

# 2016 TRB Asset Management Conference

Minneapolis, MN

11-Jul-2016

## **Traffic Signal Asset Management System (TSAMS)**

### DATA COLLECTION PROJECT



# Why TSAMS?

How do we sustainably increase capacity?

1. Cannot build our way out of congestion
2. Congested corridors house majority of delay
3. In PA, Municipalities own signals
4. If PennDOT takes ownership of signals...
5. Step 1: Know what infrastructure is out there.



# Why TSAMS?

How many traffic signals exist in Pennsylvania?

Nobody knows exactly!



Act 89 of 2013 created new requirements for PennDOT to fund and resolve issues with traffic signal operations and maintenance (\$1B in assets)



# Project Scope

- What? - Traffic Control Device Types
  - Traffic control signals (red, yellow, green)
  - Dynamic Lane Use Control Signs
- Where? – Signalized Intersections
  - At least one approach is a state highway
  - All of PA (– City of Philadelphia)
- When? – NTP August 2015 (11 months to complete)
- How Many? - 8,641 Signalized Intersections in Scope
  - Added 619 intersections
  - Removed 637 intersections
  - Net 8,623 intersections

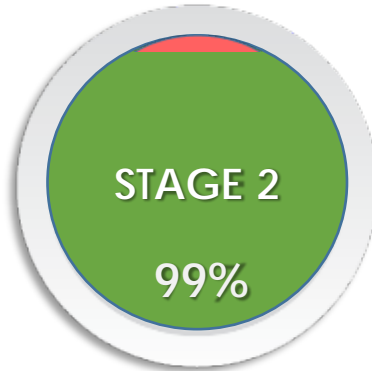


# Timeline



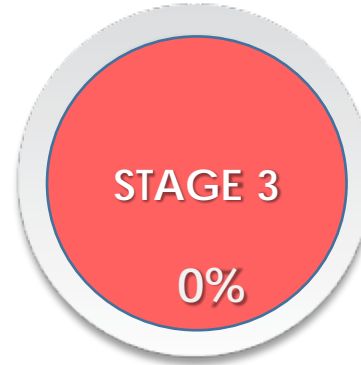
**Completed**  
(Aug-2015)

Available to Central  
Office Users  
Basic Functionality



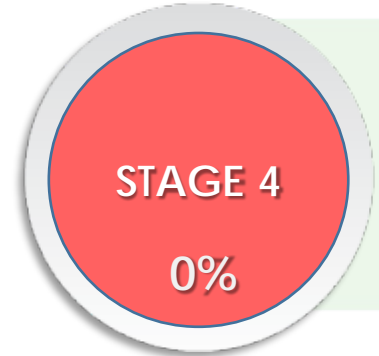
**Planned  
Completion**  
(July-2016)

Available to all Users  
Basic GIS  
Responsive  
Maintenance



**Planned  
Completion**  
(Late 2016)

Inspection  
Projects  
Enhanced GIS  
Preventative  
Maintenance



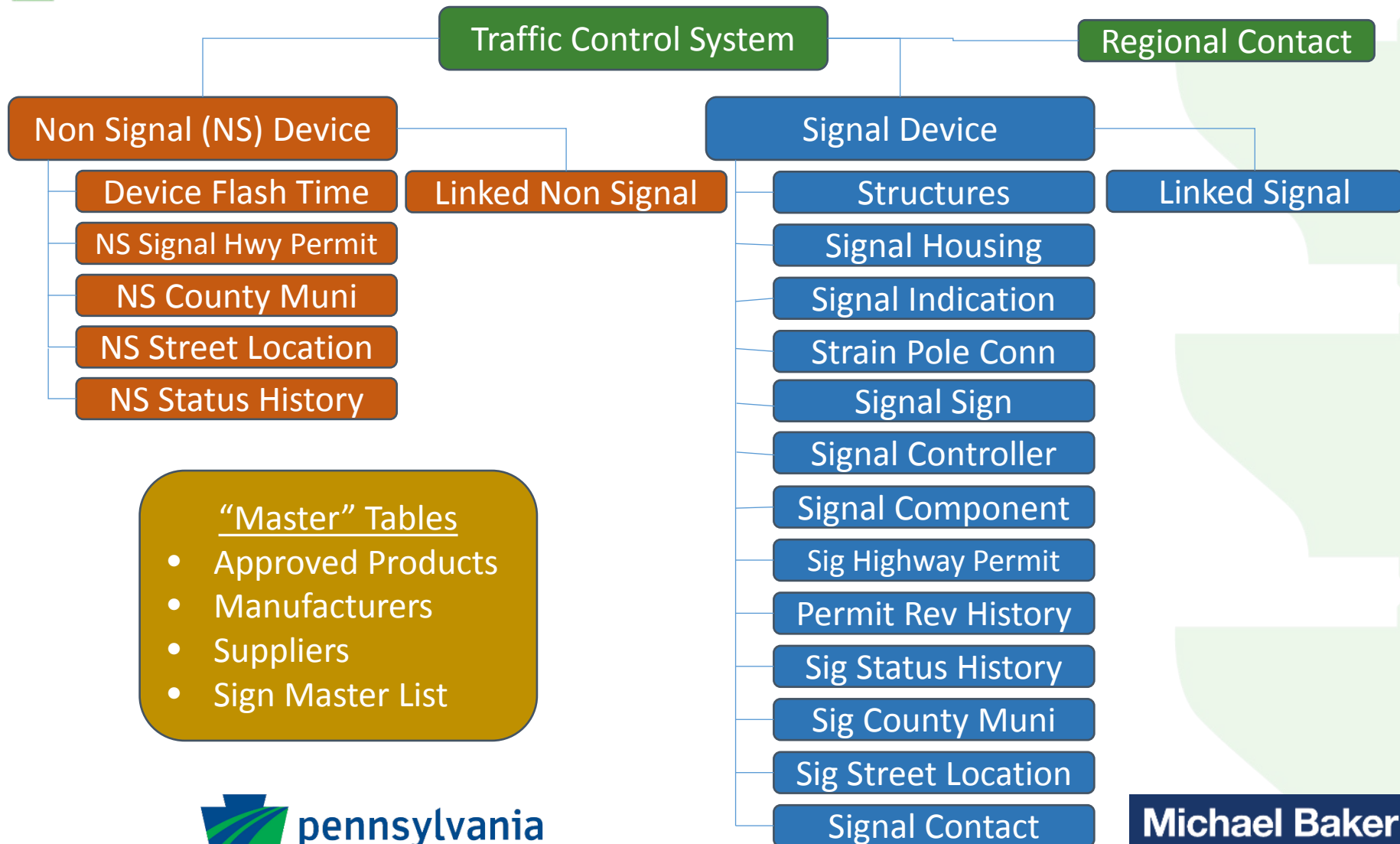
**Planned  
Completion**  
(2017+)

System requirements yet  
to be established.

ITS Devices (???)



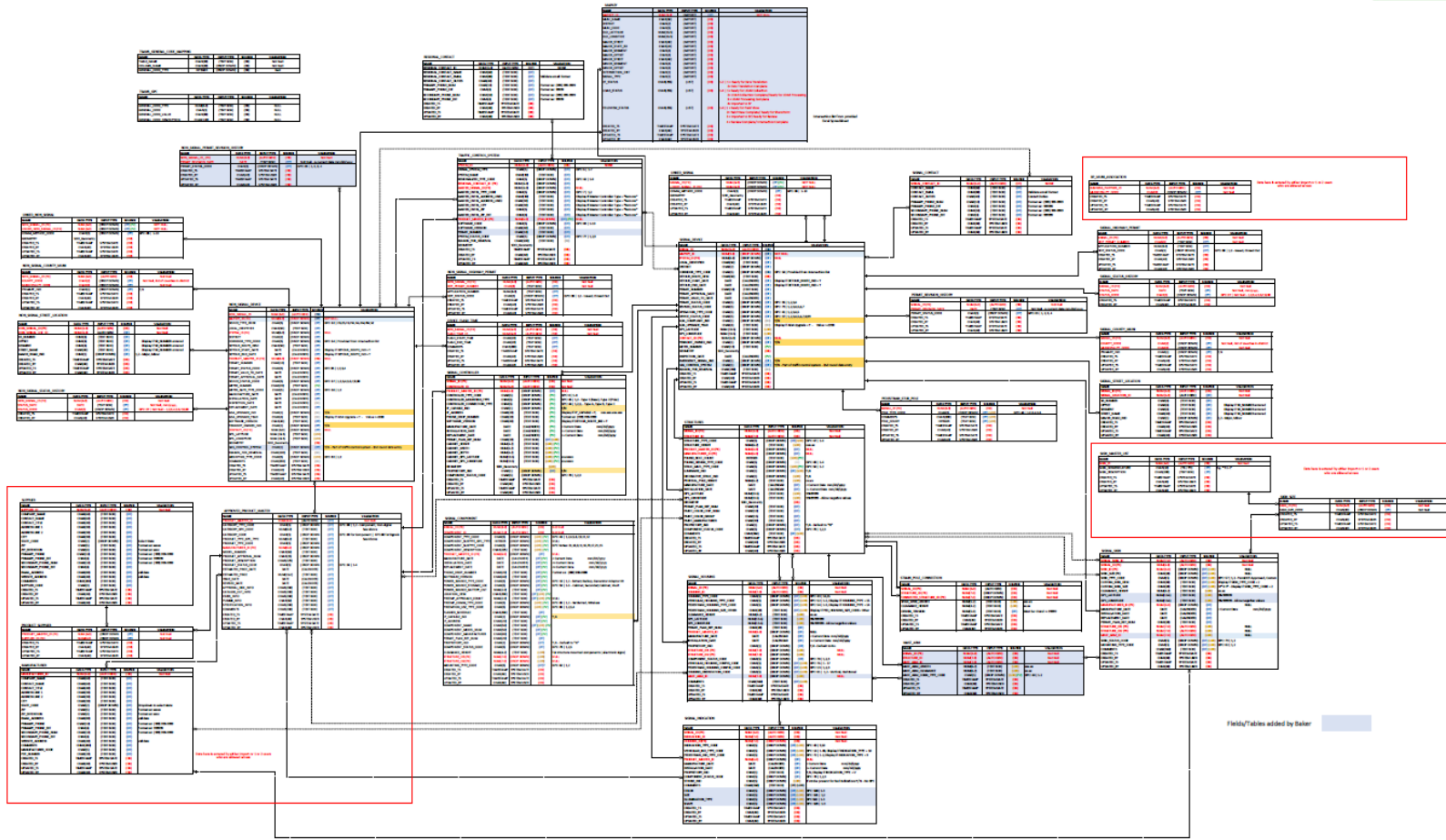
# TSAMS Database Structure





# TSAMS Database Structure

19.9M Data for 510 fields





# Data Collection Techniques

## Mobile LiDAR

- Capture 3D location (point cloud) of exposed signal components
- Extract visible signal asset attributes with dimensions
- Capture 360-degree spherical images
- Lady Bug Images



## Stakeholder Data Acquisition

- PennDOT Central Office
- PennDOT Districts
- Municipal Signal Owners
- Planning Organizations
- Maintenance Contractors
- Vendors



## Field Inspection

- Capture elements unable to be collected by other methods (inside controller cabinets)
- Custom iPad application (created by Baker)
- Validate information collected by LiDAR





# Mobile LiDAR



- Geospatial information
  - 3D Point Cloud
- Visual information
  - Spherical photography
- Purpose of using LiDAR
  - Improved precision
  - Accelerated collection
  - Eliminate traffic impacts
  - Technician Safety
- Data Fields
  - Structures
  - Signs
  - Signal Heads & Indications
  - Controller Cabinet (dimensions)

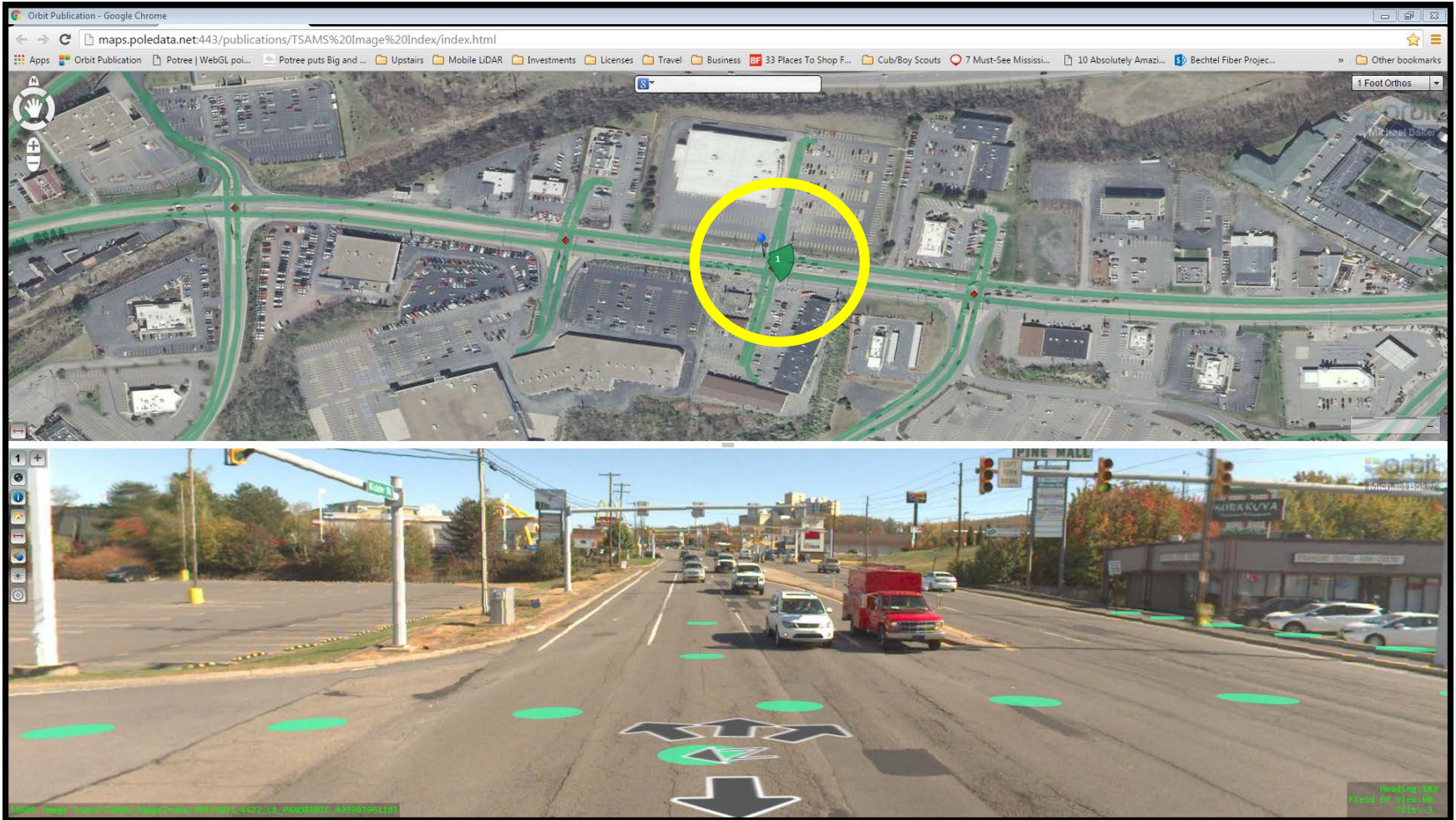


# Mobile LiDAR Point Cloud

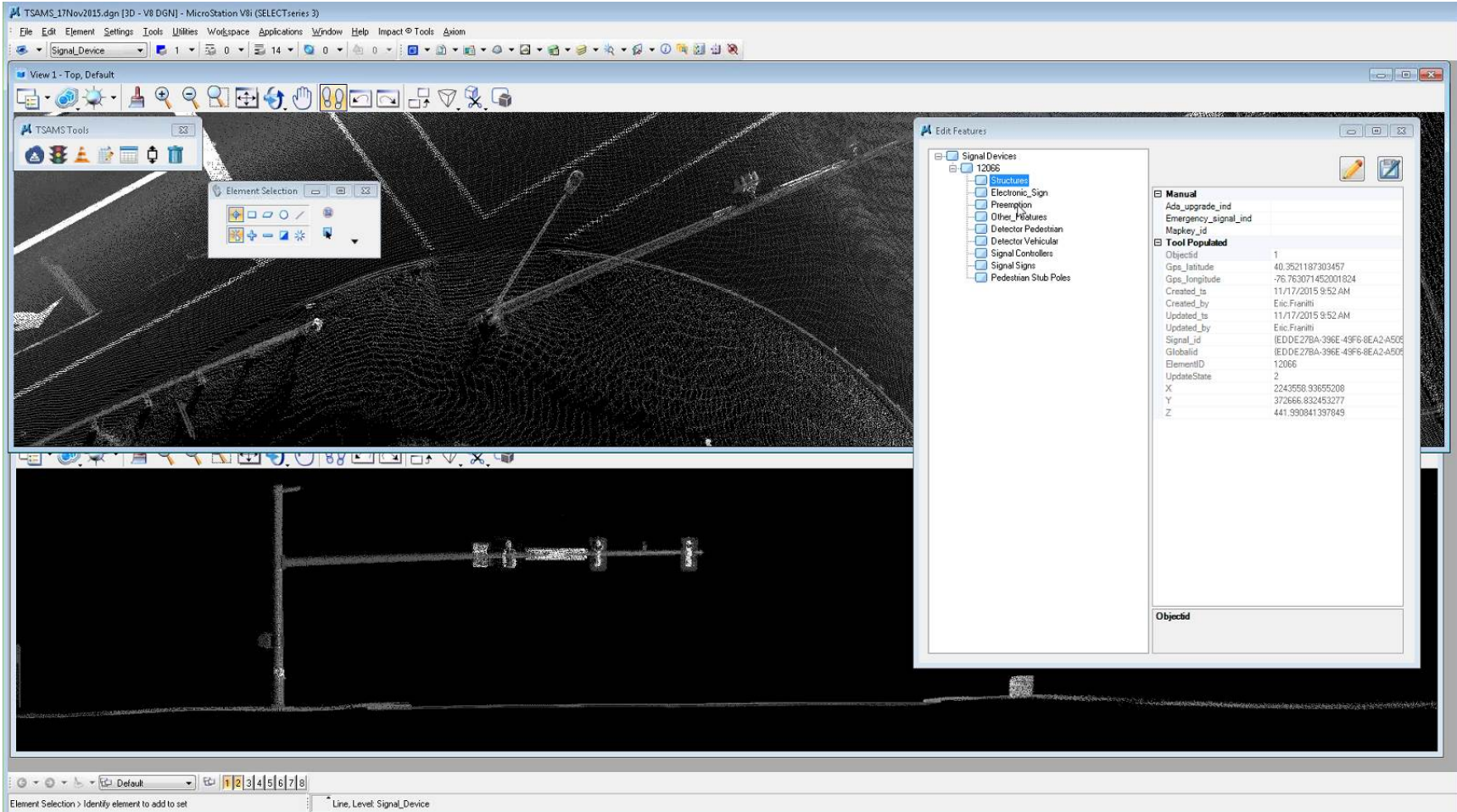




# Mobile LiDAR Spherical Imagery



# Mobile LiDAR Feature Extraction







# Stakeholder PennDOT Outreach

## Permit files

- All electronic files
- Scan relevant paper documents
- Over 87,000 documents statewide

## Sustainability

- Districts requested to send new or revised permits

## Relevant Paper Documents Include:

- ✓ Agreements
- ✓ Permits
- ✓ Design Documents and Drawings
- ✓ Studies/analysis
- ✓ Signal databases or GIS
- ✓ Key municipal correspondence/activities





# Stakeholder PennDOT Outreach

- TSAMS constructed to be connected with PennDOT's Electronic Document Management System (EDMS)
- Nine document type “tags” to be assigned to all documents uploaded

## Document Types

1. Agreements	6. Photographs
2. Correspondence-Activities	7. Product Approvals
3. Design Documents-Drawings	8. Studies
4. Financials	9. Traffic Analysis
5. Permits	

# Stakeholder Municipal Outreach

Initial outreach (Feb '16)

- 1260 Municipalities that own signals
- Letter from Deputy Secretary
- Project Brochure
- Municipal Contact Form
- Identify contact person for each stakeholder
- Follow-up with phone call
- Schedule field visits with municipalities



## WHAT IS TSAMS?

As traffic volumes continue to grow, maximizing the capacity of the existing roadway infrastructure is of increasing importance. Recognizing the need to improve management and operation of traffic signals, the Pennsylvania Department of Transportation (PennDOT) is initiating development of a Traffic Signal Asset Management System (TSAMS), which will be an internet-based database available to all traffic signal stakeholders. TSAMS is a product of the Green Light-Go program initiated by the enactment of Act 89 of 2013, which will serve as a consistent, available and accurate resource for all traffic signal stakeholders to access and update traffic signal asset information.

## BENEFITS OF TSAMS

Accurate traffic signal asset information will benefit the following traffic signal stakeholder activities:

- Municipal budgeting for maintenance and operations,
- Traffic signal management,
- Long-range planning,
- Administration of the Green Light-Go and Automated Red Light Enforcement (ARLE) funding programs by PennDOT, and
- Issuance and revision of traffic signal permits by PennDOT Districts.

## DATA COLLECTION PROJECT

Since an extended timeline for availability of traffic signal asset information would delay achieving the system benefits, PennDOT has contracted with a team of engineering firms to complete an inventory of existing traffic signals statewide to ensure quality and accurate data is entered into the database. It is anticipated that the system will be available for stakeholder use by June 2016. The data collection contract includes all traffic signals on state highways, excluding the City of Philadelphia, which will be inventoried separately.

While PennDOT is funding the data collection contract to minimize the effort required from stakeholders, the data collection teams needs the assistance of traffic signal stakeholders (including municipal signal owners, maintenance contractors, regional partners, signal manufacturers, and signal vendors, and PennDOT District Traffic Units) to collect existing traffic signal data. **The accuracy of data will depend upon stakeholder cooperation, which is critical to the overall value TSAMS can provide.** Each stakeholder will be contacted individually by the data collection team to request data as summarized in the graphic below.



Fall 2015



# Field Inspection

- Primarily focus on controller cabinet equipment
  - Signal Components (controller, conflict monitor, detection, battery backup, etc.)
- Custom iPad application to facilitate accurate data entry in field
- Verify LiDAR collected information

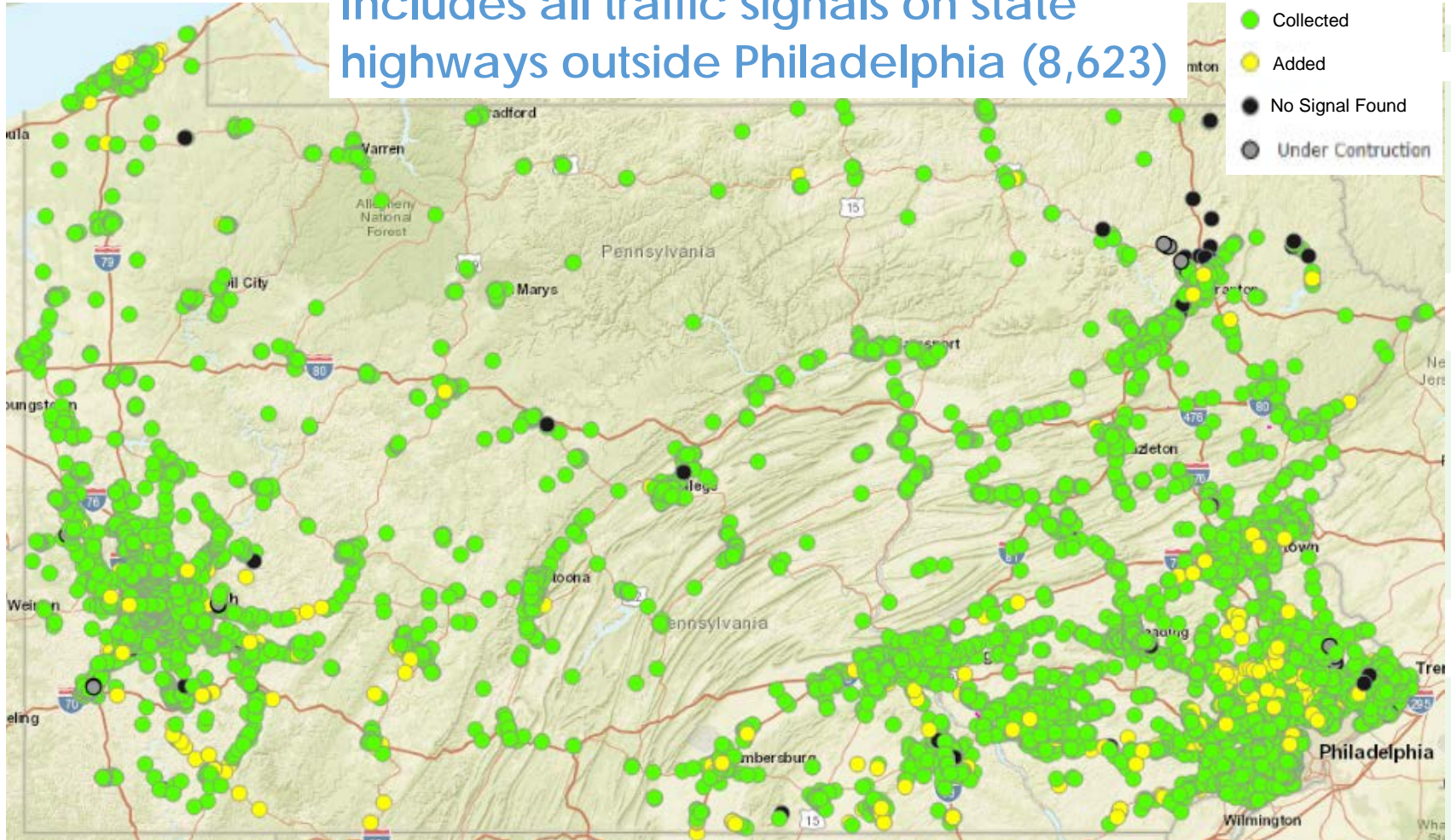






# Field Inspection

Includes all traffic signals on state highways outside Philadelphia (8,623)






# How to Access TSAMS

[www.dot.state.pa.us/signals](http://www.dot.state.pa.us/signals)





The image shows a screenshot of the Pennsylvania Department of Transportation website. A green callout box highlights the 'Traffic Signal Asset Management System (TSAMS)' link. A hand icon points to the link. The callout box also contains links to 'Manufacturer Structure Drawings' and 'MUTCD (2009 Edition)'. The main page features a navigation menu with links to 'Home', 'About Us', 'Contact Us', 'News', 'Projects', 'Services', and 'Resources'. The 'Services' link is highlighted. Below the navigation menu, there is a section titled 'Traffic Signal Asset Management System (TSAMS)' with a description of the system and a link to 'Traffic Signal Asset Management System (TSAMS)'. The callout box also contains a link to 'Traffic Signal Asset Management System (TSAMS)'.



# TSAMS Login Screen



**System Test**  
**pennsylvania**  
DEPARTMENT OF TRANSPORTATION



**TSAMS**

**Traffic Signal Asset Management System**

**WELCOME** to PennDOT's Traffic Signal Asset Management System (TSAMS).

TSAMS is a web-based application featuring...

- Signal and Non-Signal Asset Inventories
  - Traffic Signals
  - Emergency Traffic Signals
  - Electronic Signs
  - Flashing Warning Devices
  - In-Roadway Warning Lights
  - Intersection Control Beacons
  - Ramp Meters
  - Rectangular Rapid Flashing Beacons
  - Roundabouts
  - School Zone Speed Limit Signs
- GIS Integration
- Maintenance Activity Tracking
- Signal and Non-Signal Systems Identification
- Approved Products Database
- Reporting & Advance Search

It is available **FREE** of cost to all stakeholders. If you are a new user click [here](#) to create an account.

**Login**

For TSAMS users only. To request an authorized user account, please click [here](#).

**User ID**

**Password**

[LOGIN](#)

[Forgot Your Password?](#)

**Quick Links**[Traffic Signal Portal](#)  
[PennDOT Publications](#)  
[Traffic Engineering Forms \(TE-Forms\)](#)  
[511PA](#)  
[Engineering and Construction Management System \(ECMS\)](#)  
[ePermitting System \(EPS\)](#)

Release: 2.3

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Tue, Jun 28, 2016 8:15:16 AM EDT



# QA/QC and Data Sustainability

- Information from District entered into the database as base information for the field visit
- Any modifications to the signals from NTP until TSAMS goes live must be provided via electronic files (email), which will then be edited in the database
  - Revised signal permit/coordination plans
  - New agreements
  - Any other known changes
- Data transferred to TSAMS on Friday, July 8<sup>th</sup>, 2016

**STOP!**

1 If you are adjusting signal timing or modifying equipment within this cabinet, YOU will need to update the statewide signal inventory system called **Traffic Signal Asset Management System (TSAMS)**.

2 Please enter the date of the signal update in the space provided below:  
**Traffic Signal Inventory Completed**

Date	Date
Date	Date

3 GO online to update TSAMS at [www.penndot/tsams/contact.com](http://www.penndot/tsams/contact.com) within the next seven days.

**pennsylvania**  
DEPARTMENT OF TRANSPORTATION





# TSAMS Benefits

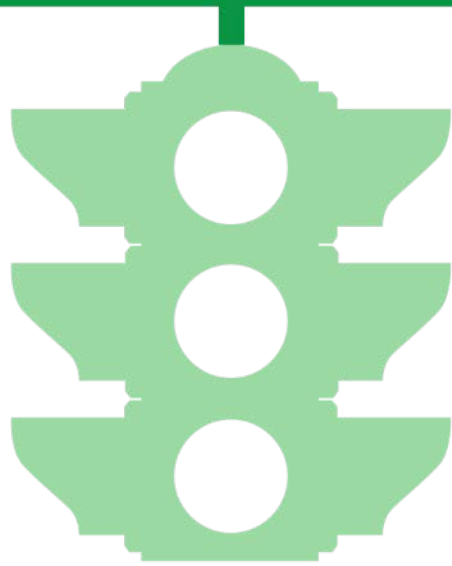


- Consistency Statewide (Policy)
- Uniform Data Collection
- One-Stop-Shop for Data & Documents
- Free for all Stakeholders
- Better Budgeting & Planning
- Cost Analysis Driven Decisions
- Component/Equipment Service Life
- Data Mining & Metrics
- Canned & Ad-hoc Reporting
- Approved Products Listing
- Product Manufacturer Information



# Key Takeaways

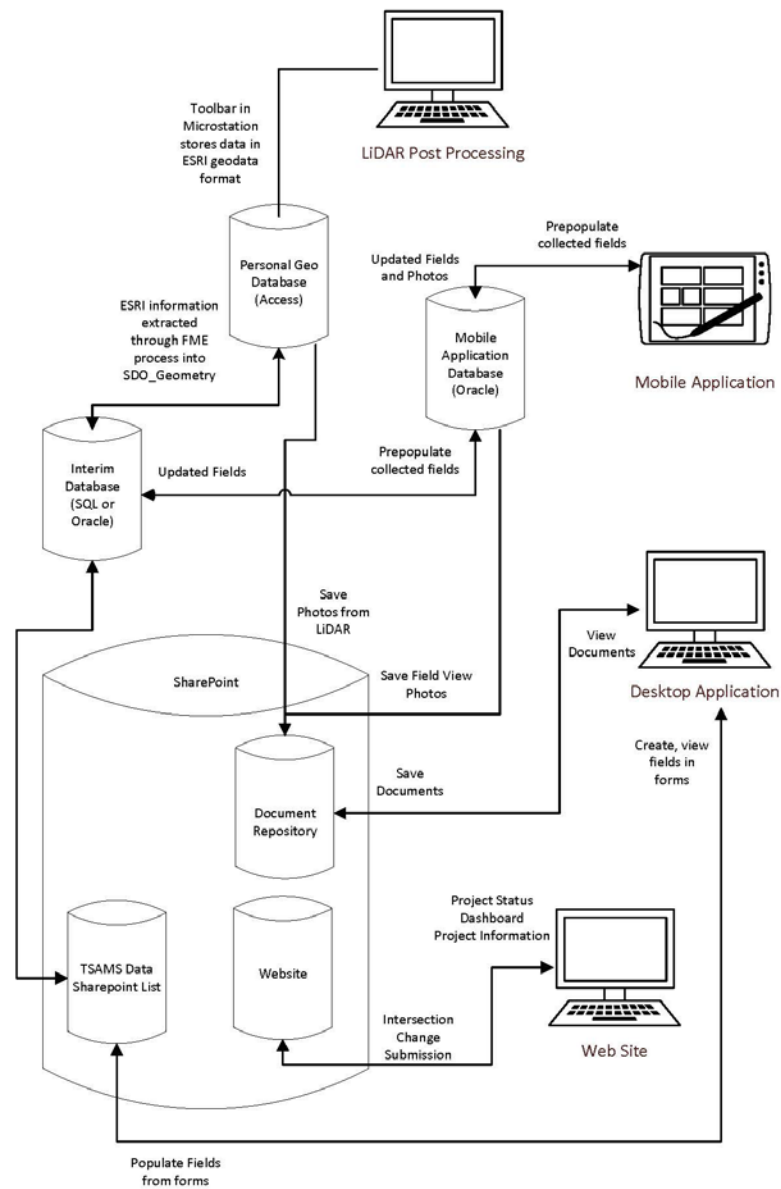
- Communication is key between data collection teams and database/application developers (IT programmers meet engineers)
- Municipal coordination and data collection
  - 2,500 municipalities of which 1,260 own traffic signals
- Schedule requirements
  - Ideal process:  
Documentation → Proof of Concept → Production
  - Documentation and proof of concept ran parallel with production due to hard deadline.
- Flexible change management
- Selection of database is important.



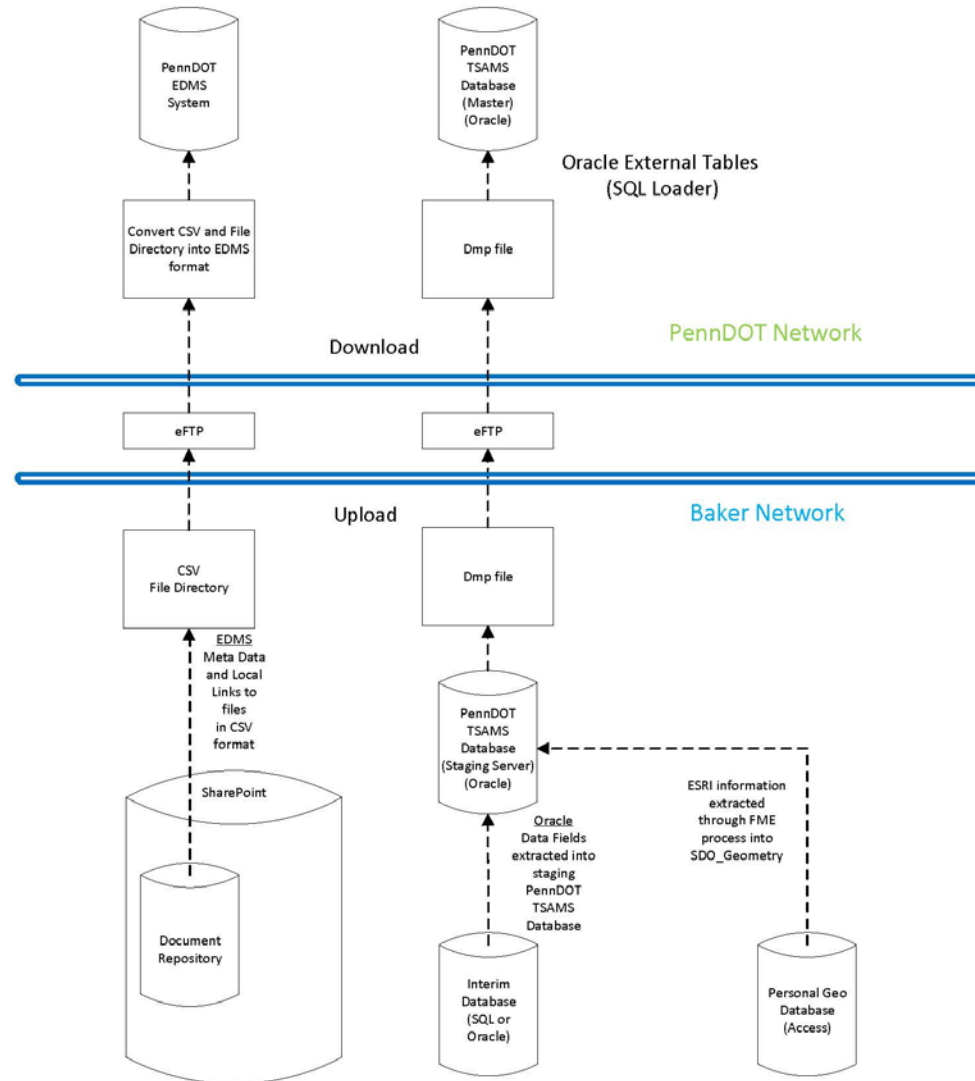
# **Traffic Signal Asset Management System (TSAMS)**

Jeff Bergsten, P.E.  
TSAMS Project Manager

Michael Baker International  
[jbergsten@mbakerintl.com](mailto:jbergsten@mbakerintl.com)







Tools will be created to automate the loading of the delivered data to the master database which includes

- Create Oracle external table based on the dmp data.
- Use Merge data (insert if it is new, otherwise update the master data) concept to update the staging server.
- Create the dmp of modified data and send to PennDOT IT team. Use Merge data (insert if it is new, otherwise update the master data) concept to update the master server.
- A staging server has been introduced to verify the data integrity before sending to the PennDOT.





# Lock Signal

