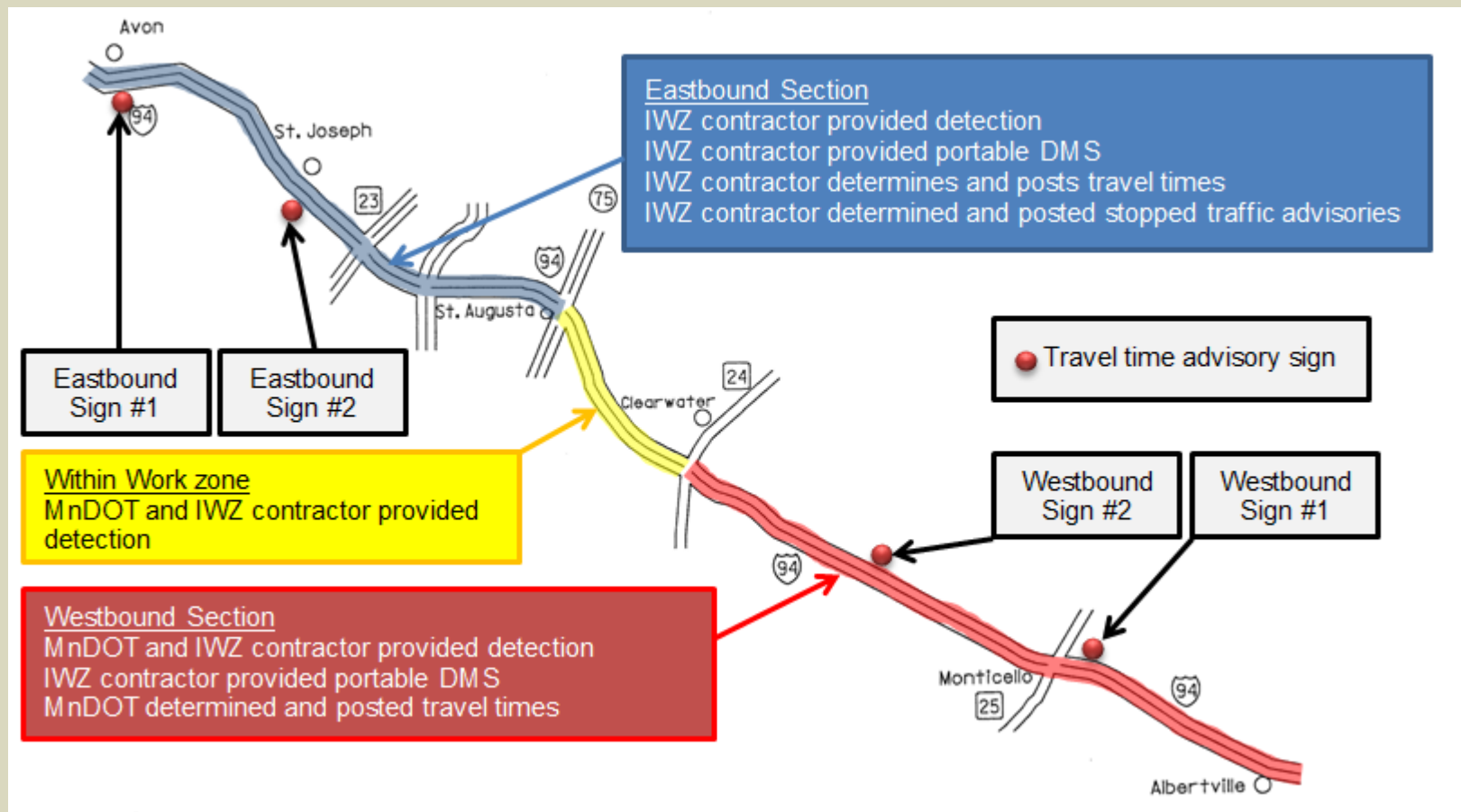


I-94 St. Cloud Intelligent Work Zone Data Collection and Evaluation

*August 26, 2013
National Rural ITS Conference
St Cloud, MN*

Scott Petersen, PE

Project Detection/Sign Responsibility Area



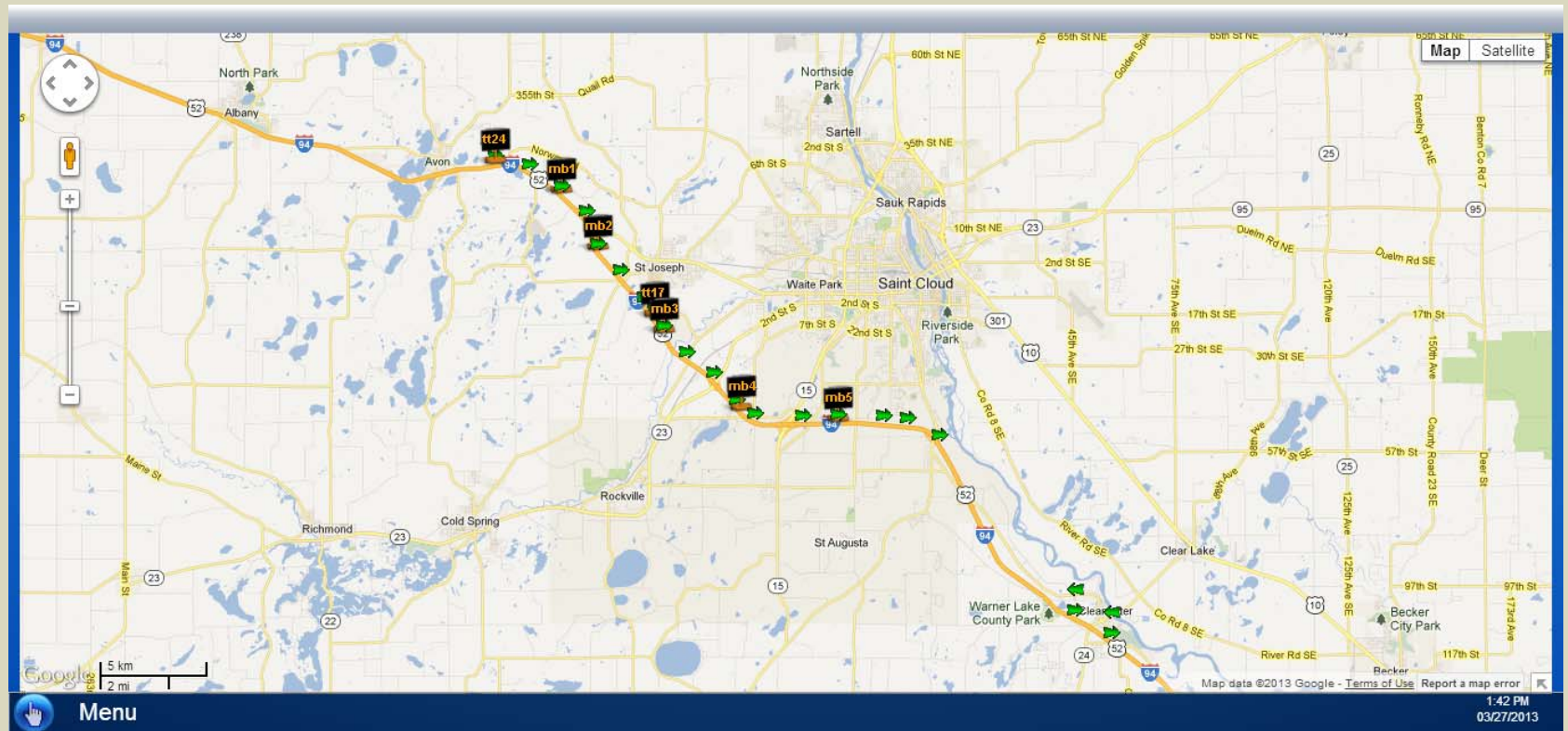
Westbound Travel Time Sign



Eastbound Travel Time Sign



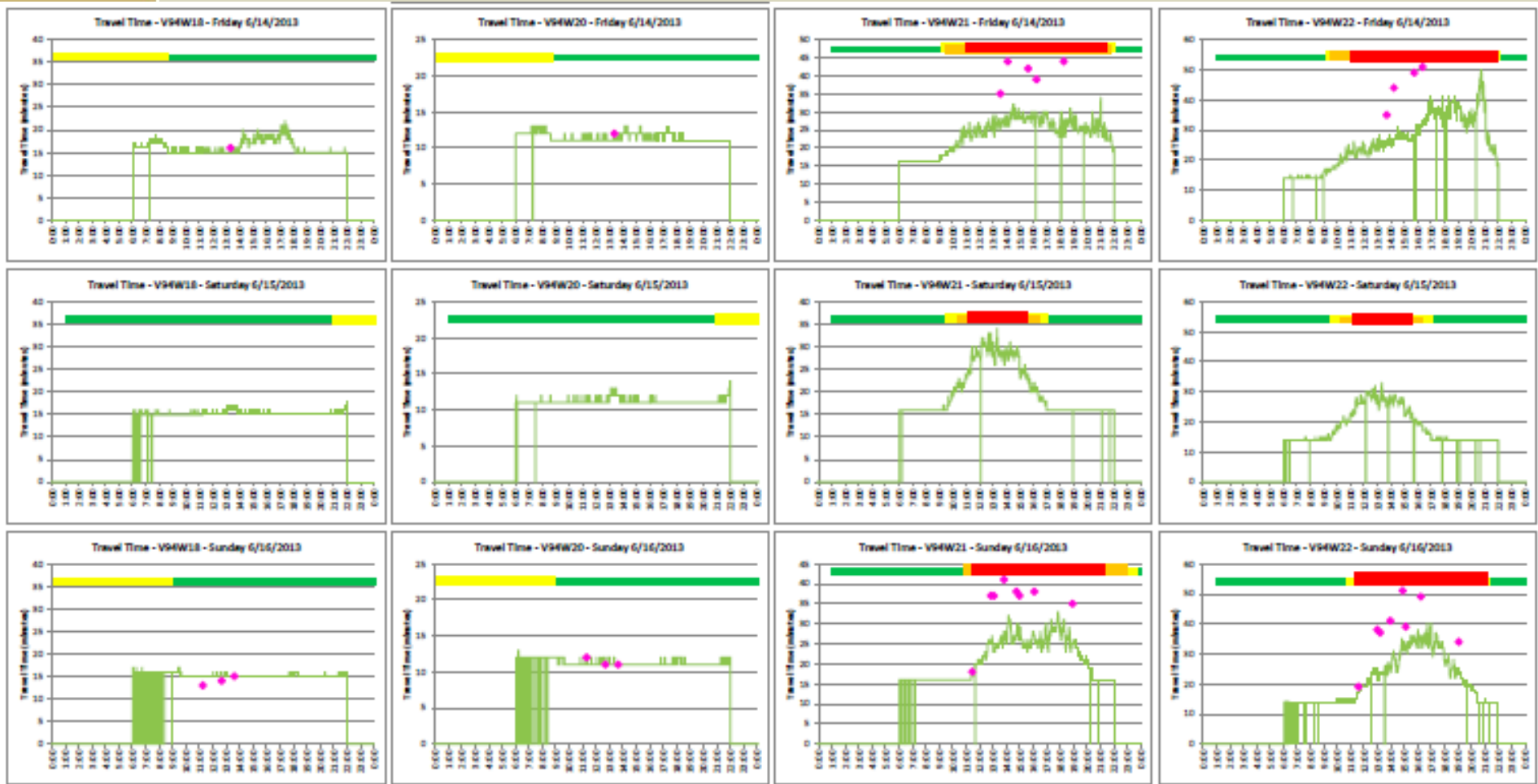
Website



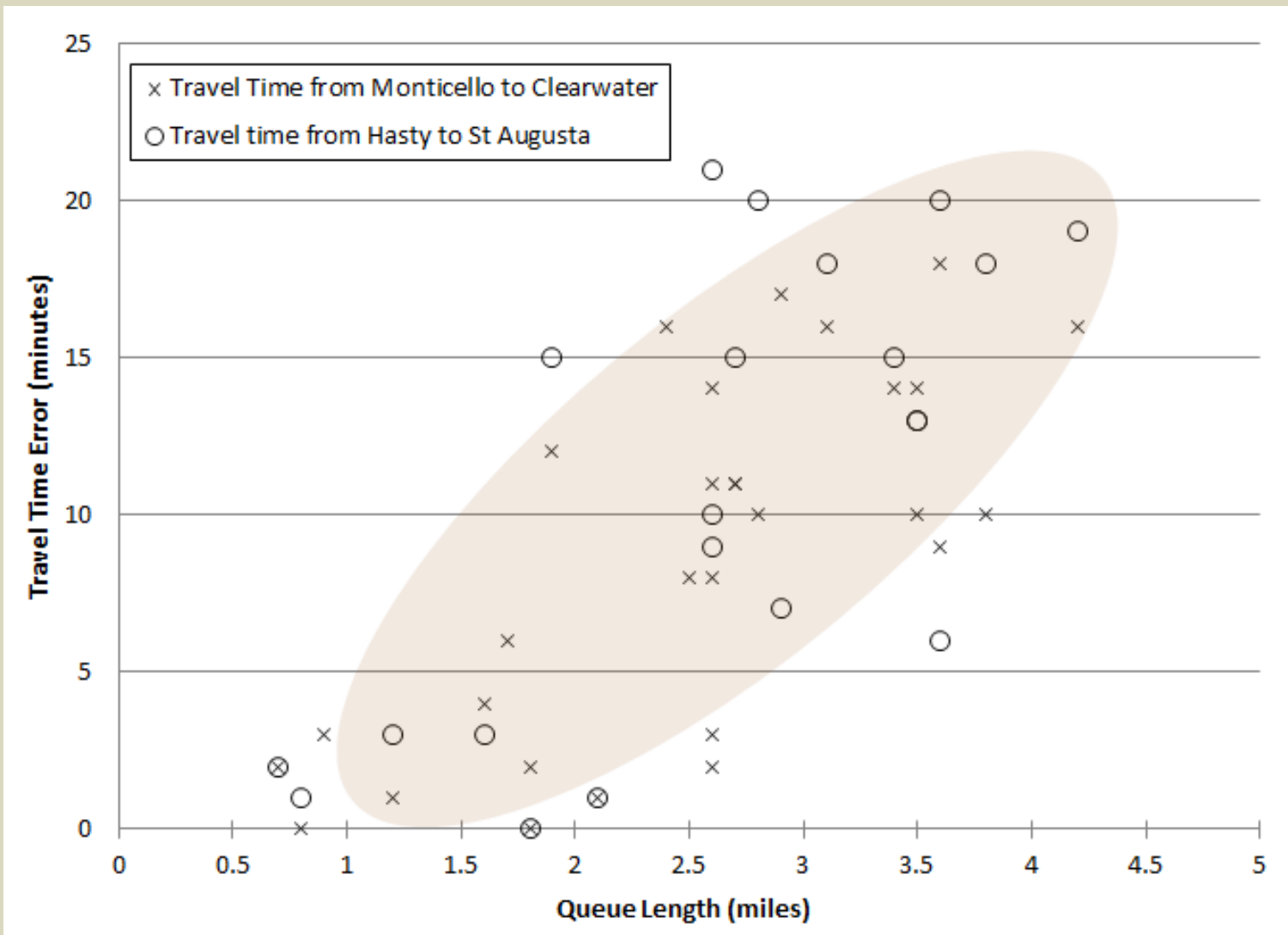
Weekly Data Summaries

	St Joseph			TH 23			TH 15			CSAH 75			Opportunity Dr				
	Q6	Q7	Q8	Q9	Q11	Q12	Q13	Q1	Q14	Q2	Q15	Q16	Q17	Q3	Q4	Q5	Q10
6/30/13 2:00 PM	72	68	72	72	69	72	73	72	69	26	11	20	33	24	36	32	40
6/30/13 2:15 PM	72	69	72	72	71	72	74	72	68	8	11	9	17	33	56	55	37
6/30/13 2:30 PM	74	69	73	73	71	73	75	73	45	5	7	21	20	53	59	58	41
6/30/13 2:45 PM	72	67	72	71	70	71	73	64	9	8	15	20	51	61	59	52	41
6/30/13 3:00 PM	69	68	73	72	71	71	71	32	8	5	10	24	52	28	40	37	41
6/30/13 3:15 PM	74	70	73	73	70	72	71	8	6	5	12	26	19	37	54	43	41
6/30/13 3:30 PM	72	68	72	72	71	72	63	7	6	5	9	23	22	52	56	48	37
6/30/13 3:45 PM	73	70	73	73	71	73	48	7	6	6	11	26	56	40	35	19	32
6/30/13 4:00 PM	73	68	73	72	70	71	31	8	6	6	13	27	27	22	39	31	41
6/30/13 4:15 PM	72	69	72	71	70	72	32	9	6	4	8	27	23	27	36	38	31
6/30/13 4:30 PM	71	67	71	72	71	71	14	6	6	7	13	28	16	34	21	36	31
6/30/13 4:45 PM	73	69	73	72	69	72	28	8	5	5	12	11	27	18	31	33	40
6/30/13 5:00 PM	73	69	73	72	71	72	5	5	5	4	10	11	15	24	15	37	41
6/30/13 5:15 PM	74	69	73	72	71	71	5	6	6	6	6	9	17	26	25	38	41
6/30/13 5:30 PM	72	68	71	71	70	71	6	6	4	6	10	16	16	24	30	33	41
6/30/13 5:45 PM	72	69	71	72	70	71	7	10	8	6	8	16	22	46	35	34	40
6/30/13 6:00 PM	72	69	73	72	70	72	7	8	4	9	13	16	28	32	36	33	41
6/30/13 6:15 PM	74	69	72	73	71	73	16	12	11	9	13	15	22	32	25	31	40
6/30/13 6:30 PM	73	69	72	72	71	72	59	8	5	5	12	6	27	22	22	33	41
6/30/13 6:45 PM	74	69	73	72	71	73	27	6	7	6	8	5	16	33	44	56	40
6/30/13 7:00 PM	72	68	73	72	72	72	57	6	3	5	11	12	33	52	53	59	39
6/30/13 7:15 PM	72	68	72	72	71	72	34	8	8	7	13	13	31	51	57	40	20
6/30/13 7:30 PM	74	69	72	72	71	71	73	18	9	7	15	32	24	21	24	20	38
6/30/13 7:45 PM	73	69	73	72	70	72	74	66	36	6	7	24	13	21	36	55	41
6/30/13 8:00 PM	73	68	73	72	71	73	74	73	8	5	10	12	23	43	50	47	26
6/30/13 8:15 PM	74	69	72	71	71	71	72	71	45	7	14	17	24	34	39	21	13
6/30/13 8:30 PM	74	68	74	73	72	73	75	74	67	8	10	24	13	21	26	35	13
6/30/13 8:45 PM	73	69	71	71	71	71	73	74	66	4	8	39	31	47	54	48	16
6/30/13 9:00 PM	73	69	73	73	71	72	74	73	70	43	13	38	36	19	35	29	17
6/30/13 9:15 PM	74	68	72	71	71	72	73	72	68	66	21	8	35	36	55	58	17
6/30/13 9:30 PM	72	68	71	72	70	72	73	73	69	67	53	9	64	46	47	36	17
6/30/13 9:45 PM	71	69	72	71	71	72	74	73	69	67	65	9	63	42	30	55	17
6/30/13 10:00 PM	70	66	72	70	70	71	74	73	68	68	64	48	65	61	59	62	17
6/30/13 10:15 PM	72	67	71	70	68	71	70	71	67	67	64	56	67	62	62	62	17
6/30/13 10:30 PM	75	68	71	71	70	72	72	72	69	69	65	58	68	63	65	64	17

Weekly Data Summaries



Westbound Travel Time Accuracy



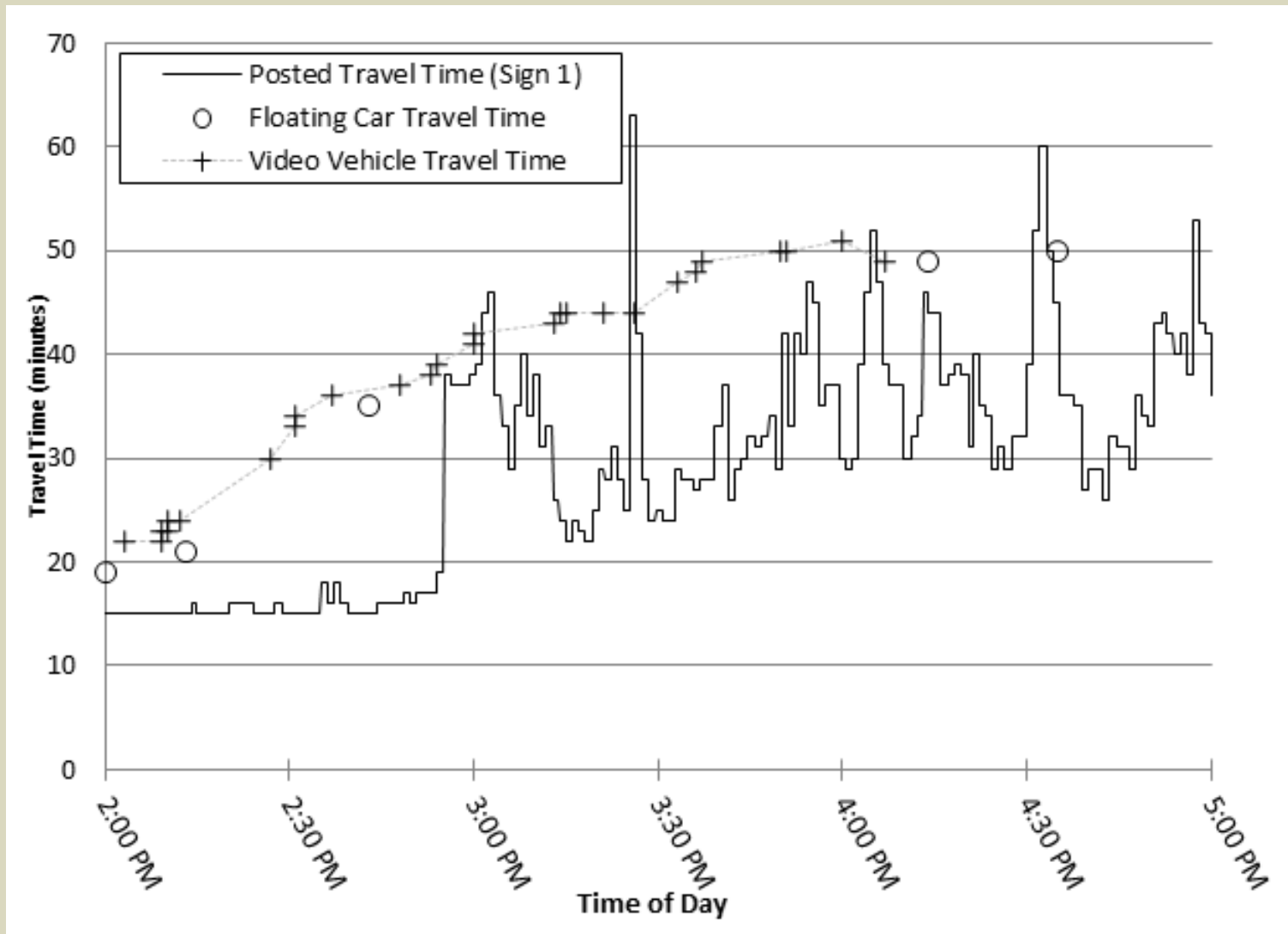
Westbound Travel Time Accuracy

Queue Length	Total Data Points	Average Travel Time Error (min)	Absolute Percent Error	Percent within 5 minutes	Percent within 10 minutes
0 - 1 miles	4	1.3	8%	100%	100%
1 - 2 miles	10	4.6	18%	70%	80%
2 - 3 miles	18	10.4	27%	22%	50%
3 - 4 miles	14	13.9	34%	0%	29%
> 4 miles	2	17.5	40%	0%	0%
TOTAL	48	9.5	27%	31%	30%

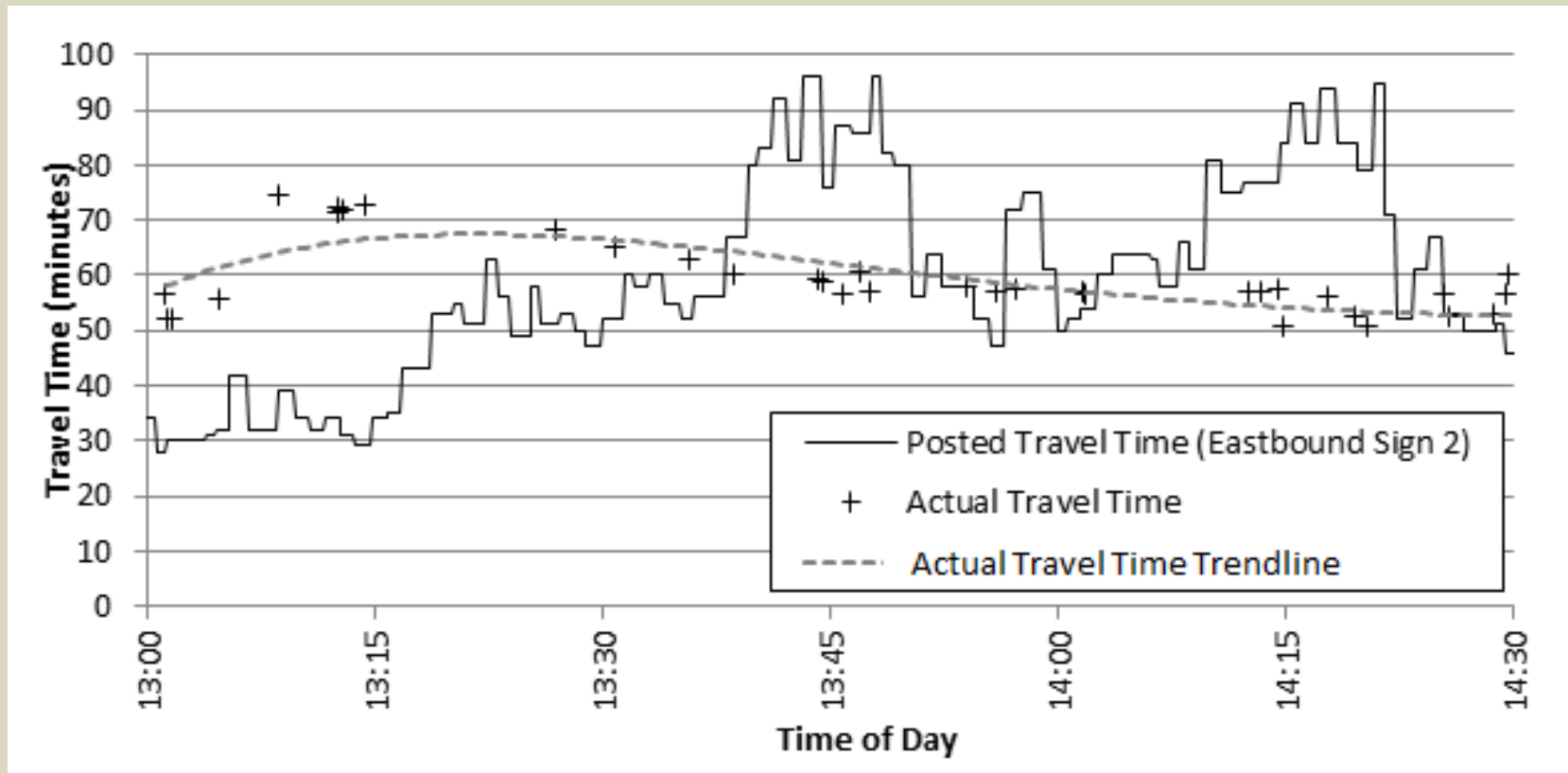
Eastbound Travel Time Accuracy

Queue Length	Absolute Average Travel Time Error (minutes)	Absolute Average Travel Time Percent Error	Percent Travel Times Within Success Threshold	
			Eastbound Sign #1 (10 minutes)	Eastbound Sign #2 (10 minutes)
0 to 1 mile	7.8	29%	75%	66%
1 to 2 miles	6.4	18%	40%	38%
2 to 3 miles	8.1	18%	75%	75%
3 to 4 miles	4.0	8%	100%	100%
TOTAL	6.6	18%	73%	70%

Eastbound Travel Time Accuracy

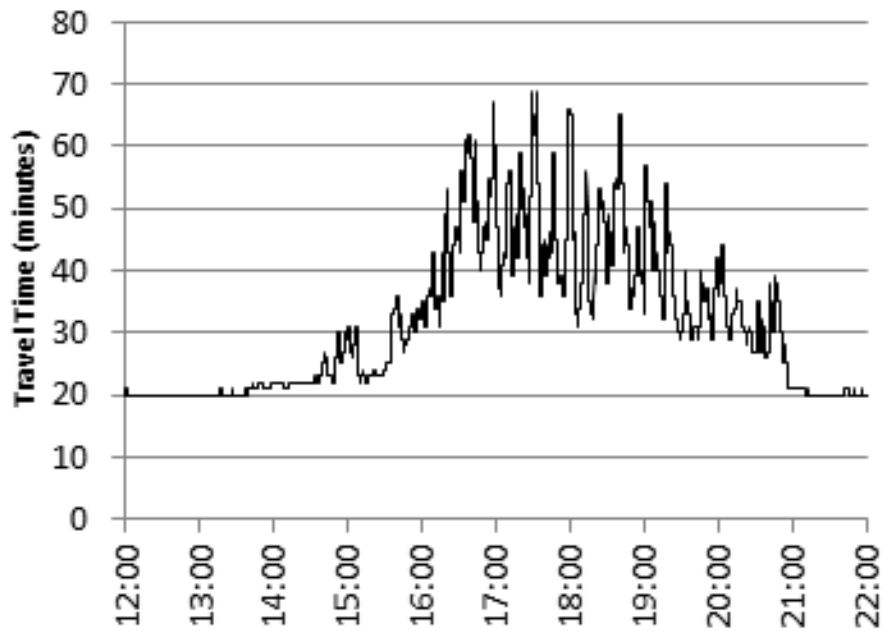


Eastbound Travel Time Accuracy

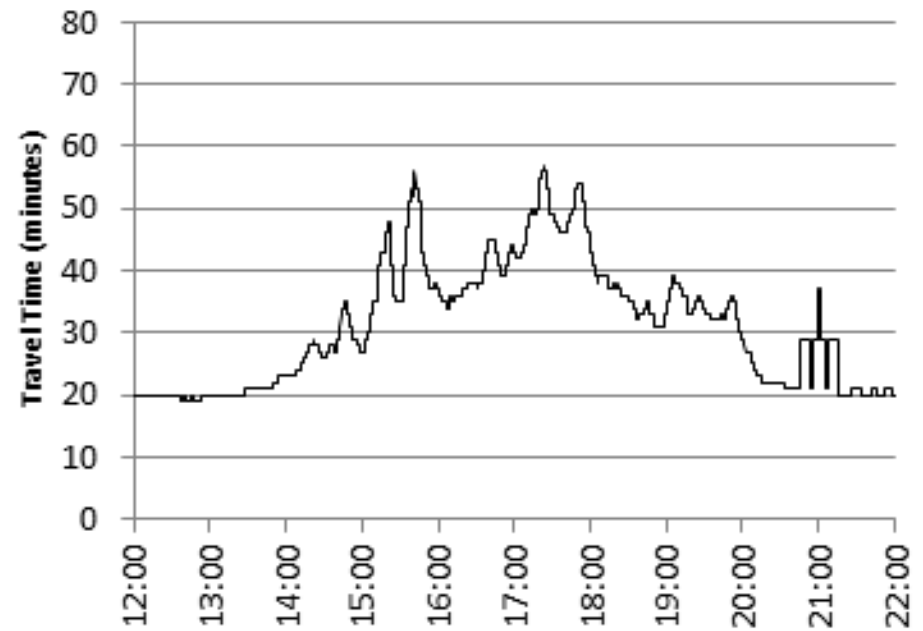


Travel Time Data Smoothing

Before Data Smoothing



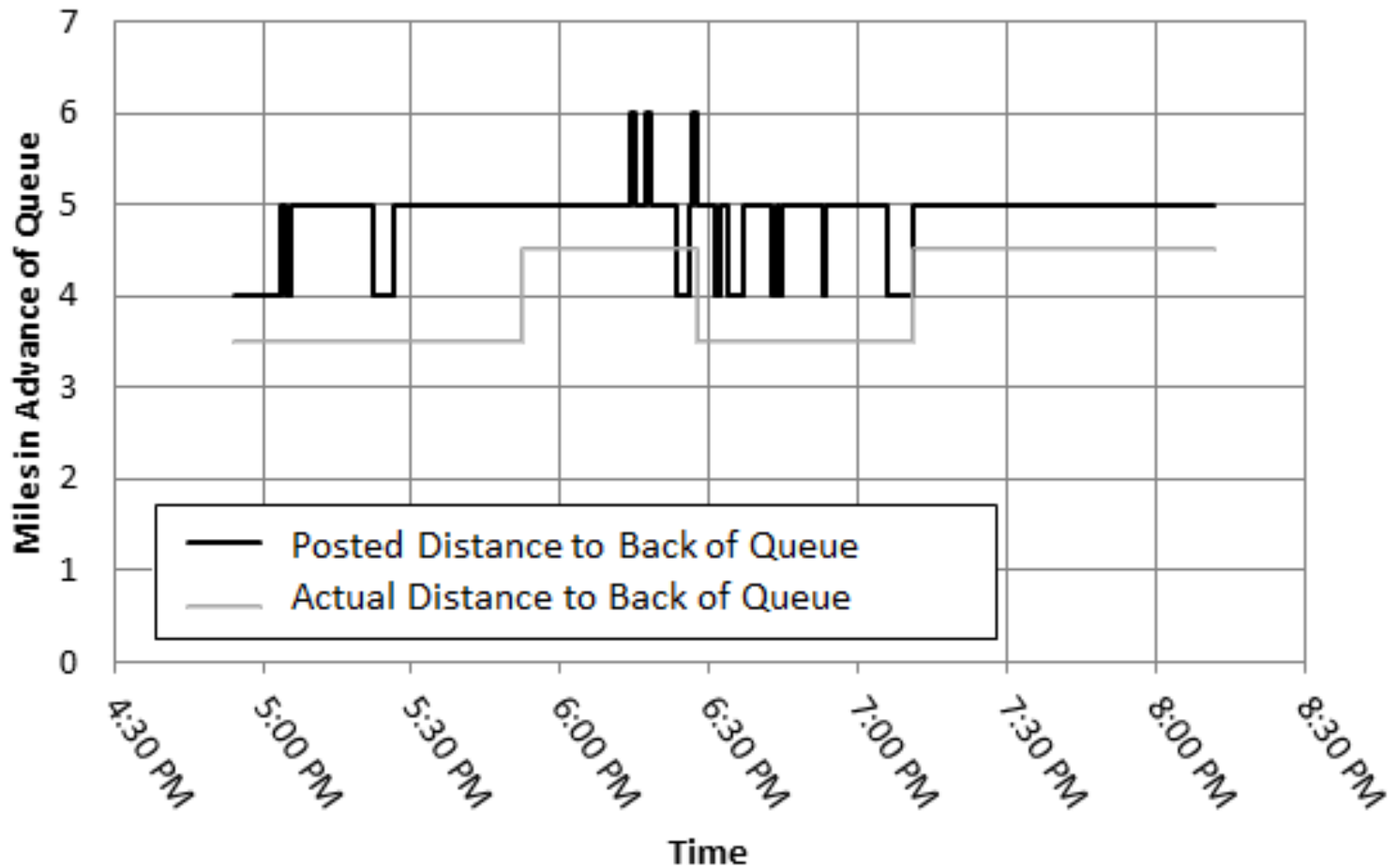
After Data Smoothing



Eastbound Queue Warning Accuracy

Posted Distance to Back of Queue (miles)	Average Actual Distance	Average Difference from Posted Distance	Percent within one mile
2	1.9	0.1	100%
3	2.8	0.51	83%
4	3.8	0.32	100%
5	4.6	0.6	71%
6	5.9	0.22	100%
7	8.1	1.1	0%
TOTAL	4.1	0.4	88%

Eastbound Queue Warning Accuracy



Conclusion

- Floating car runs provided a “ground truth” for baseline accuracy
- Weekly data summaries
 - Provided visual data representation to identify traffic patterns
 - Provided feedback to MnDOT and other project stakeholders about traffic
 - Assisted with determination of travel time latency and error
- Driver survey results and Final Report forthcoming

Contact

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