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Innovative Approaches to Assessing Risk Exposure on Rural Road Networks: Clarington Ontario's Experience

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Clarington, Ontario



- + Clarington, Ontario**
 - + Population 90,000**
 - Growing rapidly ‘905’ community
 - + 612 Sq. Km.**
 - Primarily rural
 - 4 Major Urban Centres
 - 13 Hamlets
 - + Features**
 - Lake Ontario
 - Ontario “Greenbelt”
 - Oak Ridges Moraine



+ The Challenge

- + Diverse, rural road network
- + Traffic installations 'evolved' over time
- + Missing standards-driven design processes

+ The Goal

- + Reduce risk exposure, achieve liability reduction
- + Complete comprehensive review
- + Document issues identified
- + Develop remedial action plan
- + Use innovative approaches

+ The Real Challenge

+ Long distances

- 448km of Rural Road
- 442km of Urban Road

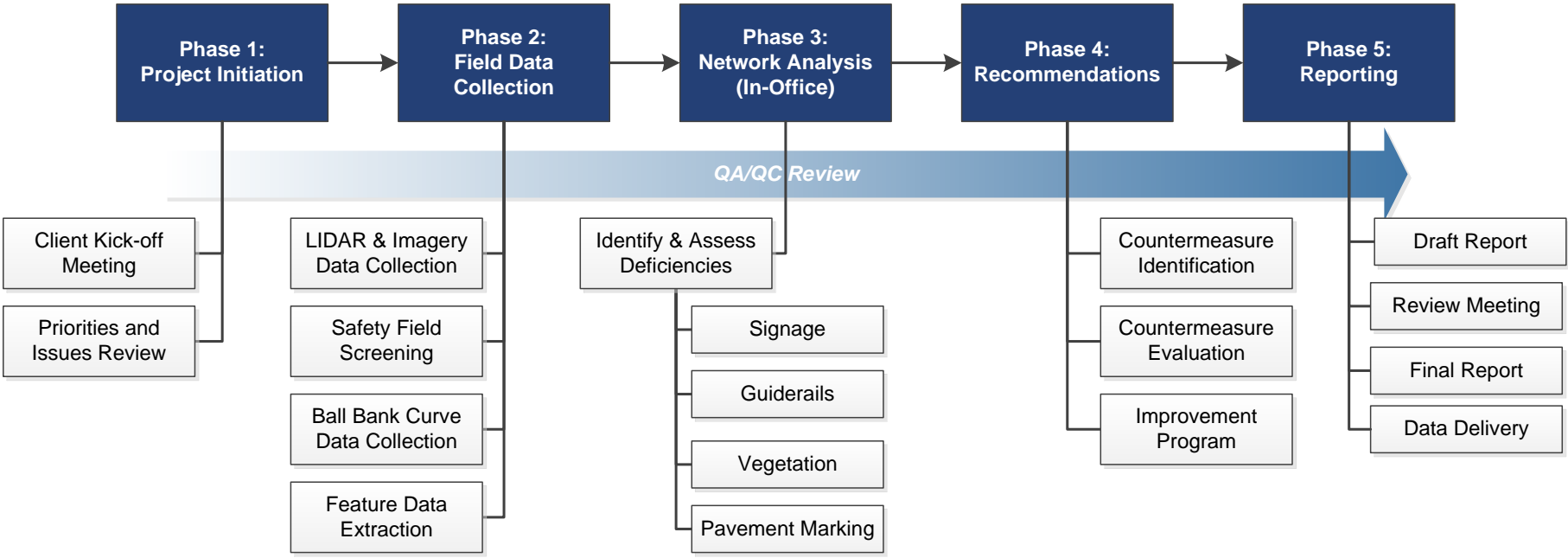
+ Information challenges

- Uncertain sign inventory
- Limited roadside safety details
- No curve ball-bank records

+ No system plan

+ Cost and time constraints

Project Approach Overview



+ Innovative Approaches

+ LiDAR

- Light Detection And Ranging
- Surveying technology, measure distance by illuminating a target with a laser light

+ Automated Curve Ball Bank Measurements

- CARS™ Curve Advisory Reporting Service
- Capture road curve “ball-bank” data in one pass

+ Quantitative Prioritization

- Treatment plan

+ LiDAR Survey

- + Used on all roads
- + Both directions
- + 3-D point cloud
 - 25mm accuracy

+ Video Data

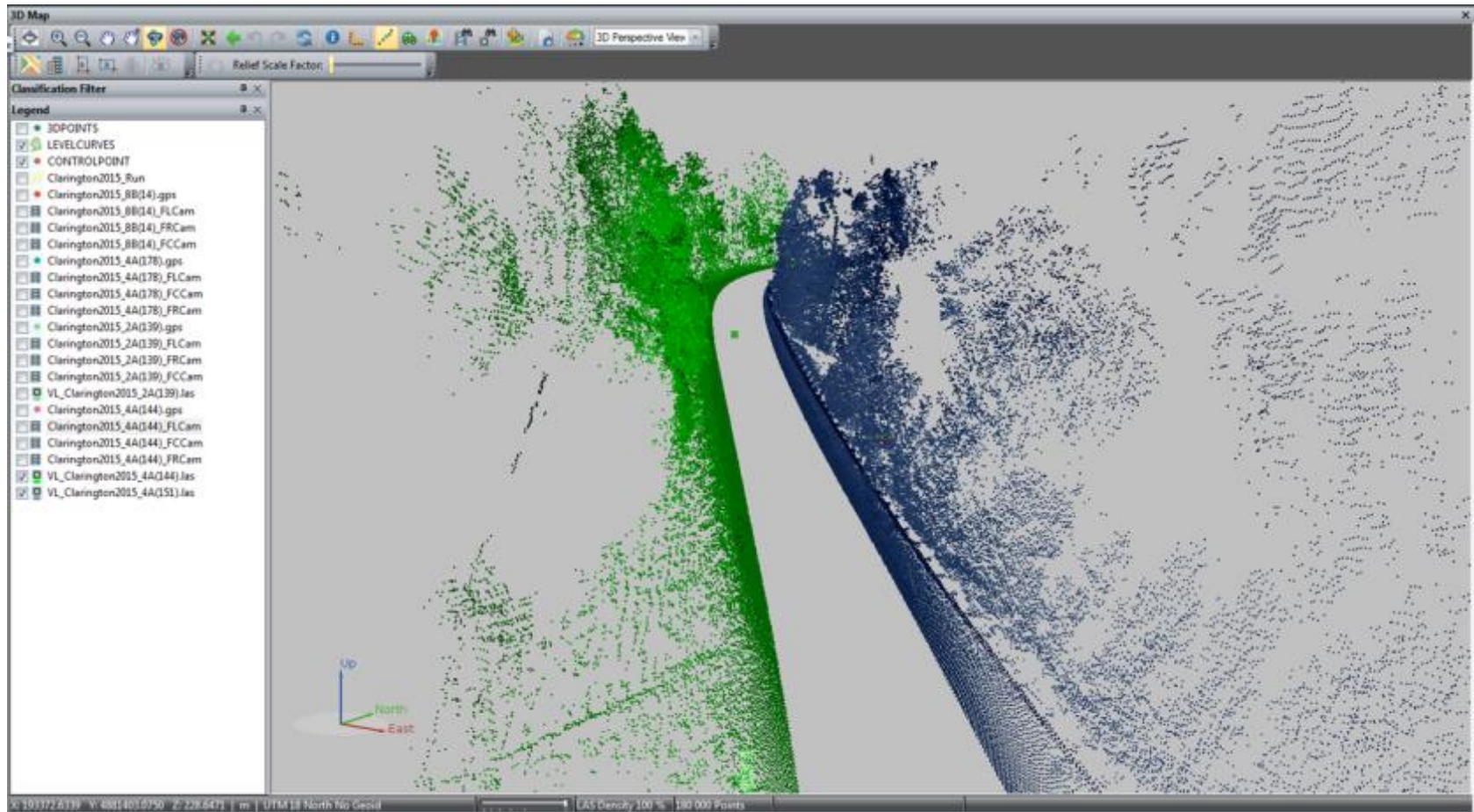
- + AVI HD Video
 - 3 m interval

+ Observer notes

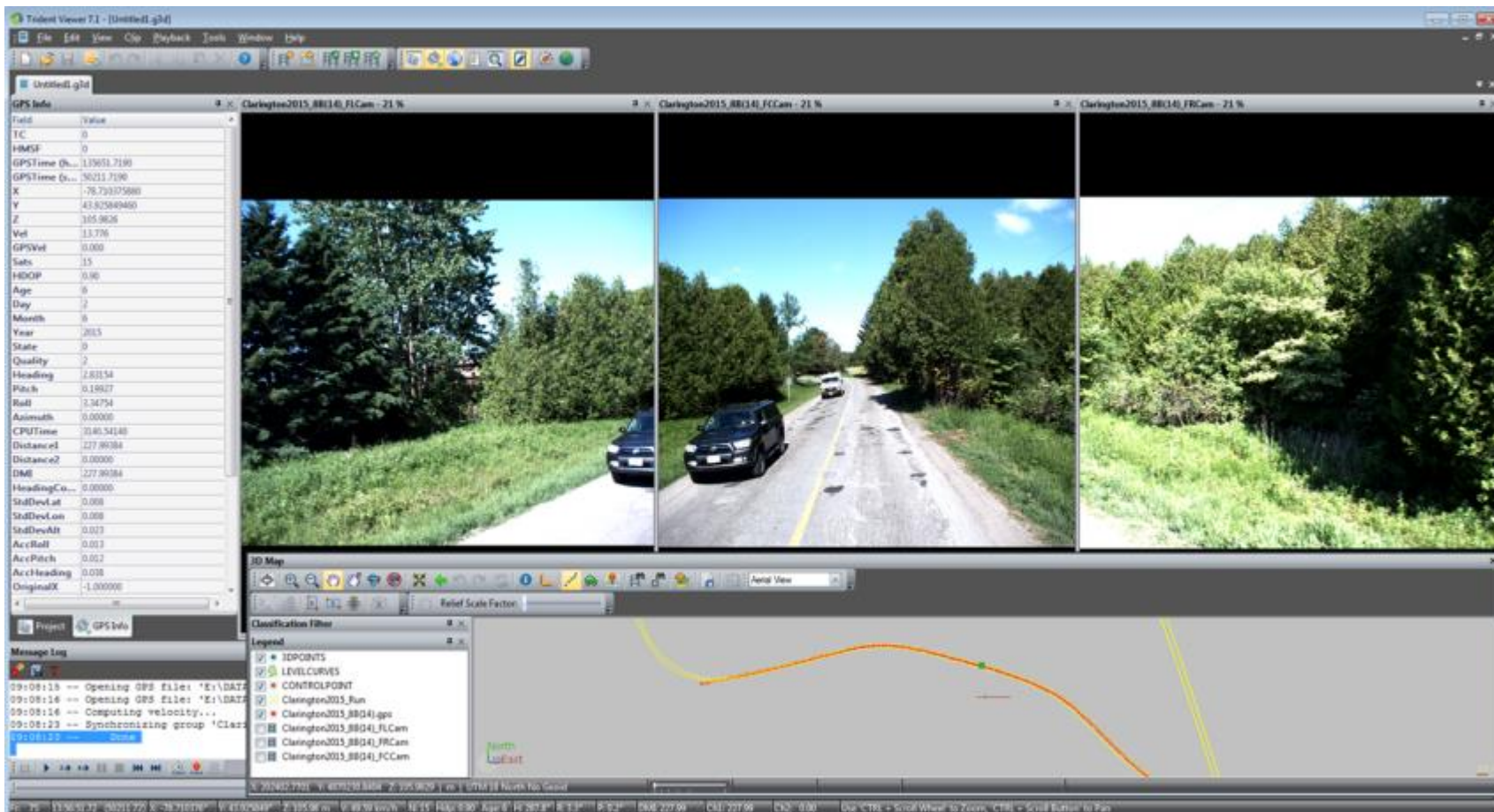
- + Geo-reference
- + Audio log



+ LiDAR Survey



+ Video Geo-reference Survey



+ Sign Inventory

+ LiDAR GIS / Mapping

- 6598 Signs

+ Correlation to existing inventory

- Geo-location verification
- Correction & adjustment

+ Video check

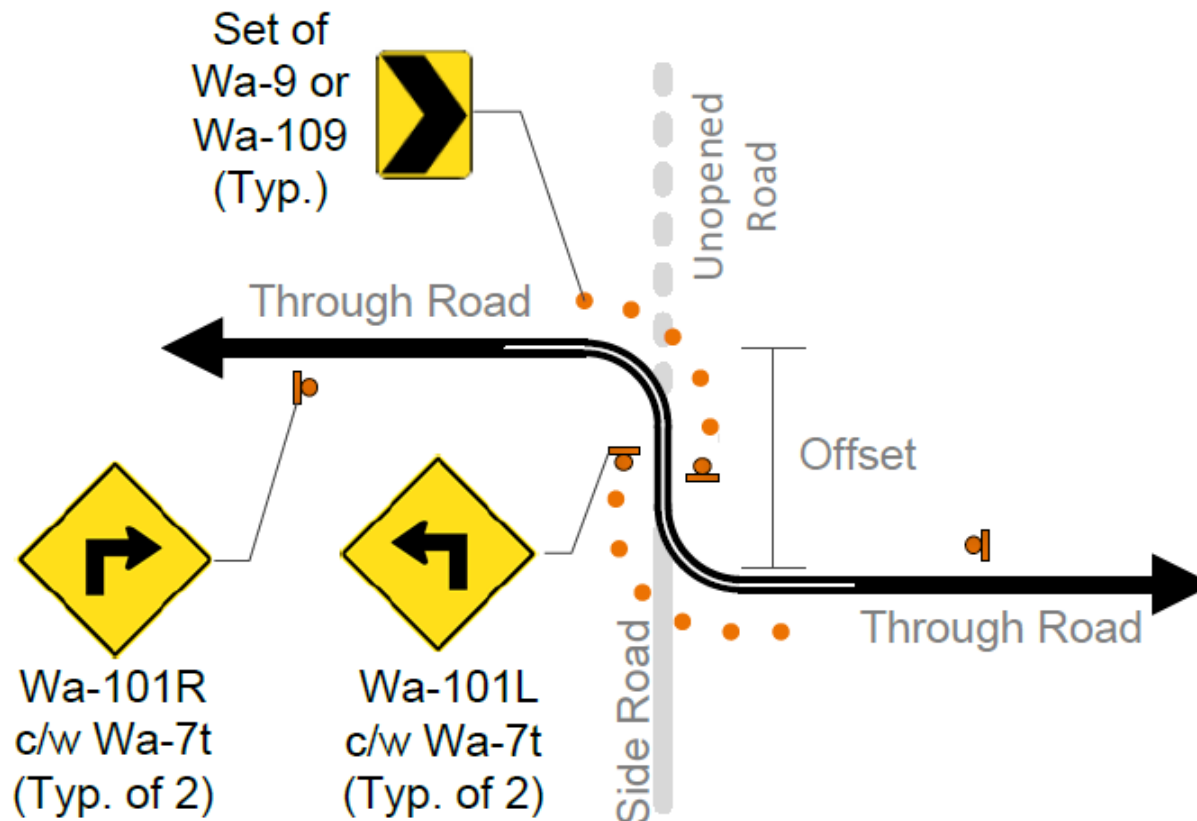
+ Retro-reflectivity analysis

- Multi-point measurement
- Aged / Damage / Alignment / Obstruction

+ Sign Inventory

+ System consideration

- Comprehensive route treatment



+ Sign Inventory

+ Non-standard applications



WA-7T Augmenting Regulatory Speed Sign on William Allin Court



WA-7T Augmenting Narrow Structure Sign on Conc. Road 1 at CPR



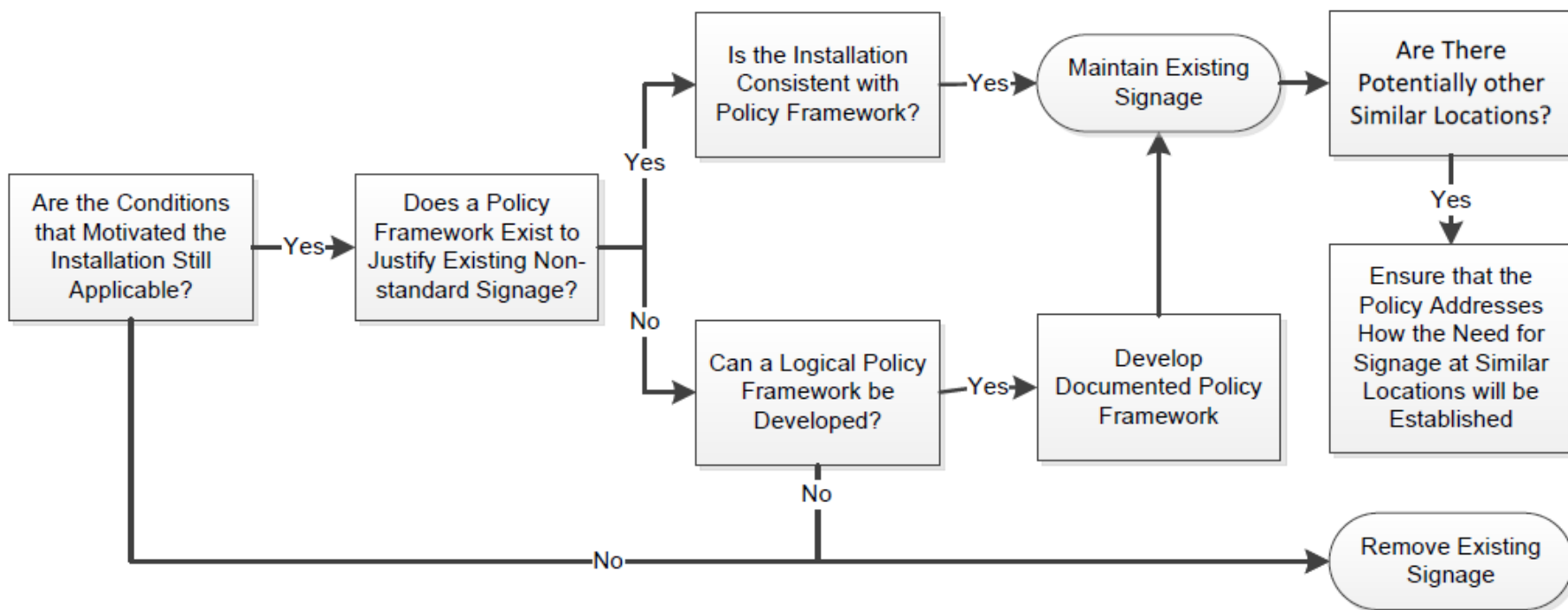
WA-7T Augmenting Intersection Warning Sign and Regulatory Speed Sign Conc. Road 10 east of RR57



WA-7T Augmenting Non-standard Hidden Int. Sign Conc. Road 6 West of Jewell Road

+ Non-standard review process

Figure 2-4: Non-standard Warning Sign Review Process



+ Road Safety Evaluation

+ In-Service Road Safety Review Process

- Application of Standards
- Ontario Traffic Manual
 - OTM Books 6, 7, 11...
- Liability risk consideration



+ Roadside Safety Evaluation

+ Embankments

+ Bridge Structure

+ Headwalls

+ Guiderail

+ Trees

+ Utility poles

Location ID	Road Name	Structure No.	Hazard Type	Ex. Sys.		Countermeasure Description	Cost (2015 \$)	Priority
				Type	Type			
RH120	Best Rd		Slope, Trees		Linear Delineation	Provide linear delineation (pavement markings and PMDs)	24,200.00	M
RH123	Bragg Rd	99017	Fixed Object, Structure		Linear Delineation	Install WB Narrow Structure Sign with One-way tab; Improve delineation for narrowing on approaches (edge markings/PDMs)	550.00	H
RH130	Lockhart Rd	98065	Slope, Creek Crossing		Point Hazard Marker	Adjust existing hazard markers to lower sign position and correct rotation	1,100.00	L
RH131	Squair Rd		Slope, Trees		Linear Delineation	Consider providing edge line pavement markings	13,200.00	M
RH132	Ochonski Rd		Fixed Object, Post, Pole, etc.		Point Hazard Marker	Install hazard markers at 1 driveway culvert on east side	550.00	L
RH133	Ochonski Rd		Slope, Trees		Linear Delineation	Consider providing edge line pavement markings at southern end	3,850.00	L
RH135	Jewel Rd		Slope, Trees		Point Hazard Marker	Install hazard markers at slope location	550.00	M
RH138	Conc Rd 5		Slope, Trees		Linear Delineation	Provide linear delineation (pavement markings and PMDs)	8,250.00	L
RH139	Conc Rd 5		Slope, Trees		Linear Delineation	None: Slope is borderline, guiderail not warranted. Linear delineation included in horz. curve recommendations.	-	L
RH140	Conc Rd 5		Slope, Trees	P	Remove	Guiderail not required remove posts.	3,850.00	L
RH142	Conc Rd 5	98085	Drop, Culvert		Point Hazard Marker	Adjust hazard markers heights ASAP	1,100.00	L
RH143	Conc Rd 4	98067	Drop, Culvert		Point Hazard Marker	Install hazard markers at all quadrants ASAP	1,100.00	H
RH144	Conc Rd 4	98069	Drop, Culvert		Point Hazard Marker	Install hazard markers at all quadrants ASAP	1,100.00	H

+ Curve Advisory Speed – Ball-Bank

- Manual – Slope Meter



- Electronic Ball Bank



+ Automatic Ball-Banking

+ Reiker Inc.

- Proprietary System

- Sold as a service

+ Rapid data collection

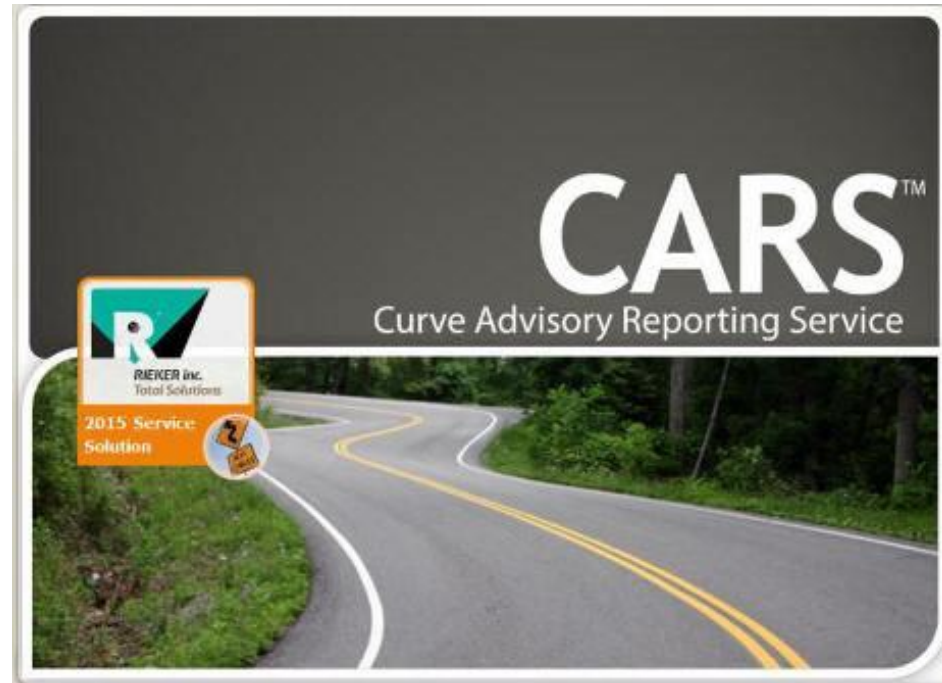
+ Large area review

+ Single Pass

+ One Operator

- GPS - Curve geometry

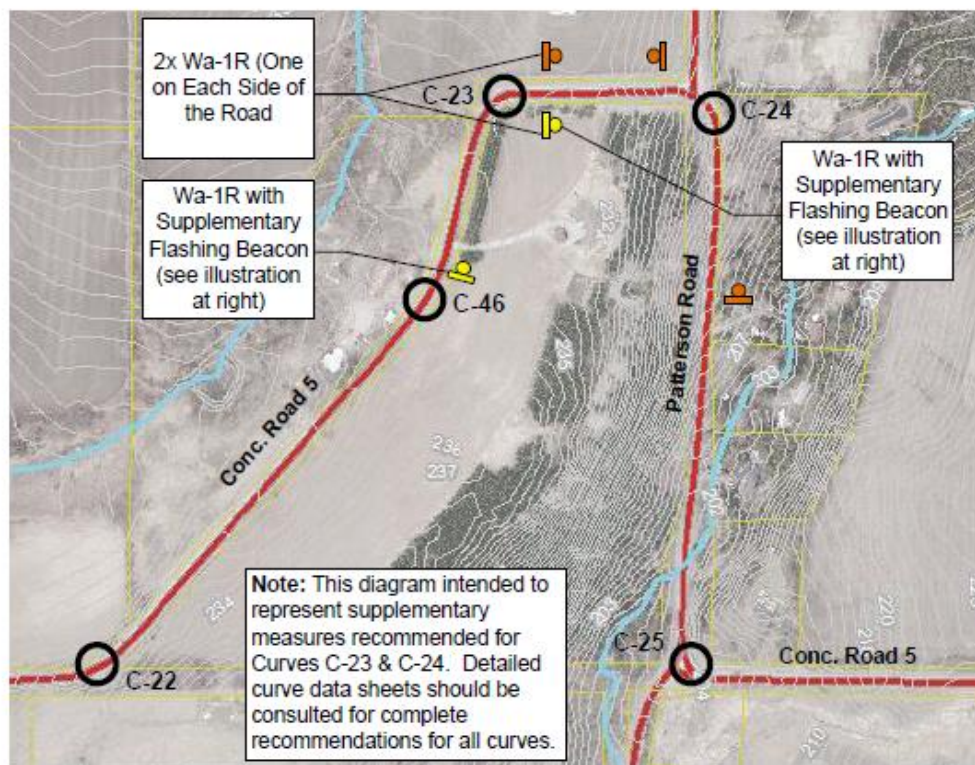
- Acceleration measure



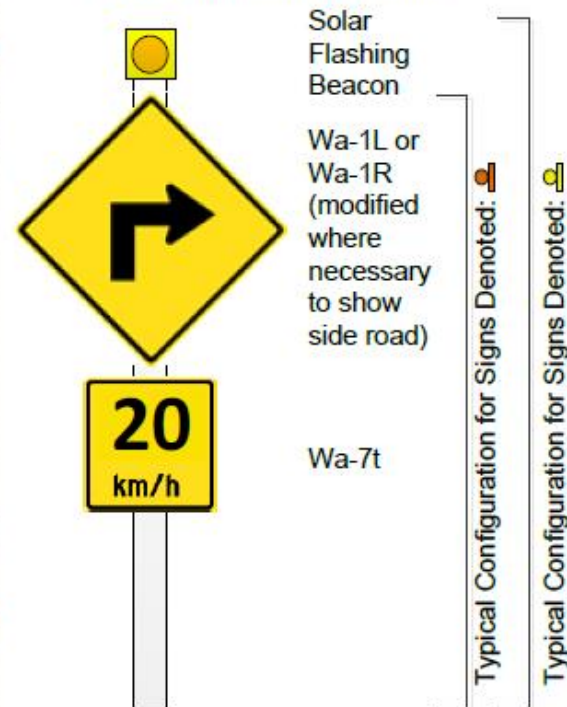
+ Curve analysis

+ Complex system integration

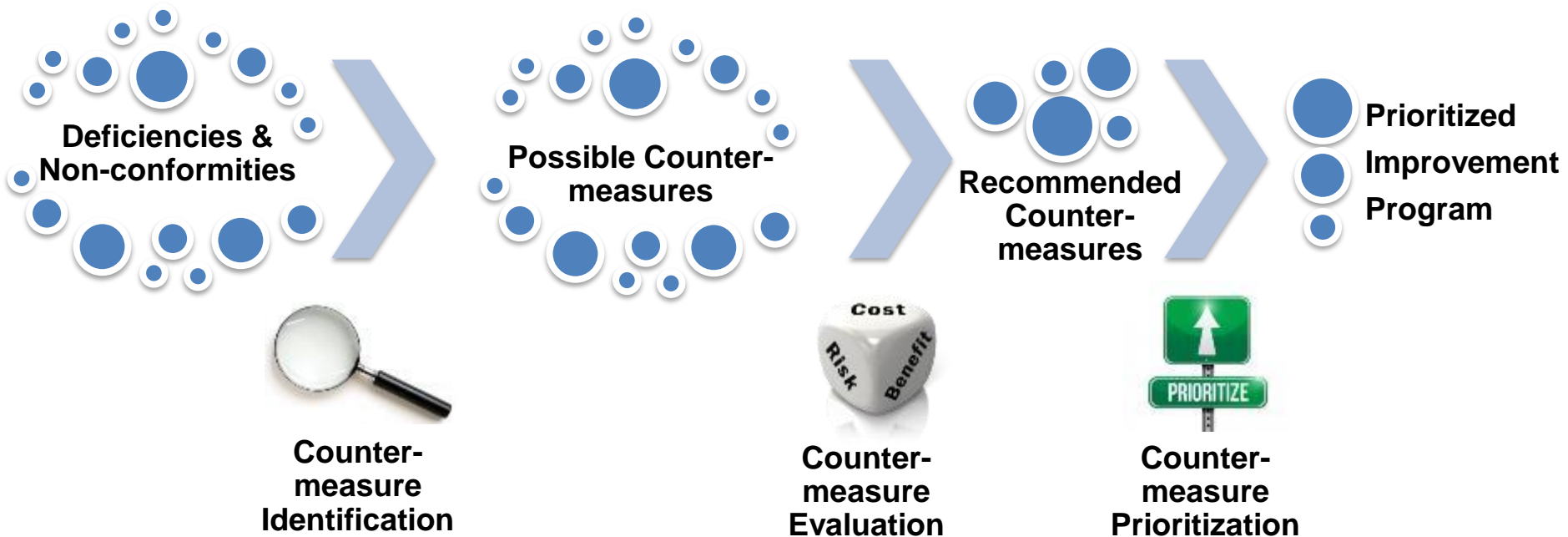
+ Quick data collection



Typical Sign Configurations



Recommendations Development Process



- + Standards-based
- + Cost-benefit analysis driven
- + Integrated with capital programs

+ **Prioritized Improvement program**

- + Maximize safety improvement
- + Optimize budget

+ **Challenges**

- + Budget constraints
- + Risk determination

+ **Risk**

- + Expert priority index
- + AADT
- + Speed
- + Improvement Potential

+ **Cost / Budget**

- + Treatment cost
- + Life cycle cost
- + Budget scenarios

+ Conclusions

+ LiDAR

- Rapid data collection
- Massive data quantity / management key
- *Some* automation, not all

+ Curve Analysis

- Accurate, rapid
- Proprietary system
- Not cost effective in this instance

+ Conclusions

+ Innovative approach

- Quick data collection
- Network wide information gathering
- Comprehensive records
- Potential future data analysis

+ System rationalization

- Full compliance check
- Development of complete plan for needed system improvements

Thank You!

