

Traffic Queue Warning System



Victor Lund, PE
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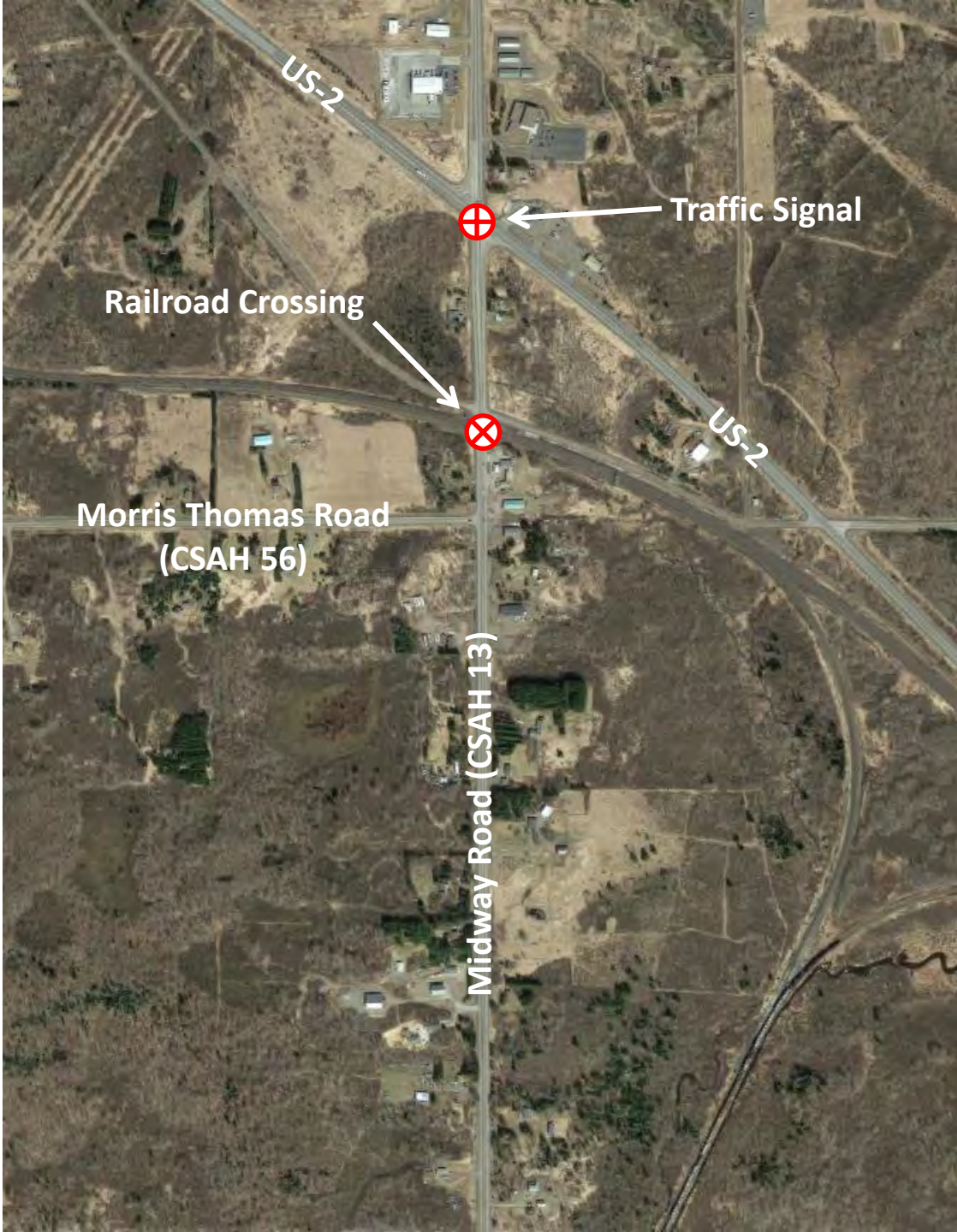
MnDOT District Safety Plans, Rail Safety Plans, and ITS Rail Safety Strategies

November 16, 2016

Minnesota Toward Zero Deaths Conference

Duluth, MN





US-2

Traffic Signal

Railroad Crossing

US-2

Morris Thomas Road
(CSAH 56)

Midway Road (CSAH 13)

Existing Conditions

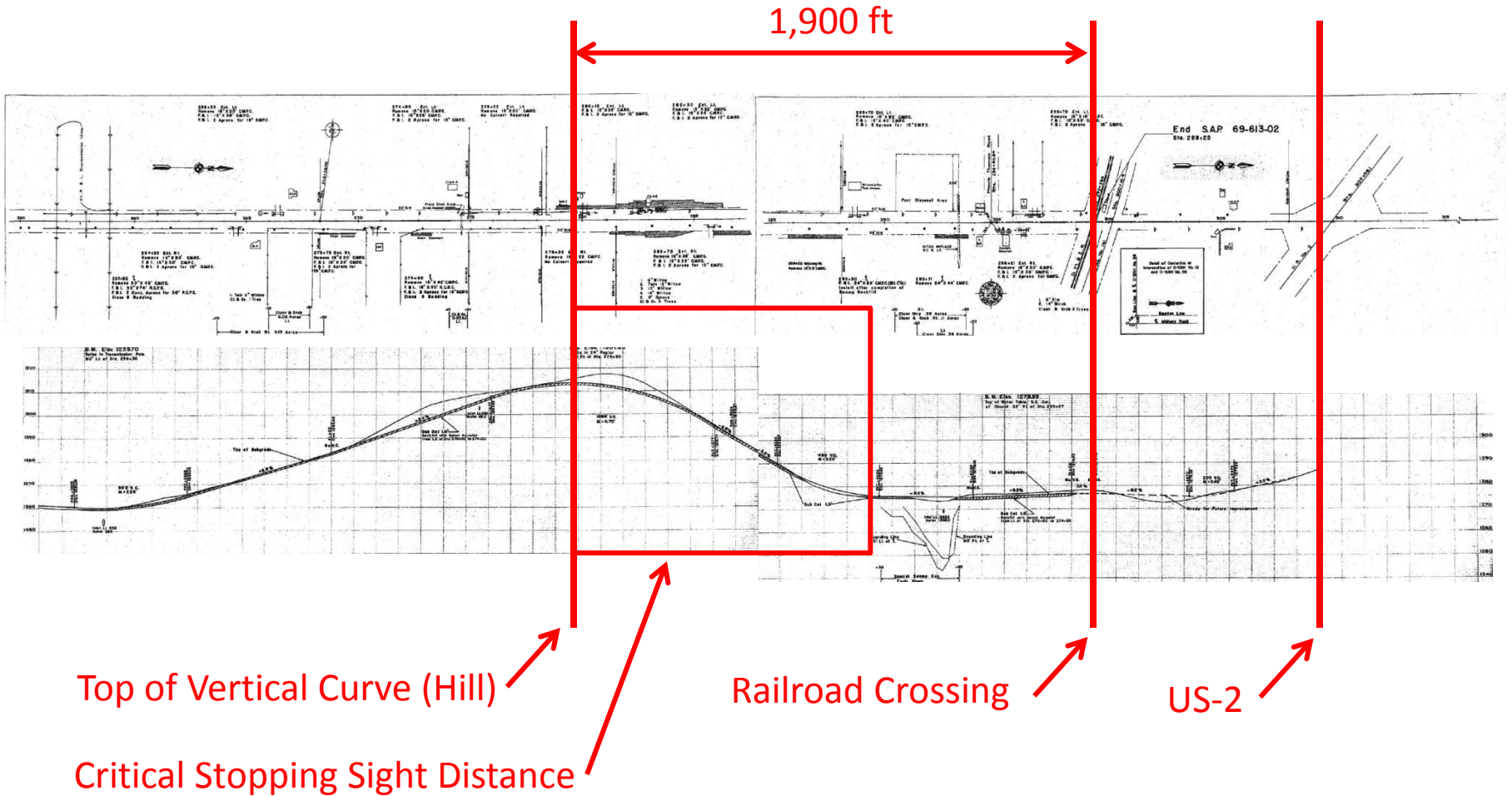
- Project located within the City of Hermantown
- Roadway Information
 - US-2 AADT = 5,500 veh/day
 - Midway Road (CSAH 13) AADT = 7,200 veh/day
 - Intersection of US-2 and CSAH 13 controlled by a traffic signal
- Railroad Crossing Information
 - Train volume = 11 trains/day
 - Crossing controlled by gates/signals
 - Major trunk line for the railroad carrying international freight
- Traffic conditions
 - During high volume conditions on Midway Road, traffic queues have been observed to exceed 2,000 ft in length when a train occupies the railroad crossing

Existing Conditions



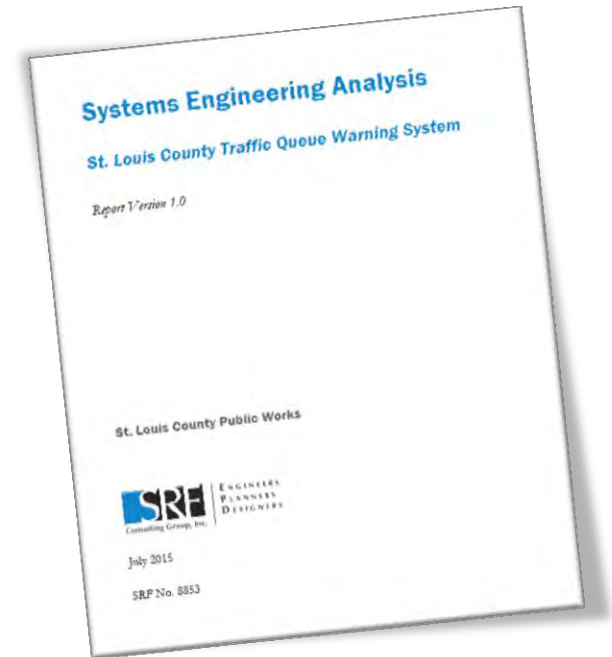
The Problem

A safety issue arises when the traffic queue extends into the critical stopping sight distance area.



Systems Engineering

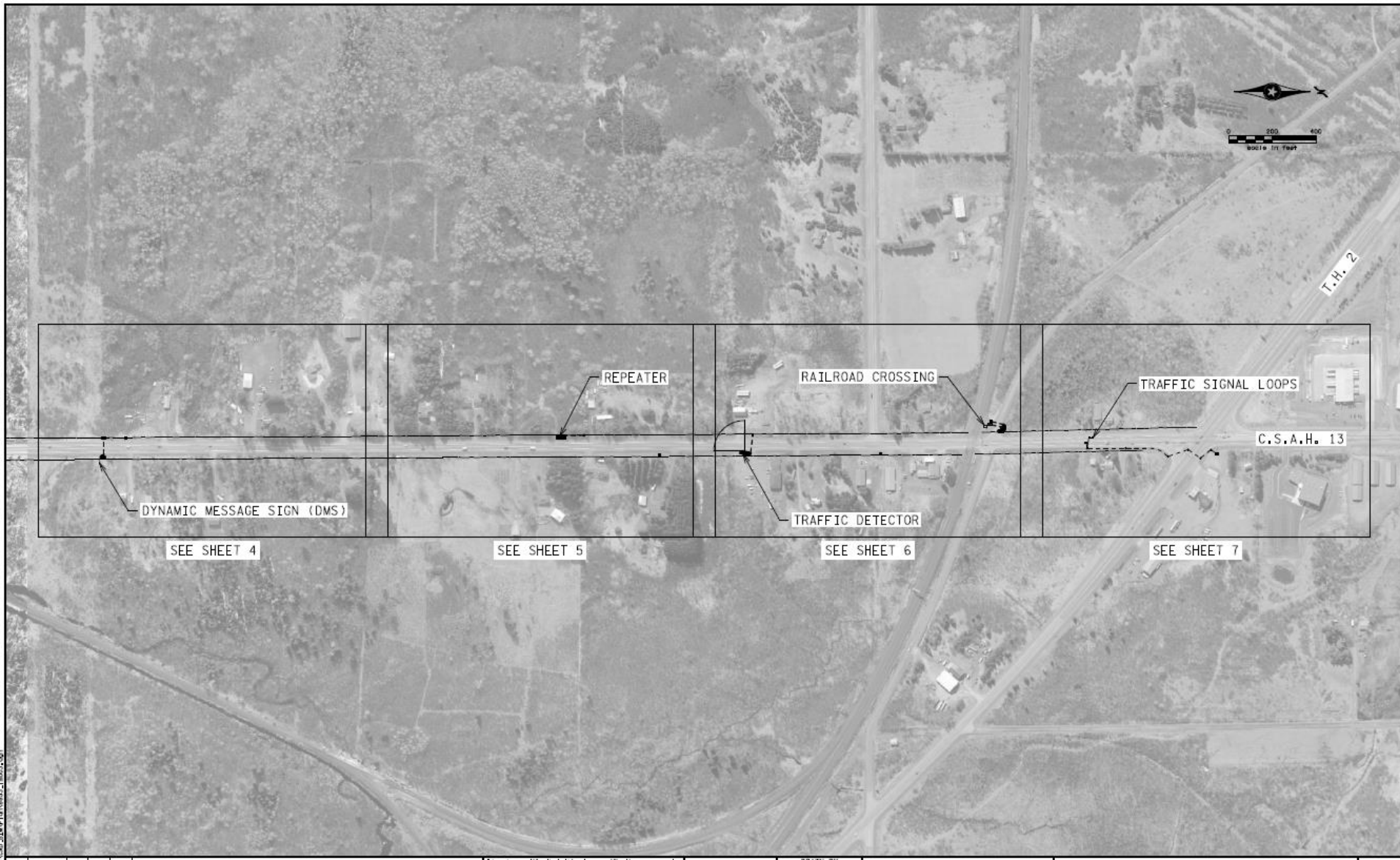
- Concept of Operations
 - System scope
 - Operational description
 - System overview
- System Needs and Requirements
 - What does the system need to do
- Testing Plan
 - Functions of sub-systems
 - Testing
- Operations and Management Procedures
 - Repairs
 - Periodic review



Operation

- The Dynamic Message Sign is the only interface with drivers. The sign faces northbound drivers only. It will display two messages based upon two difference scenarios.
- Scenario 1
 - A train is detected at the railroad crossing and traffic does not queue to the critical area
 - Message Displayed: TRAIN AHEAD
- Scenario 2
 - A train is detected at the railroad crossing and traffic does queue to the critical area
 - Message Displayed: TRAFFIC BACK UP AHEAD/BE PREPARED TO STOP

Plan Development



Plan Development



MATCHLINE A-A SEE SHEET NO. 5

Plan Development

MATCHLINE A-A SEE SHEET NO. 4



MATCHLINE B-B SEE SHEET NO. 6

- ① F&I LIGHT FOUNDATION DESIGN E MODIFIED
F&I NON-INTRUSIVE DETECTION HARDWARE
INSTALL CABINET
F&I RADIO EQUIPMENT (1-COMPAK I/O 8, 2-ANTENNAS)
- ② F&I 2" NMC & 1-3/4" NO.8
- ③ F&I SERVICE EQUIPMENT
- ④ F&I 2" NMC & 1/4" PULL ROPE
POWER CABLES (BY MINNESOTA POWER)
- ⑤ INPLACE SOP (GROUND MOUNTED TRANSFORMER)
(COORDINATE CONDUIT TERMINATION WITH MINNESOTA POWER)

Plan Development

MATCHLINE B-B SEE SHEET NO. 5



MATCHLINE C-C SEE SHEET NO. 7

Plan Development

MATCHLINE C-C SEE SHEET NO. 6

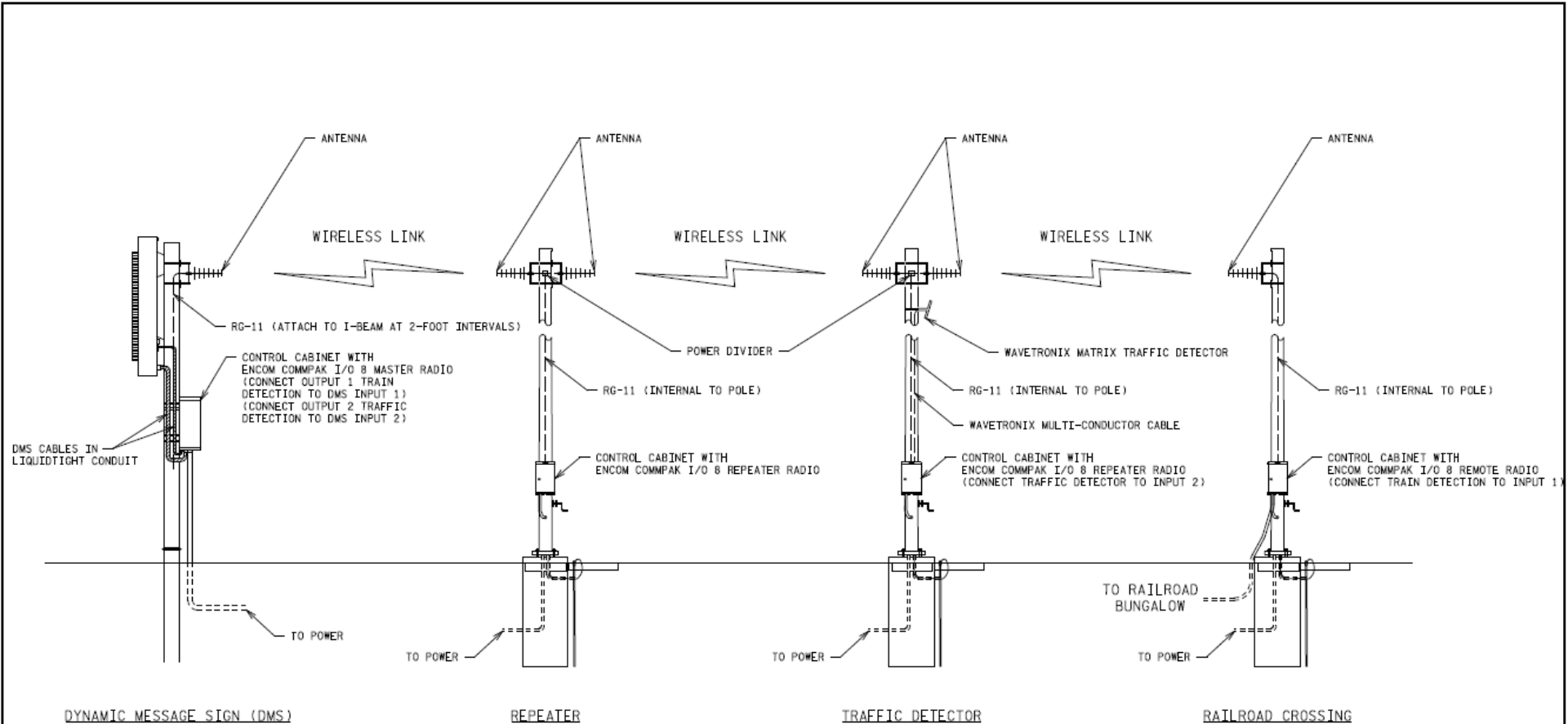


GENERAL NOTES

1. COORDINATE WITH JOHN HOIVIK (MNDOT DISTRICT 1) (218-725-2790) FOR ALL TRAFFIC SIGNAL REVISION WORK.

- 1 INPLACE 1-6' X 6' PREFORMED LOOPS (MNDOT TO MARK IN FIELD)
- 2 F&I 2-LOOP DETECTOR DESIGN NMC PREFORMED (6' X 6')
- 3 INPLACE 1.25" NMC & 1-2/C NO.14
F&I 1-2/C NO.14
- 4 INPLACE 3" RSC & 1-2/C NO.14
F&I 1-2/C NO.14
- 5 INPLACE 4" RSC, 2-12/C NO.12, 1-3/C NO.12, & 4-2/C NO.14
F&I 1-2/C NO.14
- 6 INPLACE 3" RSC, 2-12/C NO.12, 2-3/C NO.12, 8-2/C NO.14, & 1-5/C NO.12
F&I 1-2/C NO.14
- 7 INPLACE 4" RSC, 5-12/C NO.12, 8-2/C NO.14, & 1-5/C NO.12
F&I 1-2/C NO.14
- 8 INPLACE SIGNAL CABINET (MNDOT TO TERMINATE CABLE)
- 9 PLACE AN ADDITIONAL 10' OF CABLE SLACK AT THIS LOCATION

Plan Development



NOTES:

1. RADIO CONFIGURATION AND TESTING BY COUNTY.
2. WAVETRONIX TRAFFIC DETECTOR AND CABINETS FURNISHED BY COUNTY.
3. SEE SPECIAL PROVISIONS FOR EQUIPMENT DETAILS.

Equipment Pole



Cabinets



Antennas



View of Dynamic Message Sign



Costs

- Project was completed by direct purchasing and construction contract
- Direct Purchasing
 - Dynamic Message Sign = \$45,194.00
 - Train Detector = \$942.00
 - Traffic Detector = \$11,961.00
 - Sub-Total = \$58,097.00
- Construction Contract
 - Sub-Total = \$81,726.04
- **Total Project Cost = \$139,823.04**

Consider Maintenance

- Installing the Traffic Queue Warning System is not the final step...consider how your agency will maintain this system
- Some options...
 - Maintain the system by internal agency forces
 - Develop a maintenance contract with an electrical contractor to maintain the system
 - Types of contracts
 - Pay per repair
 - Fixed fee (pay a yearly fee regardless of the maintenance frequency)
 - Consider the following requirements
 - Initial response time to diagnose (48 hours?)
 - Time to repair
 - Keep items on the shelf to reduce time to repair

Closing Thoughts...

- It is very important to work closely with partnering agencies to ensure the design meets their expectations and requirements
- Railroads have special concern for connected systems displaying textual information to drivers
- Always a bit of skepticism with these projects, it is important to be able to clearly articulate their need
- Remember maintenance...

Contact Information

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