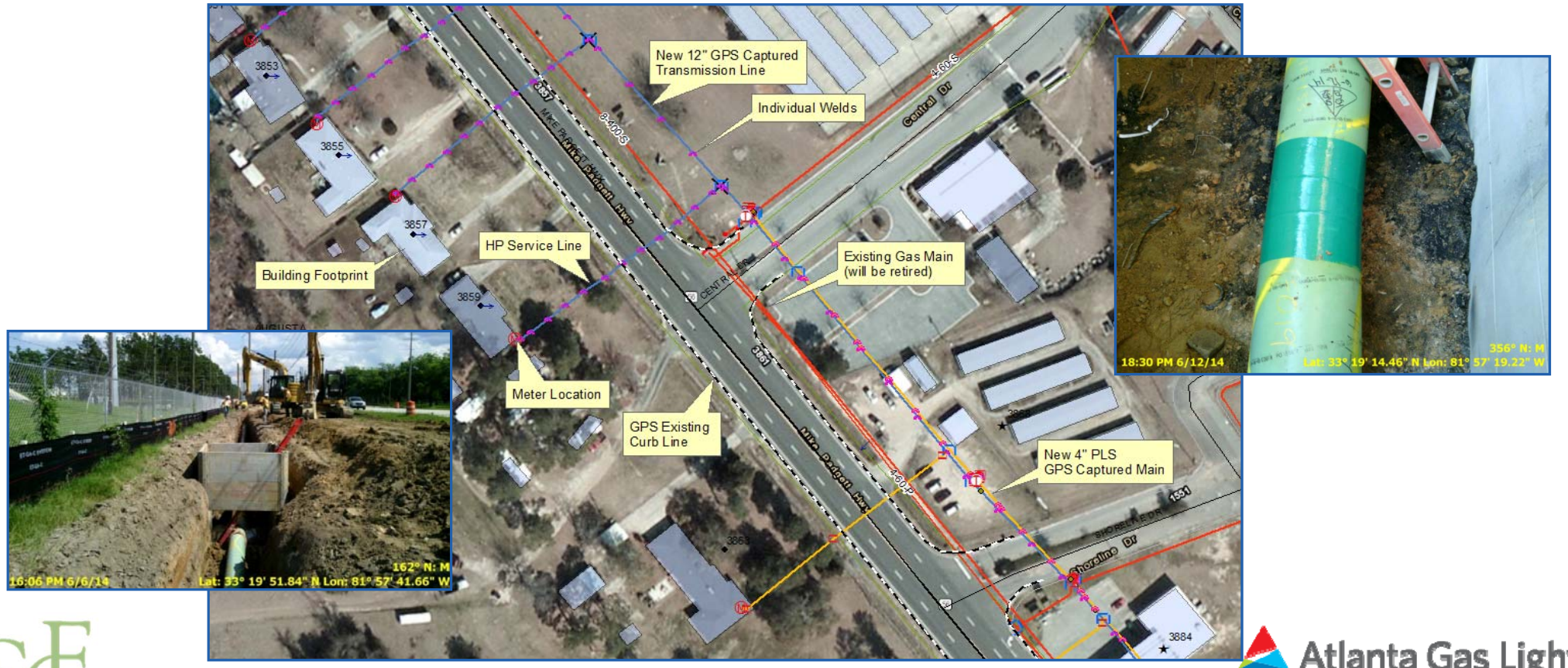
Timestamped and Geospatially referenced photos to verify date of installation and location

Photos of fusions & welds and adjoining main to verify sequence. Implementation of Stencils & Stencil Photos to verify personnel

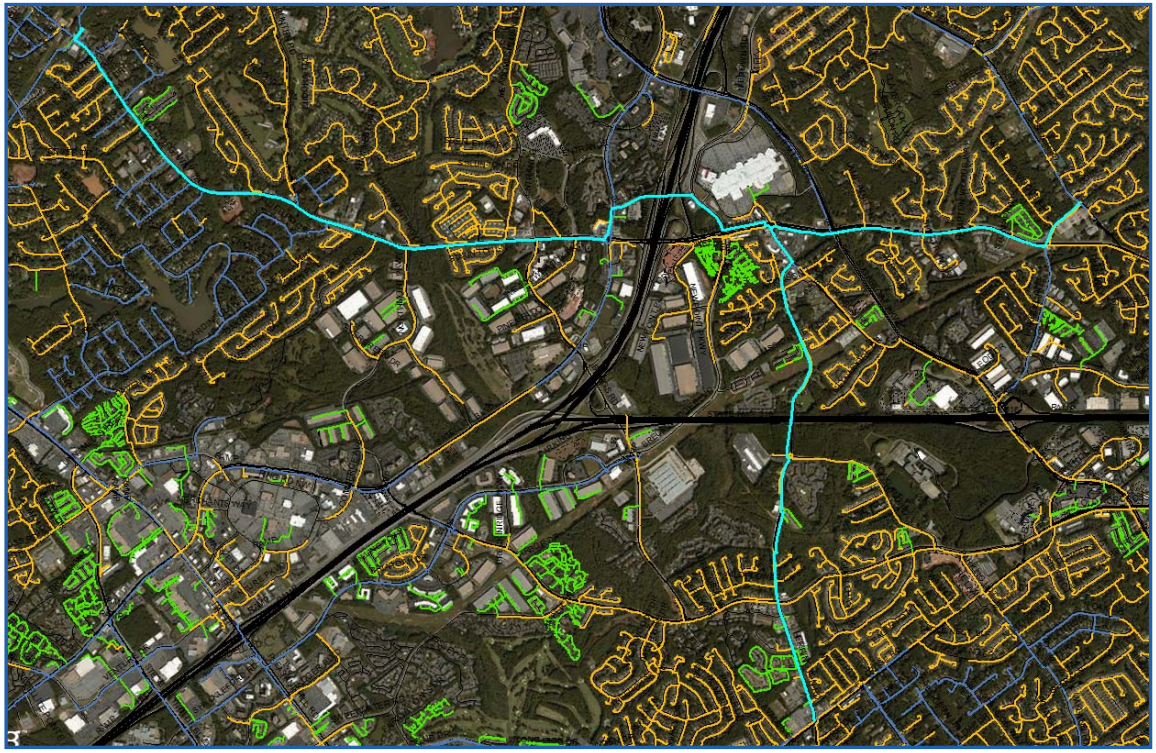
Photos of pipe in the trench to verify installation practices/guidelines



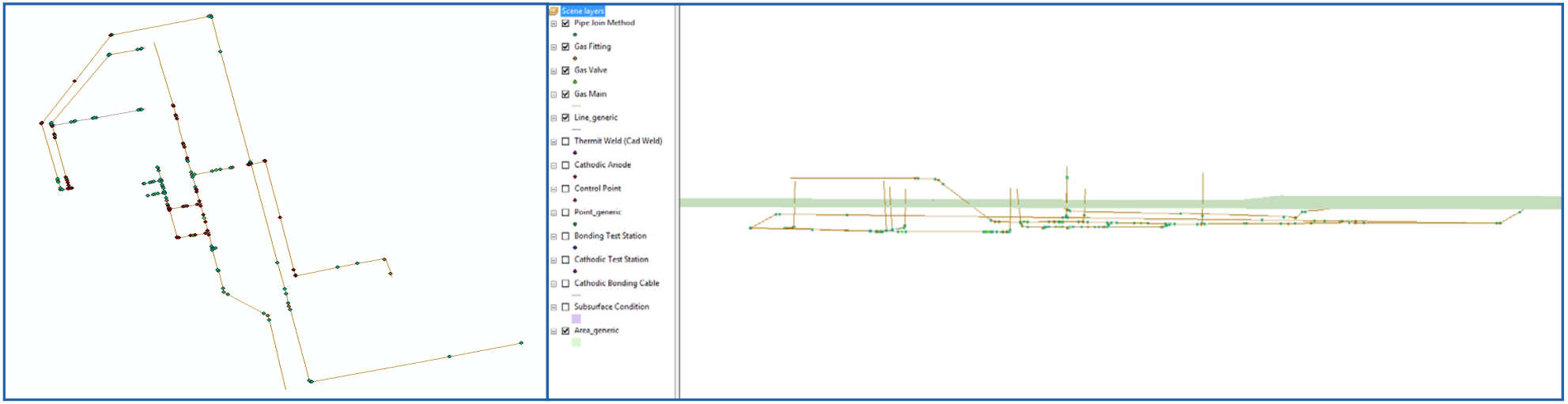
Steel - Mike Padgett Highway



Steel - Duluth Highway



Steel - Newnan Bypass Regulator Station



PLAN VIEW

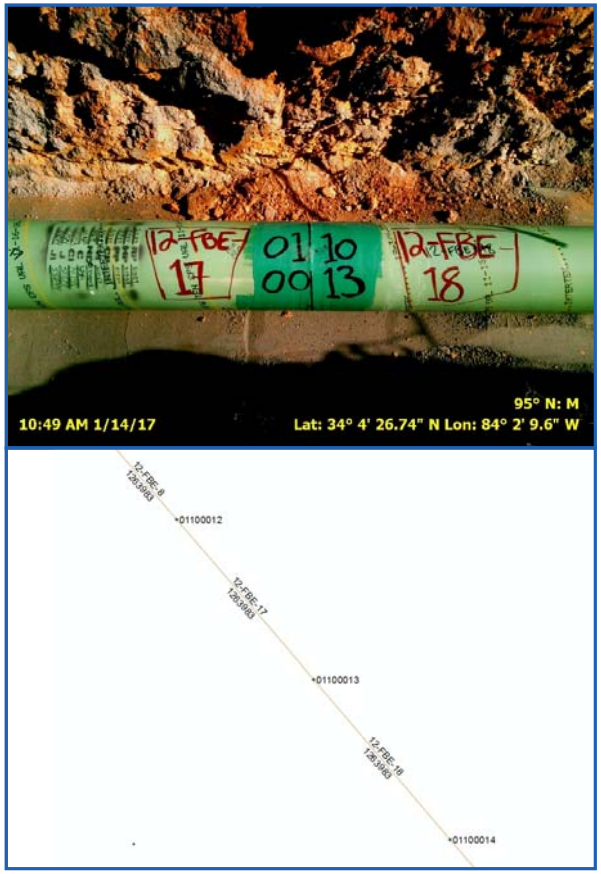
ELEVATION VIEW

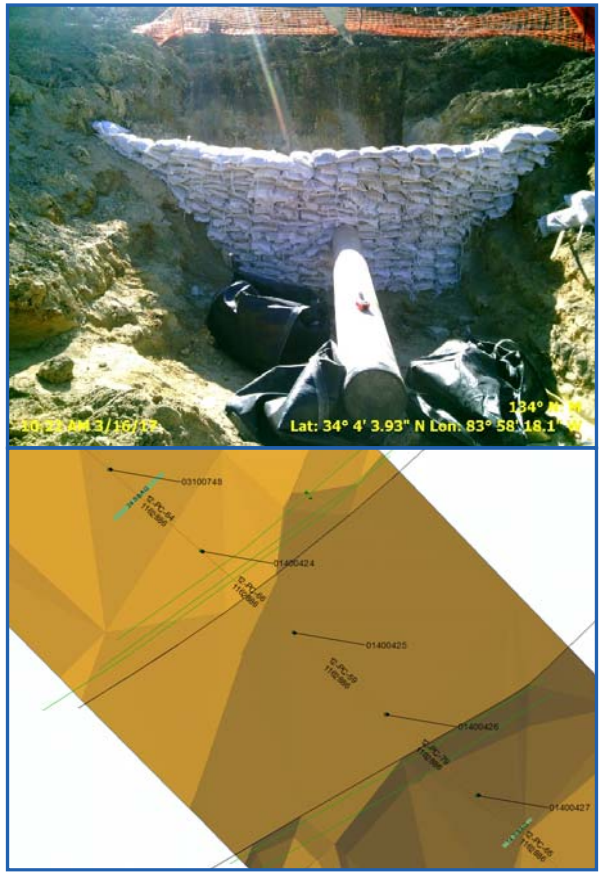
- Photos of fusions & welds and adjoining main to verify sequence
- Stencil photos to verify all personnel
- Photos of pipe in the trench to verify installation practices/guidelines

Integrity Verification

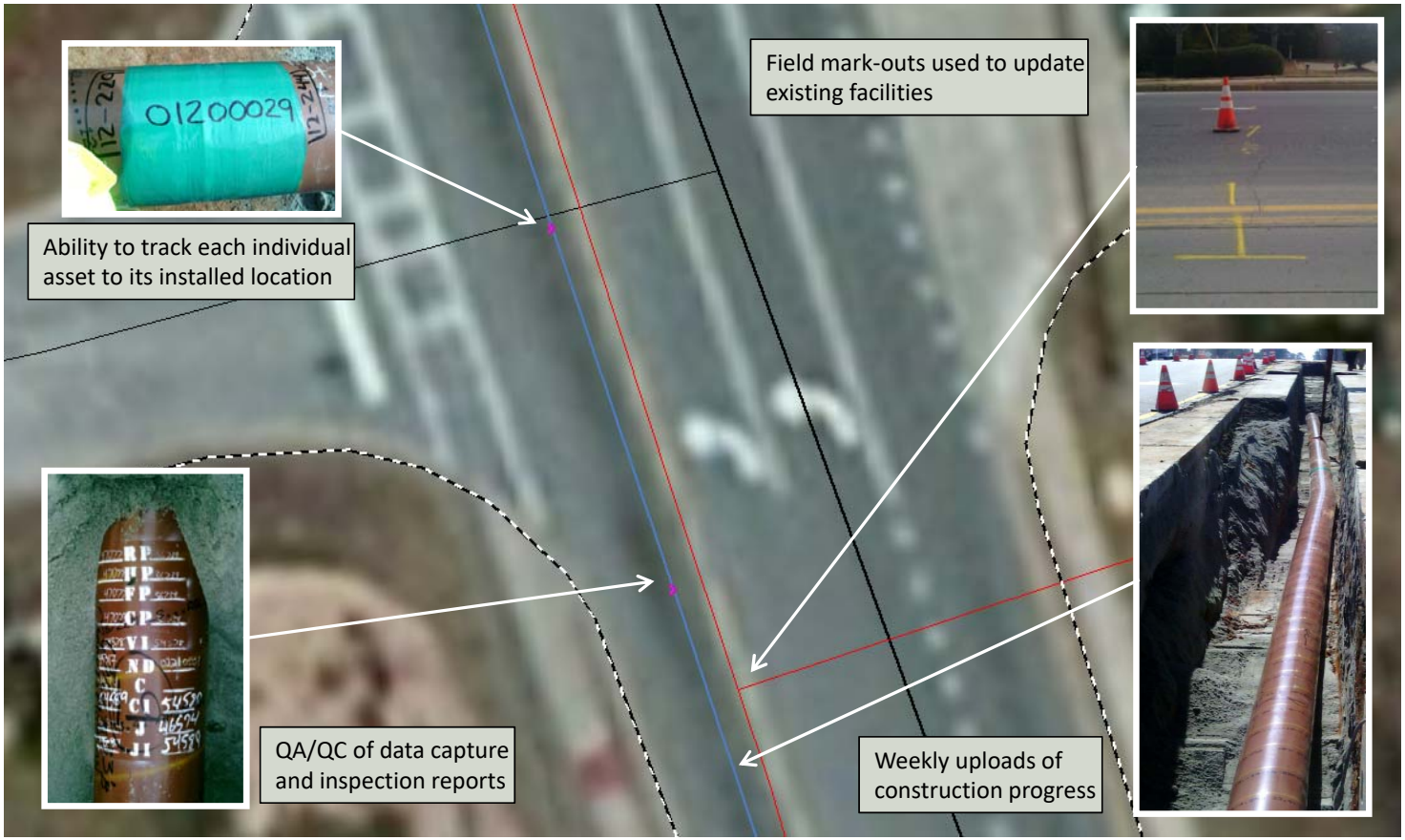
- In-Line Inspection (ILI)
- MAOP Verification
- Casing Replacement
- Retrofit
- Repair/Replacement
- Centerline Survey
  - Class Location Studies
  - Leak Survey
  - 811 Locate

New Construction Enhanced GIS Data Collection





New Construction Enhanced GIS



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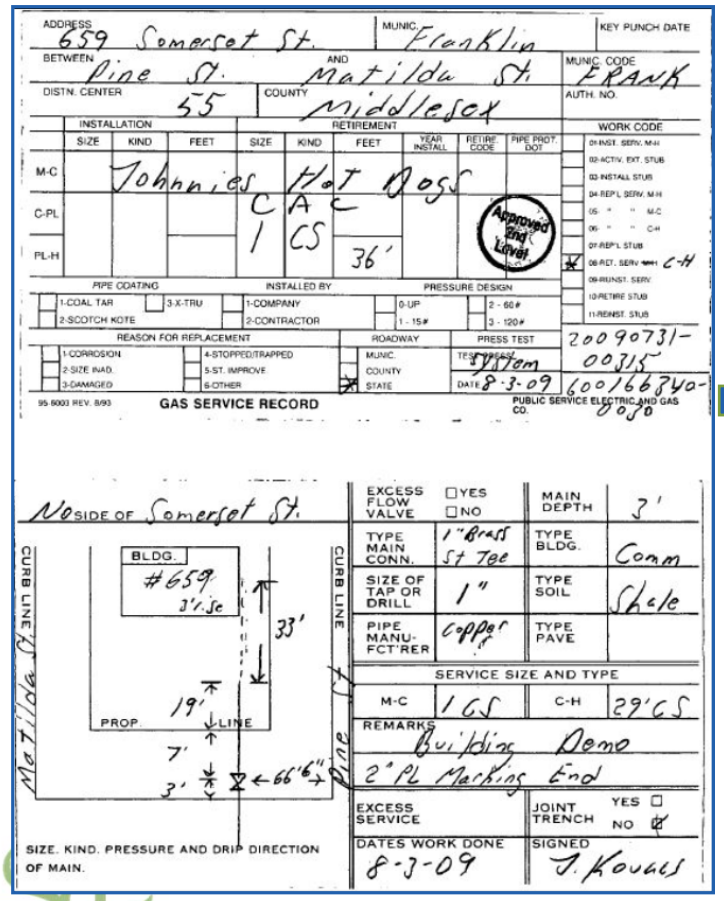
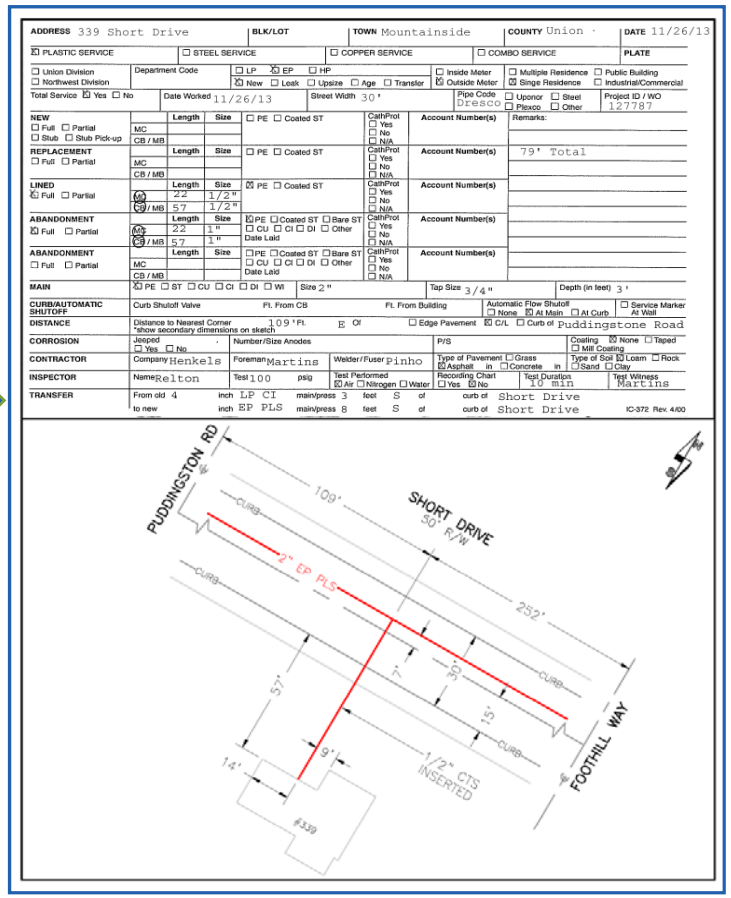
New Construction Enhanced GIS Data Collection

As-Built Generation from Enhanced GIS Data

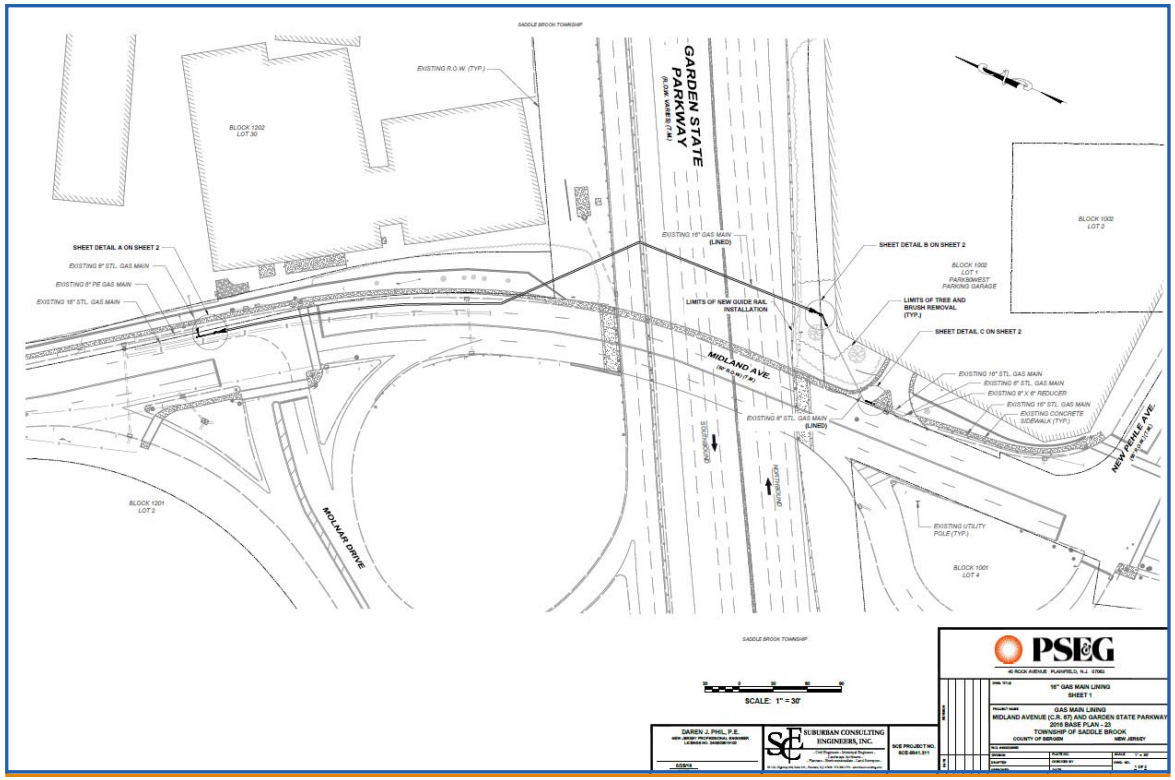


GAS SERVICE RECORD

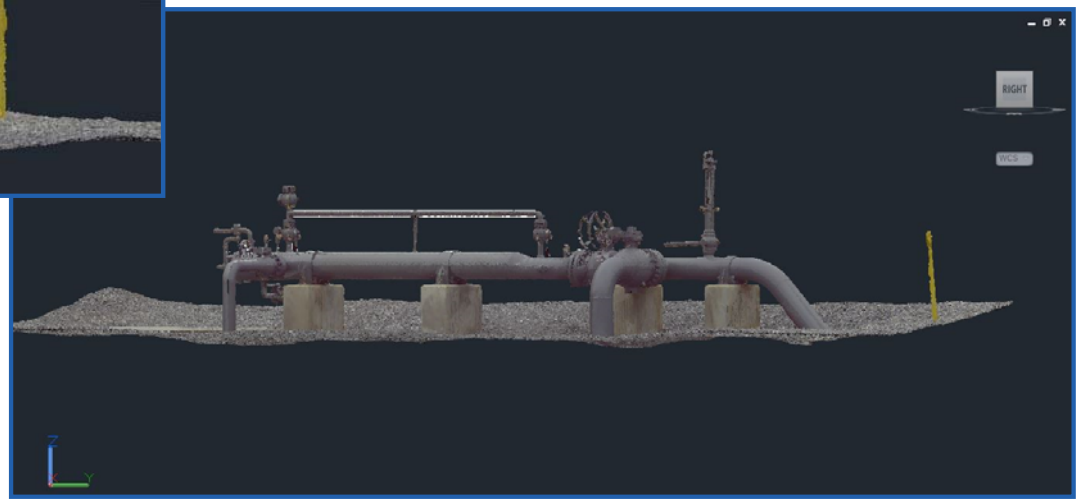
PUBLIC SERVICE ELECTRIC AND GAS CO.



As-Built Generation from Enhanced GIS Data



3D Scanning



Atlanta Gas Light

Enhanced GIS Data Collection