



## **ArcGIS Based Transmission Vegetation Management**

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# PPL's Vegetation Management Group

- Manager – Vegetation Management
- System Forester
- Regional Foresters: 4
- Line Clearance Inspectors: 14

# PPL's Vegetation Management Group

## Corporate Goal:

- 0 sustained tree related outages on the Bulk Power

Transmission System (200 kV and up)

- NERC Compliance:

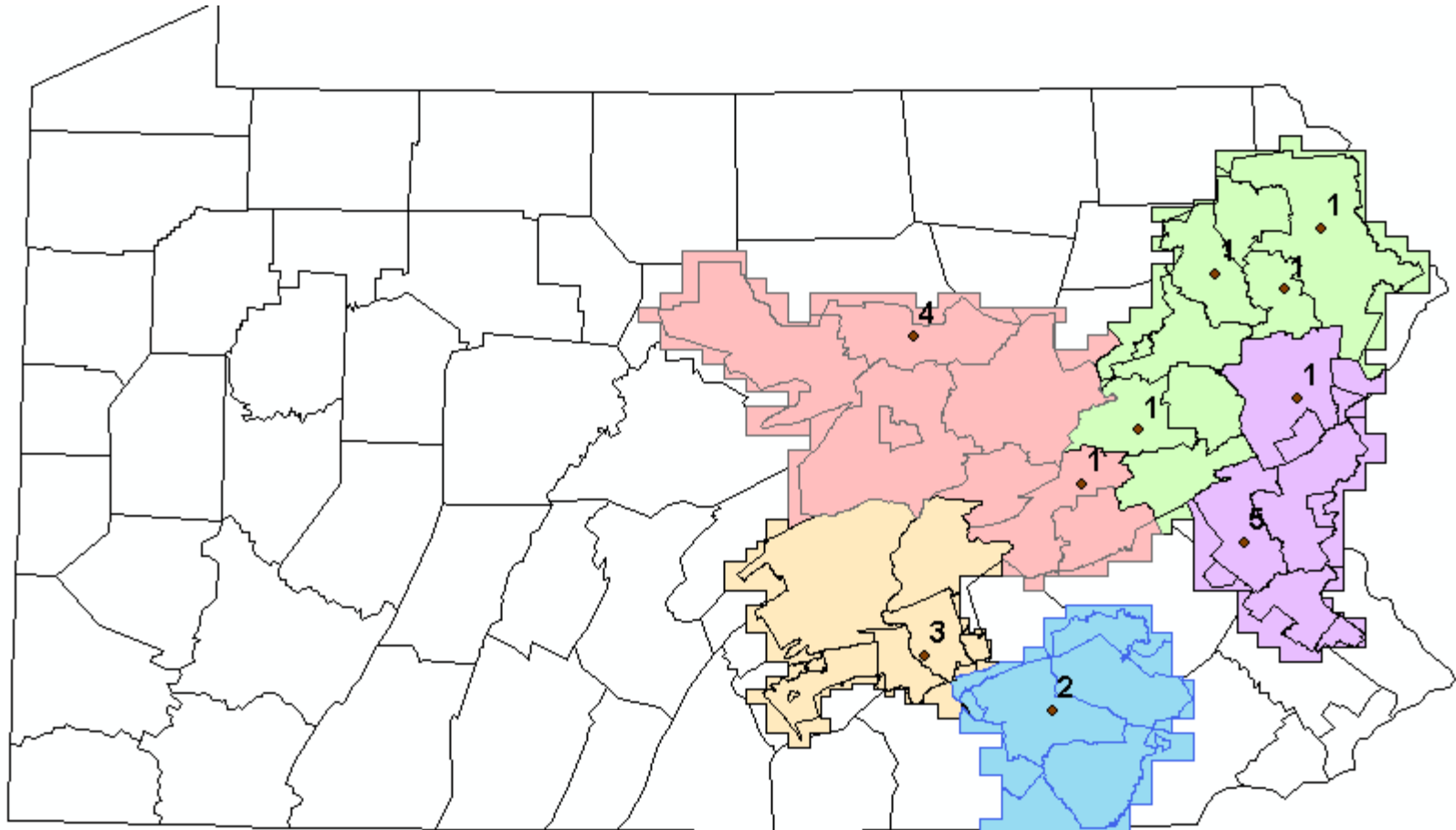
Full map-based accounting of all VM work

# PPL's Vegetation Management Group

- Responsibilities
  - All vegetation related activities on Transmission and Distribution assets
  - Investigate / respond to customer VM inquiries
  - Storm restoration management
  - Contract administration to the VM Line Clearing Contractors
  - Manage budget / invoicing

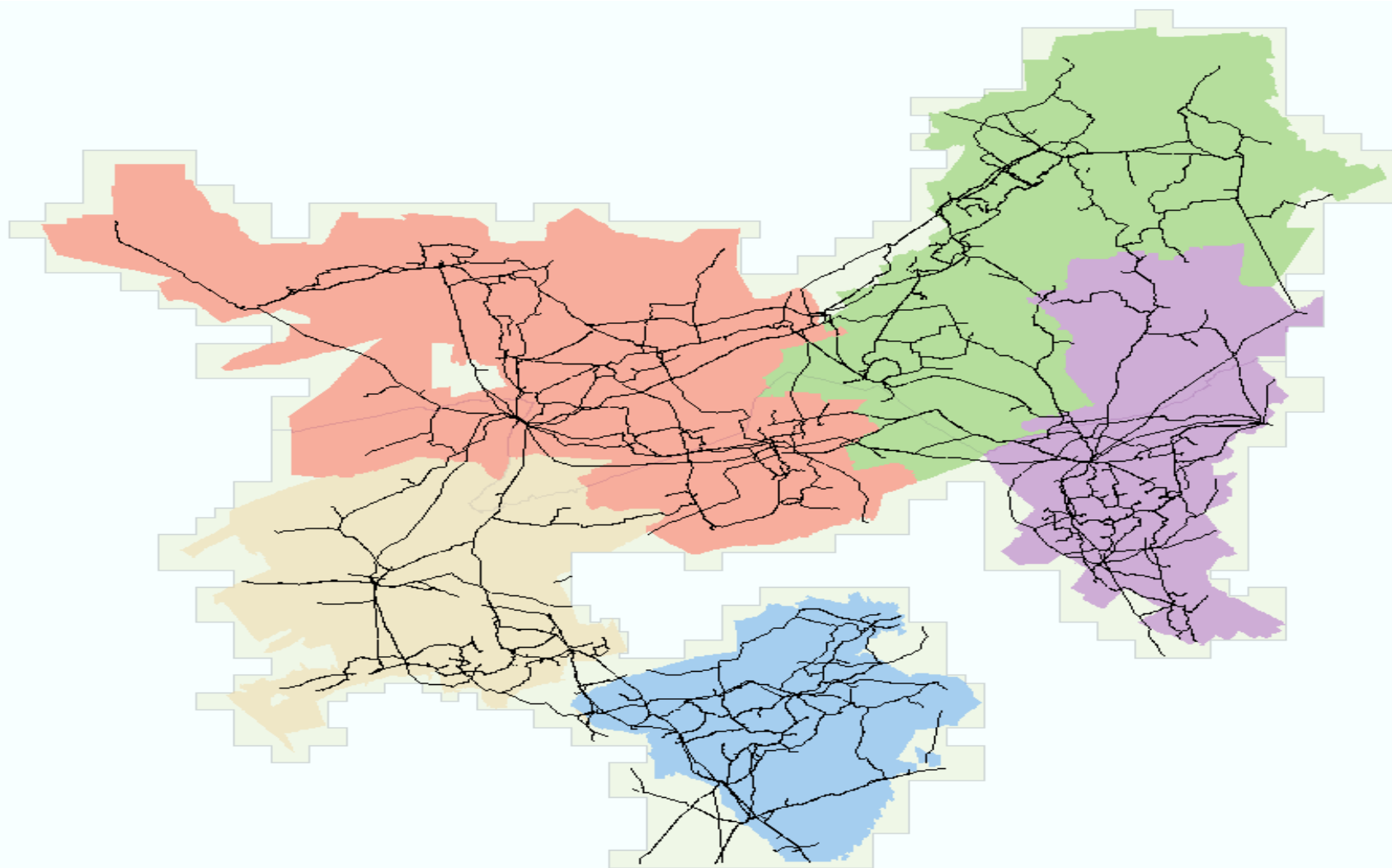
# Location of Foresters in PPL Service Territory

PPL's service territory in Pennsylvania is approx 10,000 sq. miles



# PPL's Transmission Conductor

**PPL has approximately 5,000 circuit miles. 1,500 miles are Bulk Power lines.**



# Requirements for Mobile VM Solution

- Implement a Vegetation Management (VM) solution to capture pertinent information defined by NERC/FERC requirements under FAC-003-1

# Requirements for Mobile VM Solution

- Mobile solution to provide a means to collect VM data in a uniform format and house this data in a centralized database.
  - Helicopter patrol information
  - VM foot patrol survey information
  - Data reported from LiDAR
  - Audit Data
  - Mitigation/remediation data

# Requirements for Mobile VM Solution

- Data collected will be used for:
  - Regulatory reporting requirements
  - Serve as a record of required work
  - Document work performed
  - House all audits of such work
  - Used to develop future scopes of VM work
  - Generate maps/plots for contractors

# Requirements for Mobile VM Solution

- Initial rollout to include only Transmission assets.
  - Distribution assets will be added in the future.
- Use ruggedized laptops that can be used for inside/outside work:
  - Panasonic CF-19
  - On-board GPS
  - Wireless broadband

# Clearion Software

- [Clearion Software](#) was selected as our VM solution.
  - Built on the ESRI's ArcGIS Engine 9.3 platform
  - Easy to use field GIS application for mobile users
  - Integrates GPS technology for faster mapping and easier navigation
  - Tools to synchronize data to and from PPL's centralized GIS database

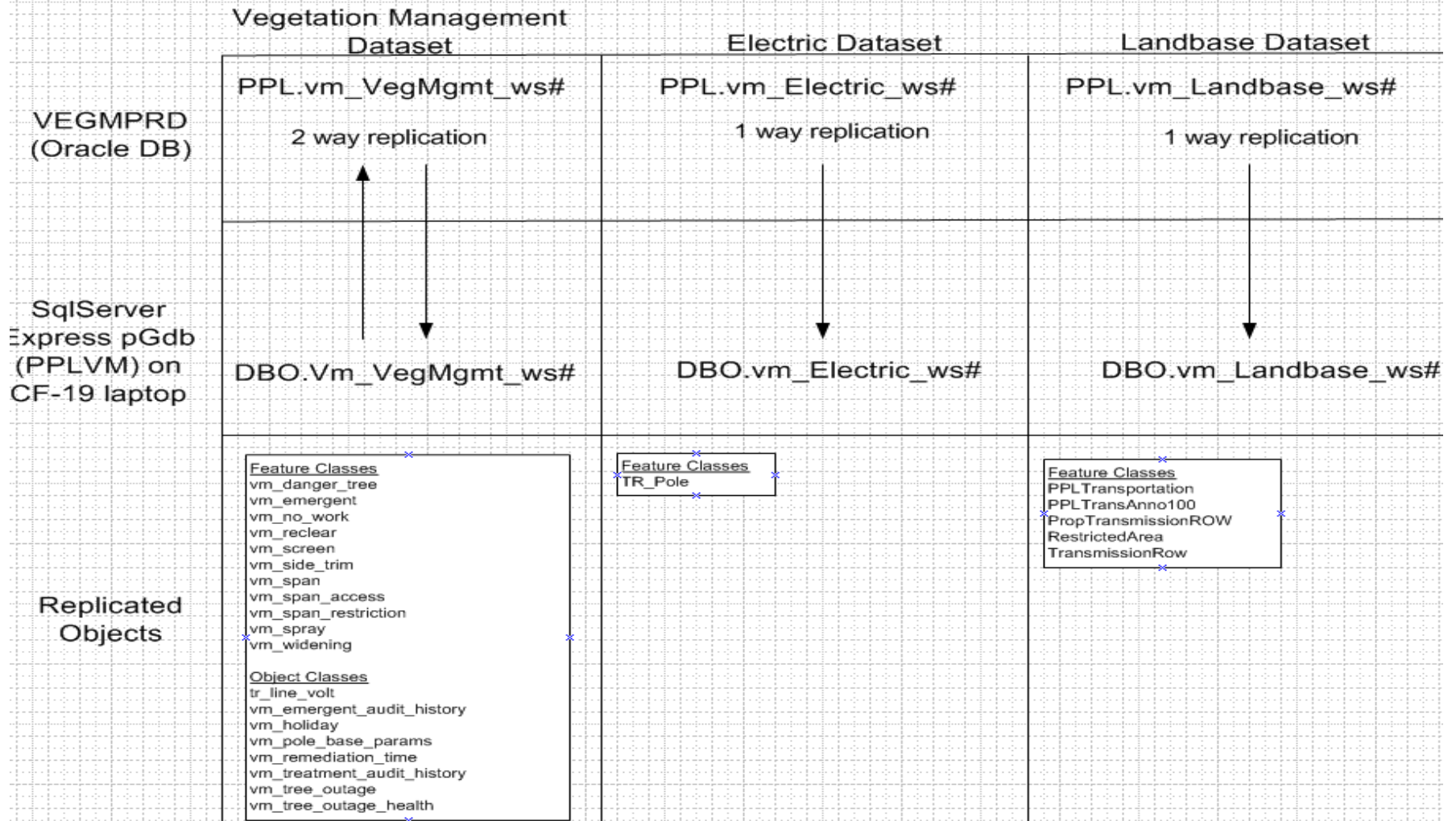
# Clearion Software

- Customizations
  - Multiple customizations were developed to support PPL specific work flows.
    - Transmission line selector tool
    - Audit tools
    - Active Directory authentication for user access
    - Tree outage data entry form
    - Reports
  - Future customizations could be developed by Clearion or in-house by PPL.

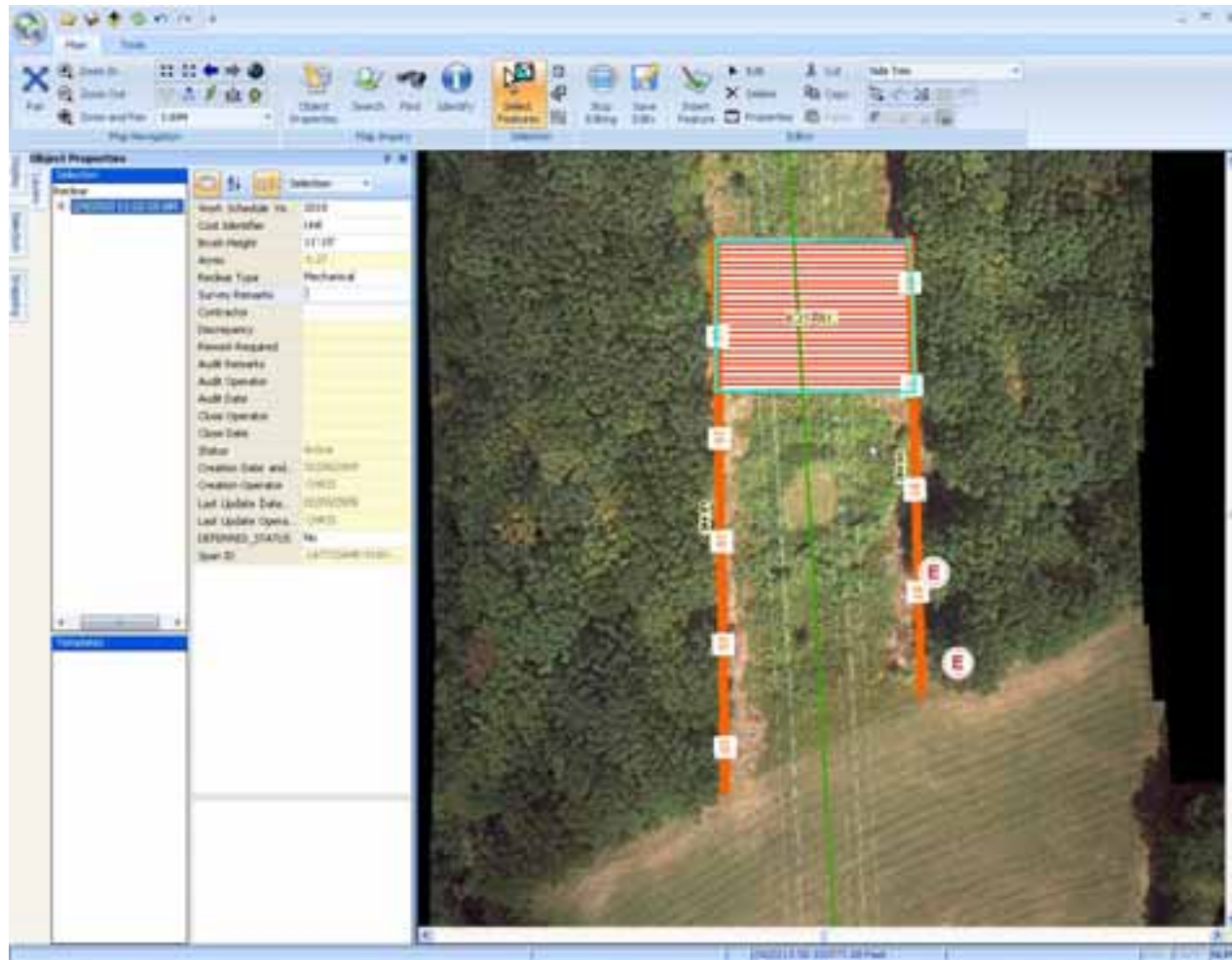
# Replication

- Central repository: Oracle 10g database
- ArcGIS Server 9.3 (ArcSDE)
- Laptop DB engine: SQL Server Express 2005
- Sync Agents on the Toughbooks initiate synchronization through Windows scheduler.
- Incremental changes to VM data are synchronized each night – two ways.
- Incremental changes to Transmission Assets and Land Base synchronize weekly – one way.

# Replication



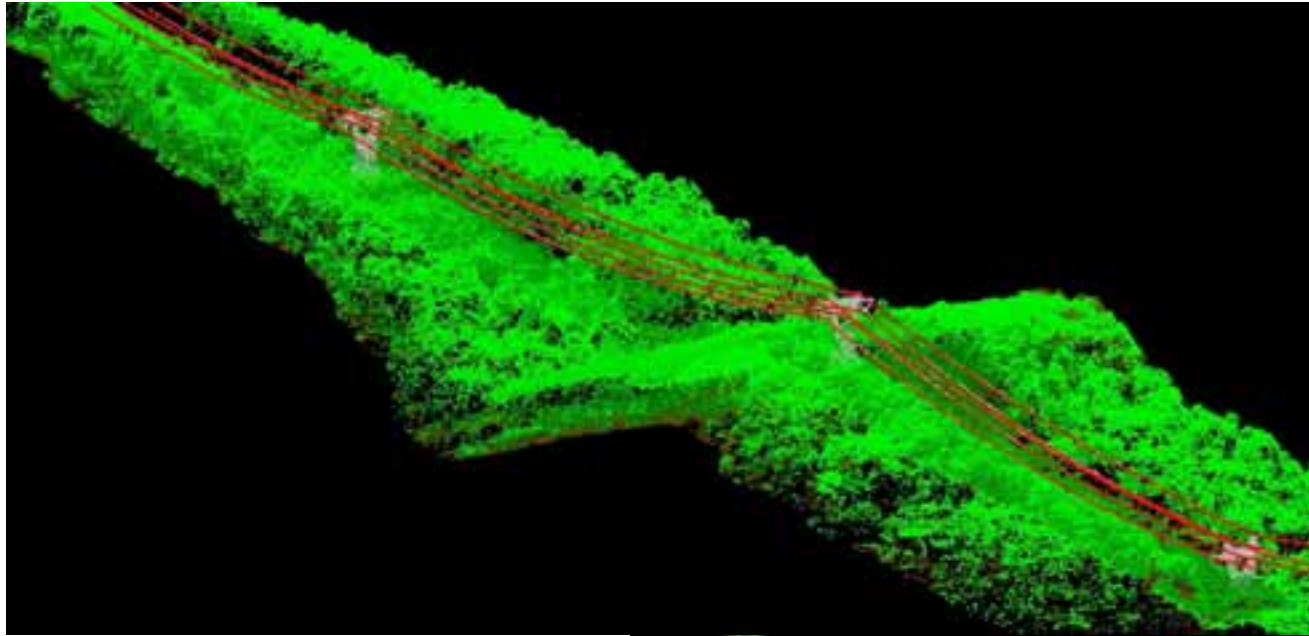
# Software and Workflow Demonstration



# LiDAR

- **Light Detection And Ranging**
  - Low altitude aerial laser survey and imaging technology
  - High-accuracy measurement of radial conductor clearances (vegetation, crossings, and ground)
  - Fully engineered conductor analysis for Max Sag
  - Delivery of potential vegetation grow-in and fall-in encroachment locations

# LiDAR



# LiDAR

- August 2008:
  - GeoDigital surveyed the Bulk Power Transmission Lines and identified encroachments.
  - PPL investigated and prioritized clearance concerns.
  - High risk encroachments remediated immediately.
- September 2009
  - Began second LiDAR cycle
  - Expecting fewer encroachments

# LiDAR Report

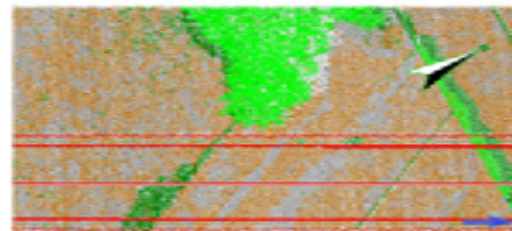
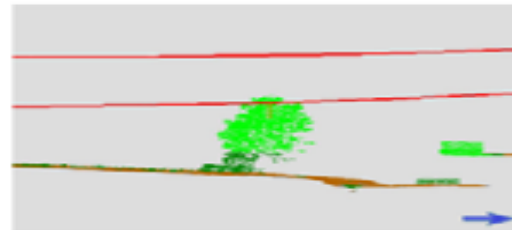
## Rapid Clearance Violation Report

Line Name: 001\_Substation1-Substation2

Date Surveyed: 07-Sep-2008

Violation ID	W0002
Violation Type	Grow-in - WSZ
Latitude	35.378274
Longitude	-70.858401
Distance to Wire (ft)	15.78
Distance From 1st Structure in Span (ft)	856.95
Clearance Criteria (ft)	17
Conductor Condition	As surveyed
Line Voltage (kV)	500
Elevation (ft)	428.45
Comment	

Spanning	Between	And
Structure ID	2	3
Latitude	35.376247	35.378937
Longitude	-70.859935	-70.857640
Span Length (ft)	1,194.68	



# Spatial Accuracy

- Pole “45/42” is 250 ft away from the “LiDAR” Pole.



# What's next for Vegetation Management

- Vegetation Management Clearion Software Enhancements
  - Business Case approved in August 2009
    - Migrate VM data into the facilities geodatabase
    - Automate creation of LiDAR encroachment records
    - Interface with OMS to capture tree caused outages for future investigation
    - Enhance Clearion Software auditing tools

# Presenter Contact Info

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# Questions?

