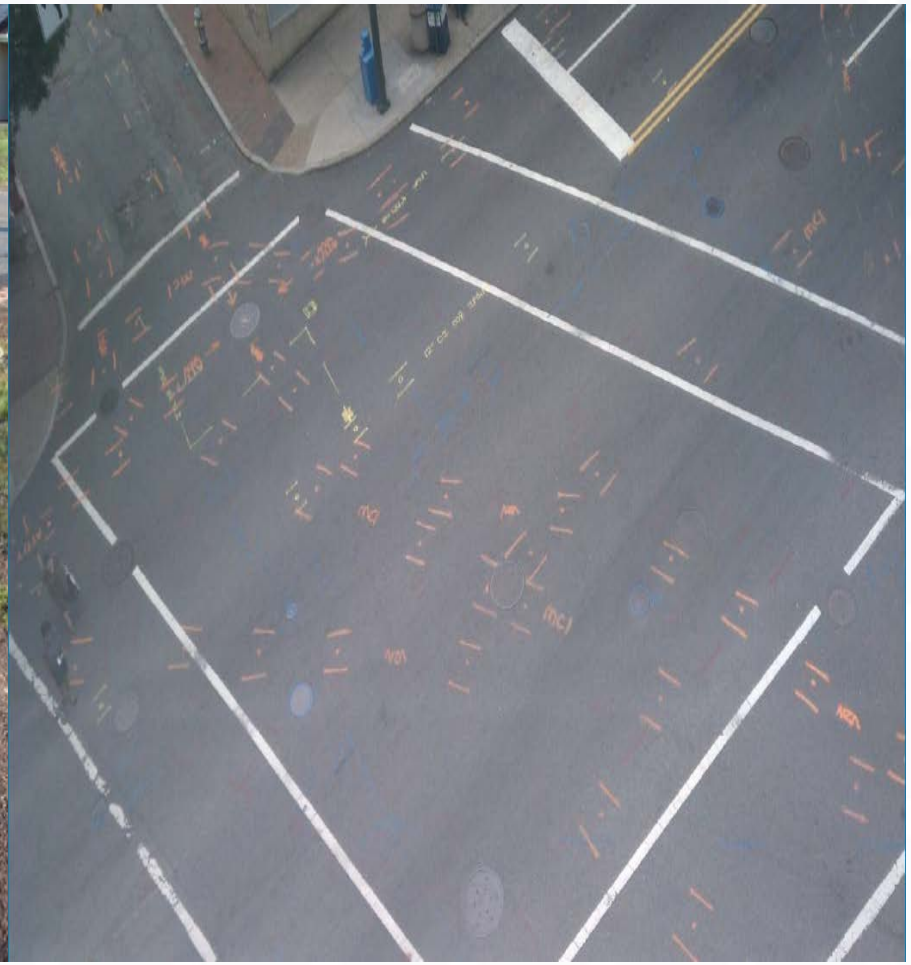
Utility As-Built Mapping Program Using RFID/GPS Advanced Technologies

Matt McLaughlin, CCM
Utilities Program Manager
CES Consulting LLC

RFID Technology Presentation Outline

- One Call Field Markings
- Crowded ROW's / Damage Prevention
- GPS/RFID Mapping Program
- Installation Process
- Installation Protocol
- Field Applications
- Incorrect Locates
- VA SCC Marking Standard
- RFID Decal Locations
- Overview of Benefits w/examples
- Cost Analysis
- Master Utility As-Built Plan
- ArcGIS/Cloud Based Storage

One Call Field Markings

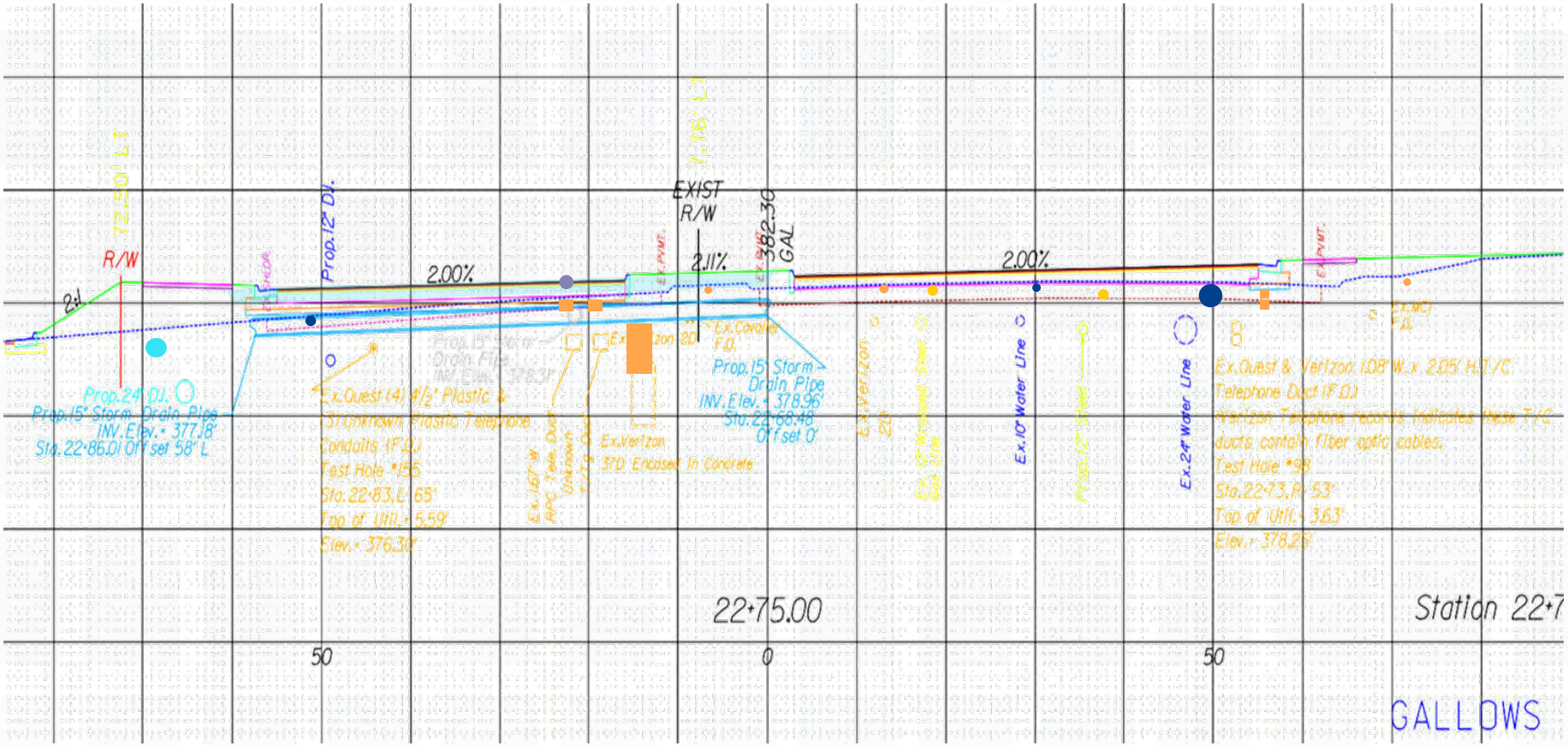


Working Around Underground Utilities

Damage Prevention

Gallows Road Pilot Program

X-Section 22+75.00



GPS/RFID Mapping Program

- RFID markers provide pertinent information about the utility system to Utility Owners, Locators, Excavators, and Design Engineers.
- The RFID markers have a specific radio frequency for all of the different utilities
- Assigns each programmable RFID tag with GPS coordinates with sub-foot accuracy for mapping and locating purposes.
- Compiles relocated and/or newly installed utility information for record keeping and retrieval.
- RFID tags have proven to increase the accuracy of utility locating in both the vertical and horizontal aspects.
- Provided pertinent information to the Excavator for construction and test pitting purposes that is normally unknown

➢ *Does not supersede any Miss Utility Laws*

RFID Marker Installation Process

Step 1

Transfer template from the PC to the RFID locator

Step 2

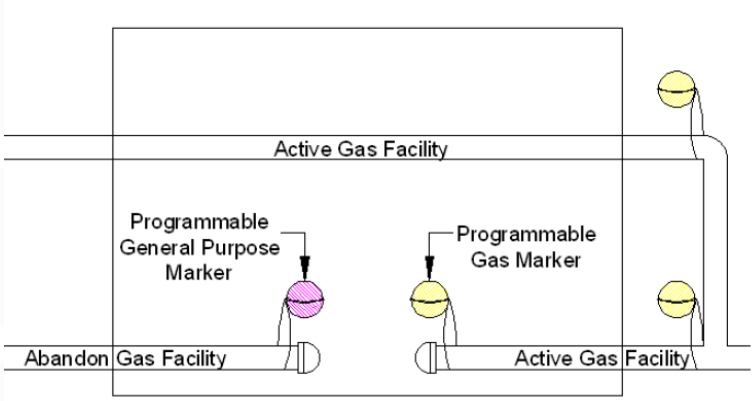
Program Ball which transfers information from the locator to the RFID Marker

Step 3

Install RFID Marker above utility

Using General Purpose RFID Markers

- Can be installed in close proximity to gas marker without interference
- Reduces the risk of being marked as an active line
- Ties specific valuable information to the abandoned main
- Assists the operator in timely determination of abandoned vs. live lines



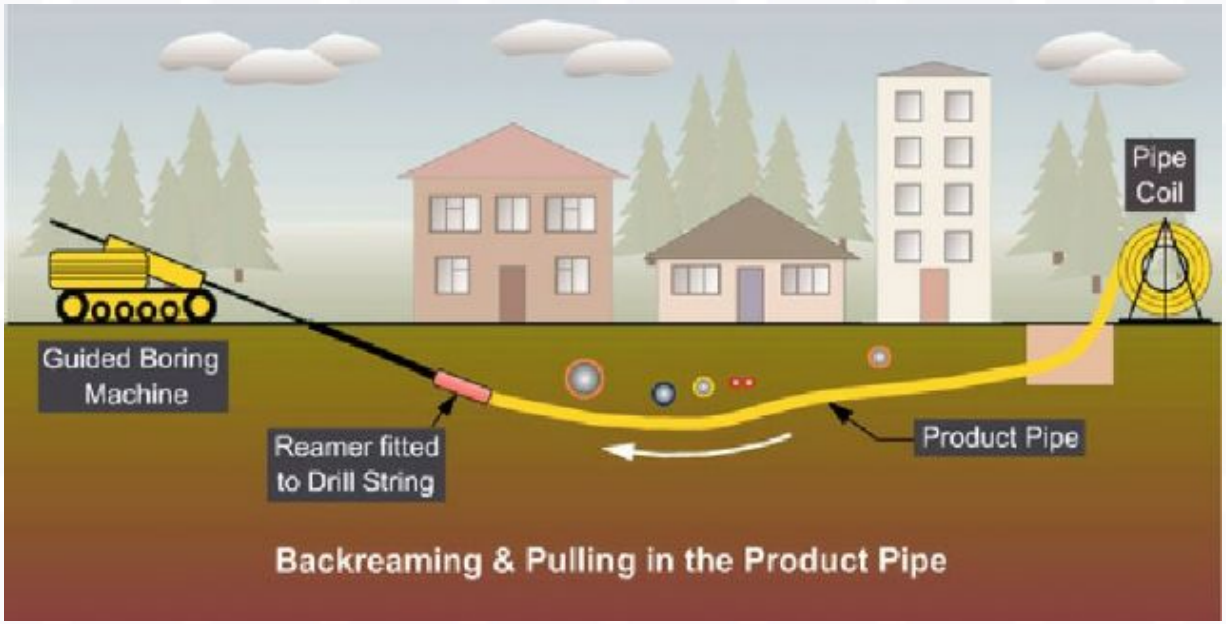
Protocol for RFID Marker Installation

- Installation of RFID markers on utility facilities:
  - Every 25’ for metallic and non-metallic pipes.
  - Every horizontal, vertical directional change, critical existing utility crossings, service connections, and abandoned facilities.
- Install RFID on existing facilities during test pit operations.
- Programmable RFID tags provide vital information about the facility (Owner, Type, Elevation, etc.).
- During utility construction phase , the as-built information can be provided to the project stakeholders on a monthly basis for progress reporting.
- At the end of relocation efforts, a Master Utility As-built Plan is provided to the Owner and the Awarded Highway Contractor

Field Application Using RFID Markers

Field Applications Using RFID Markers

Directional Drilling Operation



During the directional boring operation the RFID Near Surface Markers are utilized. These markers are installed at every other rod change. At this point the drill foreman acquires the depth and location of the drill head and paints this information on the ground at that exact location.

This information is collected and programmed into the marker. It is installed at that specific point after the rods are removed and back reamed. A RFID Near Surface Marker is installed by using a 2” drill bit placed 2’ deep or other means to create a pilot hole for the marker to be installed.

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Utilizing RFID Markers on Directional Drilling

Incorrect One Call Field Locates


Survey
10' offset
6 11:45AM

Incorrect One Call Field Locates

Incorrect One Call Field Locates

RFID power marker balls located but facility not marked due to new location not shown on utility company records

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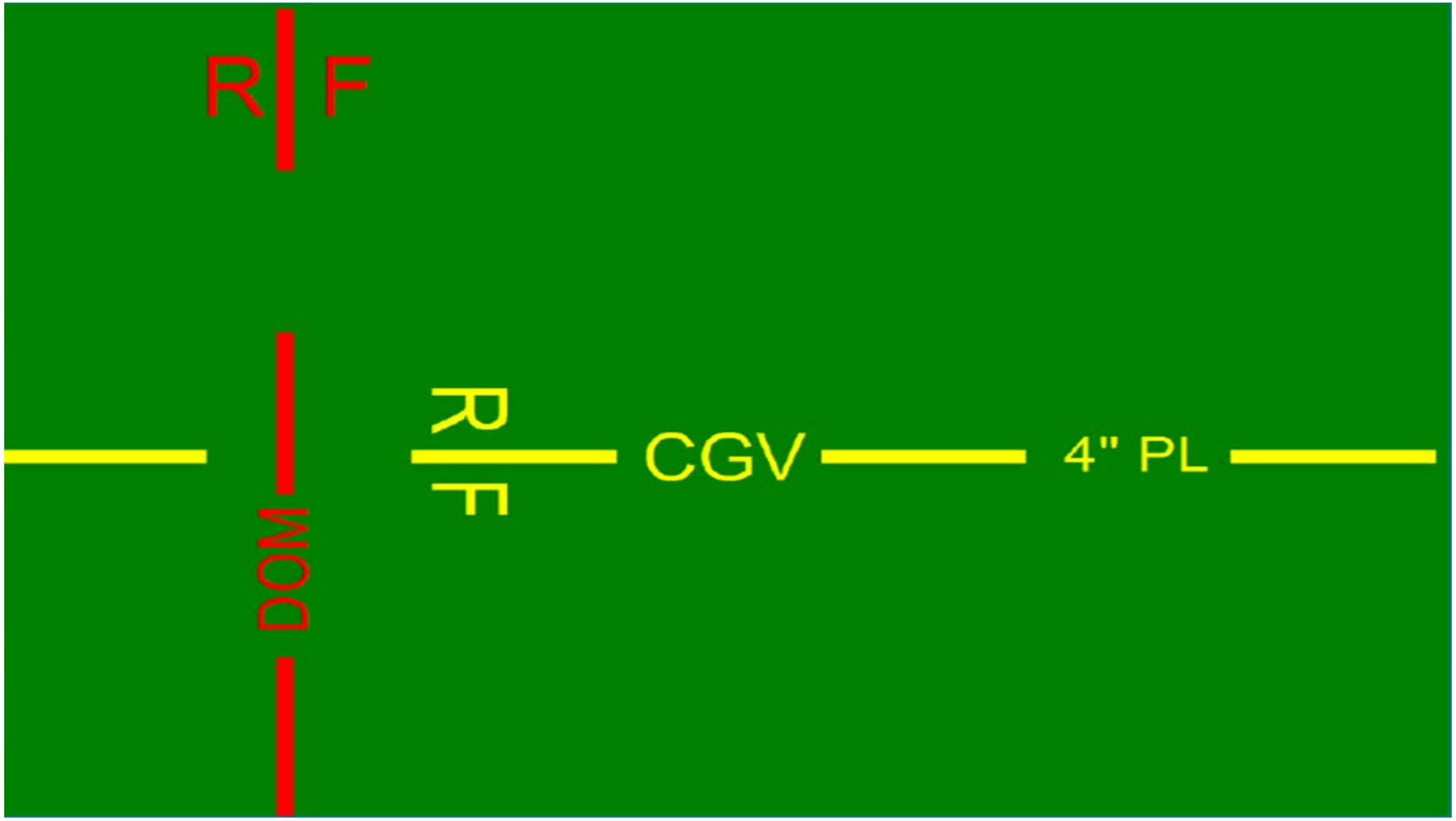
Virginia State Corporate Commission Marking Standard Best Practice for Locating RFID Capable Devices

- “When Radio Frequency Identification (“RFID”) technology is being used to mark the location of an underground utility line, locators shall indicate the letters „RF‟ over the approximate location of the RFID capable marker.”

Virginia State Corporate Commission Marking Standard Best Practice for Locating RFID Capable Devices



RFID Decal Locations

Overview of Benefits

- Enhances damage prevention and public safety throughout the Commonwealth of Virginia.
- Conveys the knowledge obtained from the utility design and inspection operations to the projects stakeholders.
- The RFID markers become the backbone of the GPS mapping system and provides specific information for future use by the Contractors, Locators and Designers.
- Creates a linear GPS segment that can be used to establish the zone of protection for the specific utility when construction equipment is outfitted with GPS enabled digging trigger mechanisms

Cost Analysis for RFID/GPS Mapping

- Gallows Road Project
- Total Utility Investment – $15M
- Cost = $10,000
- Percentage of Total Value
  0.06

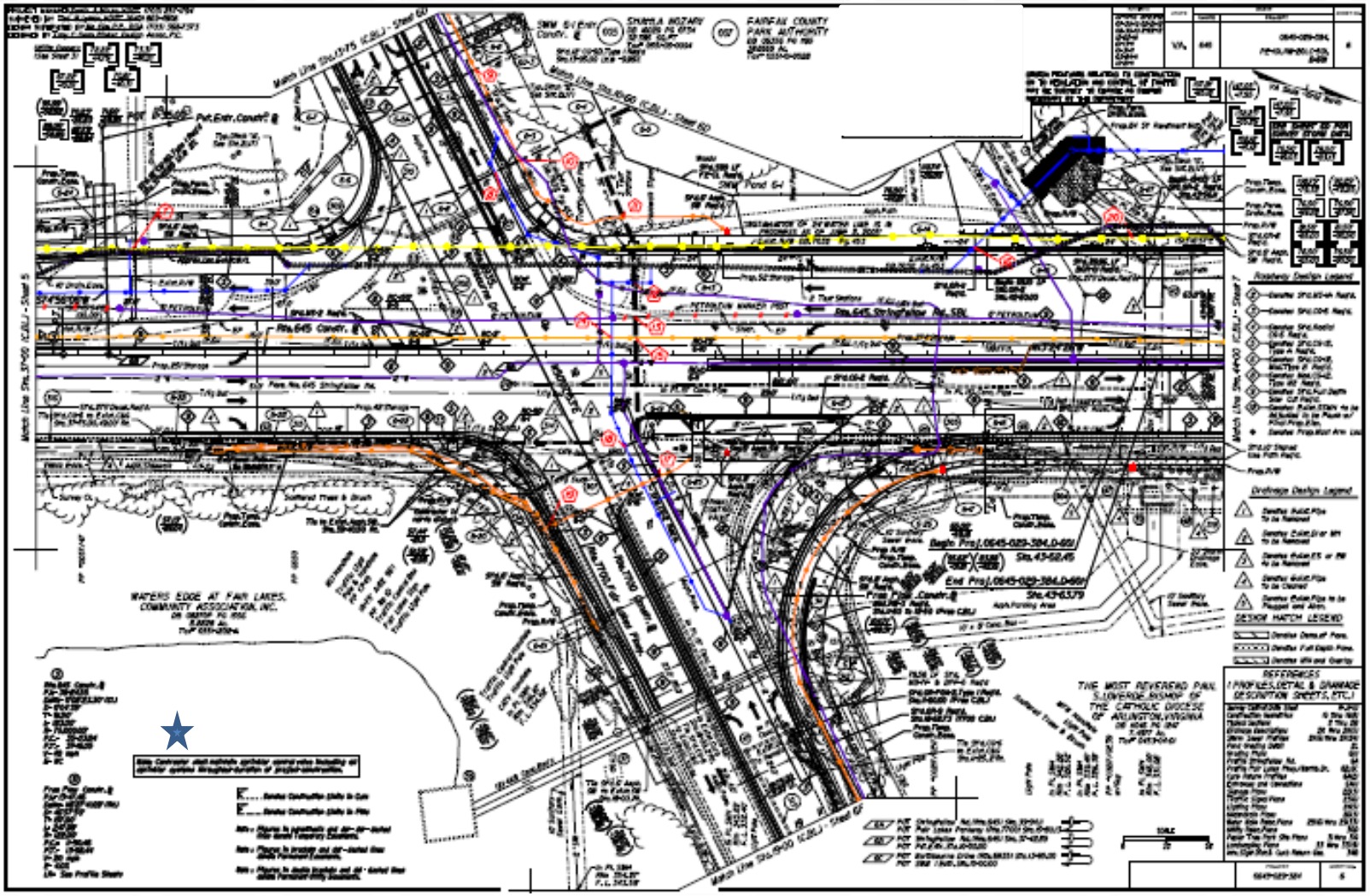
- Stringfellow Road Project
- Total Utility Investment – $25M
- Cost = $37,500
- Percentage of Total Value
  0.15

The average cost range to install a 24" water main is approximately $145.00 to over $500.00 per linear foot.

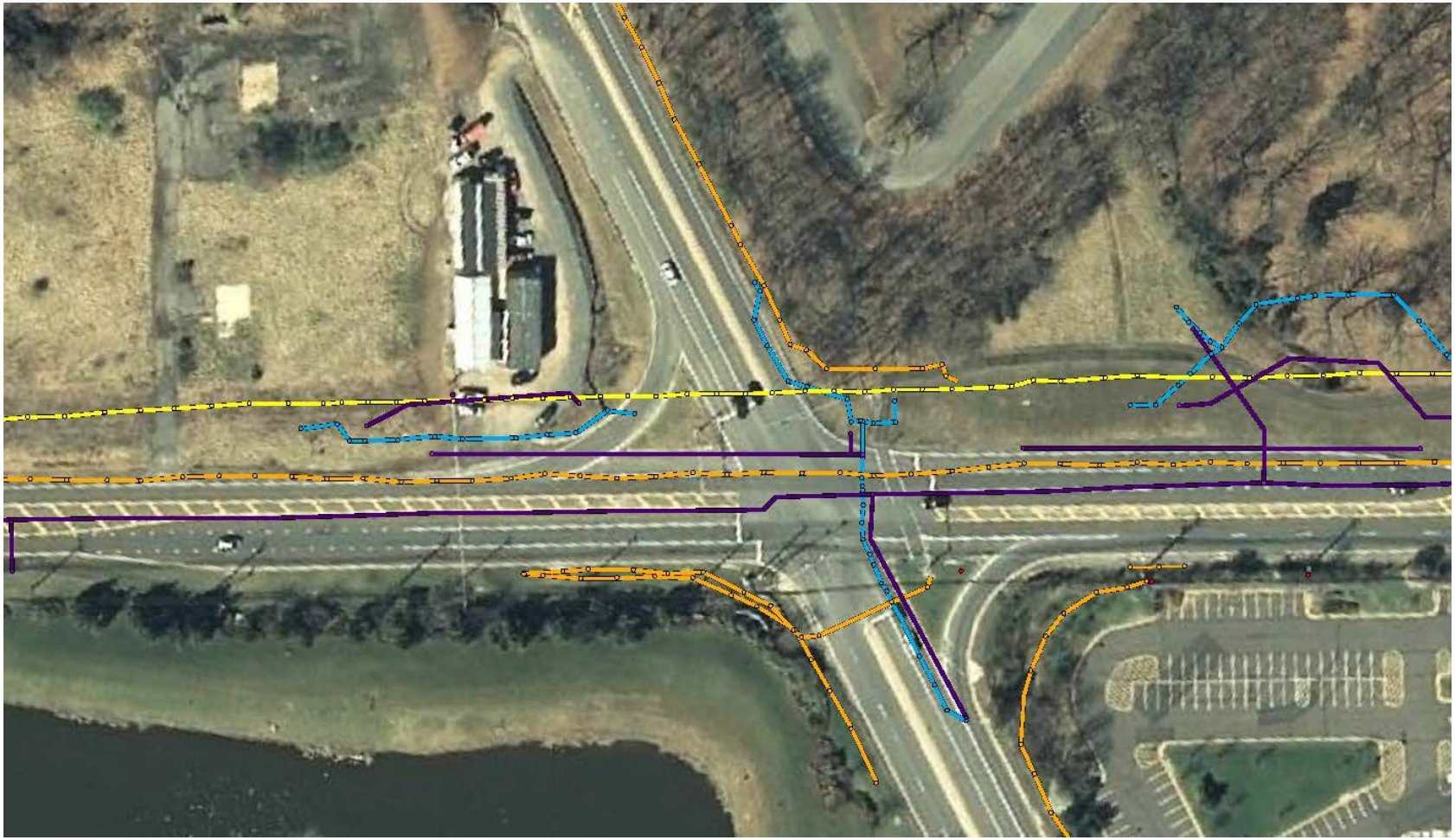
A recently installed 6" petroleum pipeline cost the owner approximately $8 million to relocate. The RFID markers were installed to facilitate the locating and mapping at a cost of $7500.00 for materials and $2500.00 for labor.

The cost to install RFID tags at a rate of 4 marker balls per hundred linear feet of pipe as previously specified increases the cost per linear foot by $ 0.60

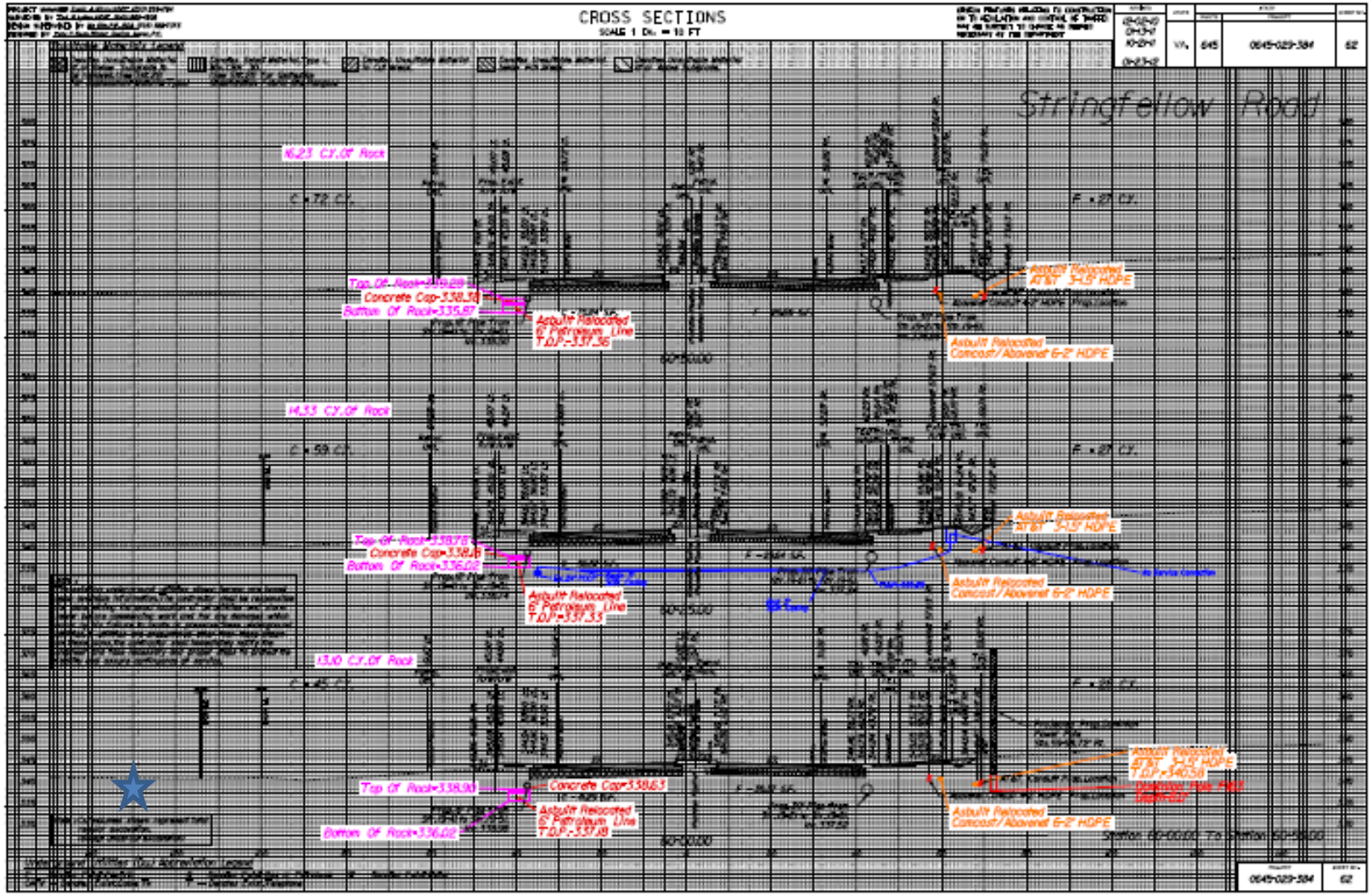
Master As-Built Plan



Google Earth Example



3D Modeling


CROSS SECTIONS
Stringfellow Road
16.23 CY.Of Rock
Top Of Rock=338.29
Concrete Cap=338.38
Bottom Of Rock=335.87
Asbuilt Relocated
6" Petroleum Line
T.O.P.=337.36
Asbuilt Relocated
Concast/Abovenet 6-2" HDPE
14.33 CY.Of Rock
Top Of Rock=338.78
Concrete Cap=338.48
Bottom Of Rock=336.02
Asbuilt Relocated
6" Petroleum Line
T.O.P.=337.33
Asbuilt Relocated
Concast/Abovenet 6-2" HDPE
13.10 CY.Of Rock
Top Of Rock=338.90
Concrete Cap=338.63
Bottom Of Rock=336.02
Asbuilt Relocated
6" Petroleum Line
T.O.P.=337.18
Asbuilt Relocated
Concast/Abovenet 6-2" HDPE
0645-029-384
62

ArcGIS Cloud Based Data Storage

Data collected

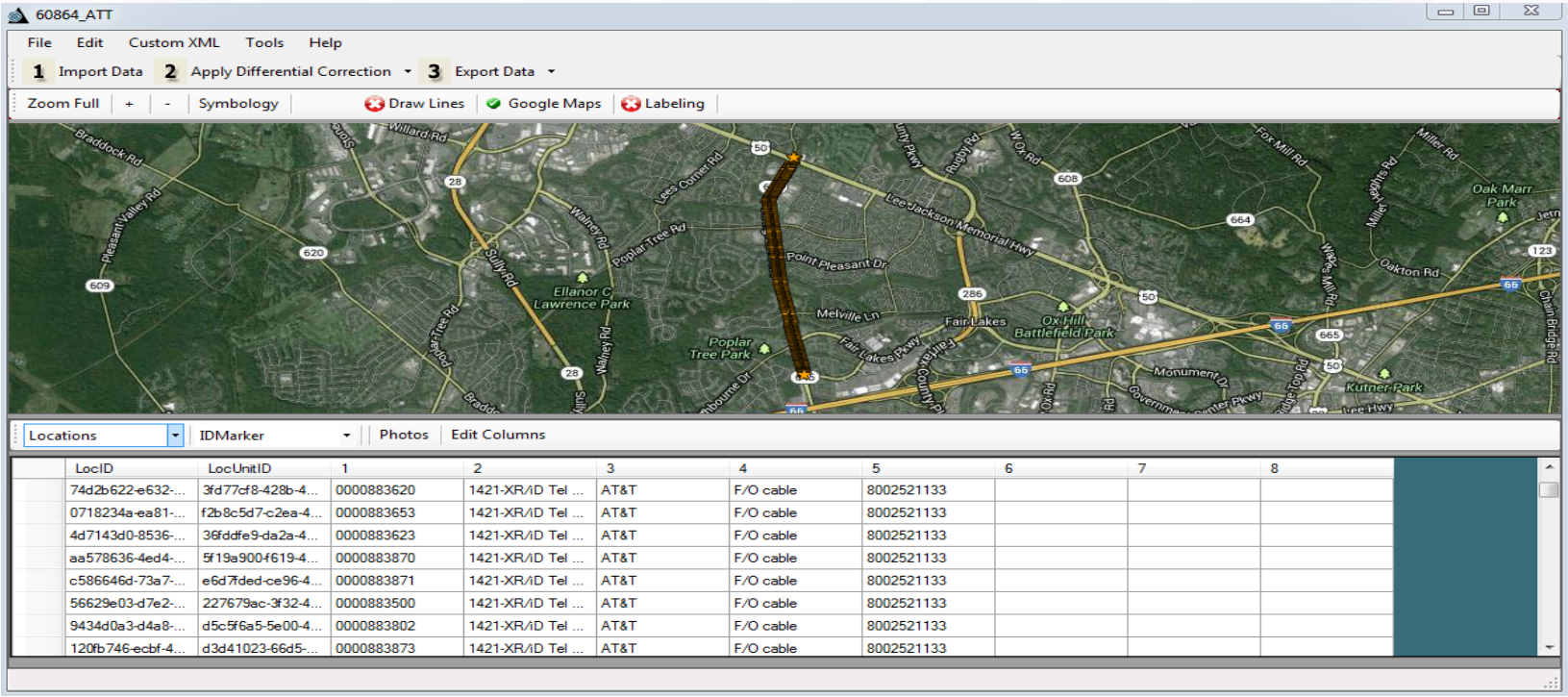
↓

Download Data & Post Process

↙ Export CSV file for Cadd

↓ Export ESRI Shape File for GIS

Export KML File for Google Earth



LocID	LocUnitID	1	2	3	4	5	6	7	8
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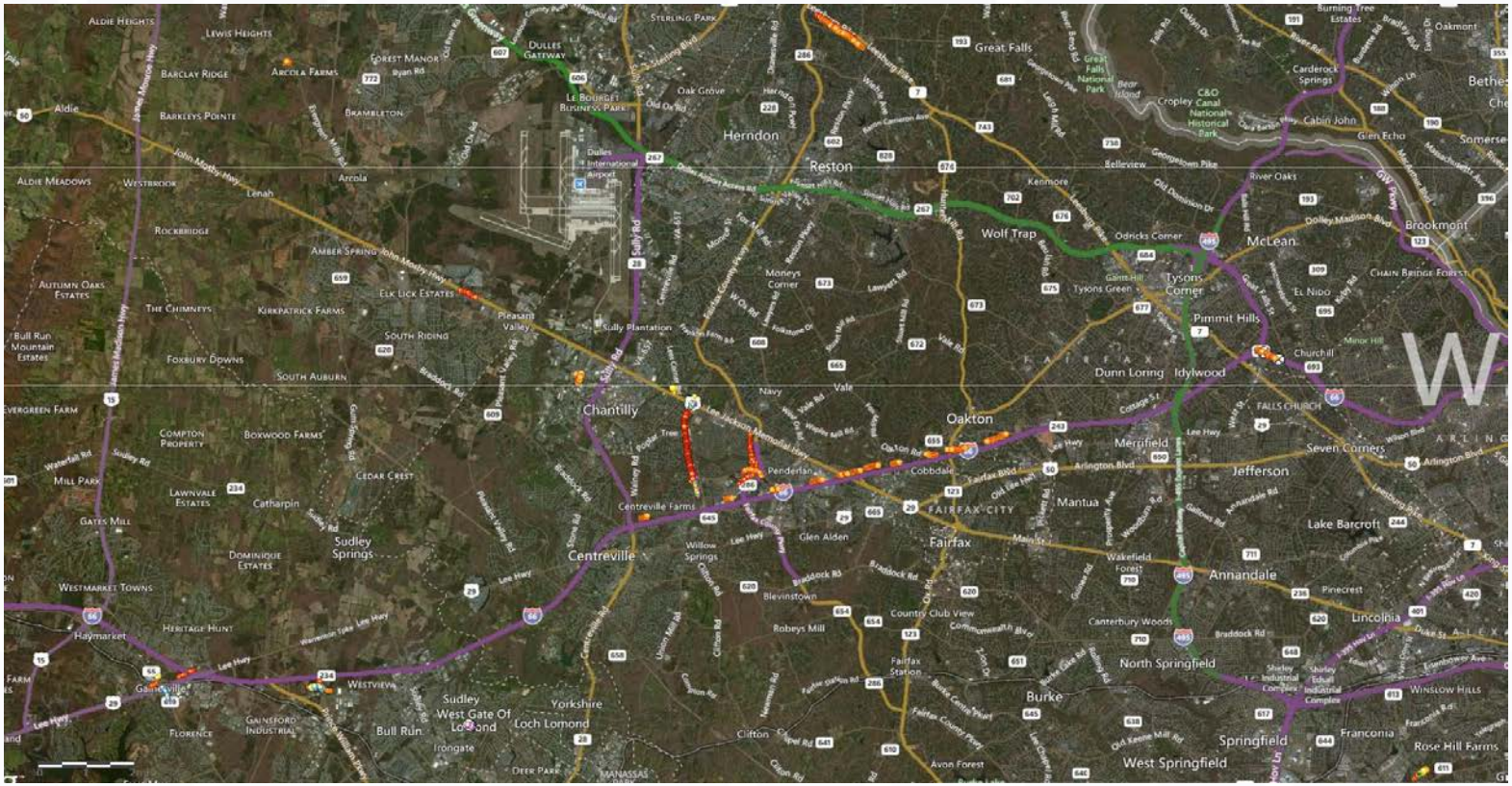
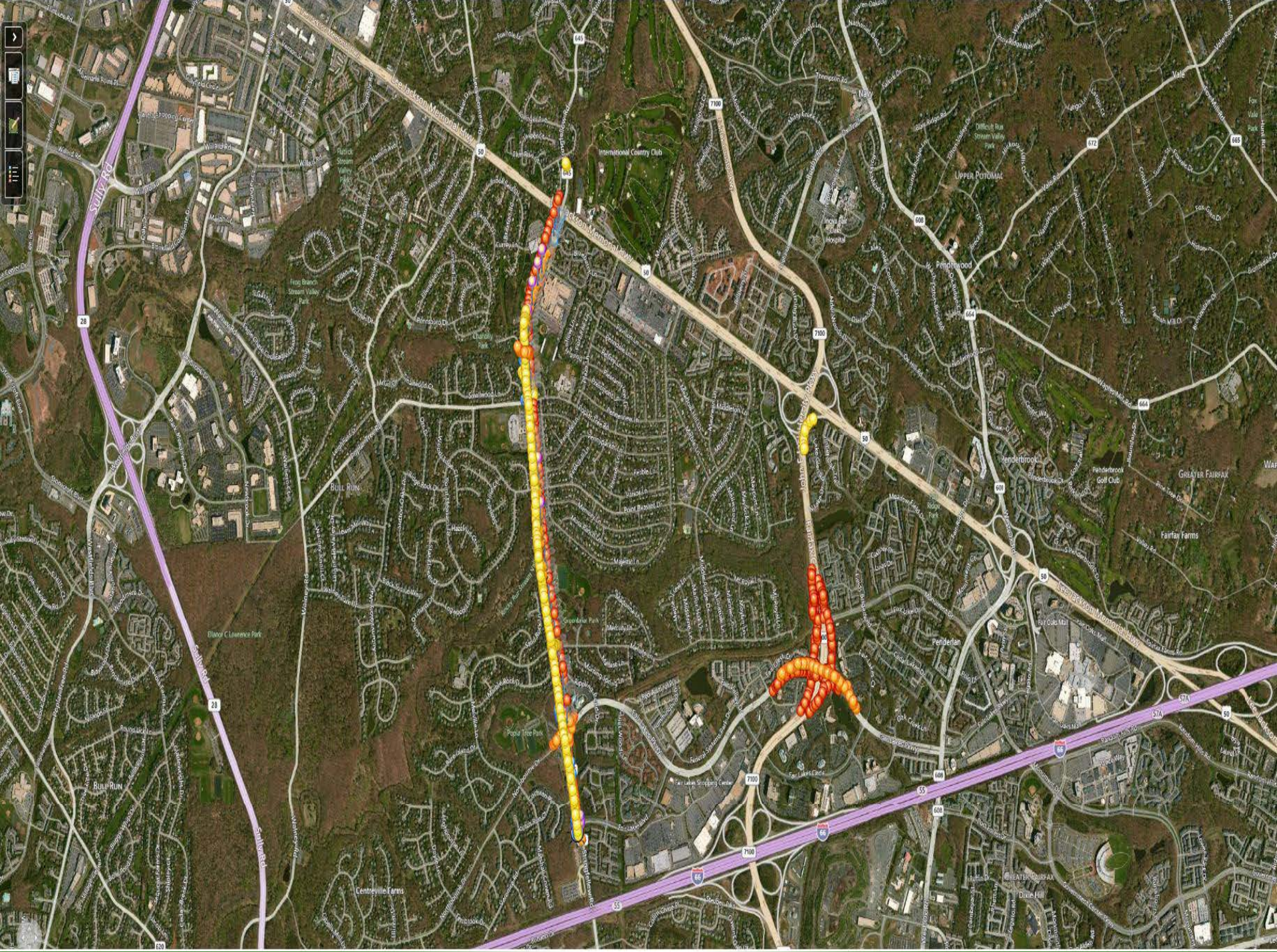
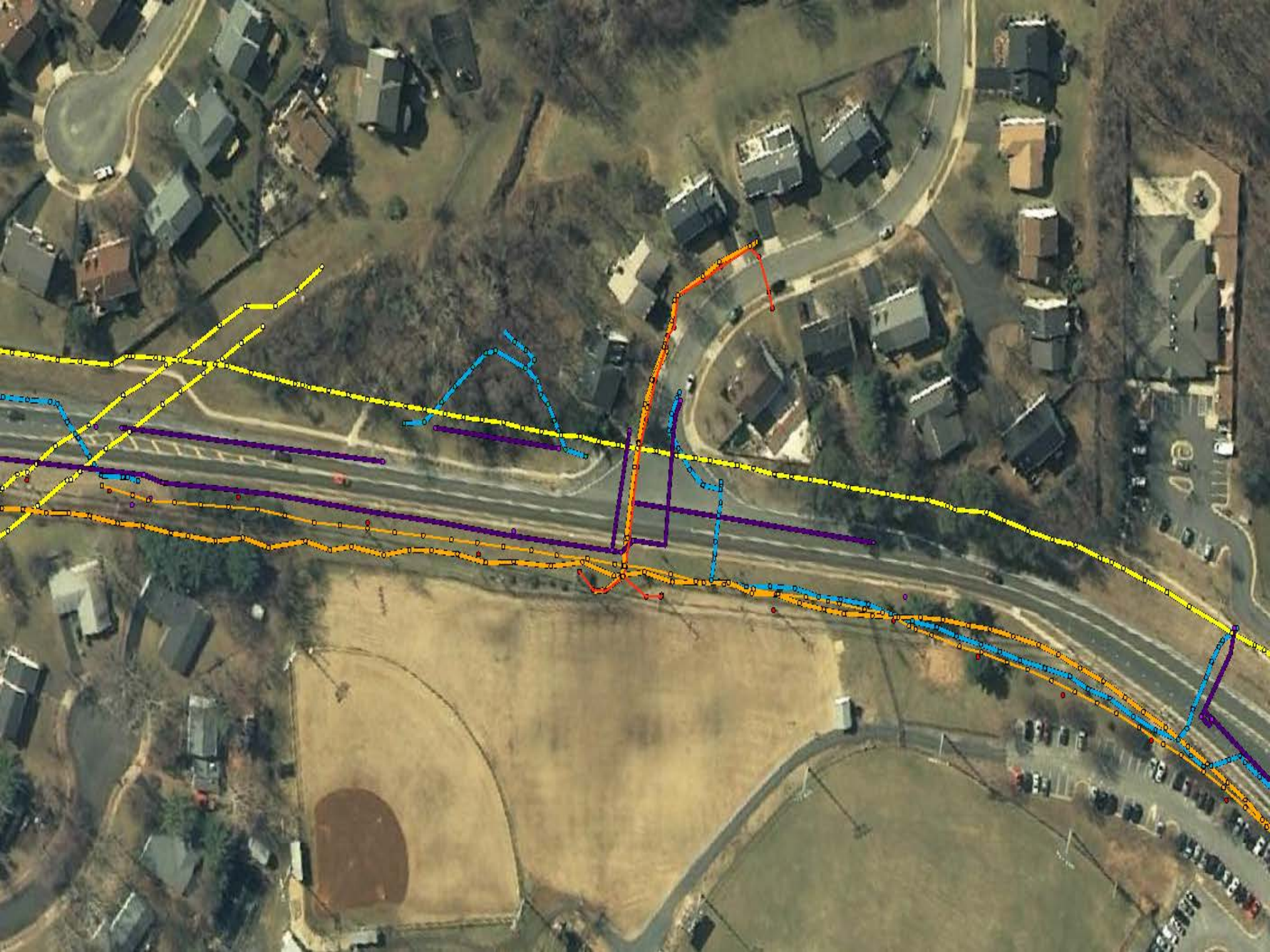
ArcGIS Data Storage



Utility Master Relocation Plans are developed for each project, which in turn establishes a Utility Data Base that can be referenced to show the location of the new facilities


Sully Rd
Jackson Memorial Hwy
International Country Club
Upper Potomac
Pendergrass
Pendergrass Golf Club
Greater Fairfax
Fairfax Farms
Bull Run
Elanor C Lawrence Park
Popular Tree Park
Centreville Farms
Fair Lakes Shopping Center
Fair Lakes Circle
Fairfax Center
Dixie Hill
Frog Branch Stream Valley Park
Difficult Run Stream Valley Park
Fox Valley Park
Hunter Mill Road
Lee Jackson Memorial Hwy
Fairfax County Parkway
Centreville Rd
Braddock Rd
Lee Hwy
Fairfax Circle
Fair Oaks Mall
Pendergrass Golf Club

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Active Marker Ball
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Description: 90 Degree Bend
Type: 8" Steel Gas
Latitude: 38 Deg 53.2421 Min N
Longitude: 077 Deg 04.8474 Min W
2/27/2012 9:30:52 PM
Active Marker Ball
Options
Serial ID: 000-062-1756
Company: Washington Gas
Description: Tie-In
Type: 8" Steel Gas
Latitude: 38 Deg 53.2511 Min N
Longitude: 077 Deg 04.9216 Min W
7100
7100
Timber Oak TR
Timber Oak TR
Lake Glen Dr
Scenic Ridge TR
Google
Map data ©2011 Google Imagery ©2011 , Commonwealth of Virginia, GeoEye, U.S. Geological Survey
Feet

Questions or Comments
Contact

Matt McLaughlin, CCM
mdmclaughlin@ces-consultingllc.com
(571) 455-4951