Jon Jackels, SRF Consulting Group

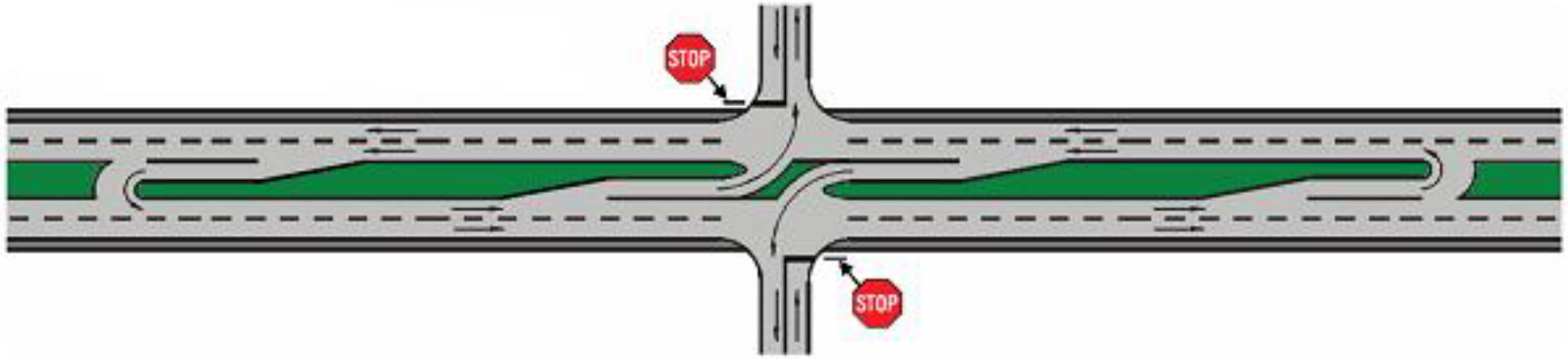
Intersection Conflict Warning Systems (ICWS)

Rural and Small Community Traffic Management Technology

Safety Challenges

Traditional Improvements

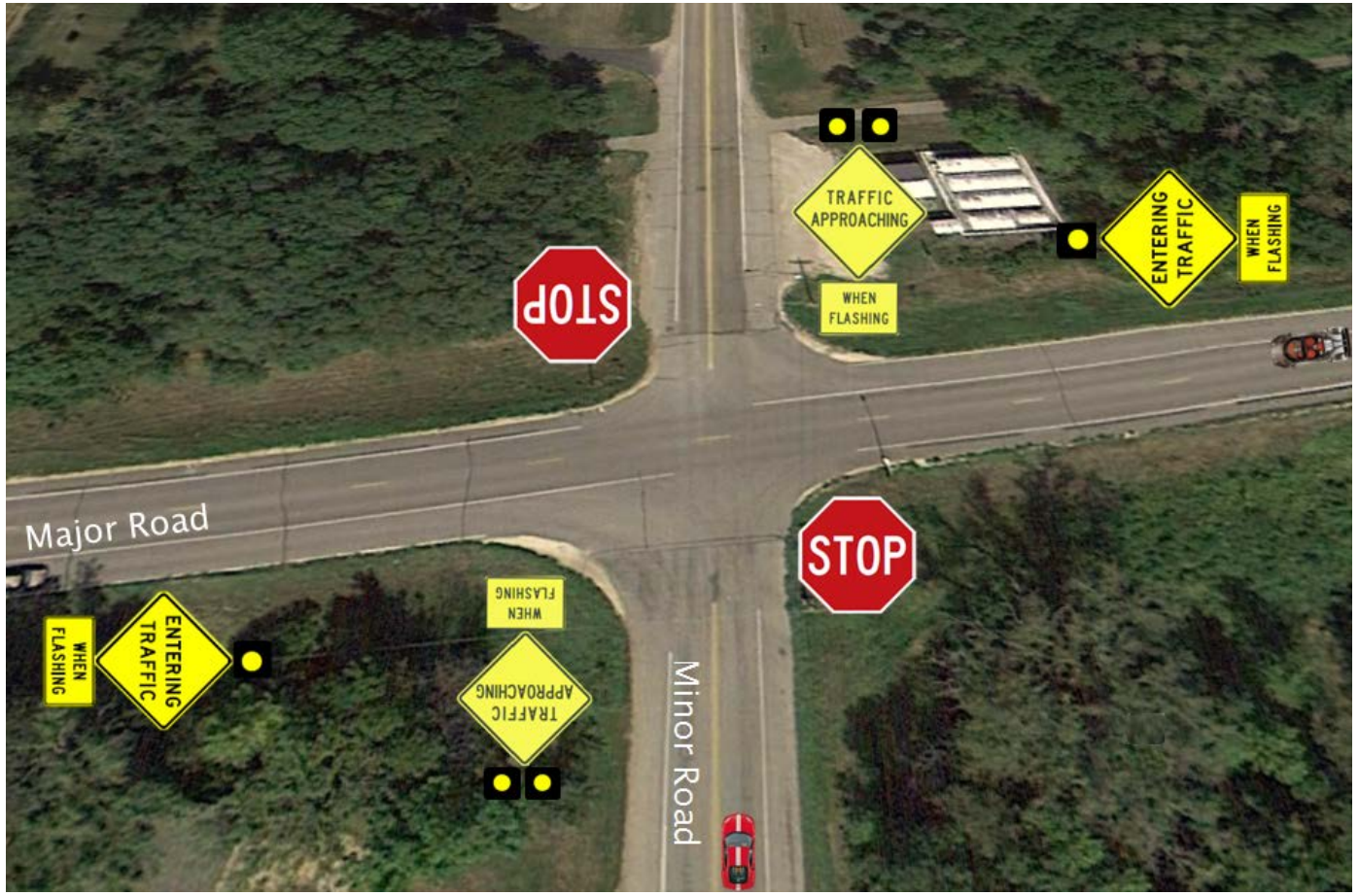
Indirect Turns



Roundabouts

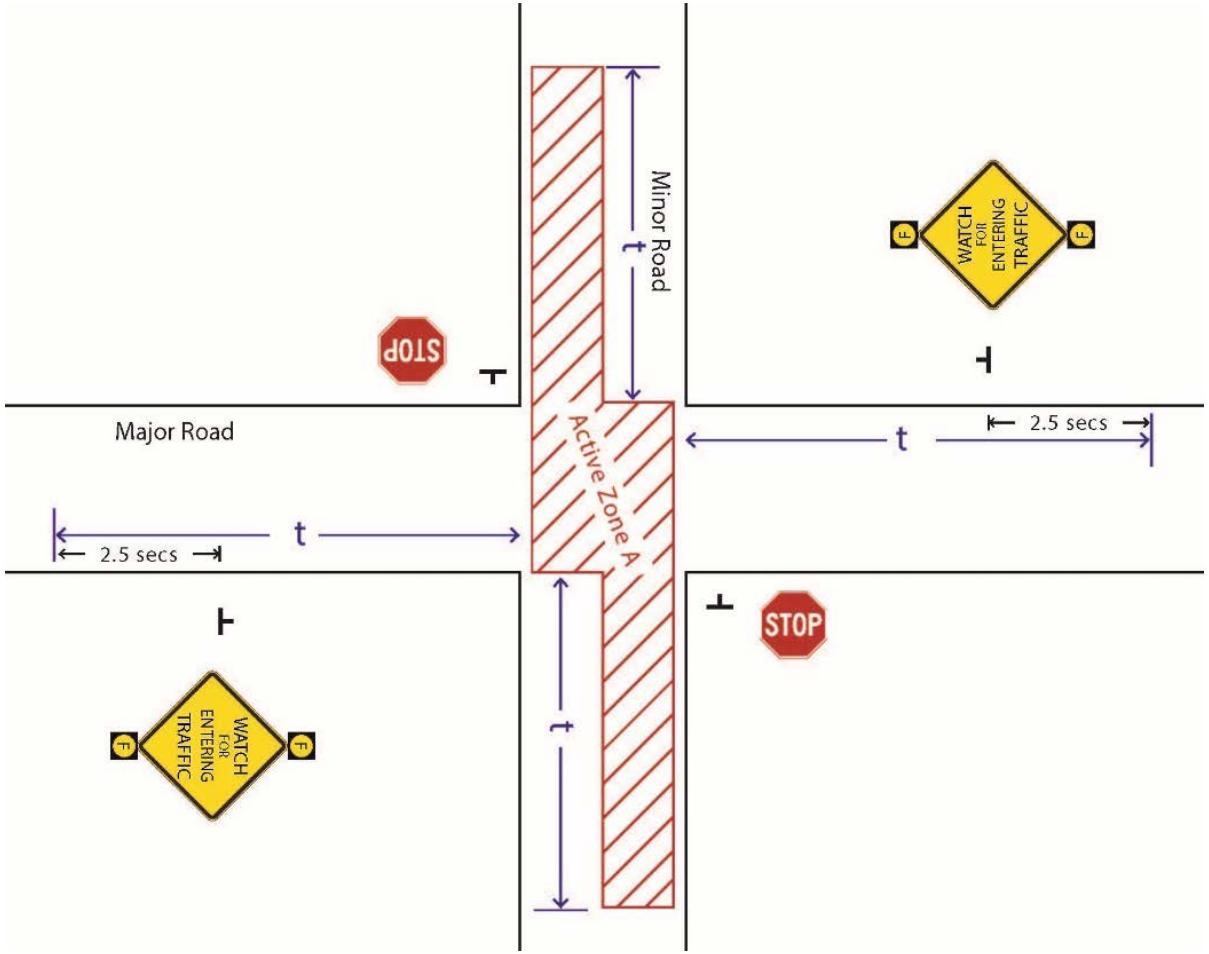
Stop Sign Beacons

Intersection Conflict Warning Systems (ICWS)

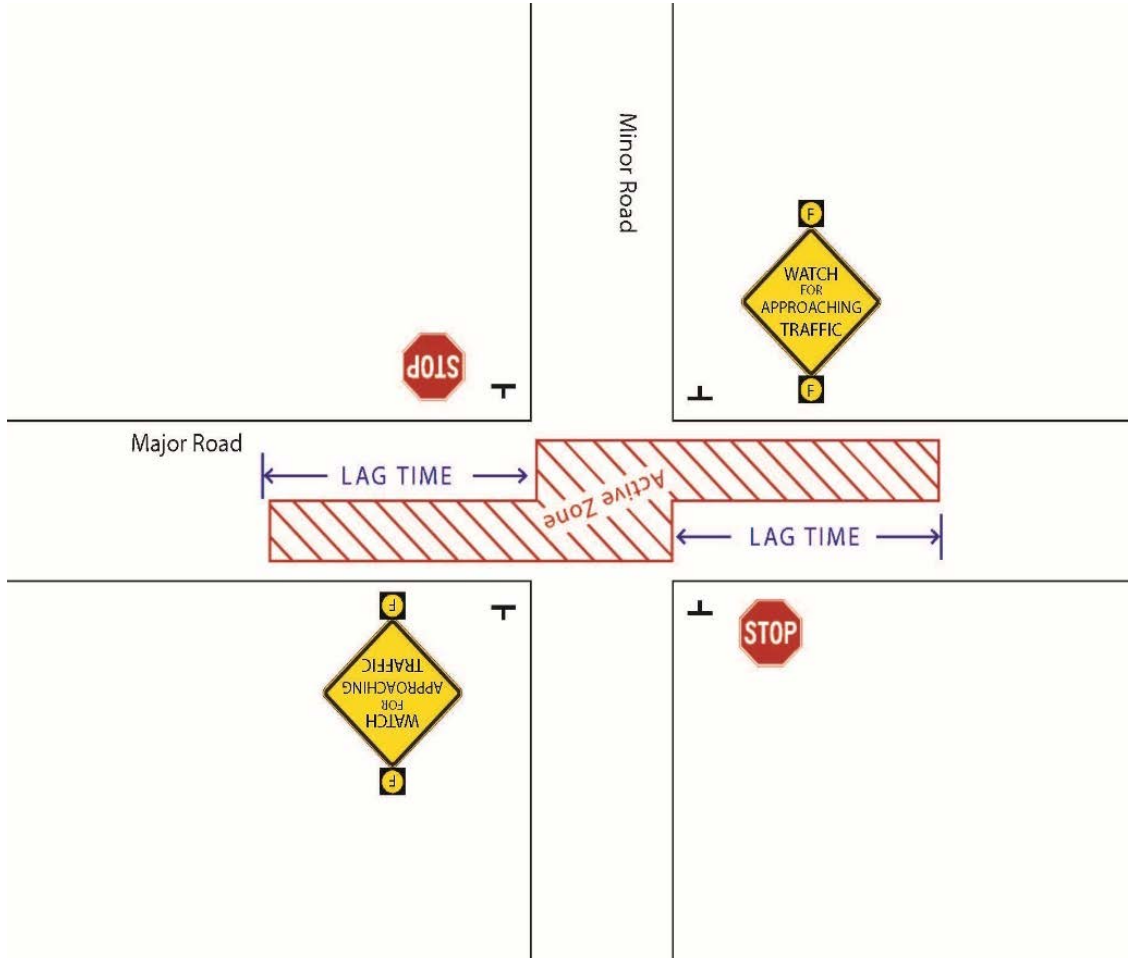


MnDOT RICWS System Operation – Major Road Warning

- Major Road warning active when vehicles are in the red zone.



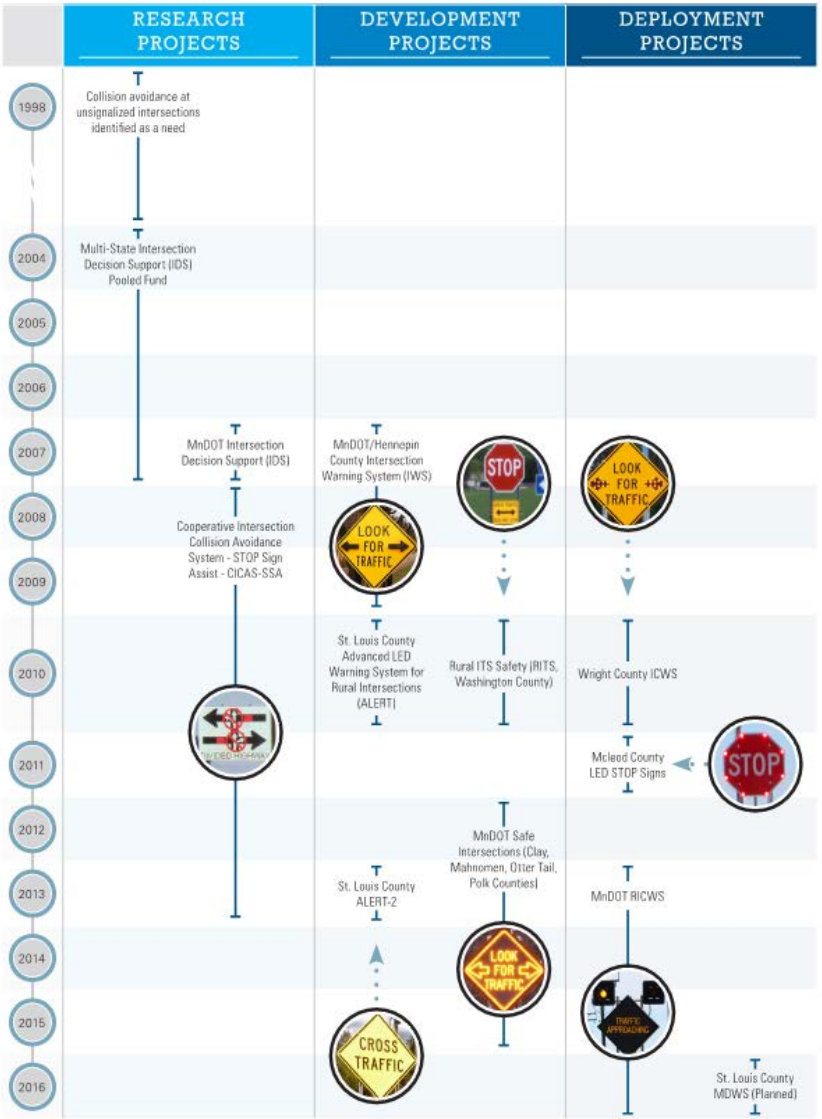
MnDOT RICWS System Operation – Minor Road Warning



- Minor Road warning active when vehicles are in the red zone.

History of ICWS in Minnesota

- Intersection Decision Support (IDS)
- Cooperative Intersection Collision Avoidance System (CICAS)
- Intersection Warning System (IWZ)
- Safe Intersections
- Rural Intersection Conflict Warning System (RICWS)
- Advanced LED Warning System (ALERT2)
- Mainline Dynamic Warning System (MDWS)
- Local RICWS Project



National Effort to Study ICWS
ENTERPRISE Transportation Pooled Fund

- Foundation for Architectural Review & Systems Engineering
- Design Decisions
- Testing and Validation Results
- Maintenance Logs

RICWS Maintenance Log

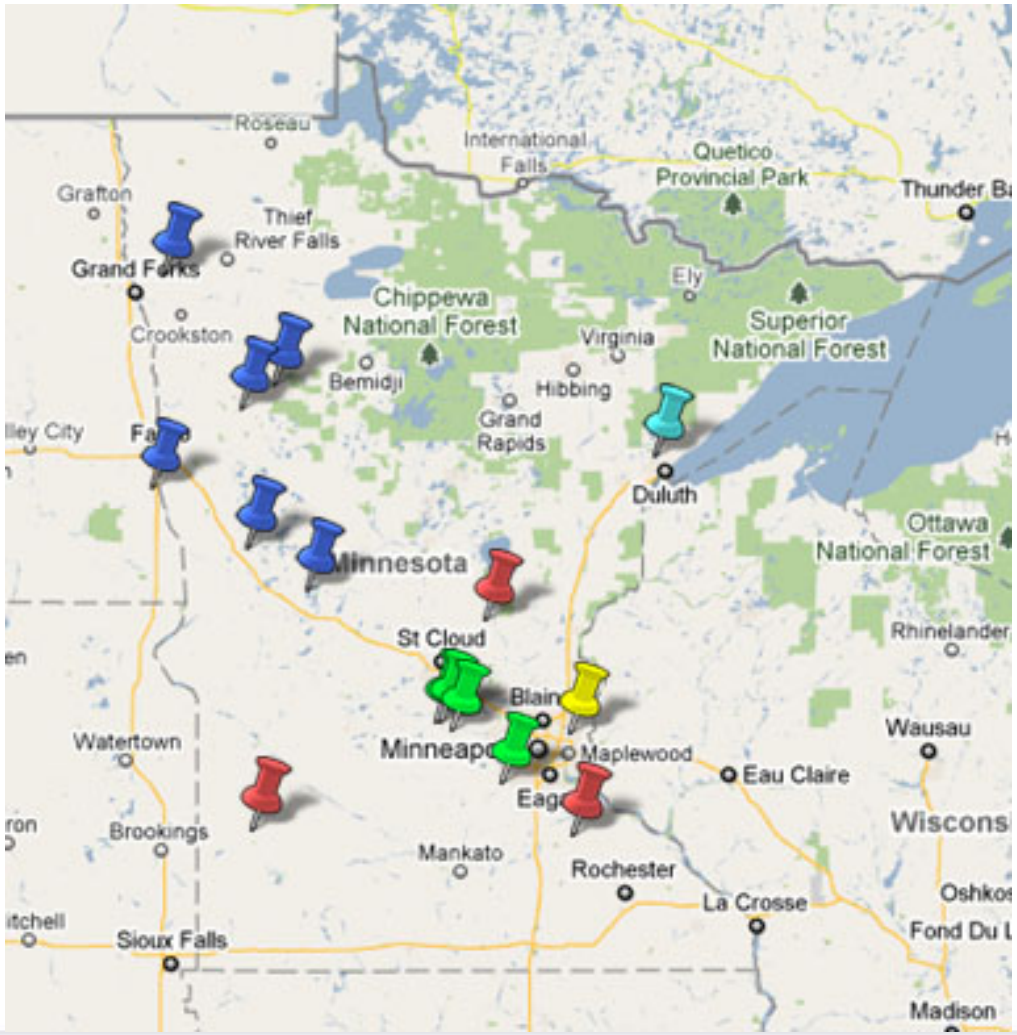
Last Updated 6/18/2015

New Items in Yellow | MnDOT to repair in Blue
Outstanding Items in Orange | In progress information

ID	Site No.	Site Location/Name	Observed Component Failure and/or Symptoms	Issue Reported By	MnDOT PM Notified (date)	Contractor Notified (date)	Diagnosis	Date of Repair	Components replaced or repaired	Notes to prevent future failures	Repair Performed By (organization and personnel)	Maintenance Activities (hours spent, replacement equipment cost, invoices generated)	Duration between Contractor notification and resolution (days)
1	10	Aitkin (TH 210 at CSAH 12)	Site not working properly	Aitkin County Engineer	12/30/2013	12/27/13	Loop sensitivity was set too high on one of the ramps.	12/30/2013	Card was adjusted and site back in operation.	Verify that loop sensitivity is set properly before turn-on test.	Origine, Design Electric	3 hours	3
2	17	Kyota (TH 42 and CSAH 9)	The flasher was on steady for NB and SB TH 42 traffic and was not flashing at all for EB or WB CSAH 9	Kile Holm, MnDOT Engineering Specialist	6/12/2014	6/18/14	System went into failsafe mode. Can design electric provide the controller/event logs so that they can diagnose this?	6/18/2014	Detection reseated, power cycled.	None	Kile Holm, MnDOT Engineering specialist	Not available	Not applicable
3	14	Dundas (TH 3 and CSAH 20)	The signs are flashing constantly on TH 3 and do not flash at all on the side street.	Kile Holm, MnDOT Engineering Specialist	4/7/2014	4/7/14	System went into failsafe mode. Can design electric provide the controller/event logs so that they can diagnose this?	4/14/2014	Detection reseated, power cycled.	None	Kile Holm, MnDOT Engineering specialist	Not available	Not applicable
4	17	Kyota (TH 42 and CSAH 9)	The flasher was on steady for NB and SB TH 42 traffic and was not flashing at all for EB or WB CSAH 9	Kile Holm, MnDOT Engineering Specialist	6/18/2014	6/20/14	Detector has a bad connection.	6/20/2014	Found some protective coating on the back of the loop detector pin. This appears to make it temporary lose contact. Thus putting the system into failure mode. Repaired, tested and observed it for a few hours and seems to be working.	Remove protective coating from loop detector pins.	Design Electric, MnDOT personnel	3+1/2 hours	2
28	44	Isanti (MNTH 47 & CSAH 9)	System was in failsafe mode (The blank out signs were dark, and the lights on mainline were flashing continuously.)	Chad Erickson, MnDOT Metro	12/15/2014	12/15/2014	Unused detection channel still programmed. So it timed out and put system in failure	12/16/2014	Not applicable	None	Dan Brick, Design Electric	1/4 hour	1 day
29	15	Marshall (MNTH 23 & CSAH 30)	One of the flashing beacons was "hanging off the back of the sign.	District 8 sign crew	6/23/2014	6/23/14	Lock nut loose	7/1/2014	Reattached head.	Consider attachment method if this problem becomes more prevalent.	Dan, Design Electric	15 minutes	8
30	15	Marshall (MNTH 23 & CSAH 30)	Median detector has extraneous and stuck calls.	Luke James, SRF inspector	6/24/2014	6/30/14	Detector card sensitivity was to maximum.	7/1/2014	Lowered sensitivity on Canoga detector card.	Check sensitivity of loop cards upon installation.	Dan, Design Electric	1 hour	1
31	17	Kyota (TH 42 and CSAH 9)	System was in failsafe mode.	Originally reported by public, verified by District 6.	6/30/2014	6/30/14	None.	6/30/2014	System power cycled. District was instructed to leave system in failsafe mode so that Design Electric can troubleshoot the system.	None	MnDOT D6	Not available	Not applicable
32	15/16	Marshall/Glencoe	Major road flashers do not wig wag	Jim Schoon, Design Electric	7/3/2014	7/3/2014	Controller needs to be reprogrammed to allow for wig wag operation.	Glencoe: 7/9/2014 Miranac: 7/9/2014	Sites reprogrammed for wig wag operation.	Program controller upon install.	Design Electric		6
33	14	Dundas (TH 3 and CSAH 20)	Not working properly	Ken Hansen, MnDOT PM, reported by Mike Daugherty, Public Affairs from DK who was informed from a member of the public.	6/23/2014	6/24/14	Canoga card showed fault on detector channel	6/25/2014	Tested resistance on loop associated with fault. Loop resistance was found it to be too high. This loop was replaced and was retested and found to be	Verify resistance upon installation.	Dan, Design Electric	3 1/2 hours	1
34	17	Kyota (TH 42 and CSAH 9)	The system was was working on 7/5/2014 and was in failsafe mode on 7/6/2014	City called District 6	7/7/2014	7/7/2014	Inactivity on the loop 0 2 (right turn lane)	7/9/2014	Extended inactivity (ACT) time for loops in right turn lane	Monitor to see if reprogramming or resetting the loops is needed	Dan, Design Electric	2 hours	2
35	17	Kyota (TH 42 and CSAH 9)	System not working	District 6	7/15/2014	7/15/2014	One Canoga detector	7/15/2014	Replaced and retested. Dropped	None	Dan, Design Electric	1.5 hours	0

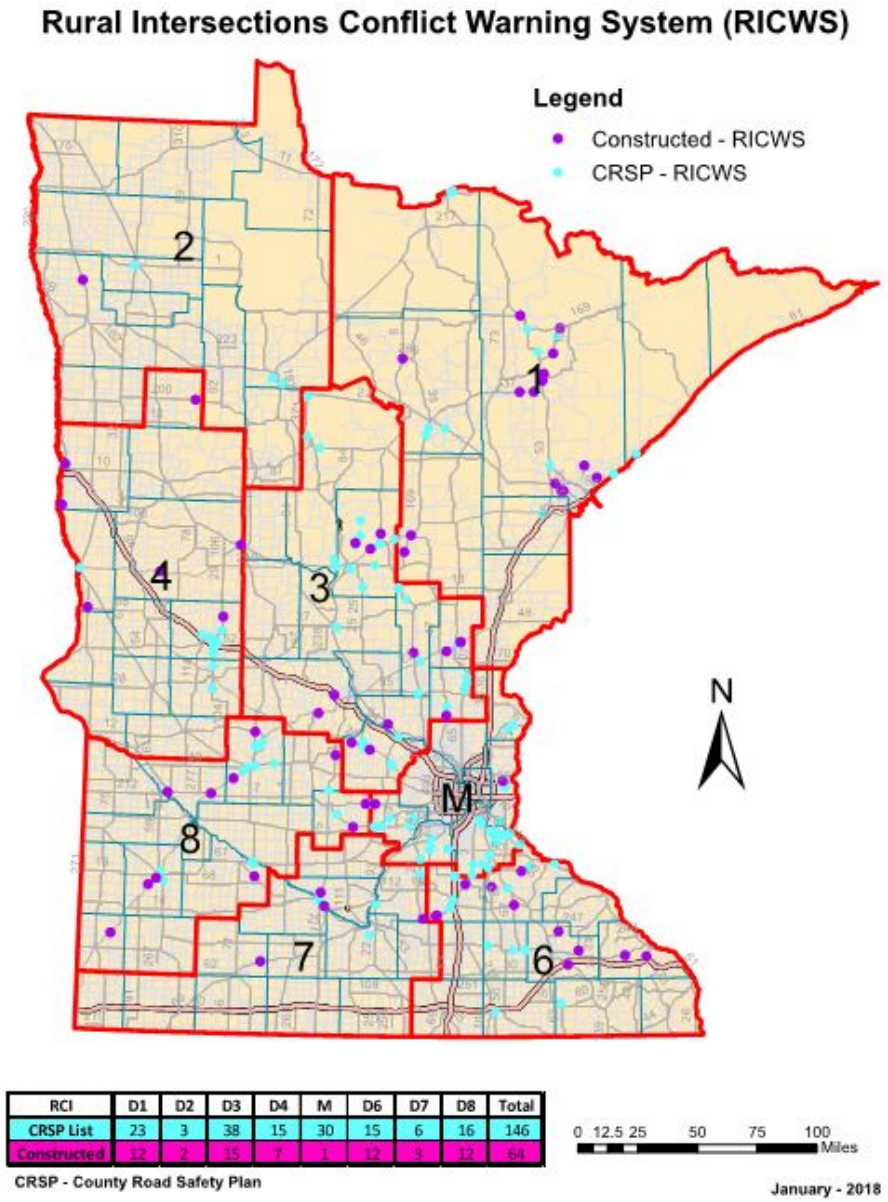
ENTERPRISE

Safe Intersection



MnDOT's Rural Intersection Conflict Warning System (RICWS) Project

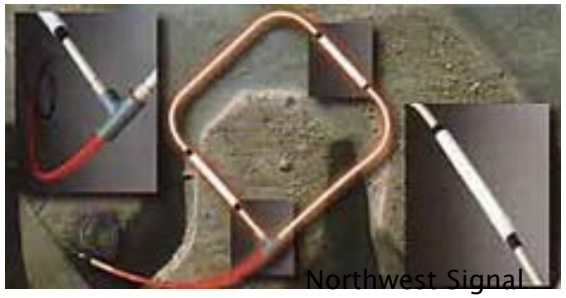
- 50+ Deployments, 3 years operation
- Project Findings
  - Safety improved (35 to 45%)
  - Standard equipment for ease of maintenance (once/year)
  - Systems are reliable
  - Detection accuracy and driver confidence (99.98%)
- Additional 350+ Sites Identified
  - At discretion of Districts



RCI	D1	D2	D3	D4	M	D6	D7	D8	Total
CRSP List	23	3	38	15	30	15	6	16	146
Constructed	12	2	15	7	1	12	3	12	64

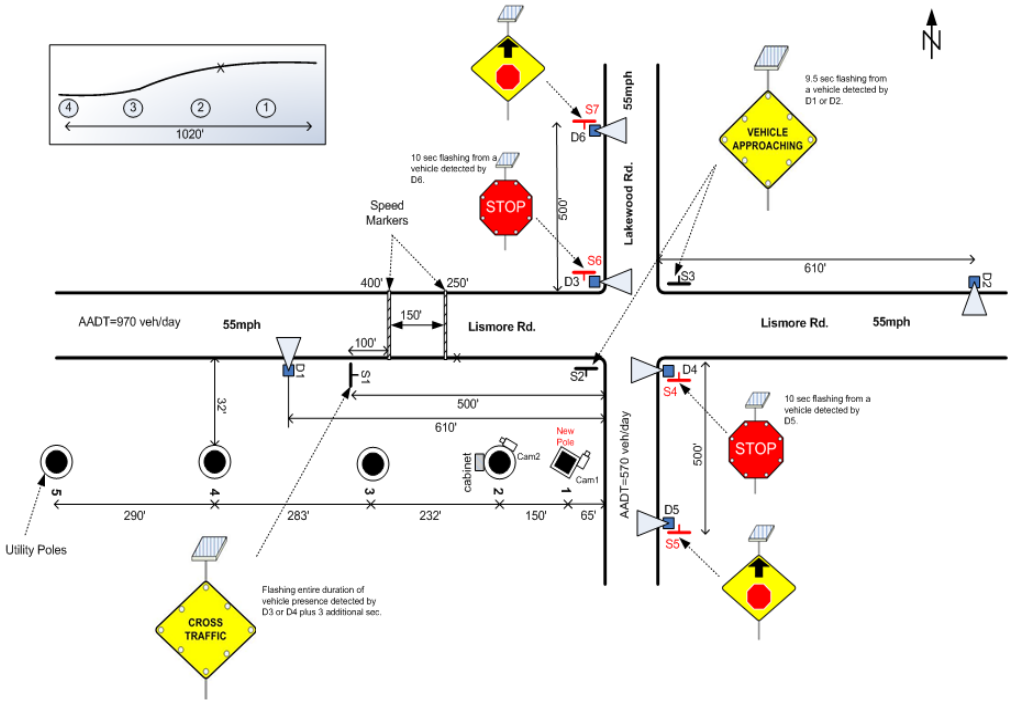
RICWS Components

- Detection
  - Canoga Micro Loops
  - Loop Detectors
- Controller
  - Econolite ASC/3
- Signs
  - Blank Out
  - Static



ALERT 2

- Advanced LED Warning System for Rural Intersections



Mainline Dynamic Warning System

St. Louis County, MN – “Local” RICWS Project

- “Local” RICWS Project Goals
  - Lower cost
  - Easier to operate and maintain
  - Reliable
  - Minimize underground locate requests
  - Can be leveraged by other counties

“Local” RICWS Project Team

- Technical panel to lead project:
  - Vic Lund (St. Louis County)
  - Guy KohInhofer (Dodge County)
  - Tim Bray (Crow Wing County)
  - Karin Grandia (Itasca County)
  - Mark Vizecky (MnDOT State Aid)
  - Rick West (Ottertail County)
  - Jodi Tech (Stearns County)
  - Taek Kwon (UMD)
  - Joe Gustafson (Washington County)
  - Sara Buermann (Wright County)
  - Chad Hausmann (Wright County)
  - Virgil Hawkins (Wright County)

“Local” RICWS Systems Engineering Approach

- Architectural Review
- Concept of Operations
- Systems Requirements
- System Design
- Construction
- Project Documentation

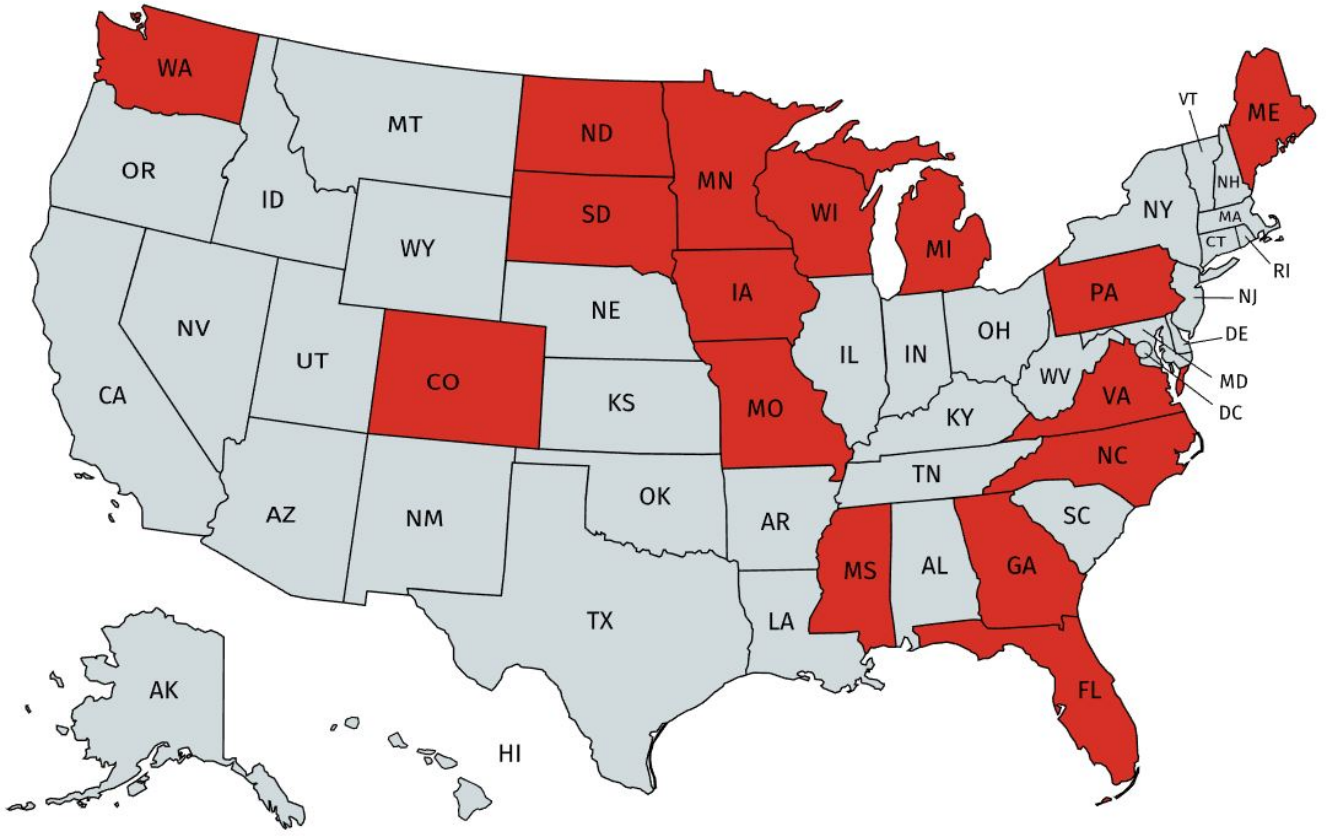
- Intersection Location
  - County Hwy 25 & County 16

Architectural Review – Overall Process

- ENTERPRISE Transportation Pooled Fund
- Literature search into ICWS effectiveness (sign type, wording, driver perception, etc.)
- Leverage relationships with agencies that have ICWS
- Broad survey of agencies that have ICWS

Architectural Review – State DOT Outreach

- National search for existing systems
  - System components
    - Make and model of components
    - Controller types and capabilities
    - Sign choice
    - Detector technology
    - Communication
    - Power
  - Notable issues and overall cost
  - Future upgrades or deployments



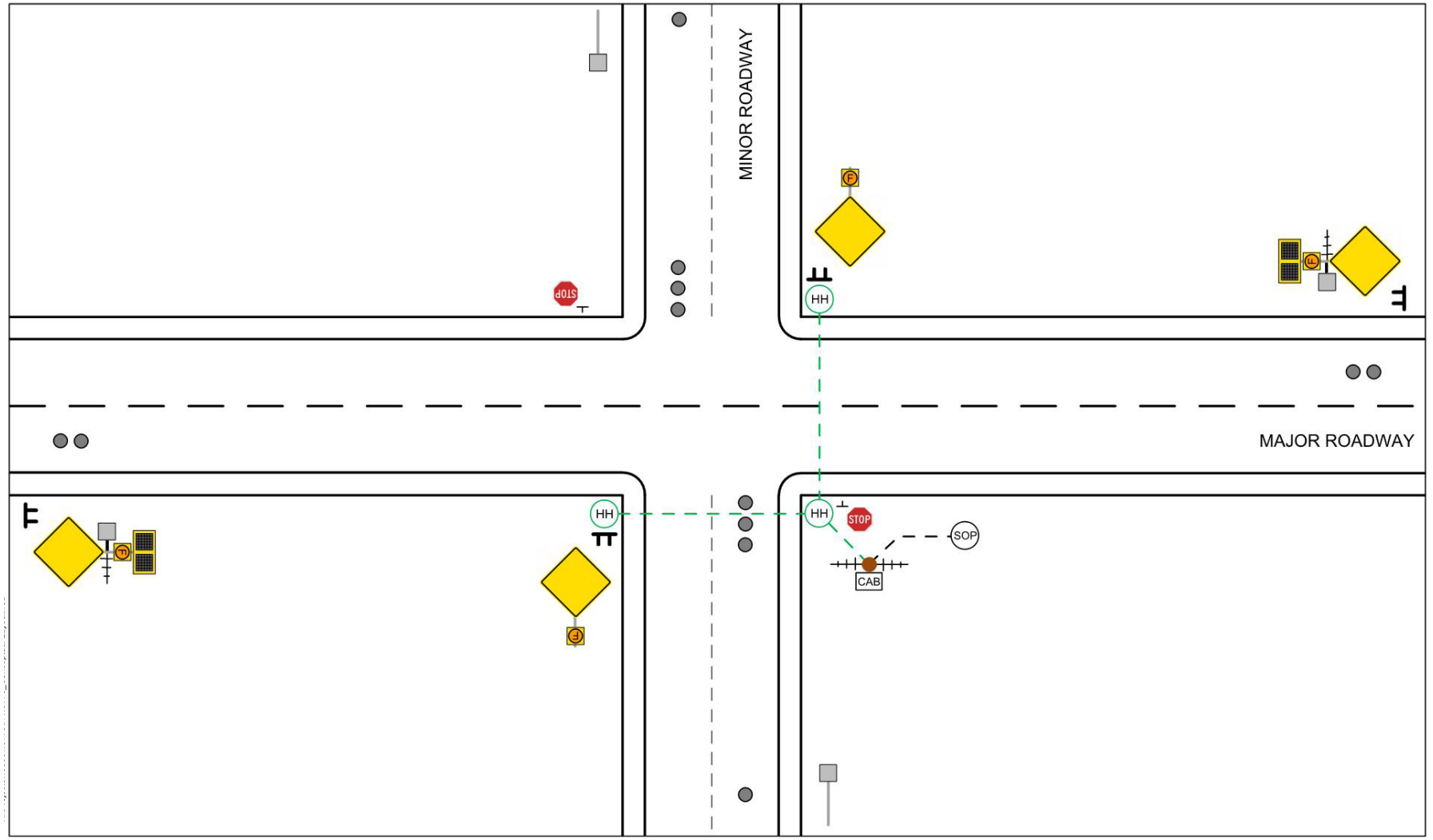
Survey Findings (61 responses)

Survey Topic:	Response:
1. Include Minor Road Alert	1. Depends on site conditions
2. Underground Components	2. Local agencies prefer to minimize
3. Solar Power	3. Interested if reliable
4. Maintenance	4. Want option to maintain with own staff
5. System Cost	5. Cheaper is better
6. Remote Monitoring	6. Important as long as low cost

Conclusions:

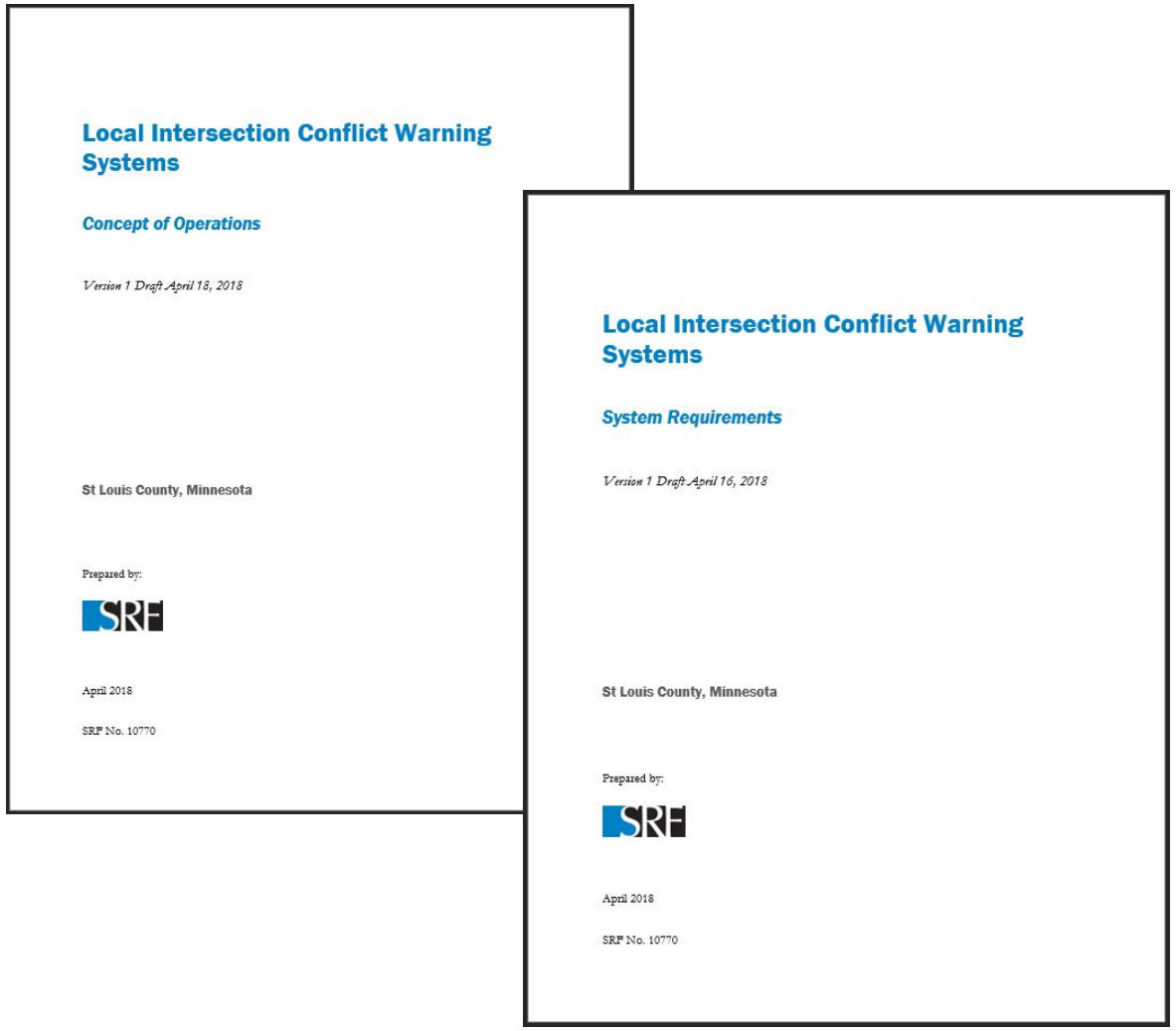
- Findings align with project goals
- Open to solar, detection, and wireless to reduce cost
- Remotely monitor for MnDOT support

Systems Engineering - Conceptual Design



Local" RICWS Project Approach – Next Steps

- Finalized Systems Engineering
  - Concept of Operations
  - System Requirements
- Completed System Design
  - Project has be let, not awarded
- System Deployment



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Thank you!

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