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MEMORANDUM

TO: Susan Karnowski
MnDOT District 8

FROM: Graham Johnson, PE

DATE: September 9, 2014

RE: Highway 23 Gap - Crash History
SEH No. MNT08 129296

Highway 23 (TH 23) extends across the state of Minnesota from Interstate 90, in the southwest corner of the state, to Interstate 35 in the City of Duluth. TH 23 is an interregional corridor that connects regional trade centers including the cities of Marshall, Willmar, St Cloud, and Duluth-Superior. The segment of TH 23 between Willmar and Interstate 94 (I-94) is approximately 53 miles. Of this total distance, approximately 38 miles of TH 23 is currently a 4-lane roadway, this leaves approximately 15 miles of TH 23 as a 2-lane roadway. There are two different 2-lane sections along TH 23 which are between the cities of New London and Paynesville and between the cities of Paynesville and Richmond.

This project will address the 2-lane section of TH 23 between the cities of New London and Paynesville; an approximate 7.2 mile section of TH 23.

As part of the project, a crash analysis was completed along the corridor using data provided by MnDOT District 8, from the MnDOT Crash Mapping Analysis Tool (MnCMAT). A 10-year crash analysis was conducted for crashes occurring from January 1st, 2004 through December 31st, 2013.

Crash and severity rates were calculated for all intersections and segment sections along the corridor. The rates were compared to the MnDOT District 8 average rates for similar intersections and sections. A critical crash and severity rate was also calculated for each intersection and segment; the critical rates are a statistical rate calculated for each individual intersection or segment based on amount of vehicle exposure. If an intersection or segment crash rate is at or above the critical rate, there is a sustained crash problem and these locations are considered to be unsafe.

Intersection Crashes

Crashes were assigned to each intersection and the segments between the intersections based on the reference mile marker. With all the crashes assigned to either a specific intersection or segment, an assessment was completed on the minor intersections to determine if there were specific crash problems at the low volume intersections. Almost all minor street stop controlled intersections had at least one crash occur during the 10-year analysis. The highest number of crashes for a single intersection was 11 crashes. All of the minor intersections were below both the District 8 average crash rates and the intersection critical crash rates. Therefore, these intersection crashes were combined into larger segments.

During the 10-year crash analysis, there were six intersections that had more than 3 crashes; two intersections had more than 3 crashes. A total of 18 crashes occurred at the two major intersections. Of

the 39 intersection crashes, 75% of the crashes occurred during daylight conditions and 72% occurred on dry pavement.

All intersections along this segment of TH 23 are minor street stop controlled. The table below represents the 10-year crash history for all intersections that had at least a single crash. TH 23 and CSAH 2 (160th Street) is the only intersection that has a crash and severity rate higher than the district average rates; however no intersection is at or above the critical rates.

Table 1 10-year Intersection Crash History

TH 23 @	Fatal	A	B	C	N	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate
CSAH 31 (199th St NE)	0	0	2	0	0	2	0.08	0.25	0.92	1.22
115th St NE (South Side)	0	0	1	2	0	3	0.13	0.31	0.93	1.24
115th St NE (North Side)	0	0	1	0	2	3	0.13	0.22	0.93	1.24
212th Ave	0	0	1	0	0	1	0.04	0.13	0.93	1.24
CR 135 (130th St NE)	0	0	1	0	0	1	0.04	0.13	0.93	1.24
CR 106 (225th Ave/141st St)	0	0	1	1	1	3	0.13	0.26	0.92	1.23
CSAH 2 (145th St)	0	1	0	1	5	7	0.30	0.47	0.92	1.22
232nd Ave	0	0	0	0	1	1	0.05	0.05	0.94	1.25
CSAH 2 (160th St)	0	0	2	3	6	11	0.49	0.80	0.93	1.24
240th Ave NE	0	0	1	1	1	3	0.14	0.28	0.94	1.25
175th St NE	0	0	1	1	0	2	0.09	0.23	0.94	1.25
CSAH 6/CR 143 (190th St)	0	0	0	0	2	2	0.09	0.09	0.93	1.24
							Above D8 Average Rate		Above Critical Rate	

Based on the above analysis, there is a high percentage of rear end (31%) and run-off-road (41%) crashes at the intersections. These could be attributed to all traffic turning from the through lane on TH 23 and drivers following to close or being distracted and having to maneuver off the road to avoid a vehicle collision.

See the attached Tables 3 and 4 for additional intersection crash data, including District 8 average rates.

Segment Crashes

All intersection crashes at the segment splits along TH 23 were removed from the segment crash data; this includes 115th Street NE, CSAH 2 (145th St) and CSAH 2 (160th Street). The table below represents the 10-year crash history for the 4 different segments in the crash analysis. The segments between the major intersections all are above both the District 8 average severity rates. The two segments west of CSAH 2 have severity rates that are higher than the calculated critical rates for each segment.

A total of 51 crashes occurred along TH 23 in the 10-year analysis period. Of the 51 segment crashes 60% of the crashes occurred during daylight conditions and 45% occurred on wet or icy pavement.

Table 2 10-Year Segment Crash History

From	To	Length (Miles)	Segment ADT	Fatal	A	B	C	N	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate
4 to 2 Lane Transition	115th St NE (North Side)	1.65	6,200	0	0	4	8	3	15	0.40	0.83	0.54	**0.68**
115th St NE (North Side)	CSAH 2 (145th St)	2.22	6,200	0	0	5	6	5	16	0.32	0.64	0.51	**0.64**
CSAH 2 (145th St)	CSAH 2 (160th St)	1.10	5,900	0	0	2	1	3	6	0.25	0.46	0.61	0.76
CSAH 2 (160th St)	2 to 4 Lane Transition	2.34	5,900	0	1	2	4	7	14	0.28	0.50	0.51	0.64
										Above D8 Average Rate		Above Critical Rate	

Based on the above analysis, there is a high percentage of rear end (25%) and run-off-road (37%) crashes along each segment. These could be attributed to the high number of access points along TH 23 and all traffic turning from the through lane on TH 23. Another cause could be attributed to drivers following too closely or being distracted and having to maneuver off the road to avoid a vehicle collision.

See the attached Table 5 for additional segment crash data.

Conclusion

A crash analysis along the 7.3 miles section of TH 23 was completed based on a 10-year crash history. Only one intersection along TH 23, at CSAH 2 (160th Street) is above the District 8 average crash and severity rates for a similar intersection. No intersection along TH 23 is at or near the calculated critical rates.

The roadway was divided into 4 segments near major intersections. The entire 2-lane section of TH 23 is above the District 8 average severity rate for a rural 2-lane roadway; the crash rates are higher than the District 8 average west of CSAH 2 (145th Street).

The high percentage of rear end and run-off-road crashes along the corridor could be attributed to the high number of access onto TH 23 and lack of separate turning lanes for vehicles. All turning traffic along the corridor must turn from the TH 23 through lane which is posted at 55 mph.

Attachments:
Table 3 Intersection Crash Severity
Table 4 Intersection Crash Type
Table 5 Segment Crash Severity and Type

Table 3
TH 23 Intersection Crash Summary
2004 to 2013 Crash Data
MnDOT Crash Mapping Software Information*

*Data provided by MnDOT District 8

TH 23	Crash Severity						Average Rates		Critical Rates	
From	Fatal	A	B	C	Property	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate
TH 23 at CSAH 31 (199th St NE)	0	0	2	0	0	2	0.08	0.25	0.92	1.22
TH 23 at 115th St NE (South Side)	0	0	1	2	0	3	0.13	0.31	0.93	1.24
TH 23 at 115th St NE (North Side)	0	0	1	0	2	3	0.13	0.22	0.93	1.24
TH 23 at 212th Ave	0	0	1	0	0	1	0.04	0.13	0.93	1.24
TH 23 at CR 135 (130th St NE)	0	0	1	0	0	1	0.04	0.13	0.93	1.24
TH 23 at CR 106 (225th Ave/141st St)	0	0	1	1	1	3	0.13	0.26	0.92	1.23
TH 23 at CSAH 2 (145th St)	0	1	0	1	5	7	0.30	0.47	0.92	1.22
TH 23 at 232nd Ave	0	0	0	0	1	1	0.05	0.05	0.94	1.25
TH 23 at CSAH 2 (160th St)	0	0	2	3	6	11	0.49	0.80	0.93	1.24
TH 23 at 240th Ave NE	0	0	1	1	1	3	0.14	0.28	0.94	1.25
TH 23 at 175th St NE	0	0	1	1	0	2	0.09	0.23	0.94	1.25
TH 23 at CSAH 6/CR 143 (190th St)	0	0	0	0	2	2	0.09	0.09	0.93	1.24
TOTAL	**0**	**1**	**11**	**9**	**18**	**39**				
	0%	**3%**	**28%**	**23%**	**46%**					

Table 4
TH 23 Intersection Crash Summary
2004 to 2013 Crash Data
MnDOT Crash Mapping Software Information*

*Data provided by MnDOT District 8

TH 23	Diagram - Crash Type								Rates	
From	Rear End	Left Turn	Right Angle	Side Swipe	Head On	Ran Off Road	Other	Total	Crash Rate	Severity Rate
TH 23 at CSAH 31 (199th St NE)	0	0	1	0	1	0	0	2	0.08	0.25
TH 23 at 115th St NE (South Side)	1	0	2	0	0	0	0	3	0.13	0.31
TH 23 at 115th St NE (North Side)	0	0	0	0	0	3	0	3	0.13	0.22
TH 23 at 212th Ave	1	0	0	0	0	0	0	1	0.04	0.13
TH 23 at CR 135 (130th St NE)	1	0	0	0	0	0	0	1	0.04	0.13
TH 23 at CR 106 (225th Ave/141st St)	1	0	0	0	0	2	0	3	0.13	0.26
TH 23 at CSAH 2 (145th St)	2	0	1	1	0	3	0	7	0.30	0.47
TH 23 at 232nd Ave	0	0	1	0	0	0	0	1	0.05	0.05
TH 23 at CSAH 2 (160th St)	3	0	1	0	1	6	0	11	0.49	0.80
TH 23 at 240th Ave NE	1	0	0	0	0	2	0	3	0.14	0.28
TH 23 at 175th St NE	0	0	1	1	0	0	0	2	0.09	0.23
TH 23 at CSAH 6/CR 143 (190th St)	2	0	0	0	0	0	0	2	0.09	0.09
TOTAL	**12**	**0**	**7**	**2**	**2**	**16**	**0**	**39**		
	31%	**0%**	**18%**	**5%**	**5%**	**41%**	**0%**			

MnDOT District 8 Averate Rates		
Mn/DOT 2011 Data		
Intersection Type	Crash Rate	Severity Rate
6 Rural Thru/Stop	0.40	0.60
7 All Way Stop	0.90	1.20

Table 5
Highway 23 Crash Summary
2004 to 2013 Crash Data
MnDOT Crash Mapping Software Information*

*Data provided by MnDOT District 8

TH 23 — **Crash Severity** — **Average Rates** — **Critical Rates**

From	To	Length (Miles)	Segment ADT	Fatal	A	B	C	Property	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate
4 to 2 Lane Transition	115th St NE (North Side)	1.65	6,200	0	0	4	8	3	15	0.40	0.83	0.54	**0.68**
115th St NE (North Side)	CSAH 2 (145th St)	2.22	6,200	0	0	5	6	5	16	0.32	0.64	0.51	0.64
CSAH 2 (145th St)	CSAH 2 (160th St)	1.10	5,900	0	0	2	1	3	6	0.25	0.46	0.61	0.76
CSAH 2 (160th St)	2 to 4 Lane Transition	2.34	5,900	0	1	2	4	7	14	0.28	0.50	0.51	0.64
TOTALS				**0**	**1**	**13**	**19**	**18**	**51**				
				0%	**2%**	**25%**	**37%**	**35%**					

*Does not include crashes at major intersections.

These include: 115th St NE, CSAH 2 (145th St), and CSAH 2 (160th St)

TH 23 — **Diagram - Crash Type**

From	Total	Rear End	Left Turn	Right Angle	Side Swipe	Head On	Ran Off Road	Other	Total
4 to 2 Lane Transition	115th St NE (North Side)	2	0	3	2	1	7	0	15
115th St NE (North Side)	CSAH 2 (145th St)	5	0	2	0	2	7	0	16
CSAH 2 (145th St)	CSAH 2 (160th St)	0	1	1	1	0	1	2	6
CSAH 2 (160th St)	2 to 4 Lane Transition	6	0	1	2	1	4	0	14
TOTALS		**13**	**1**	**7**	**5**	**4**	**19**	**2**	**51**
		25%	**2%**	**14%**	**10%**	**8%**	**37%**	**4%**	

*Does not include crashes at major intersections.

These include: 115th St NE, CSAH 2 (145th St), and CSAH 2 (160th St)

	MnDOT District 8 Averate Rates (2011 Data)		
	Section Type	Crash Rate	Severity Rate
3	2-Lane Rural ADT 5000 to 7999	0.3	0.4
4	2-lane Rural ADT > 8000	0.3	0.4