Applications of Enterprise GIS in Transportation (AEGIST)

California Road Sharing (CaRS)

Road to Governed California Centerlines

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Agenda

- What is California Road Sharing (CaRS) Program? What are the benefits of CaRS? Who Benefits?
- Implementing CaRS - Collaboration Vision: Federal Agency, State Agencies, Counties, Local Agencies
- What roads data is shared and integrated across agencies to create Statewide roads data?
- Success stories from other States: Arizona, Georgia. Lessons for California.
- Technical Feasibility: Data Ingestion, Integration, Data Quality, Data Conflation
- Sustainable Process for Data Sharing and Integration: Statewide Roads Data Governance

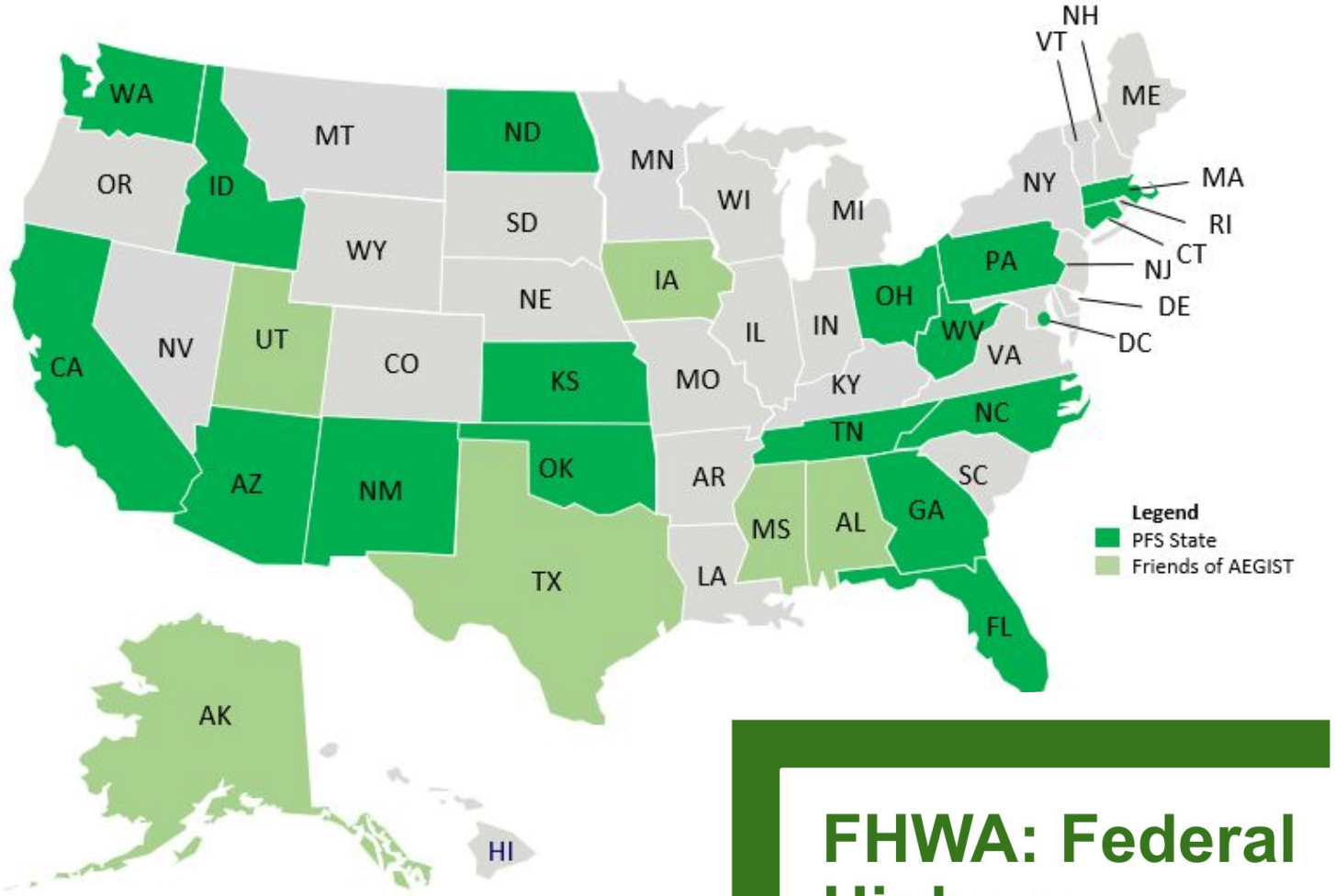
AEGIST - National Effort for Professional, Governed and Standards-Based GIS Data & Applications

AEGIST is a FHWA-led National Initiative for **Spatial Data Modeling, Management, Governance and Analytics**

- **Vision:** Road Network Data Modeling, including Road Centerline Modeling and Governance is key to supporting National Projects such as the National Road Network (NRN), Transportation for the Nation (TFTN). Professional Approach to GIS

- **Participation:** 18 States in the AEGIST Pooled Fund Study (PFS). There are 6 Engaged (Friend) States. **California is one of the participating States.**

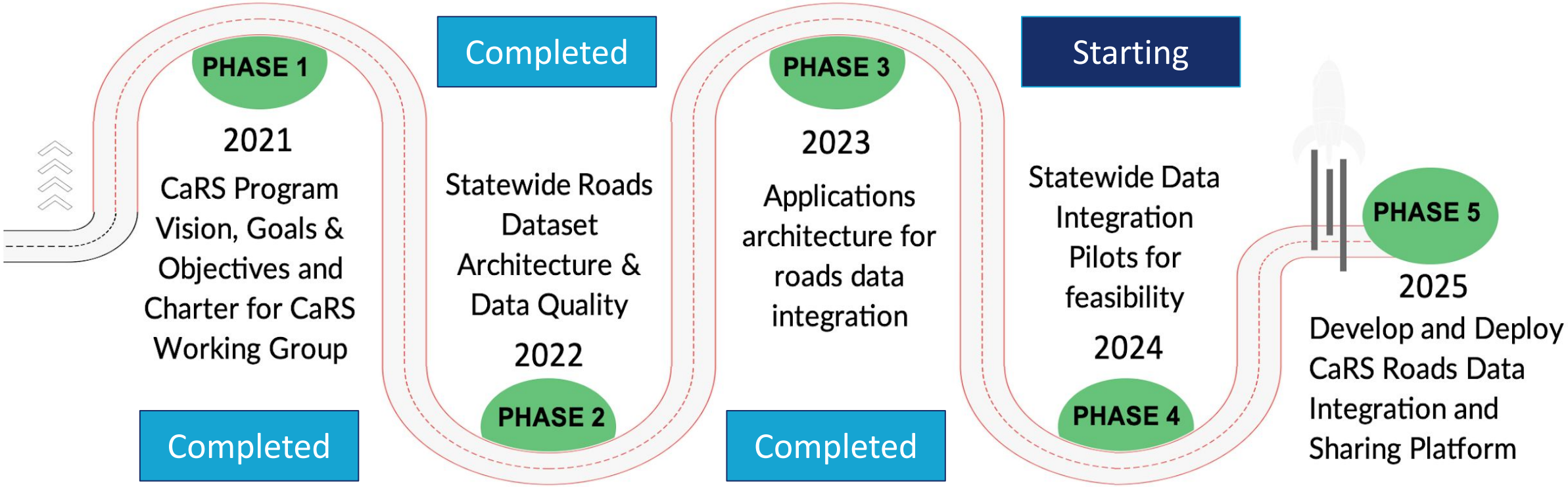
- **Goal:** Encourage and support deployment of Enterprise GIS Applications that utilize Spatial Data Modeling Standards and enable Data Governance within and across agencies. That is, Building Information Modeling (BIM) for Spatial Transportation data using **National and State pilot projects**



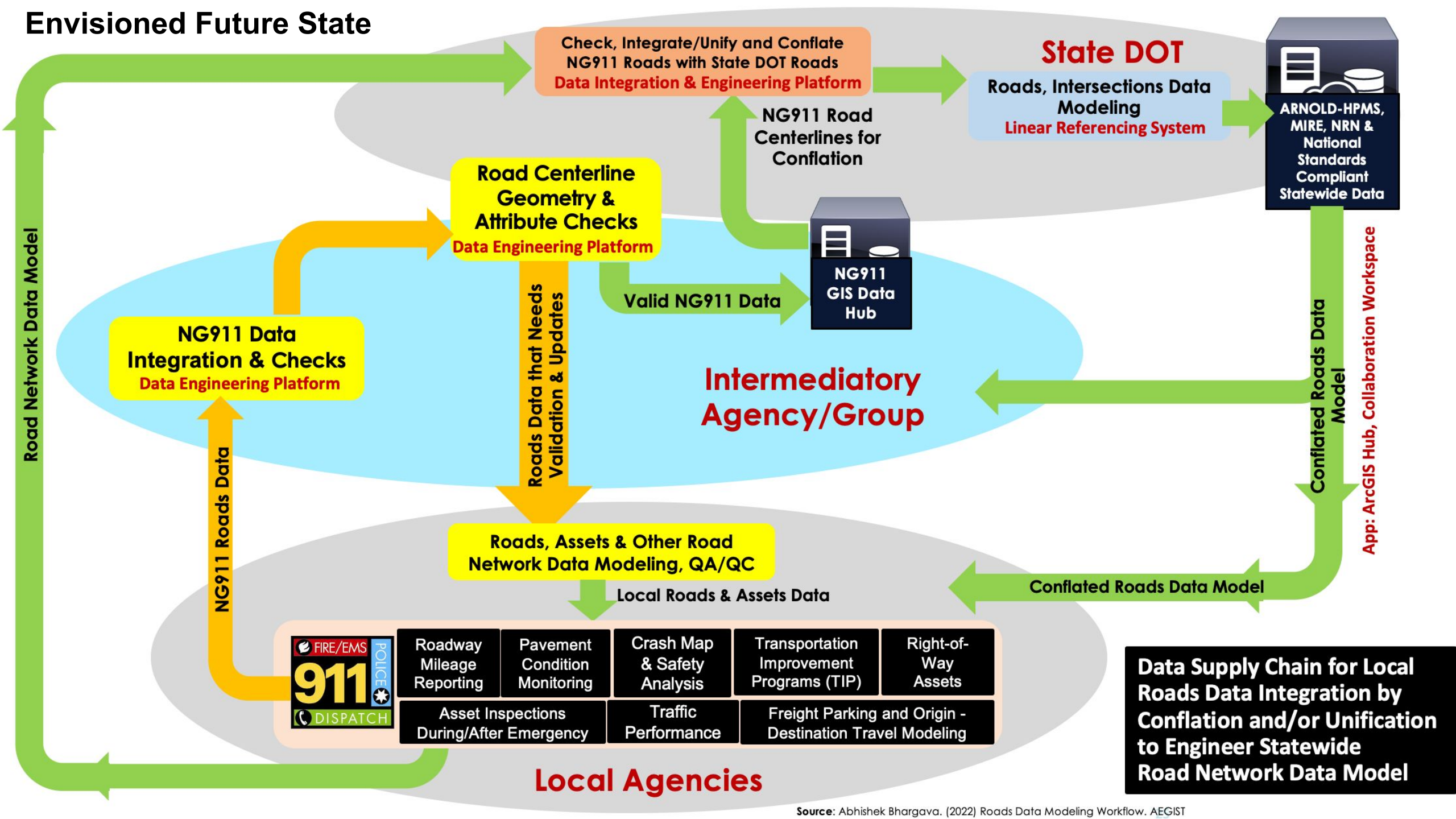
FHWA: Federal Highway Administration

More Information about AEGIST:
https://www.gisintransportation.com/about/pfs-state-activities/

California Roads Sharing Timeline



Envisioned Future State



Data Supply Chain for Local Roads Data Integration by Conflation and/or Unification to Engineer Statewide Road Network Data Model

Source: Abhishek Bhargava. (2022) Roads Data Modeling Workflow. AEGIST

Benefits of CaRS

- **Road Inventory Tracking:** To report roadway mileage, NG911, and All Roads Network of Linearly Referenced Data (ARNOLD).
- **Asset Management:** To allow agency using the road network to reference the geospatial data associated with highway infrastructure assets such as the asset inventory, inspection/condition assessment, and capital and maintenance work data, thereby allowing asset data exchange and integration.
- **Highway Safety:** To enhance public safety enhancement through data-driven emergency management, preparedness and incident response, crash mapping, and statewide highway safety analysis.
- **Project Planning & Programming:** To drive transportation planning, traffic studies, and statewide capital and maintenance transportation improvement program (TIP/STIP) development,
- **Emergency Management:** To report emergencies to the Federal Emergency Management Agency, geo-locate address information (geocoding), and develop the NG911 dataset.
- **Routing & Traffic Flow Studies:** To develop a connected routable network for map-based vehicle routing and analysis of driving directions, distances, roadway mileage reporting, and freight routing.
- **California Road User Charging:** To map connected vehicles to roads to track mileage and travel to deploy RUC, and other applications that require a uniform and comprehensive statewide roads dataset.

PROGRAM GOALS

- ✓ Create a governed state-wide roads dataset to meet roads data use cases of multiple agencies in California.
- ✓ Provide mutual benefits to State and local jurisdictions, especially to business users involved in highway project planning, survey, design, construction, safety, traffic and asset management operations.
- ✓ Coordinate roadway cartographic and data model recommendations
- ✓ Support Transportation for the Nation (TFTN), which promotes a publicly available, high quality road centerline that is coordinated across all levels of government.
- ✓ Building Information Modeling (BIM) for roads and assets using standards for supporting artificial intelligence (AI) /machine learning (ML) applications, CV/autonomous vehicles (AV), and uncrewed aerial systems (UAS).

Collaboration Vision
Create Statewide Roads Dataset

Local Governments

- Roadway Mileage Reporting
- Emergency Call Routing and Emergency Management
- Pavement Condition Monitoring
- Traffic Performance Monitoring System (PEMS)
- Transportation Improvement Programs (TIPs)
- Detailed Damage Inspection Reports (Assets)
- Asset Management: Right-of-way Assets

Counties

State Agencies: Caltrans & CalOES

- Roads Network Modeling, Reporting
- Emergency Management: NG911
- Detailed Damage Inspection Reports
- Project Planning & Programming (STIP)
- Road User Charging
- Travel Demand Modeling
- Routing and Traffic Flow Studies
- Emergency Call Routing
- Highway Safety Analysis
- Asset Management

FHWA: Federal Highway Administration

- All Roads Network (ARNOLD)
- National Road Network (NRN)
- Emergency Management
- Detailed Damage Inspection Reports (for Assets)
- Next Gen Public Safety Call Routing
- Highway Safety Analysis
- Asset Performance Management

What will Statewide Roads Dataset have?

Caltrans will ingest following road attributes from the NG911 roads database:
(a) local road unique identifier (NG911 road centerline identifier),
(b) local road name and street name
(c) road class
(d) directionality (one-way/two-way).
(e) road centerline geometry
Caltrans will integrate this NG911 data with Highway Performance Monitoring System (HPMS) Road Characteristics data in its All Roads Linear Referencing System (LRS) and publish the integrated dataset for use by State agencies as well for submission to FHWA ARNOLD, HPMS and MIRE Systems.

Federal Highway Administration (FHWA)

NRN
The National Road Network
Connecting America's Roads

ALL ROAD NETWORK OF LINEAR REFERENCED DATA
ARNOLD

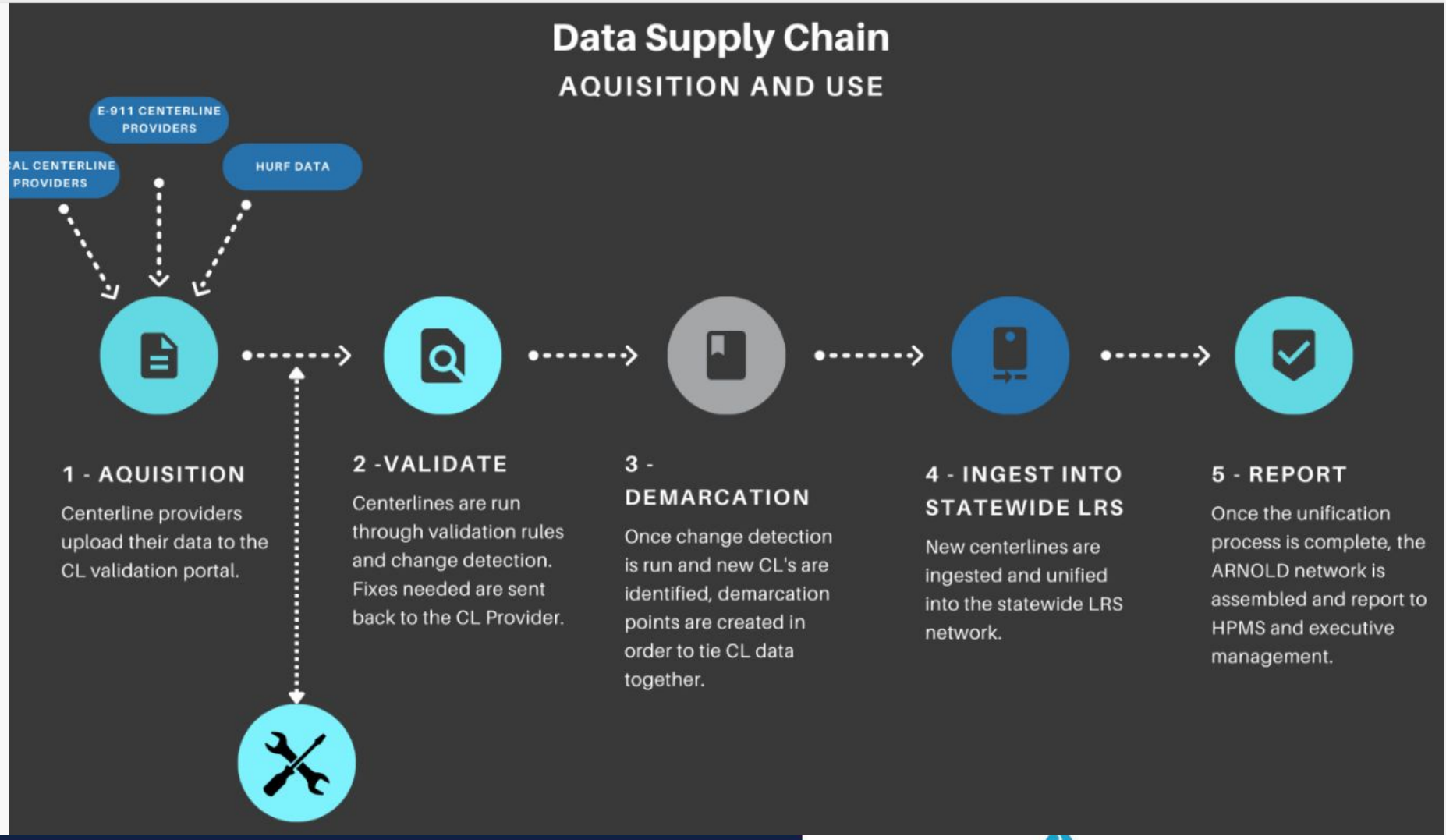
Caltrans
All Roads

CalOES

NENA
THE 9-1-1 ASSOCIATION

Once the state is unified with all new local centerline data, the ARNOLD network is assembled and reported as part of the annual HPMS report as well as reported for other facets of agency wide transportation needs.

Deploy a proven 5-Step Process to integrate roads data in the State



Adding Missing Roads

- Pre-Processing
  - NG911_RCL
  - RH_LRS_RH_LRSN_AllRoads
- Conflation Results
  - Post-Conflation Validation

Note

- Gap in the LRS Network
- LRS Route has no matching segment
- Segment does not match to LRS
- <all other values>

NG911 Road Segment

- Pre-Processing
  - NG911_RCL
  - RH_LRS_RH_LRSN_AllRoads
- Conflation Results
  - Post-Conflation Validation

Note

- Gap in the LRS Network
- LRS Route has no matching segment
- Segment does not match to LRS
- <all other values>

- NG911 Road Segment

Overview of Road Centerline Alignment:
Caltrans and Merced Geometry Comparison

- **Road Centerlines in Merced County NG911 Database : 14,159**
- **Merced County Road Centerlines in Caltrans All Roads LRS Database**
  - **Before Segmentation at Intersection Junctions : 5,976**
  - **After Segmentation at Intersection Junctions : 16,609**
- **Preliminary Results of Road Centerline Geometry Alignment Comparison**

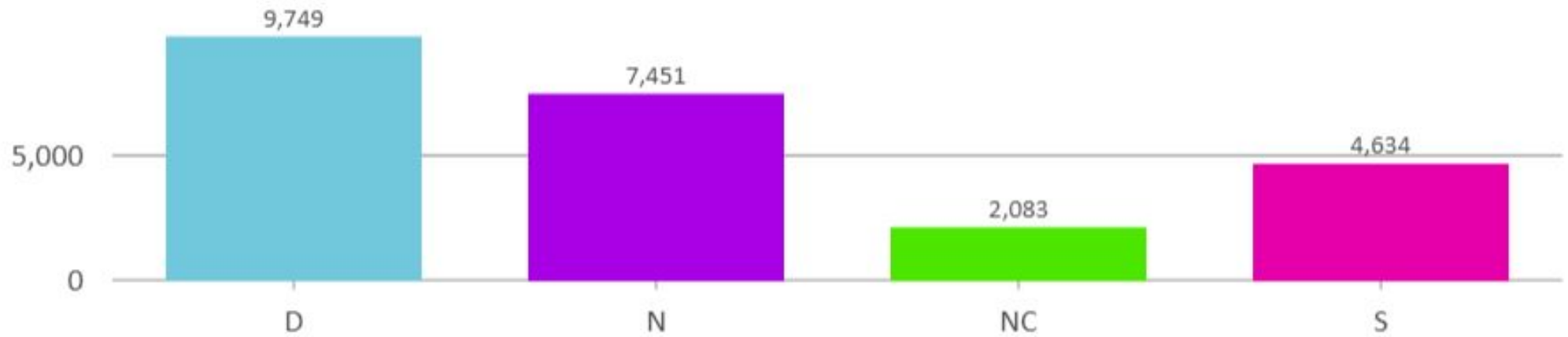
9,749 Road Segments in Caltrans "All Roads" dataset were not found in the Merced Roads NG911 dataset

7,451 Road Segments in Merced Roads NG911 dataset were not found in Caltrans "All Roads" dataset

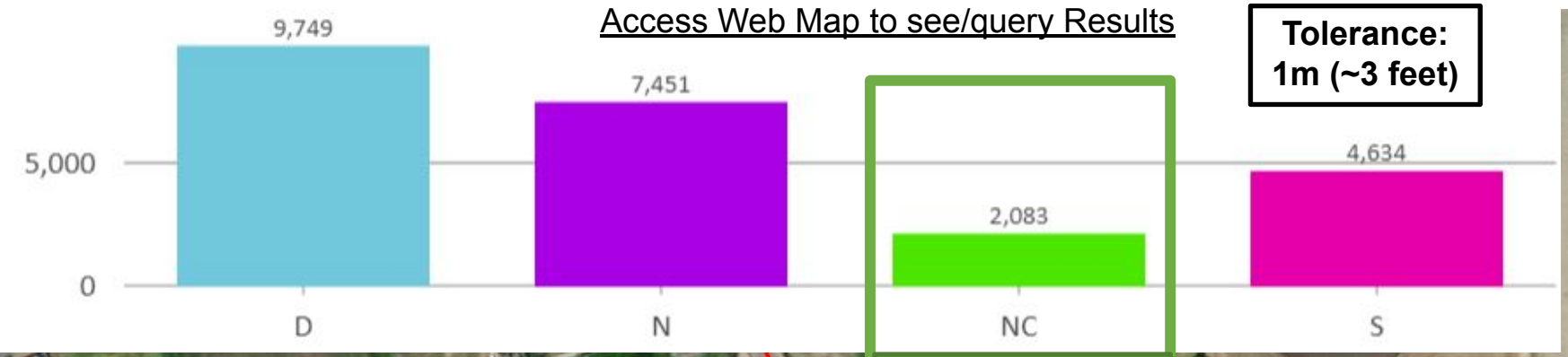
2,083 Matched Features

4,634 Segments with Geometry misaligned

Tolerance: 1m (3 feet)



Overview of Road Centerline Alignment: Caltrans and Merced Geometry Comparison

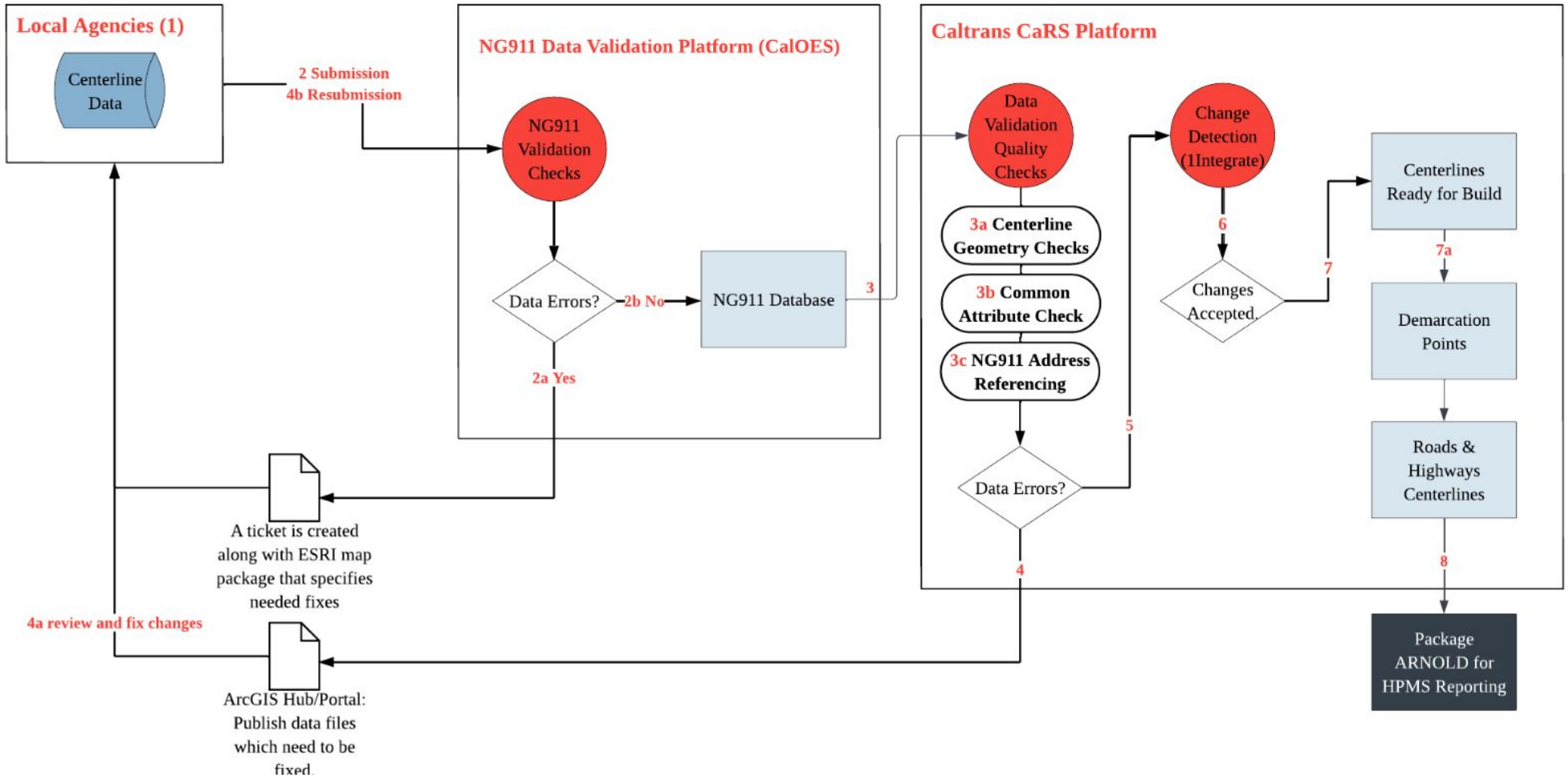


Access Web Map to see/query Results

Tolerance: 1m (~3 feet)

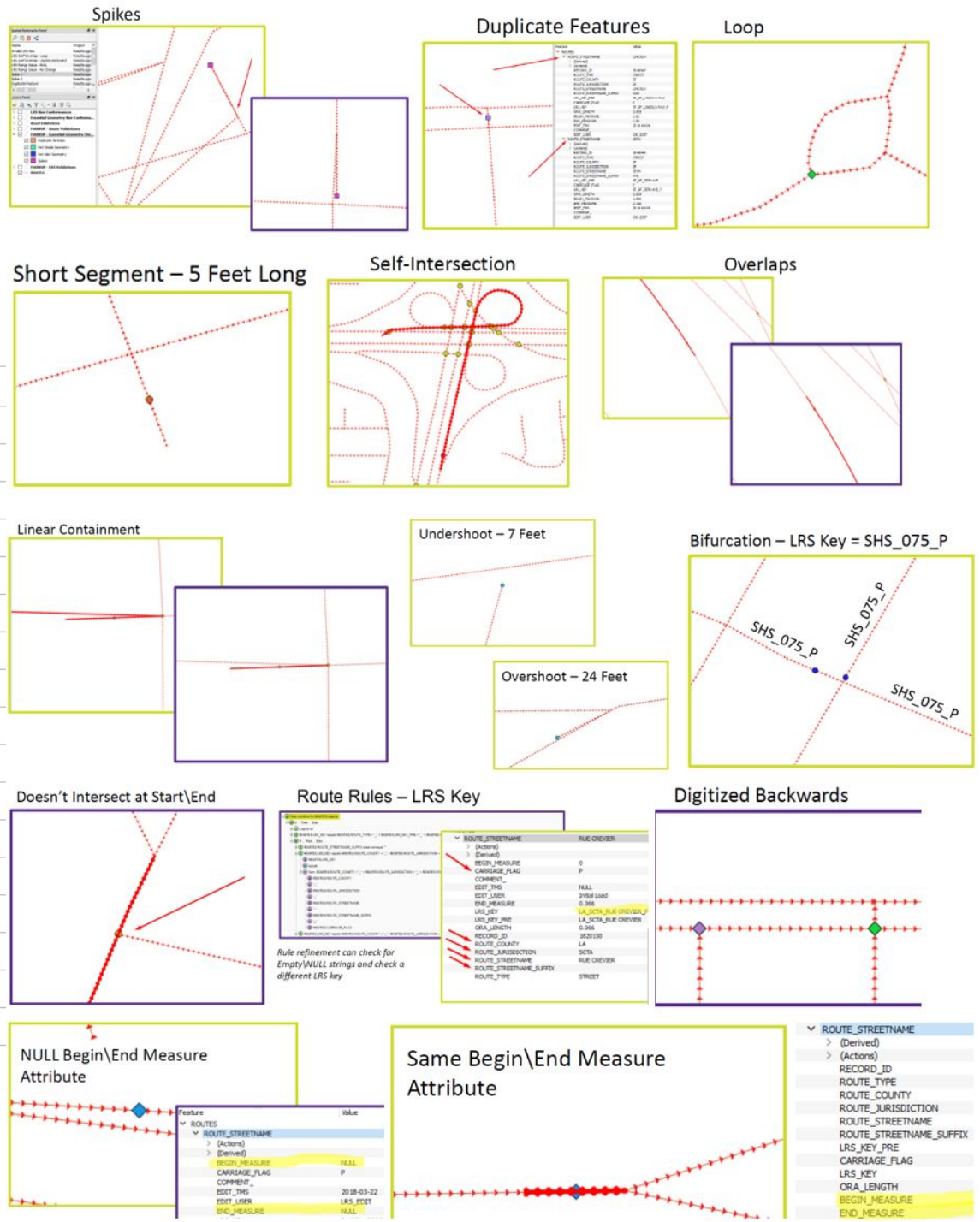
Features for which Geometry Matches

CaRS Data Quality Checks



Initiating Caltrans 1Integrate Pilot

Category	Rule	Features	Non-Conformance
Essential Geometry Checks	Check Duplicate Features	2,127,459	14
	Check for Duplicate Vertices	2,127,459	332
	Check for Spikes	2,127,459	206
	Check for Kickbacks	2,127,459	47
	Check Multi-Part Features	2,127,459	6
	Check Features are Simple	2,127,459	559
	Check Feature are Valid	2,127,459	332
Transportation Checks	Road Geometry longer than 12 feet	2,127,459	3,175
	Self-Intersecting Segments	2,127,459	284
	Overshoots\Undershoots	2,127,459	19,198
	Bifurcations	2,127,459	4,203
	Intersect at Start and End Points	2,127,459	73,474
	Linear Containment	2,127,459	45
	Overlapping Roads	2,127,459	1,153
LRS Attribute Checks	Validate LRS Key	2,127,459	175,989
	Validate LRS Range	2,127,459	7
	LRS GAP\Overlap Check	2,127,459	12,605



CaRS All Roads Working Group (ARWG) Charter

- Objectives of the Group
- Scope of Operations
  - » Problem, Mission and Vision Statements
  - » Authority, Ownership and Participants
  - » Communication Strategy
  - » Success Indicators
- Operations
  - » Operational Guidelines
  - » Roles and Responsibilities
  - » Deliverables

Monthly Meetings of the CaRS Working Group in 2024, to monitor and administer Phase 4 and plan future of CaRS

CaRS Project Phases

Phase 1: Establish CaRS Program Objectives, Statewide Work Group & Work Group Charter

Phase 2: Develop CaRS Data Architecture Using Proof-of-Concept (POC) Pilot

Phase 3: Develop Application Architecture for Enabling Roads Data Exchange. Conduct Pilots

Phase 4: Conduct Additional Proof-of-Concept (POC) Pilots involving Caltrans & Local Agencies

Phase 5: Develop & Deploy California Roads Data Governance System

Callout for Phase 4

Goto menti.com and enter code: **8719 6747**

Name and Organization (County, City, other?)
Free Text

No responses

Hide

Waiting for answers...

Would you like to participate in CaRS Phase 4?
Multiple Answer

No responses

Hide

Yes	0%
No	0%
May Be	0%
Ask me later	0%

Contact: Mariana.Cruz-Gonzalez@wsp.com

Contact us for more information

CaRS Website: https://storymaps.arcgis.com/stories/19abd0c0c16144efa53db6c75585b8f5

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