Implementing an Authoritative LRS: The ALDOT EGIS Project

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ALDOT GIS/HPMS Timeline

- Pre 2011
  - Total Chaos
  - 29 different route datasets and a multitude of data silos
  - No cooperation between business units
  - No Integration of Business Systems
  - HPMS Data deemed inadequate – had to build own data to submit
  - Difficult to produce reports

- Resulted in FHWA visit in 2011
  - Brought relevance of HPMS to upper management
  - Initiated a study to investigate and address the issues.
  - Initiated a Statewide Data Collection Project - 2012-2014
    - Focused on improving route data
    - Extensive collection of local roads
    - Assist with 2013 Submittal
ALDOT GIS/HPMS Timeline

• Data Collection, Management, and Integration Study – Nov 2011
  • Document the existing operational environment and provide recommendations for improving the HPMS Submittal Process

FINDINGS

– Departments had well formulated, well understood business processes
– GIS Expertise is Abundant
– No Complete, Consistent Linear Referencing Foundation
– Multiple GIS Systems and Data Managed Separately
– HPMS Managed Separately from Road Inventory and Contributing Data
– Road Inventory Data not Easily Accessible
– Duplication of Effort for Data Collection Activities
– Minimum integration between business systems
– Tedious Processes for Updating Business Data as LRS Edits Occur
– No GIS Governance
– Staff Disjointed and Communication Barriers

• eGIS Project Initiated June 2013
What is eGIS?

5 Major Initiatives

- Roads and Highways LRS
- Roadway Inventory
- HPMS
- Traffic
- Integrated Management System & Dashboard
Why eGIS?

Past State

Desired Future State

HPMS
Maximize Budgets
Performance Management
Maintenance

Desktop
Web
Mobile

Esri Roads and Highways
Authoritative LRS
ArcGIS Platform

Traffic
HPMS
Pavement
Safety
Roadway Inventory
Existing Data and Systems of Measure

- Statewide Milepost Routes
- County Milepoint Routes
- Project Stationing
- Link-Node
- Equations
- Lat-Long
- Addresses
- Road Inventory
- Traffic Counters and Segments
- Bridge Databases
- Pavement Databases
- HPMS Centerline Derivatives
Key LRS Requirements

- Milepoint (GIS Length) Based Calibration
- Unique Route Identifiers for All Routes
- Support Location by Statewide Mileposts
- Support Overlapping Routes
- Support Gapped Local Routes
- Support Route Dominance
- Support Dual Carriageway Routes
- Support Ramps as Routes
- Support Publication of Data to External Systems
- Synchronize Route Edits with related Event Data
- Support Temporal (Time Based) Data Viewing
- Support Link-Node data as events
eGIS Recommendations – Route ID

Route Type Domain
- IN – Interstate
- AL – State
- NC – New Construction
- RP – Ramp
- IV – Local / Inventory

Route Direction
- 0 – Inventory
- 1 – Non-Inventory

County FIPS not used for On-System (IN and AL) routes. Use 000 suffix
eGIS Recommendations – Routes

Calibration
- Shape Length
- Calibrate in Inventory Direction
- Use Route Concurrency to ensure full route calibration
- Use Route Dominance rules to ensure events are associated with dominant routes
  - Exclusions
  - Interstates
  - AL Routes
  - Locals
  - Lowest Route Number

Current Single/Dual Carriageways Model

Final Proposal Single/Dual Carriageways Model
Migration Tools

- ETLs Developed to Transform Data from Multiple ALDOT Data Sources to New Model
- Utilize FME Workbench and Esri Geoprocessing

Route Merging
Migration Tools

Route ID Transformation
Migration Tools

Route Exclusions

Route Loading Preparation
ALDOT’s New Milepoint LRS

- In Production February 2015
- New Authoritative System of Record
- Isolated and Consolidated EGIS IT Infrastructure
  - Test
  - Staging
  - Production
- Consolidated Routes, Measures, and Road Characteristics
  - Milepoint based LRM
  - 145,537 Routes
  - 102,017 Miles
  - 42 Events Support Road Inventory and HPMS Data Items
  - Remaining data items direct from business systems.
- New Governance Model
  - New GIS Section responsible for all Enterprise GIS activities
COTS and Configuration Based Approach

Task and Resource Management
  • Workflow Manager

Route Editing
  • Roads and Highways Desktop

Event Editing and Data Maintenance
  • Roadway Characteristics Editor (RCE)

Data Validations and QA/QC
  • Data Reviewer and HPMS QA/QC Toolbox

HPMS Submittal Files
  • HPMS Toolbox

Reporting
  • Roadway Reporter

Field Data Collection
  • Collector for ArcGIS
Workflow Management

- Assign Jobs Daily
- Users Receive Job Notifications
- Handles Versioning Complexity
- Perform Edits, Post, and Reconcile Throughout the Day
- Delete Versions and Jobs
Event Management

- Started with one complete RCE Configuration
  - Use Different Attribute Sets matched to business responsibilities
  - Now several in place to support different business functions and restrict access.
  - RCE instance matched to business responsibility
  - Less layers in each, better performance, simpler approach for data entry
QA/QC and HPMS Submittal Tools

PMG HPMS QA/QC Toolbox

Esri HPMS Submittal Toolbox
Roadway Reporter and Portal
Collector for ArcGIS
Technical Challenges

• Changing Primary System of Measure
  - Requires change of mindset and approaches to data collection
  - BUT, Eliminates data entry errors and falsifying of mileage

• Changing Terminology
  - “The gap is on the event, not the route”

• New Event Management Approach
  - Few feature classes, many attributes.....
  - Many events, few attributes
  - Accounting for Route Concurrency and Dominance
  - Editing through Web Application rather than Desktop

• Evolving Software
  - Timing and availability of desired capabilities
Lessons Learned

• Milepoint (GIS Length) Based Calibration
  - *Eliminates data entry/mileage errors*

• Regular Meetings with Key Stakeholders
  - *In Person meetings more effective than webcasts*
  - *Discuss and resolve issues as a group*
  - *Regular communications and no surprises*
  - *Rapid response to data issues encountered*

• Thorough Prototyping and Pilot Process
  - *Test and Revise Model in Iterative Fashion*
  - *Choose Pilot Area with thorough cross section of route/event types*
  - *Get the Routes “right” first, then translate events*
  - *Expect event translation to not be perfect*
  - *Makes Statewide translation much smoother*

• Phase the work through Task Orders
The Results

• Staff have adapted rapidly to new environment.
• Unified data cleanup effort has resolved long standing data issues.
• R&H Tools have greatly improved the HPMS submittal.
• User Feedback has been used to improve the R&H product.
• Data is in best shape ever. Most successful HPMS submittal to date.
• Will result in a simpler, more streamlined data management and HPMS submittal process in the future.
Thank You!

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