APPENDIX D

Existing Traffic Safety Analysis Memo

Draft Memorandum

SRF No. 01912083

To: Angie Stenson, AICP, Sr. Transportation Planner
Carver County

From: Leif Garnass, PE, PTOE
Matt Knight, AICP

Date: May 7, 2019

Subject: Arboretum Area Transportation Plan
Draft Existing Conditions Safety Memorandum

Introduction

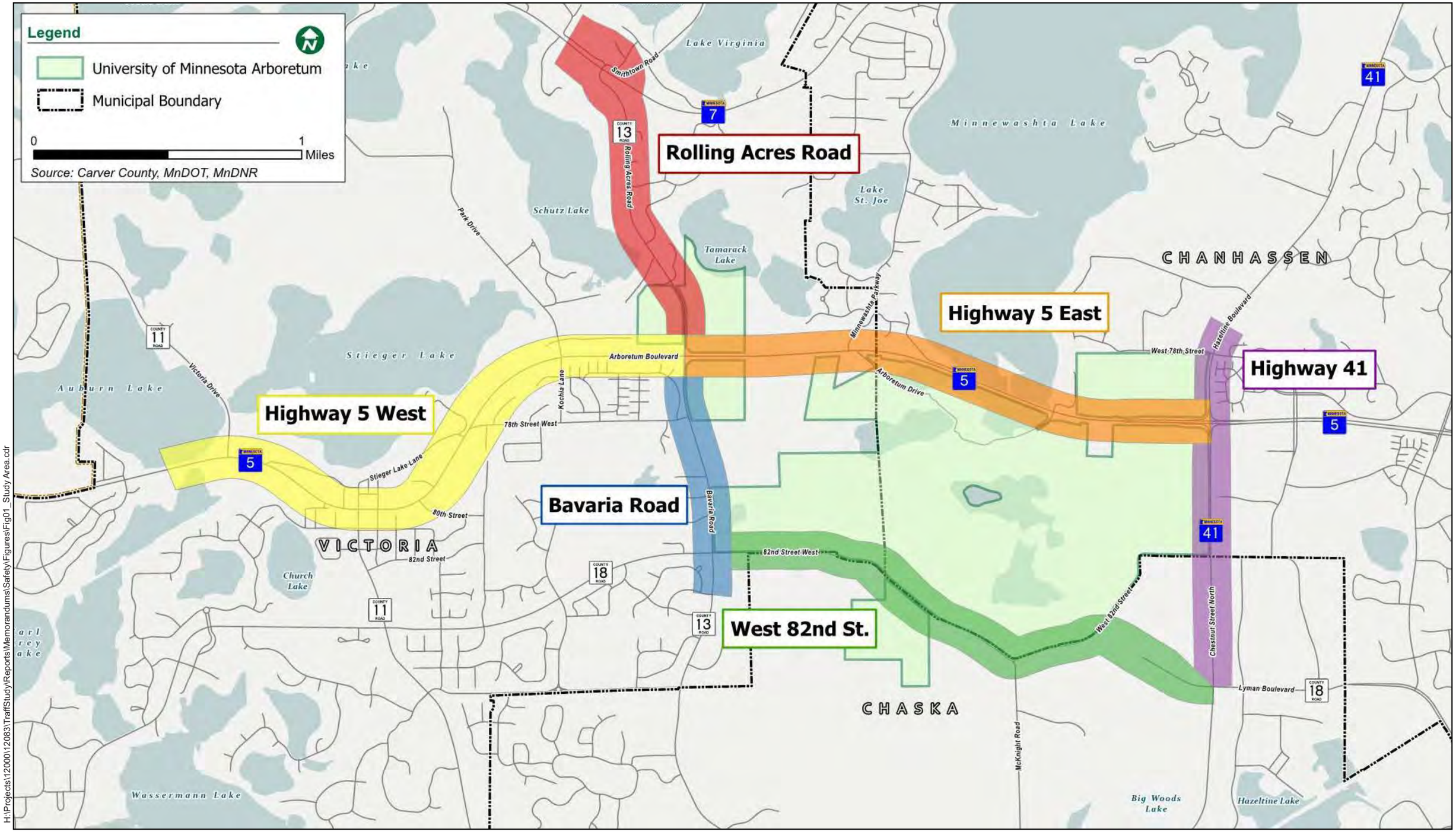
The Arboretum Area Transportation Plan is being developed to provide short-, mid-, and long-term transportation improvements along Highway 5 and the additional study areas, which include CSAH 13 (Rolling Acres Road), Highway 7, Highway 41, and CSAH 18. The study area is shown in Figure 1. The first step in the development of the Plan is to define the problem. Before proceeding with analysis or jumping to solutions, it is important to develop a well-rounded understanding of existing conditions within the study area. This memorandum documents the existing safety evaluation which includes crash data collection and a comprehensive safety analysis.

Crash Data

Crash data were obtained from MnDOT for January 1, 2016 through December 31, 2017 and was supplemented using MnDOT's Minnesota Crash Mapping Analysis Tool (MnCMAT) for January 1, 2013 through December 31, 2015. The two crash data sets were combined to capture the most recent five-year period available at the time of the analysis. This data was used to establish current crash trends and issues within the study area. There were 239 reported crashes at the study intersections, of which one was fatal. There were also 177 reported non-intersection crashes on the study segments, of which one was fatal. There was one reported crash that involved a pedestrian.

Safety Analysis

An intersection and segment safety analysis has been completed. The analysis included calculating and reviewing intersection and segment crash rates, reviewing predominant crash types, and the development of crash diagrams to assist in identifying geometric or traffic control deficiencies and proximate causes, as well as trends.



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Study Area

Arboretum Area Transportation Plan

Carver County

Figure 1

01912083
May 2019

Intersection and Segment Crash Rates

The first step in the safety evaluation was to review intersection and segment crash rates. The purpose of reviewing crash rates is to determine the statistical significance of the number of crashes at each intersection and segment. Crash rates were calculated and then compared to typical crash rates for intersections and segments with similar characteristics. Published statewide average crash rates from MnDOT were referenced for comparison purposes. Crash rates are per million entering vehicles (MEV) for intersections and per million vehicle miles (MVM) for segments.

It should be noted that a higher than the statewide average crash rate does not necessarily indicate a crash problem. Therefore, the critical crash rate was also calculated to determine the statistical significance of the crashes at locations that experienced above average crash rates. If the calculated crash rate is below the critical crash rate, crashes that occurred are likely due to the random nature of crashes and not necessarily a geometric design or traffic control issue. A crash rate that is higher than the critical crash rate is an indication of a geometric design or traffic control issue and warrants further evaluation. The critical index is the actual crash rate divided by the critical crash rate. A critical index greater than 1.0 indicates that the actual crash rate is greater than the critical crash rate.

An intersection and segment crash summary that includes the total number of crashes, total number of severe (fatal and A-severity) crashes, the actual crash rate, the statewide average crash rate, the critical crash rate, and the critical index is shown in Table 1 and Table 2, respectively. A complete summary can be found in Attachment 1.

Table 1 Intersection Crash Summary (January 1, 2013-December 31, 2017)

Intersection	Total Crashes	Severe Crashes (K + A)	Actual Crash Rate	Statewide Average	Critical Rate	Critical Index
Hwy 7 & CSAH 13	22	0	0.58	0.25	0.47	1.22
Hwy 5 & CSAH 11 (North)	9	0	0.36	0.25	0.53	0.67
Hwy 5 & Stieger Lake Ln	4	0	0.16	0.25	0.53	0.29
Hwy 5 & CSAH 11 (South)	8	0	0.22	0.52	0.84	0.27
Hwy 5 & Quamoclit	0	0	0.00	0.18	0.41	0.00
Hwy 5 & 80th St	2	0	0.07	0.25	0.52	0.14
Hwy 5 & Stieger Lake Ln	0	0	0.00	0.25	0.52	0.00
Hwy 5 & 78th St	4	0	0.14	0.25	0.52	0.28
Hwy 5 & Park Dr	5	0	0.18	0.25	0.52	0.35
Hwy 5 & CSAH 13	58	0	1.04	0.45	0.69	1.50
Hwy 5 & Minnewashta Pkwy	7	0	0.13	0.25	0.44	0.30
Hwy 5 & Crimson Bay Rd	9	0	0.18	0.25	0.44	0.40

Intersection	Total Crashes	Severe Crashes (K + A)	Actual Crash Rate	Statewide Average	Critical Rate	Critical Index
Hwy 5 & Hwy 41	66	0	0.88	0.45	0.66	1.34
CSAH 18 & CSAH 13	13	0	1.01	0.25	0.65	1.55
82nd St & McKnight Rd	2	0	1.49	0.16	1.41	1.05
82nd St & Hwy 41	15	0	0.51	0.40	0.71	0.71
Hwy 41 & 78th St	4	1	0.22	0.25	0.58	0.38
Hwy 41 & Lyman Blvd	11	0	0.41	0.25	0.52	0.79

The Highway 7/CSAH 13, Highway 5/CSAH 13, Highway 5/Highway 41, CSAH 18/CSAH 13, and 82nd Street/McKnight Road intersections all experienced a crash rate greater than the critical crash rate, indicating a strong likelihood of a geometric design, access, or traffic control issue.

Table 2 Segment Crash Summary (January 1, 2013-December 31, 2017)

Segment	Total Crashes (Segment)	Severe Crashes (K + A)	Actual Crash Rate	Statewide Average	Critical Rate	Critical Index
Hwy 5 – CSAH 11 (North) to CSAH 11 (South)	12	0	0.86	0.35	1.00	0.86
Hwy 5 – CSAH 11 (South) to CSAH 13	24	0	0.59	0.35	0.95	0.62
Hwy 5 – CSAH 13 to Hwy 41	62	0	0.62	0.35	0.58	1.07
82nd St – CSAH 13 to Hwy 41	13	0	12.56	0.40	6.39	1.97
CSAH 13 – Hwy 7 to Hwy 5	35	0	1.57	0.35	1.19	1.32
CSAH 13 – Hwy 5 to CSAH 18	10	0	1.09	0.30	1.62	0.67
Hwy 41 – Hwy 5 to RR Crossing	21	1	0.41	0.35	0.88	0.47

The Highway 5 from CSAH 13 to Highway 41, 82nd Street from CSAH 13 to Highway 41, and CSAH 13 from Highway 7 to Highway 5 segments experienced a crash rate greater than the critical crash rate, indicating a strong likelihood of a geometric design, access, or traffic control issue.

Maps illustrating the locations of fatal crashes (2008-2017) and intersections and segments that experienced a crash rate greater than the critical crash rate (2013-2017) can be found in Attachment 2.

Predominant Crash Types

A review of the manner of collision (crash diagram) indicates that the predominant types of crashes occurring at the intersections are rear-end (54 percent) and right-angle/left-turn (20 percent) crashes while the predominant types of non-intersection crashes on the segments are rear-end (47 percent) and runoff road (22 percent) crashes. A summary of the intersection crash types is shown in Table 3 and Chart 1. A summary of the segment crash types is shown in and Table 4 and Chart 2.

Table 3 Intersection Crash Type Summary (January 1, 2013-December 31, 2017)

Intersection/Interchange	Right Angle/ Left Turn	Side-swipe Passing	Side-swipe Oppos-ing	Rear End	Head On	Runoff Road	Other/ Unknwn
Hwy 7 & CSAH 13	1	1	0	18	1	1	0
Hwy 5 & CSAH 11 (North)	3	0	0	2	1	1	2
Hwy 5 & Stieger Lake Ln	1	0	0	2	0	0	1
Hwy 5 & CSAH 11 (South)	1	0	0	4	1	1	1
Hwy 5 & Quamoclit	0	0	0	0	0	0	0
Hwy 5 & 80th St	0	0	0	2	0	0	0
Hwy 5 & Stieger Lake Ln	0	0	0	0	0	0	0
Hwy 5 & 78th St	2	1	0	1	0	0	0
Hwy 5 & Park Dr	2	0	0	1	0	1	1
Hwy 5 & CSAH 13	10	3	2	36	2	4	1
Hwy 5 & Minnewashta Pkwy	3	0	0	2	0	2	0
Hwy 5 & Crimson Bay Rd	2	1	0	3	0	1	2
Hwy 5 & Hwy 41	8	10	0	42	2	3	1
CSAH 18 & CSAH 13	6	0	1	4	0	0	2
82nd St & McKnight Rd	0	0	0	0	0	1	1
82nd St & Hwy 41	4	1	0	7	1	0	2
Hwy 41 & 78th St	1	0	0	0	1	1	1
Hwy 41 & Lyman Blvd	3	1	0	6	1	0	0
Total	47	18	3	130	10	16	15

Chart 1 Intersection Crash Types (January 1, 2013-December 31, 2017)

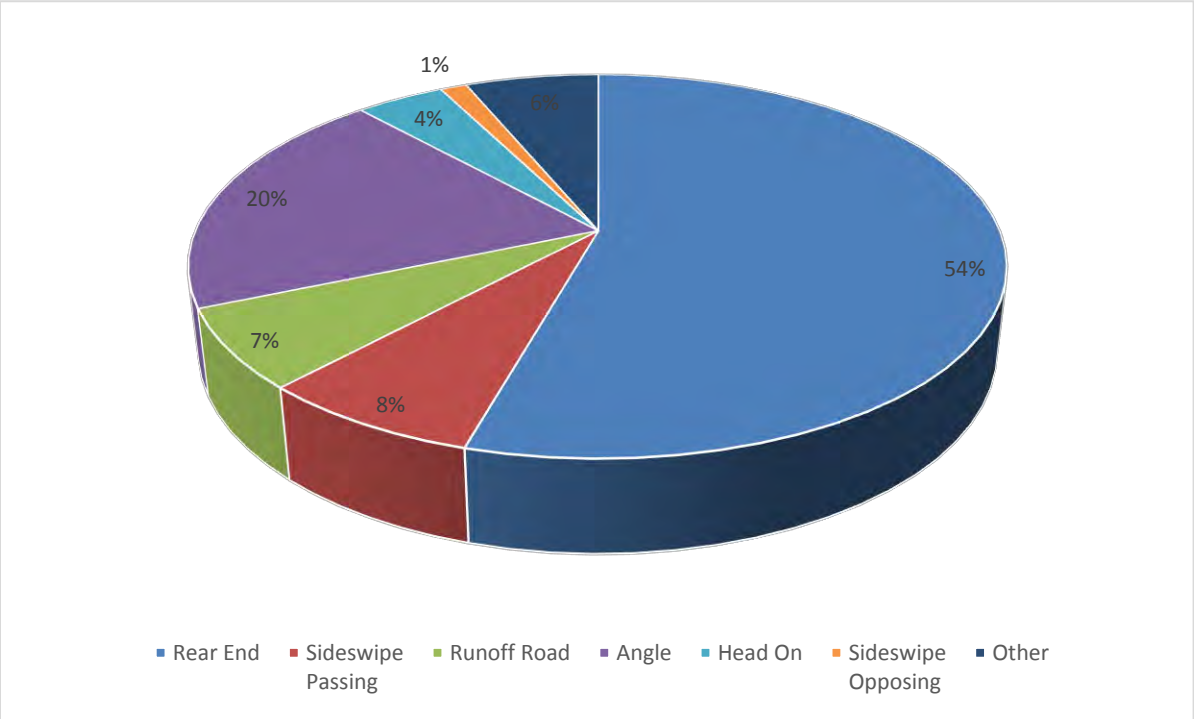
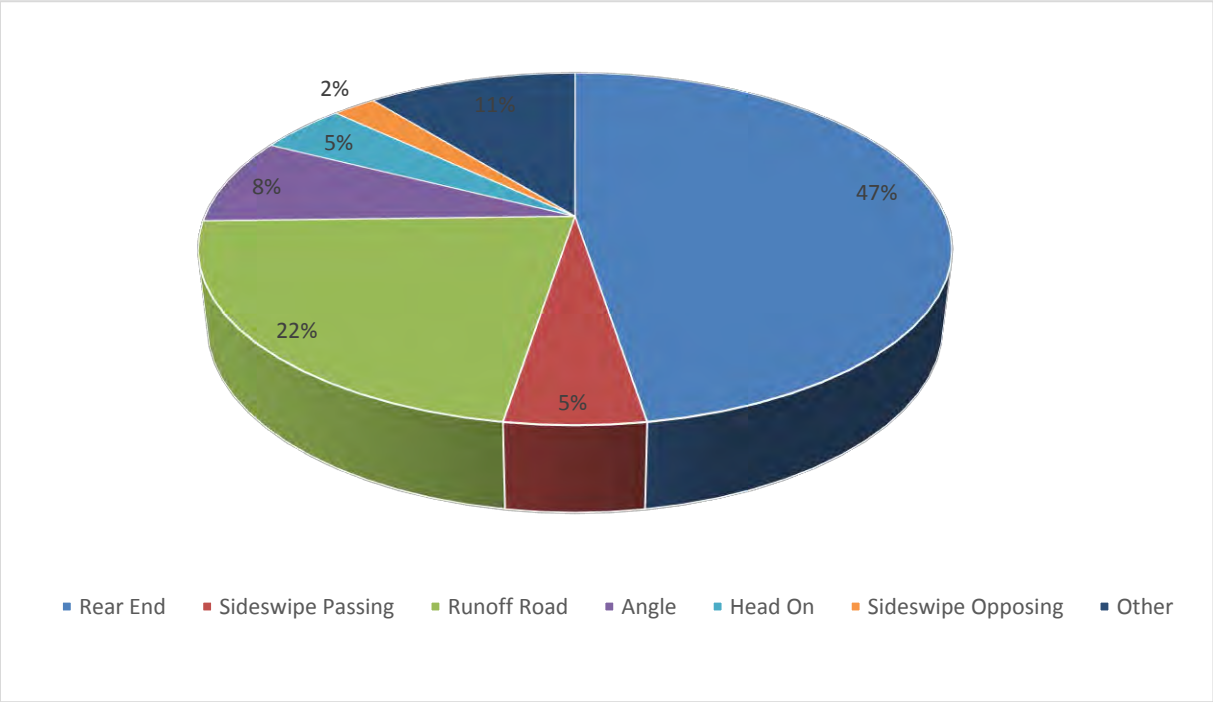


Table 4 Segment Crash Type Summary (January 1, 2013-December 31, 2017)

Segment	Right Angle/ Left Turn	Side-swipe Passing	Side-swipe Opposing	Rear End	Head On	Runoff Road	Other/ Unknwn
Hwy 5 – CSAH 11 (North) to CSAH 11 (South)	2	0	0	6	0	2	2
Hwy 5 – CSAH 11 (South) to CSAH 13	1	0	0	12	1	6	4
Hwy 5 – CSAH 13 to Hwy 41	3	6	1	36	3	6	7
82nd St – CSAH 13 to Hwy 41	1	1	1	1	1	7	1
CSAH 13 – Hwy 7 to Hwy 5	3	0	2	16	1	10	3
CSAH 13 – Hwy 5 to CSAH 18	1	0	0	6	0	2	1
Hwy 41 – Hwy 5 to RR Crossing	3	2	0	7	2	6	1
Total	14	9	4	84	8	39	19

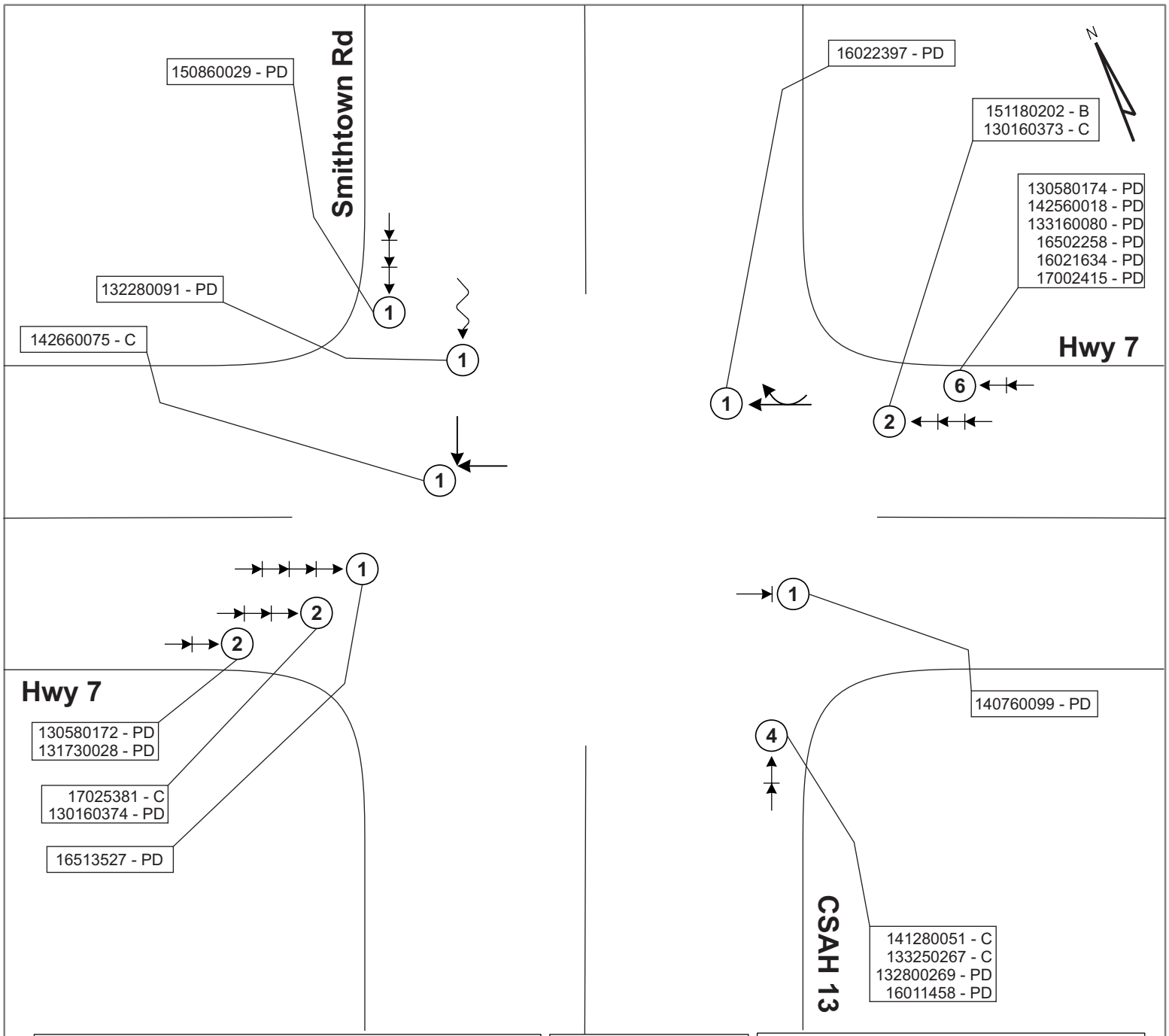
Chart 2 Segment Crash Types (January 1, 2013-December 31, 2017)



Crash Diagrams

Crash diagrams are a useful way to illustrate the location, severity, and crash types at an intersection and can be used to identify crash trends and geometric deficiencies. Crash diagrams have been produced for the key study intersections listed below and are shown in Figures 2-14.

- Hwy 7 & CSAH 13
- Hwy 5 & CSAH 11 (North Leg)
- Hwy 5 & CSAH 11 (South Leg)
- Hwy 5 & 78th St
- Hwy 5 & Park Dr
- Hwy 5 & CSAH 13
- Hwy 5 & Minnewashta Pkwy
- Hwy 5 & Crimson Bay Rd
- Hwy 5 and Hwy 41
- CSAH 18 (82nd Street) & CSAH 13
- 82nd St & McKnight Rd
- Hwy 41 & 82nd St
- Hwy 41 & Lyman Blvd



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity — MnDOT Documentation

CRASH RATE

0.58 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 20,875/day

CRASH FREQUENCY/SEVERITY

22 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 1 Non-Incapacitating (B-level)
- 5 Possible Injury (C-level)
- 16 Property Damage Only

LEGEND

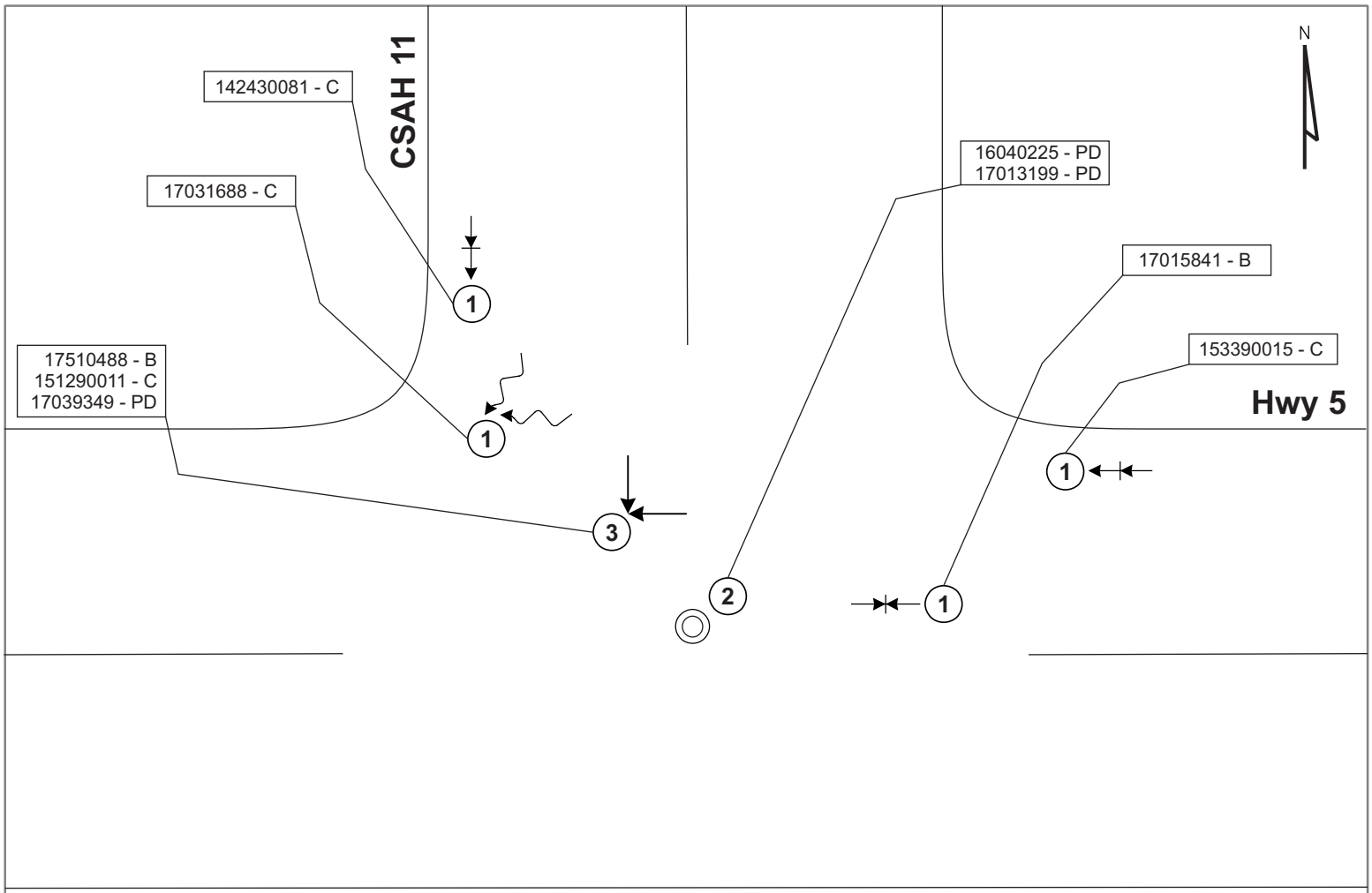
Moving Vehicle · Sideswipe Passing · Right Angle · Runoff Road

Rear End · Sideswipe Opposing · Head On · Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 2
COLLISION DIAGRAM
HWY 7 & CSAH 13 (Rolling Acres Rd)
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

0.36 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 13,825/day

CRASH FREQUENCY/SEVERITY

9 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 2 Non-Incapacitating (B-level)
- 4 Possible Injury (C-level)
- 3 Property Damage Only

LEGEND

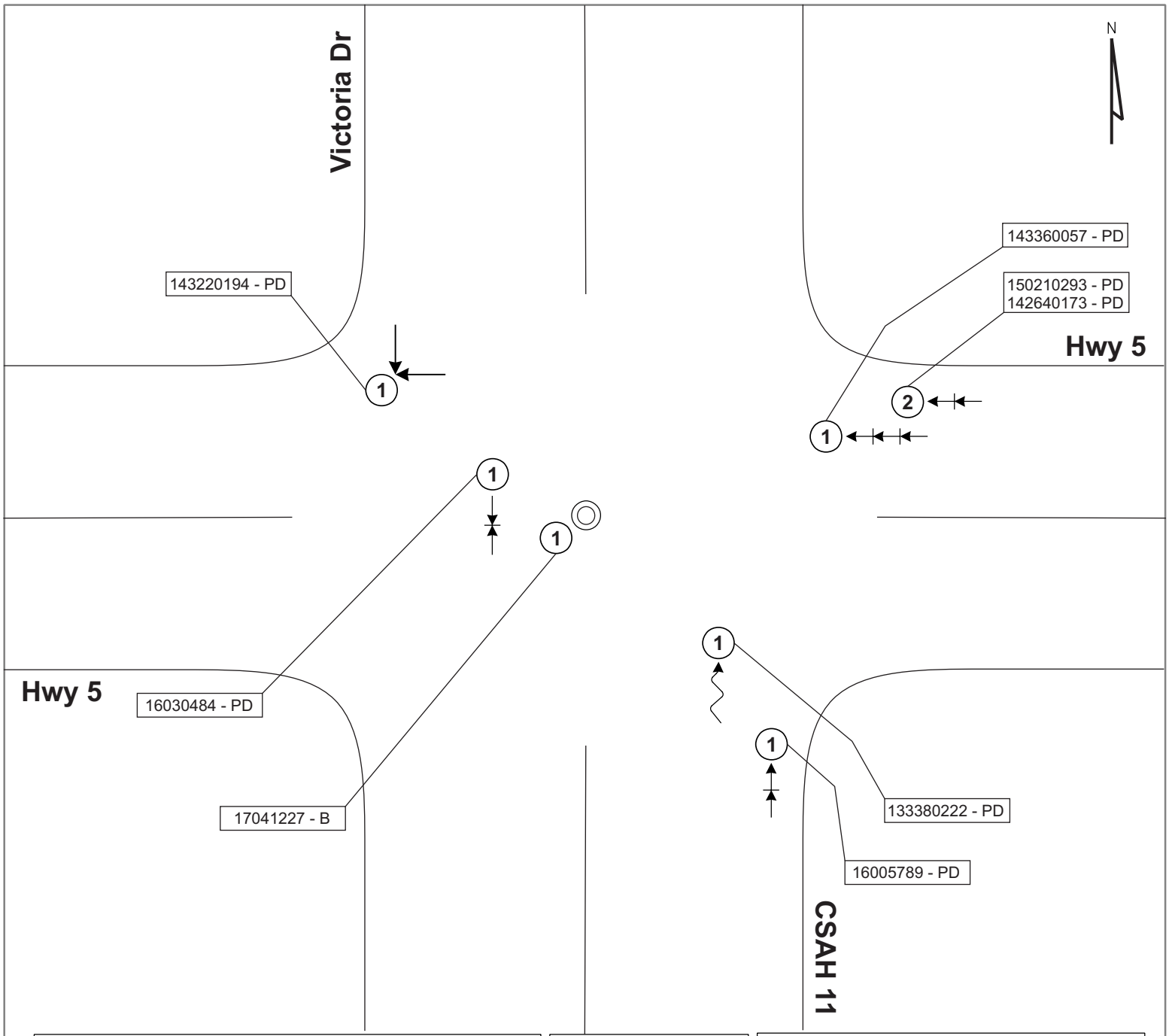
Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 3
COLLISION DIAGRAM
HWY 5 & CSAH 11 (Victoria Dr - North Leg)
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

0.22 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 19,550/day

CRASH FREQUENCY/SEVERITY

8 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 1 Non-Incapacitating (B-level)
- 0 Possible Injury (C-level)
- 7 Property Damage Only

LEGEND

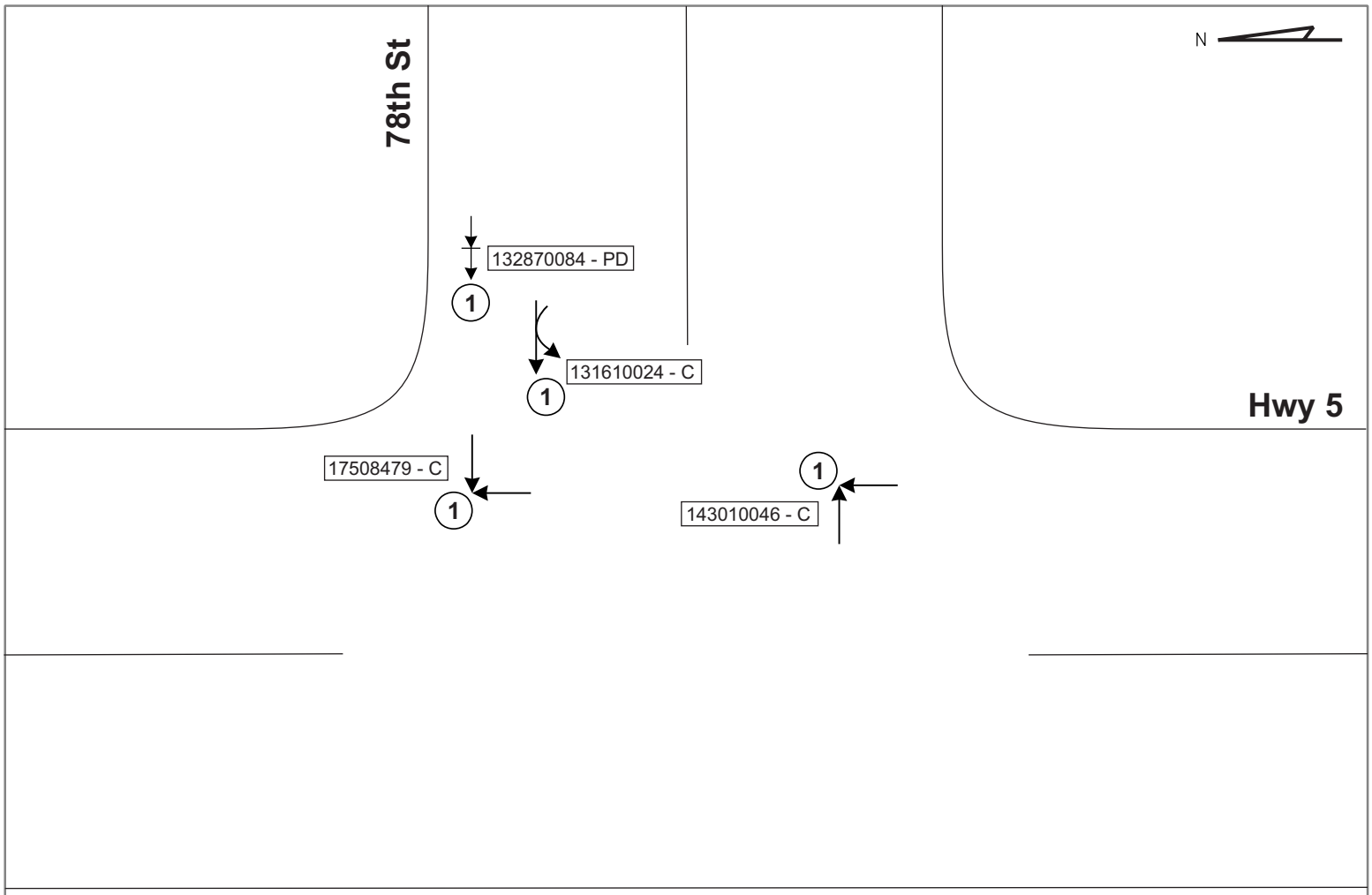
Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 4
COLLISION DIAGRAM
HWY 5 & CSAH 11 (Victoria Dr - South Leg)
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

0.14 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 15,165/day

CRASH FREQUENCY/SEVERITY

4 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 0 Non-Incapacitating (B-level)
- 3 Possible Injury (C-level)
- 1 Property Damage Only

LEGEND

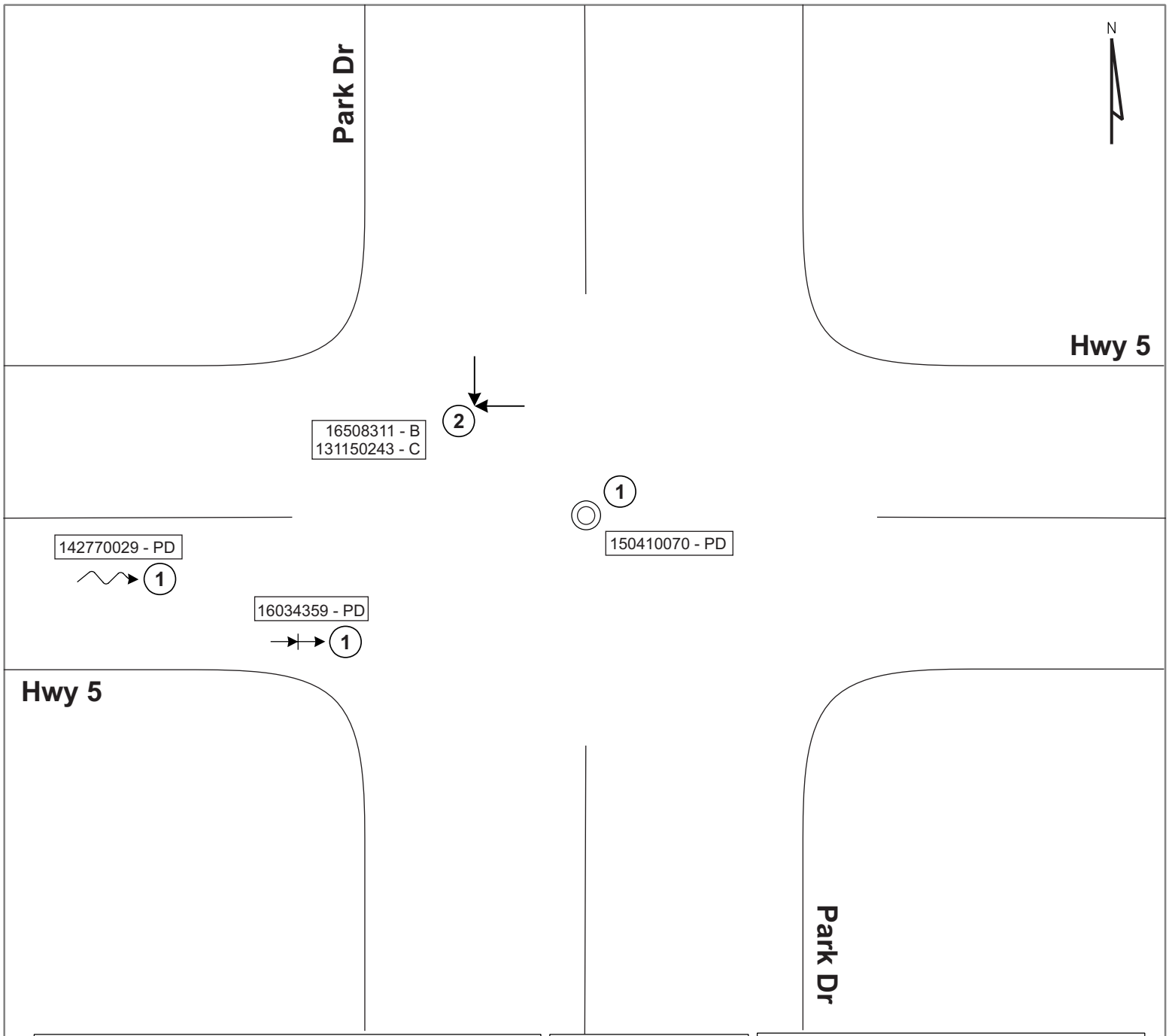
Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 5
COLLISION DIAGRAM
HWY 5 & 78TH ST
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

0.18 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 15,135/day

CRASH FREQUENCY/SEVERITY

5 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 1 Non-Incapacitating (B-level)
- 1 Possible Injury (C-level)
- 3 Property Damage Only

LEGEND

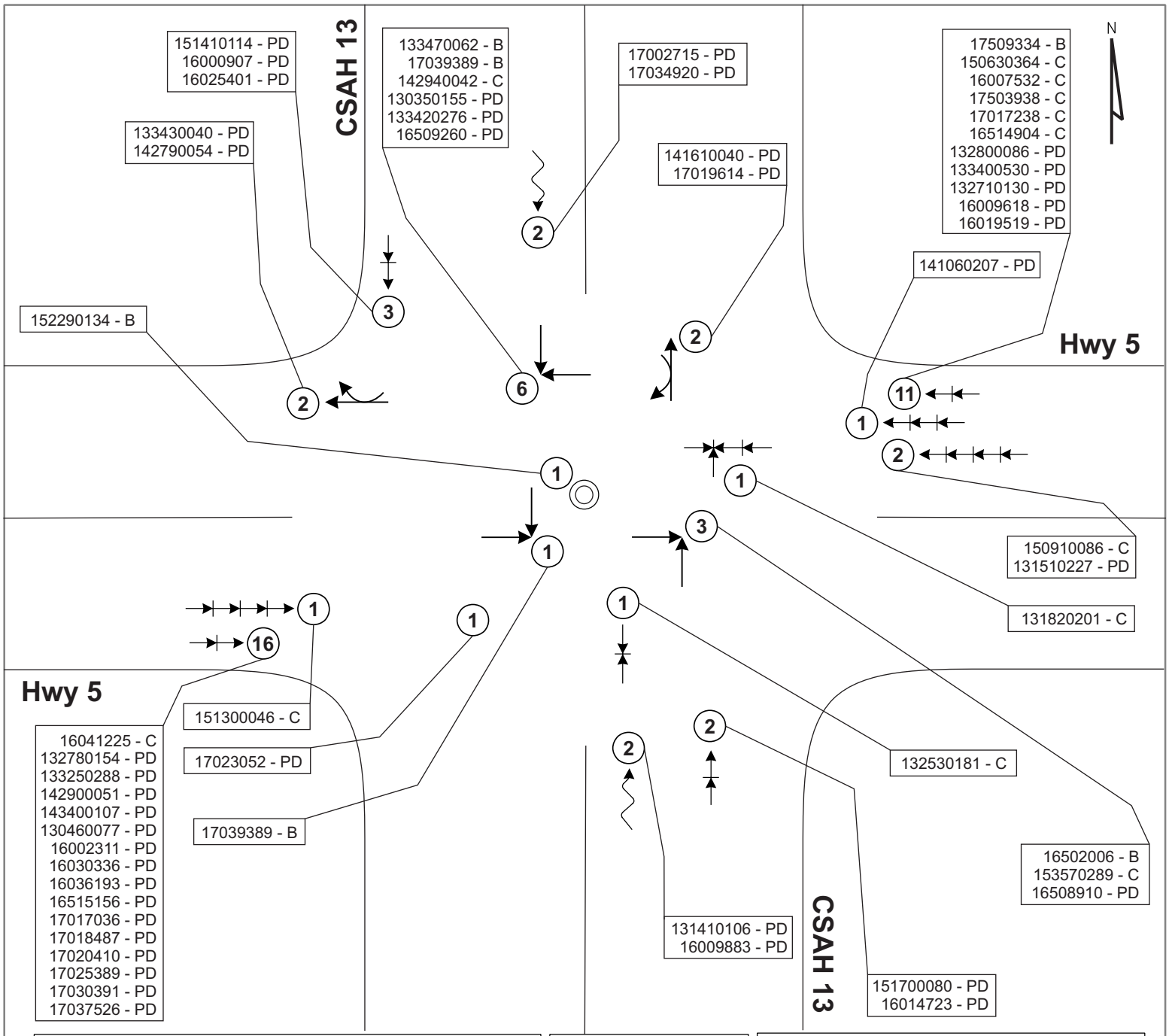
Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 6
COLLISION DIAGRAM
HWY 5 & PARK DR
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity — MnDOT Documentation

CRASH RATE

1.04 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 30,600/day

CRASH FREQUENCY/SEVERITY

58 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 6 Non-Incapacitating (B-level)
- 12 Possible Injury (C-level)
- 40 Property Damage Only

LEGEND

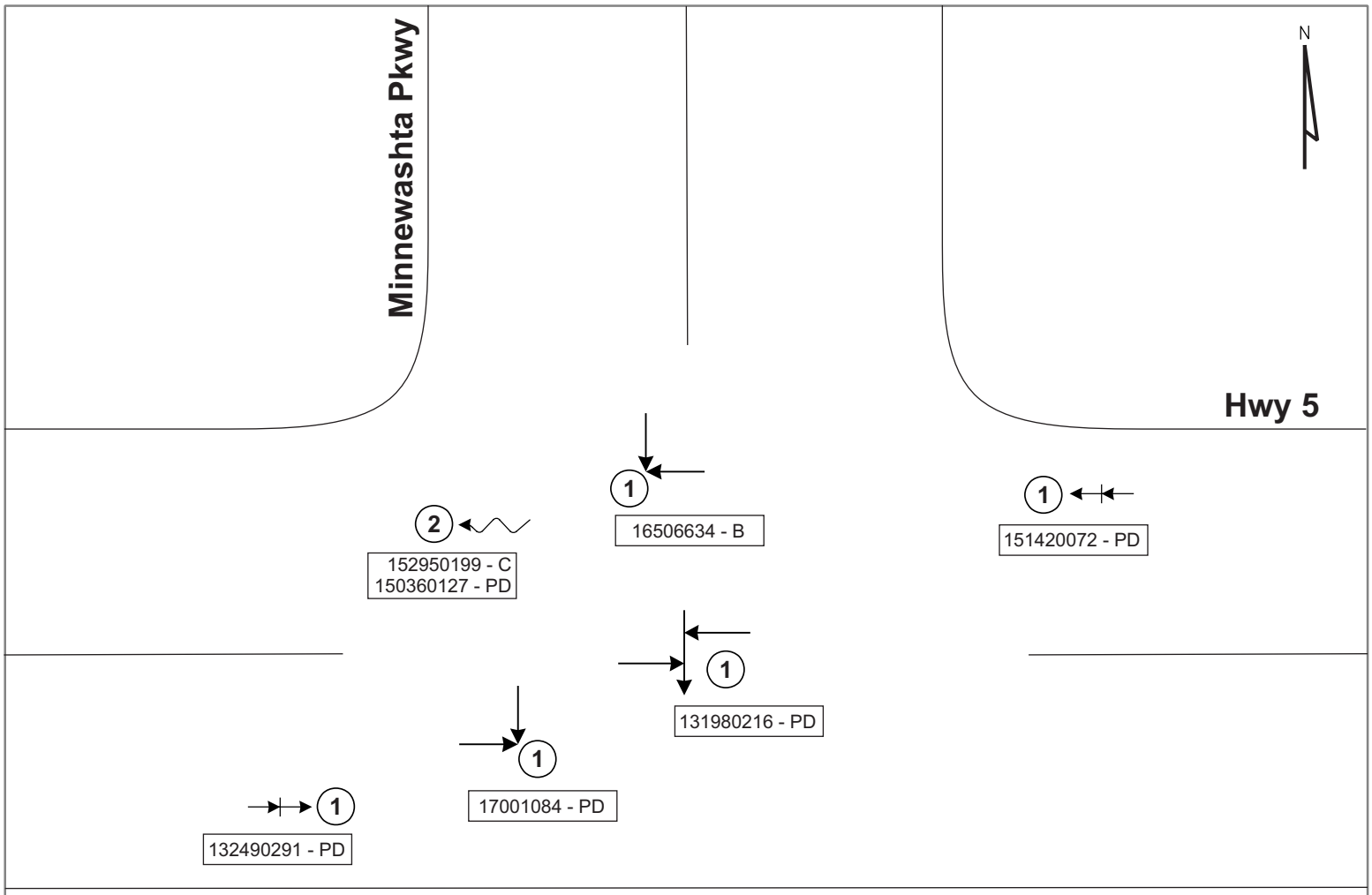
Moving Vehicle · Sideswipe Passing · Right Angle · Runoff Road

Rear End · Sideswipe Opposing · Head On · Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 7
COLLISION DIAGRAM
HWY 5 & CSAH 13 (Rolling Acres Rd)
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

0.13 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 28,525/day

CRASH FREQUENCY/SEVERITY

7 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 1 Non-Incapacitating (B-level)
- 1 Possible Injury (C-level)
- 5 Property Damage Only

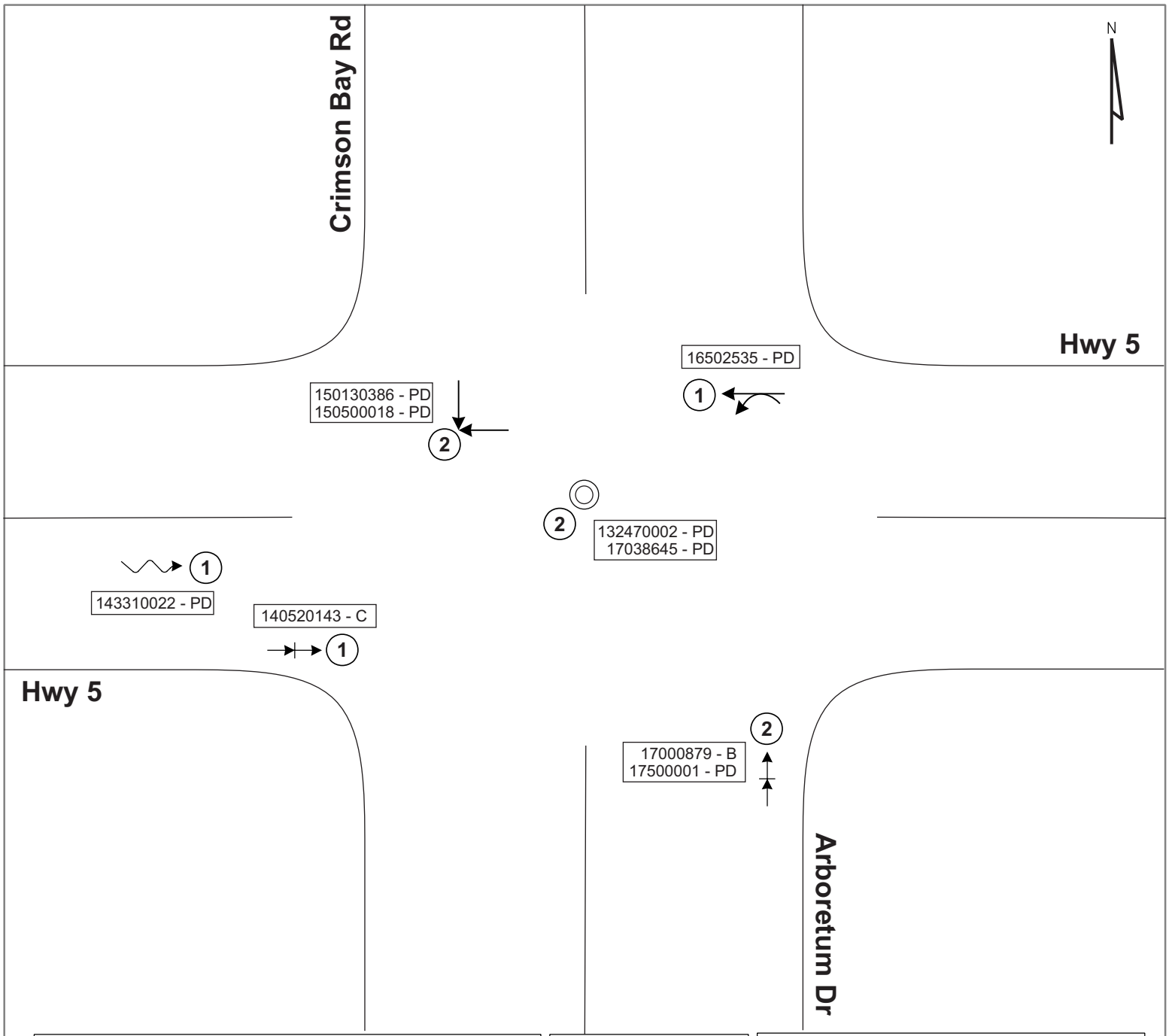
LEGEND

Moving Vehicle
Sideswipe Passing
Right Angle
Runoff Road
Rear End
Sideswipe Opposing
Head On
Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 8
COLLISION DIAGRAM
HWY 5 & MINNEWASHTA PKWY
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

0.18 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 27,625/day

CRASH FREQUENCY/SEVERITY

9 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 1 Non-Incapacitating (B-level)
- 1 Possible Injury (C-level)
- 7 Property Damage Only

LEGEND

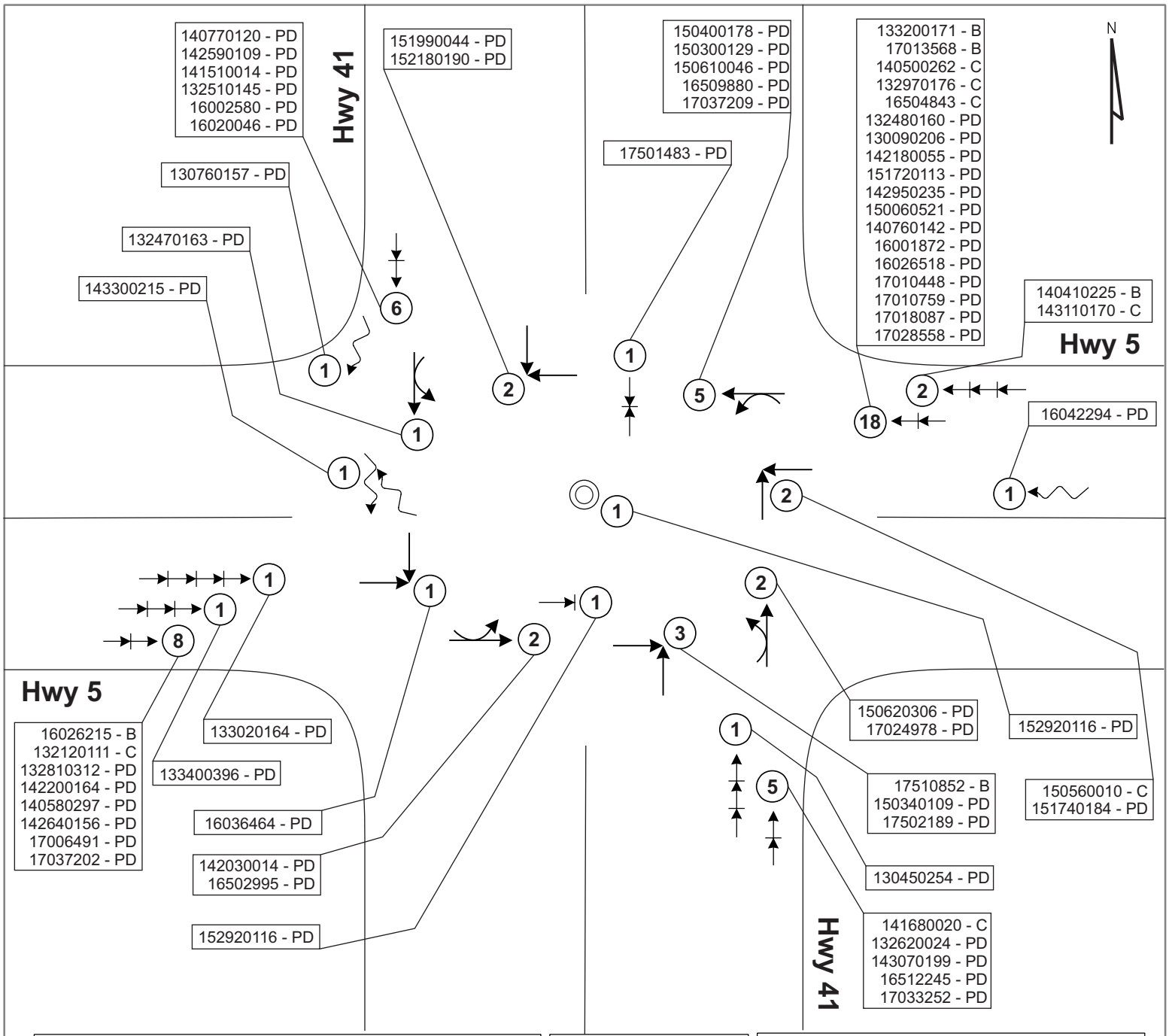
Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 9
COLLISION DIAGRAM
HWY 5 & CRIMSON BAY RD
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity — MnDOT Documentation

CRASH RATE

0.88 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 41,150/day

CRASH FREQUENCY/SEVERITY

66 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 5 Non-Incapacitating (B-level)
- 7 Possible Injury (C-level)
- 54 Property Damage Only

LEGEND

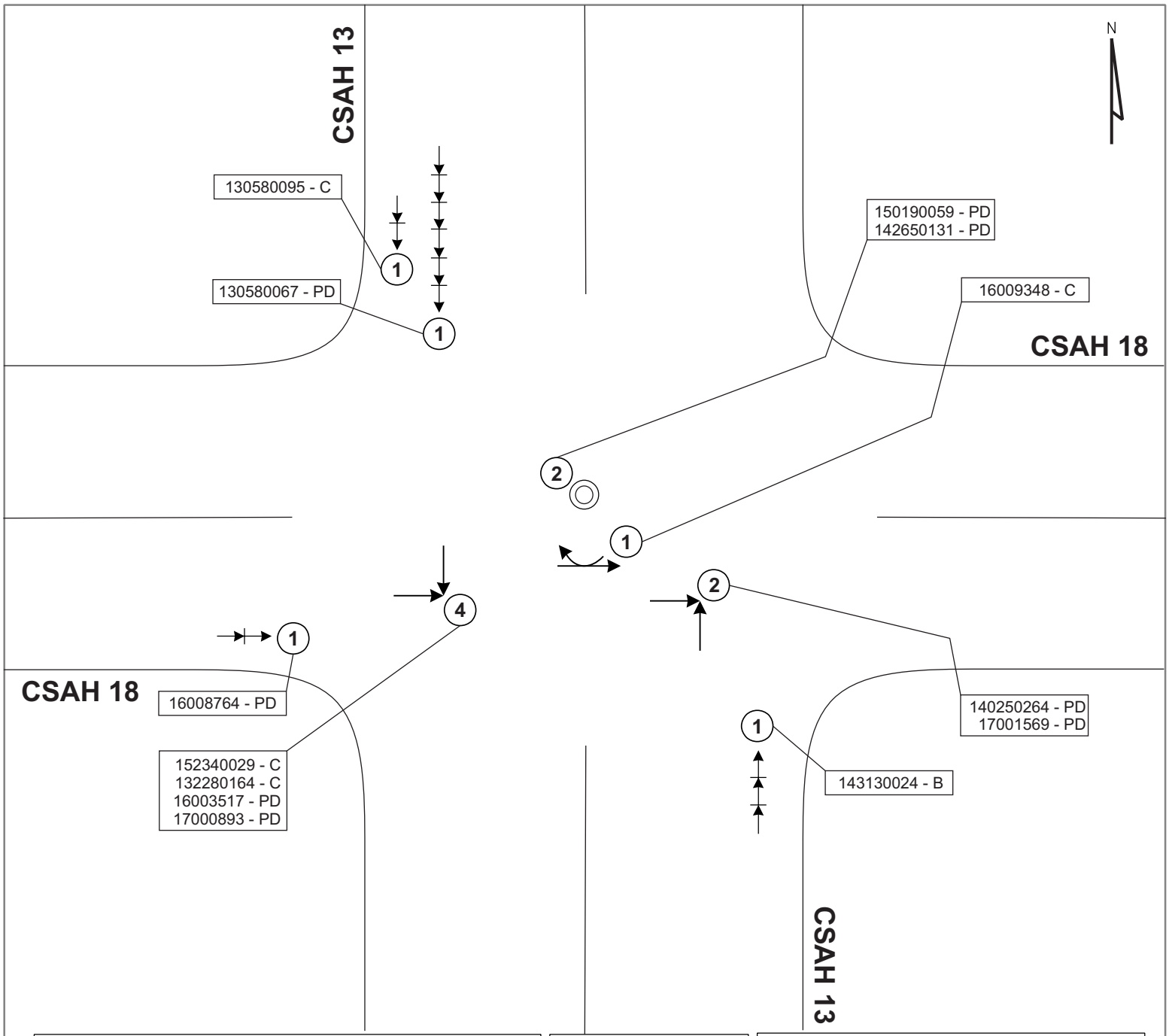
Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 10
COLLISION DIAGRAM
HWY 5 & HWY 41
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity — MnDOT Documentation

CRASH RATE

1.01 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 7,020/day

CRASH FREQUENCY/SEVERITY

13 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 1 Non-Incapacitating (B-level)
- 4 Possible Injury (C-level)
- 8 Property Damage Only

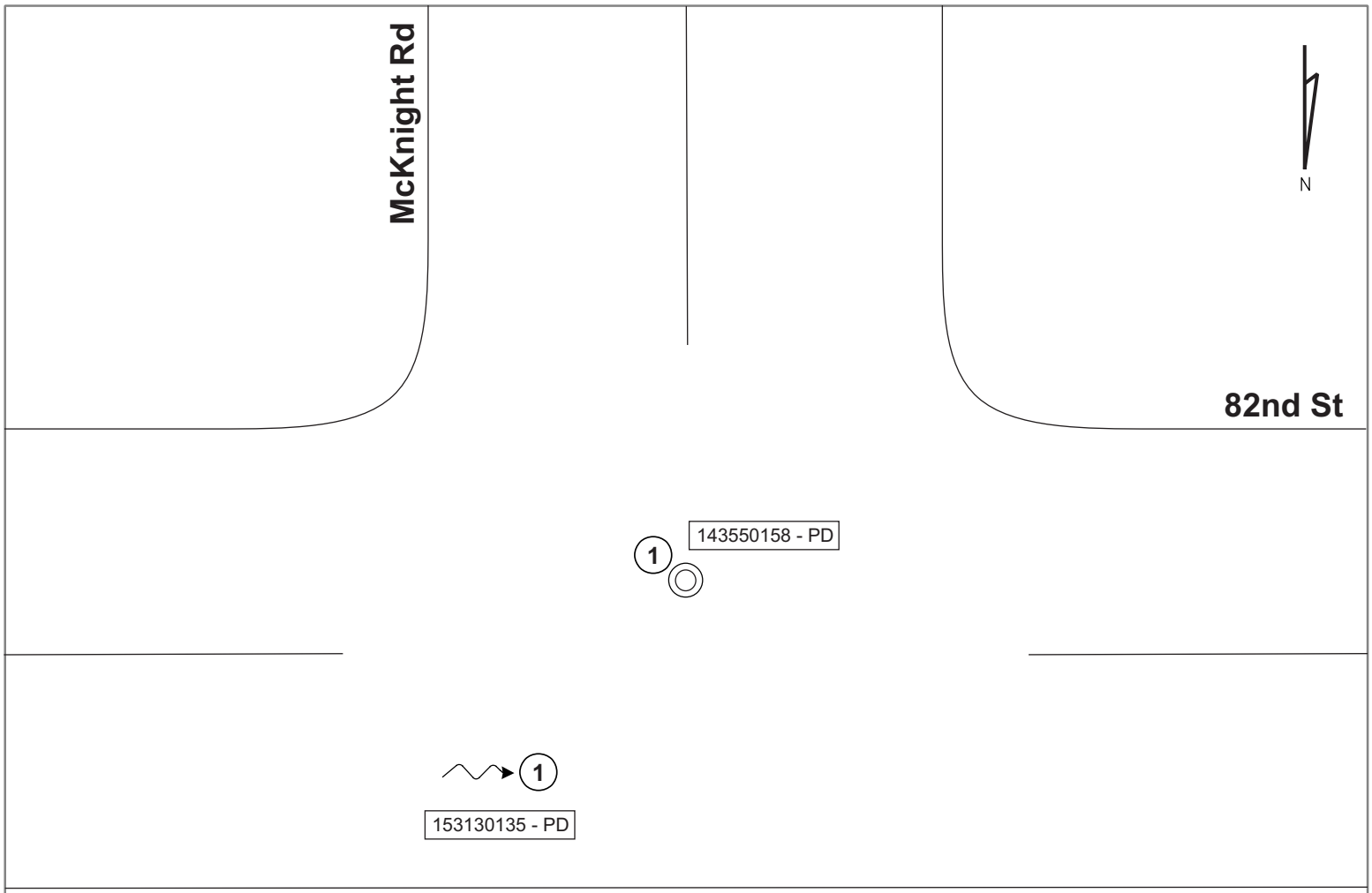
LEGEND

Moving Vehicle
Sideswipe Passing
Right Angle
Runoff Road
Rear End
Sideswipe Opposing
Head On
Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 11
COLLISION DIAGRAM
CSAH 18 (82nd St) & CSAH 13 (Bavaria Rd)
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

1.49 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 750/day

CRASH FREQUENCY/SEVERITY

2 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 0 Non-Incapacitating (B-level)
- 0 Possible Injury (C-level)
- 2 Property Damage Only

LEGEND

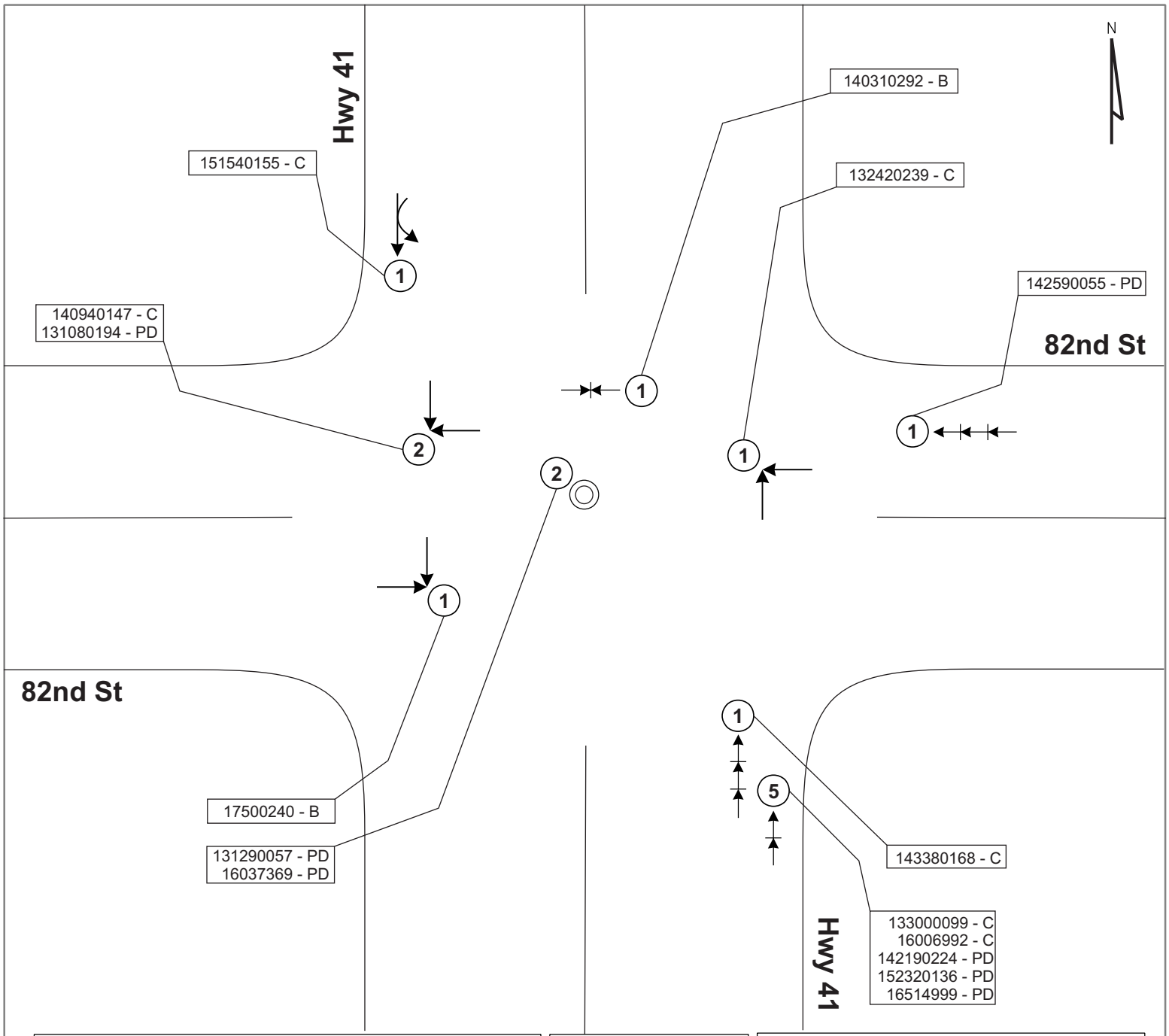
Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 12
COLLISION DIAGRAM
82ND ST & MCKNIGHT RD
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity — MnDOT Documentation

CRASH RATE

0.51 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 16,200/day

CRASH FREQUENCY/SEVERITY

15 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 2 Non-Incapacitating (B-level)
- 6 Possible Injury (C-level)
- 7 Property Damage Only

LEGEND

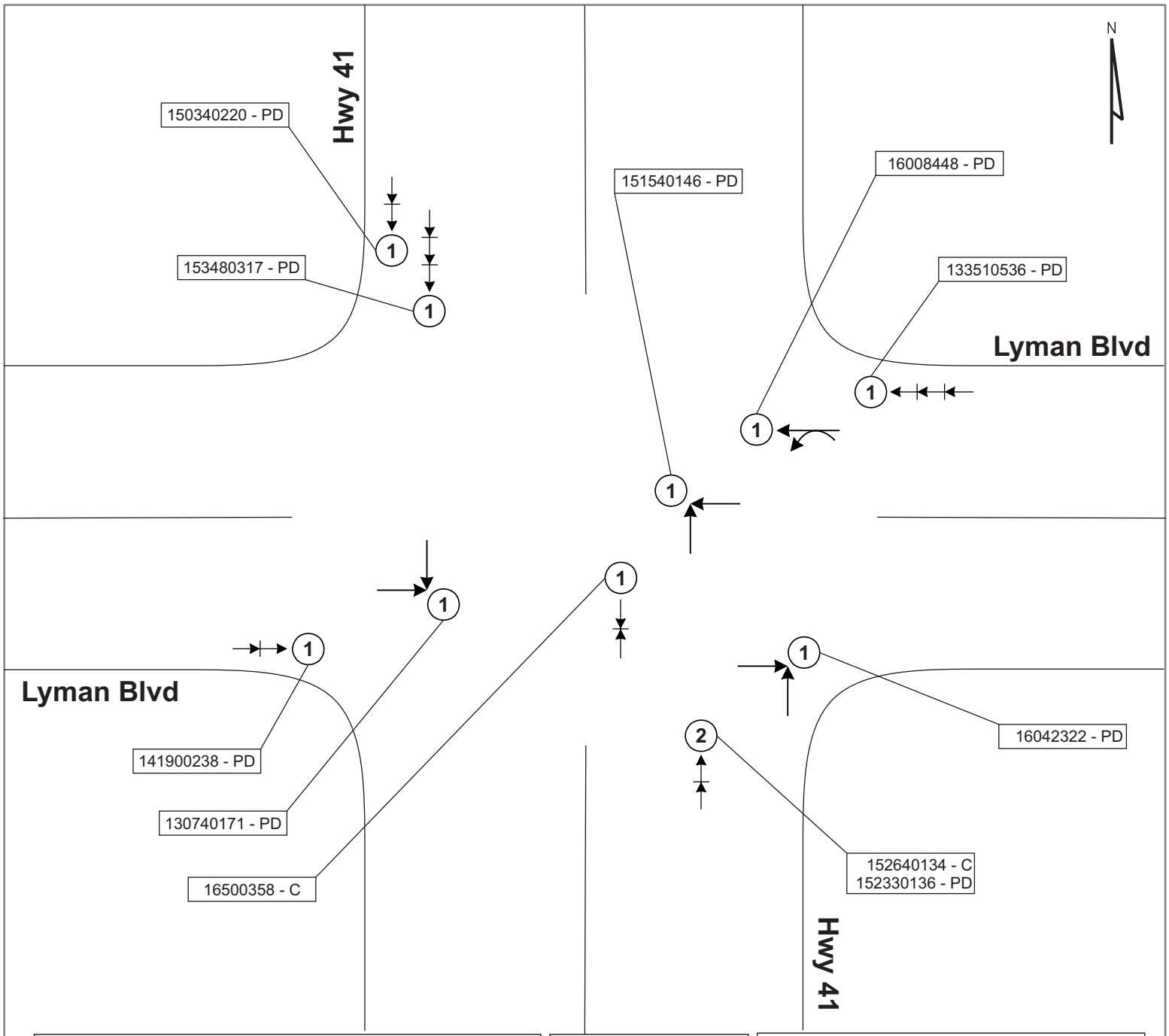
Moving Vehicle · Sideswipe Passing · Right Angle · Runoff Road

Rear End · Sideswipe Opposing · Head On · Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 13
COLLISION DIAGRAM
82ND ST & HWY 41
CARVER COUNTY, MINNESOTA



DOCUMENTATION CONVENTION

(#) Number of Crash Occurrences (2013 - 2017)

Crash ID - Severity MnDOT Documentation

CRASH RATE

0.41 Crashes
Per One Million Entering Vehicles

Entering Vehicles: 18,450/day

CRASH FREQUENCY/SEVERITY

11 Crashes

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 0 Non-Incapacitating (B-level)
- 2 Possible Injury (C-level)
- 9 Property Damage Only

LEGEND

Moving Vehicle | Sideswipe Passing | Right Angle | Runoff Road

Rear End | Sideswipe Opposing | Head On | Other

SRF Consulting Group, Inc.

Years: 2013- 2017

FIGURE 14
COLLISION DIAGRAM
HWY 41 & LYMAN BLVD
CARVER COUNTY, MINNESOTA

The crash diagrams for the intersections that experienced a crash rate greater than the critical crash rate were reviewed to determine crash trends and potential geometric deficiencies. These are summarized below:

Hwy 7 & CSAH 13 (Rolling Acres Road)

The Highway 7/CSAH 13 (Rolling Acres Road) intersection is a signalized intersection that experienced a crash rate of 0.58 crashes per MEV and a critical index of 1.22 indicating that the crash rate is 22 percent higher than the critical crash rate. Highway 7 has one left-turn, one thru lane, and one right-turn lane in the eastbound and westbound directions.

18 of the crashes (82 percent) were rear end crashes, of which 13 (72 percent) were on Highway 7. Most of the rear end crashes occurred during the a.m. and p.m. peak periods, indicating that congestion is likely a contributing factor.

Hwy 5 & CSAH 13 (Rolling Acres Road/Bavaria Road)

The Highway 5/CSAH 13 (Rolling Acres Road/Bavaria Road) intersection is a signalized intersection that experienced a crash rate of 1.04 crashes per MEV and a critical index of 1.50 indicating that the crash rate is 50 percent higher than the critical crash rate. Highway 5 has a one left-turn lane, one thru lane, and one right-turn lane in the eastbound and westbound directions. CSAH 13 has one left-turn lane, one thru lane, and one right-turn lane in the northbound direction and a one left-turn lane and one shared thru/right-turn lane in the southbound direction.

36 of the crashes (62 percent) were rear end crashes, of which 31 (86 percent) were on Highway 5. Approximately 50 percent of the rear end crashes occurred during the a.m. and p.m. peak periods, indicating that congestion is likely a contributing factor.

10 (17 percent) of the crashes were right angle crashes, of which six (60 percent) occurred between vehicles traveling in the southbound and westbound directions. Disregard traffic device and failure to yield were the most common factors.

Hwy 5 and Hwy 41

The Highway 5/Highway 41 intersection is a signalized intersection that experienced a crash rate of 0.88 crashes per MEV and a critical index of 1.34 indicating that the crash rate is 34 percent higher than the critical crash rate. Highway 5 has one left-turn lane, two thru lanes, and one right-turn lane in the eastbound and westbound directions. TH 41 has one left-turn, one thru lane, and one right-turn lane in the northbound and southbound direction.

42 of the crashes (64 percent) were rear end crashes, of which 20 (48 percent) were on westbound Highway 5 and 10 (24 percent) were on eastbound Highway 5. Most of the rear end crashes occurred during the p.m. peak period, indicating that congestion is likely a contributing factor.

CSAH 18 (82nd Street) & CSAH 13 (Bavaria Rd)

The CSAH 18/CSAH 13 (Bavaria Road) intersection is a side-street stop controlled intersection that experienced a crash rate of 1.01 crashes per MEV and a critical index of 1.55 indicating that the crash rate is 55 percent higher than the critical crash rate. CSAH 13 has one shared thru/left-turn lane and one right-turn lane in the southbound direction and one shared left-turn/thru/right-turn lane in the northbound direction. CSAH 18 has one shared left-turn/thru lane in the eastbound direction and 82nd Street is a gravel approach.

Six of the crashes (46 percent) were angle crashes, of which four involved vehicles traveling in the eastbound and southbound direction and two involved vehicles traveling in the eastbound and northbound and directions. The angle crashes were likely caused by poor gap selection.

82nd St & McKnight Rd

The 82nd Street/McKnight Road intersection is a low-volume gravel side-street stop controlled intersection. Two crashes were reported during the study period. One crash was a runoff road crash and one was coded as other. Due to the overall low number of crashes at this intersection, no crash trends were identified.

Summary and Conclusions

The following summary and conclusions are offered for your consideration:

1. Crash data were obtained from MnDOT for January 1, 2016 through December 31, 2017 and was supplemented using MnDOT's Minnesota Crash Mapping Analysis Tool (MnCMAT) for January 1, 2013 through December 31, 2015.
2. There were 246 reported crashes at the study intersection, of which one was fatal. There were also and 177 reported non-intersection crashes on the study segments, of which one was fatal during the five-year period.
3. There was one reported crash involving pedestrian.
4. The Highway 7/CSAH 13, Highway 5/CSAH 13, Highway 5/Highway 41, CSAH 18/ CSAH 13, and 82nd Street/McKnight Road intersections all experienced a crash rate greater than the critical crash rate, indicating a strong likelihood of a geometric design, access, or traffic control issue.
5. The Highway 5 from CSAH 13 to Highway 41, 82nd Street from CSAH 13 to Highway 41, and CSAH 13 from Highway 7 to Highway 5 segments experienced a crash rate greater than the critical crash rate, indicating a strong likelihood of a geometric design, access, or traffic control issue.
6. A review of the manner of collision (crash diagram) indicates that the predominant types of crashes occurring at the intersections are rear-end (54 percent) and right-angle/left-turn (20 percent) crashes while the predominant types of non-intersections crashes on the segments are rear-end (47 percent) and runoff road (22 percent) crashes.

7. The crash diagrams for the intersections that experienced a crash rate greater than the critical crash rate were reviewed to determine crash trends and potential geometric deficiencies.
    a. The Highway 7/CSAH 13 (Rolling Acres Road) intersection is a signalized intersection that experienced a crash rate of 0.58 crashes per MEV and a critical index of 1.22 indicating that the crash rate is 22 percent higher than the critical crash rate. Highway 7 has one left-turn, one thru lane, and one right-turn lane in the eastbound and westbound directions.
    18 of the crashes (82 percent) were rear end crashes, of which 13 (72 percent) were on Highway 7. Most of the rear end crashes occurred during the a.m. and p.m. peak periods, indicating that congestion is likely a contributing factor.
    b. The Highway 5/CSAH 13 (Rolling Acres Road/Bavaria Road) intersection is a signalized intersection that experienced a crash rate of 1.04 crashes per MEV and a critical index of 1.50 indicating that the crash rate is 50 percent higher than the critical crash rate. Highway 5 has a one left-turn lane, one thru lane, and one right-turn lane in the eastbound and westbound directions. CSAH 13 has one left-turn lane, one thru lane, and one right-turn lane in the northbound direction and a one left-turn lane and one shared thru/right-turn lane in the southbound direction.
    36 of the crashes (62 percent) were rear end crashes, of which 31 (86 percent) were on Highway 5. Approximately 50 percent of the rear end crashes occurred during the a.m. and p.m. peak periods, indicating that congestion is likely a contributing factor.
    10 (17 percent) of the crashes were right angle crashes, of which six (60 percent) occurred between vehicles traveling in the southbound and westbound directions. Disregard traffic device and failure to yield were the most common factors.
    c. The Highway 5/Highway 41 intersection is a signalized intersection that experienced a crash rate of 0.88 crashes per MEV and a critical index of 1.34 indicating that the crash rate is 34 percent higher than the critical crash rate. Highway 5 has one left-turn lane, two thru lanes, and one right-turn lane in the eastbound and westbound directions. TH 41 has one left-turn, one thru lane, and one right-turn lane in the northbound and southbound direction.
    42 of the crashes (64 percent) were rear end crashes, of which 20 (48 percent) were on westbound Highway 5 and 10 (24 percent) were on eastbound Highway 5. Most of the rear end crashes occurred during the p.m. peak period, indicating that congestion is likely a contributing factor.
    d. The CSAH 18/CSAH 13 (Bavaria Road) intersection is a side-street stop controlled intersection that experienced a crash rate of 1.01 crashes per MEV and a critical index of 1.55 indicating that the crash rate is 55 percent higher than the critical crash rate. CSAH 13 has one shared thru/left-turn lane and one right-turn lane in the southbound direction and one shared left-turn/thru/right-turn lane in the northbound direction. CSAH 18 has one shared left-turn/thru lane in the eastbound direction and 82nd Street is a gravel approach.

Six of the crashes (46 percent) were angle crashes, of which four involved vehicles traveling in the eastbound and southbound direction and two involved vehicles traveling in the eastbound and northbound and directions. The angle crashes were likely caused by poor gap selection.

e. The 82nd Street/McKnight Road intersection is a low-volume gravel side-street stop controlled intersection. Two crashes were reported during the study period. One crash was a runoff road crash and one was coded as other. Due to the overall low number of crashes at this intersection, no crash trends were identified.

Attachment 1

Intersection and Segment Crash Summary

Arboretum Area Transportation Plan

Intersection Crash History (2013-2017)

							Crash Rates					Crashes		Severity					Diagram							Light Condition					Road Condition			
Intersection Name	Traffic Control	Major 1	Major 2	Minor 1	Minor 2	ADT	Expected Crash Rate*	Actual Crash Rate	Critical Crash Rate	Critical Crash Rate Index	Severity Rate	Total Crashes	Total Severe Crashes	K	A	B	C	PD	Rear End	Sideswipe Passing	Runoff Road	Angle	Head On	Sideswipe Opposing	Other	Day	Dawn/Dusk	Dark with Streetlights	Dark	Other/ Unknown	Dry	Wet	Snow/Slush	Other
Hwy 7 & CSAH 13 (Rolling Acres Rd)	Traffic Signal	17,000	13,100	10,000	1,650	20,875	0.25	0.58	0.47	1.22	0.76	22	0	0	0	1	5	16	18	1	1	1	1	0	0	17	2	2	1	0	16	3	3	0
Hwy 5 & CSAH 11 (Victoria Dr - North Leg)	Thru Stop	13,900	10,200	3,550		13,825	0.25	0.36	0.53	0.67	0.67	9	0	0	0	2	4	3	2	0	1	3	1	0	2	5	1	3	0	0	7	0	2	0
Hwy 5 & Stieger Lake Ln (West)	Thru Stop	13,900	13,900	465		14,133	0.25	0.16	0.53	0.29	0.19	4	0	0	0	0	1	3	2	0	0	1	0	0	1	4	0	0	0	0	3	0	1	0
Hwy 5 & CSAH 11 (Victoria Dr - South Leg)	Traffic Signal	14,900	13,900	8,700	1,600	19,550	0.52	0.22	0.84	0.27	0.28	8	0	0	0	1	0	7	4	0	1	1	1	0	1	5	2	1	0	0	6	0	2	0
Hwy 5 & Quamoclit	Thru Stop	14,900	14,900	670	499	15,485	0.18	0.00	0.41	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hwy 5 & 80th St	Thru Stop	14,900	14,900	580		15,190	0.25	0.07	0.52	0.14	0.11	2	0	0	0	0	1	1	2	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
Hwy 5 & Stieger Lake Ln (East)	Thru Stop	14,900	14,900	720		15,260	0.25	0.00	0.52	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hwy 5 & 78th St	Thru Stop	14,900	14,900	530		15,165	0.25	0.14	0.52	0.28	0.25	4	0	0	0	0	3	1	1	1	0	2	0	0	0	4	0	0	0	0	4	0	0	0
Hwy 5 & Park Dr	Thru Stop	14,900	14,900	235	235	15,135	0.25	0.18	0.52	0.35	0.29	5	0	0	0	1	1	3	1	0	1	2	0	0	1	2	1	1	1	0	4	0	0	1
Hwy 5 & Rolling Acres Rd	Traffic Signal	27,500	14,900	11,300	7,500	30,600	0.45	1.04	0.69	1.50	1.47	58	0	0	0	6	12	40	36	3	4	10	2	2	1	45	7	5	1	0	45	4	9	0
Hwy 5 & Minnewashta Pkwy	Thru Stop	27,500	27,500	2,050		28,525	0.25	0.13	0.44	0.30	0.19	7	0	0	0	1	1	5	2	0	2	3	0	0	0	6	1	0	0	0	5	0	2	0
Hwy 5 & Crimson Bay Rd	Thru Stop	27,500	27,500	199	45	27,622	0.25	0.18	0.44	0.40	0.24	9	0	0	0	1	1	7	3	1	1	2	0	0	2	5	3	0	1	0	6	0	3	0
Hwy 5 and Hwy 41	Traffic Signal	27,500	25,500	15,600	13,700	41,150	0.45	0.88	0.66	1.34	1.11	66	0	0	0	5	7	54	42	10	3	8	2	0	1	44	7	13	1	1	50	9	7	0
CSAH 18 (82nd Street) & CSAH 13 (Bavaria Rd)	Thru Stop	5,300	4,350	4,000	390	7,020	0.25	1.01	0.65	1.55	1.48	13	0	0	0	1	4	8	4	0	0	6	0	1	2	9	0	2	1	1	6	3	4	0
82nd St & McKnight Rd	Thru Stop	630	390	455		738	0.16	1.49	1.41	1.05	1.49	2	0	0	0	0	0	2	0	0	1	0	0	0	1	1	1	0	0	0	1	0	1	0
82nd St & Hwy 41	Traffic Signal	13,700	13,700	4,550	455	16,203	0.40	0.51	0.71	0.71	0.85	15	0	0	0	2	6	7	7	1	0	4	1	0	2	10	3	2	0	0	10	2	3	0
Hwy 41 & 78th St	Thru Stop	15,600	15,600	1,600	499	16,650	0.25	0.22	0.58	0.38	0.44	4	1	1	0	0	0	3	0	0	1	1	1	0	1	3	0	1	0	0	2	2	0	0
Hwy 41 & Lyman Blvd	Traffic Signal	15,700	13,700	6,300	1,200	18,450	0.25	0.41	0.52	0.79	0.48	11	0	0	0	0	2	9	6	1	0	3	1	0	0	8	0	3	0	0	3	4	4	0
														0%	0%	9%	20%	71%	54%	8%	7%	20%	4%	1%	6%	71%	12%	14%	3%	1%	71%	11%	17%	0%

Notes:

*Expected 5-year rates from MnDOT's 2015 Intersection Green Sheets

Estimated AADTs

Crash Rate < Expected Crash Rate

Expected Crash Rate < Crash Rate < Critical Crash Rate

Crash Rate > Critical Crash Rate

Arboretum Area Transportation Plan

Segment Crash History (2013-2017) Summary

			Crash Rates - Non Junction Crashes				Crashes		Severity					Diagram							Light Condition					Road Condition			
Description	AADT	Length	Expected Crash Rate*	Actual Crash Rate	Critical Crash Rate	Critical Crash Rate Index	Total Crashes	Total Severe Crashes	K	A	B	C	PD	Rear End	Sideswipe Passing	Runoff Road	Angle	Head On	Sideswipe Opposing	Other	Day	Dawn/Dusk	Dark with Streetlights	Dark	Other/Unknown	Dry	Wet	Snow/Slush	Other
Hwy 5 from CSAH 11 (Victoria Dr North Leg) to CSAH 11 (Victoria Dr South Leg)	13,900	0.6	0.35	0.86	1.00	0.86	12	0	0	0	0	2	10	6	0	2	2	0	0	2	5	0	3	3	1	8	2	2	0
Hwy 5 from CSAH 11 (Victoria Dr South Leg) to CSAH 13 (Rolling Acres Rd)	14,900	1.5	0.35	0.59	0.95	0.62	24	0	0	0	2	3	19	12	0	6	1	1	0	4	15	5	0	4	0	18	2	4	0
Hwy 5 from CSAH 13 (Rolling Acres Rd) to Hwy 41	27,500	2.0	0.35	0.62	0.58	1.07	62	0	0	0	4	11	47	36	6	6	3	3	1	7	40	5	1	12	4	45	5	12	0
82nd St from CSAH 13 (Bavaria Rd) to Hwy 41	420	1.4	0.40	12.56	6.39	1.97	13	0	0	0	1	2	10	1	1	7	1	1	1	1	7	0	0	3	3	0	1	8	4
CSAH 13 (Rolling Acres Rd) from Hwy 7 to Hwy 5	10,650	1.2	0.35	1.57	1.19	1.32	35	0	0	0	1	7	27	16	0	10	3	1	2	3	26	2	2	4	1	21	6	8	0
CSAH 13 (Rolling Acres Rd) from Hwy 5 to CSAH 18	6,700	0.8	0.30	1.09	1.62	0.67	10	0	0	0	1	2	7	6	0	2	1	0	0	1	8	1	0	1	0	7	2	1	0
Hwy 41 from Hwy 5 to Railroad Crossing	14,700	1.9	0.35	0.41	0.88	0.47	21	1	0	1	2	7	11	7	2	6	3	2	0	1	14	1	3	2	1	12	5	4	0
									0%	1%	6%	19%	74%	47%	5%	22%	8%	5%	2%	11%	65%	8%	5%	16%	6%	63%	13%	22%	2%

Notes:

Analysis includes segment crashes only (all intersection crashes have been removed)

*Expected 5-year non junction rates from MnDOT's 2015 Segment Green Sheets (Rural Designation)

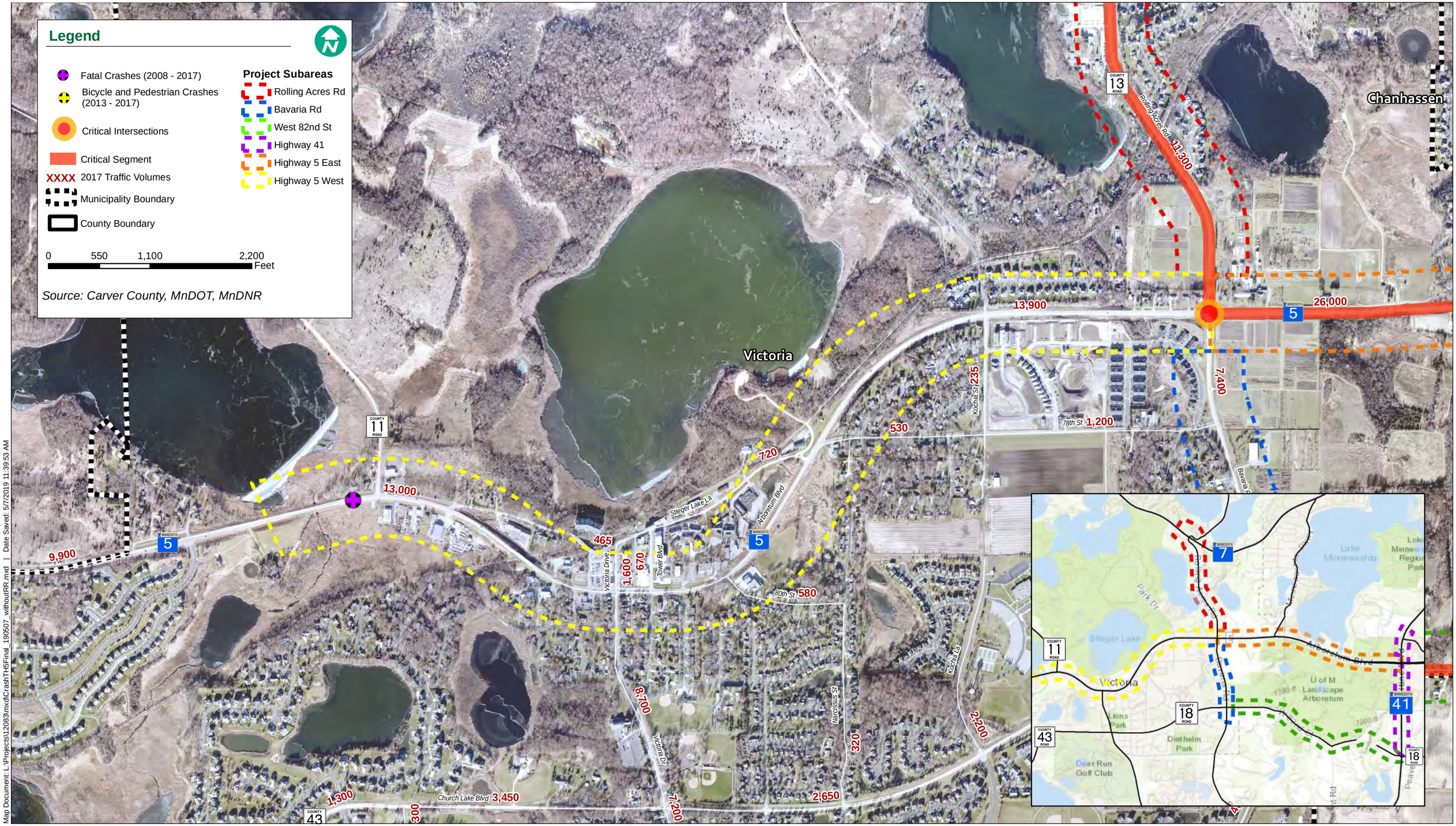
Crash Rate < Expected Crash Rate

Expected Crash Rate < Crash Rate < Critical Crash Rate

Crash Rate > Critical Crash Rate

Attachment 2

Critical Intersections and Segments


Legend
Fatal Crashes (2008 - 2017)
Bicycle and Pedestrian Crashes (2013 - 2017)
Critical Intersections
Critical Segment
XXXX 2017 Traffic Volumes
Municipality Boundary
County Boundary
Project Subareas
Rolling Acres Rd
Bavaria Rd
West 82nd St
Highway 41
Highway 5 East
Highway 5 West
0 550 1,100 2,200 Feet
Source: Carver County, MnDOT, MnDNR
Victoria
Chanhassen
11,300
13,900
26,000
7,400
1,200
530
235
720
13,000
9,900
465
1,600
670
580
8,700
2,200
320
2,650
7,200
1,300
3,450
300
Rolling Acres Rd
Kochia St
78th St
Bavaria
Stieger Lake La
Arboretum Blvd
Victoria Drive
Tower Blvd
80th St
Narcissus St
Kochia La
Victoria Dr
Church Lake Blvd
Park Dr
Stieger Lake
Lake Minnewashta
Lake Minnewashta Regional Park
U of M Landscape Arboretum
Lions Park
Diethelm Park
Deer Run Golf Club
Peavey
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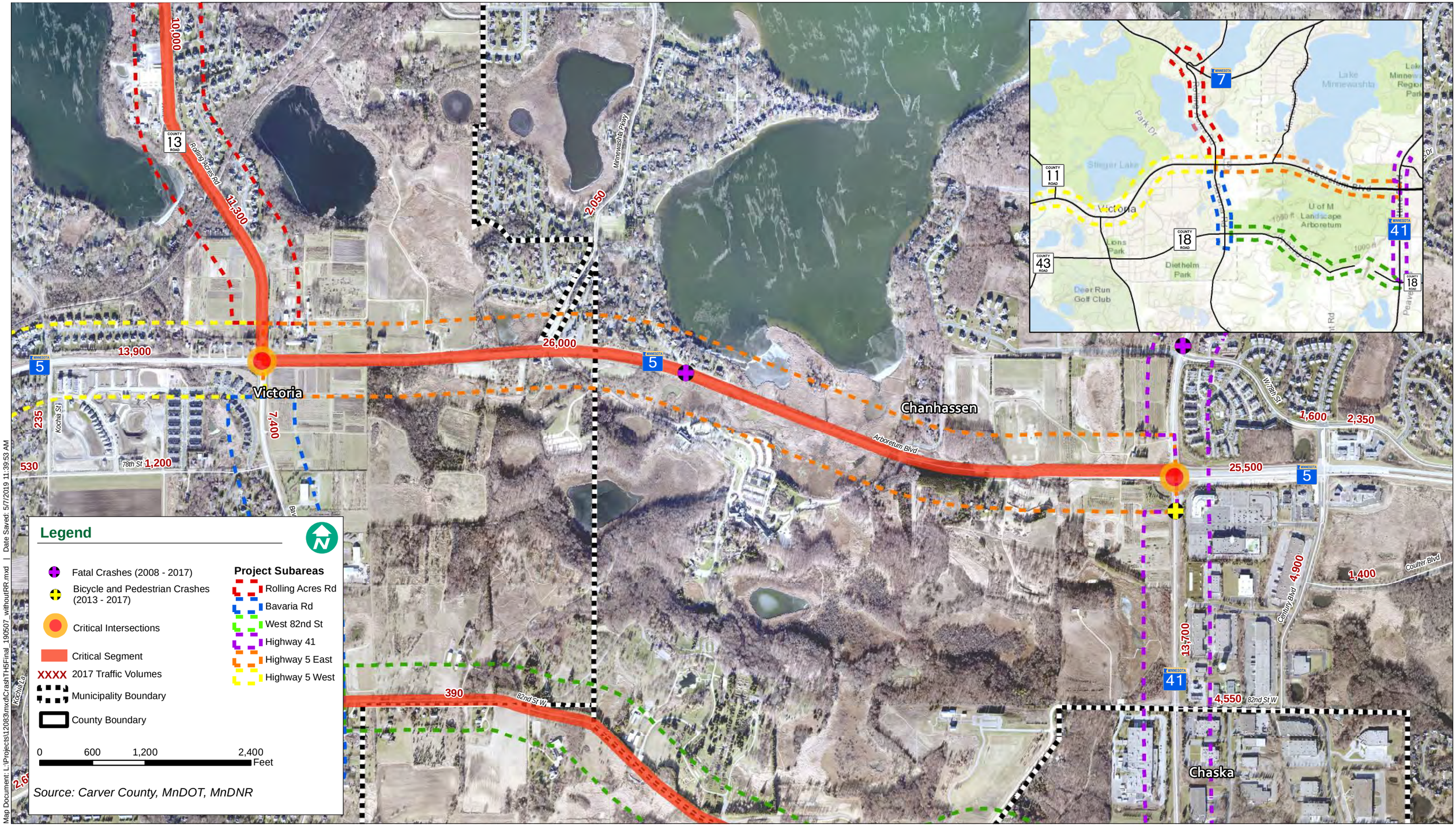

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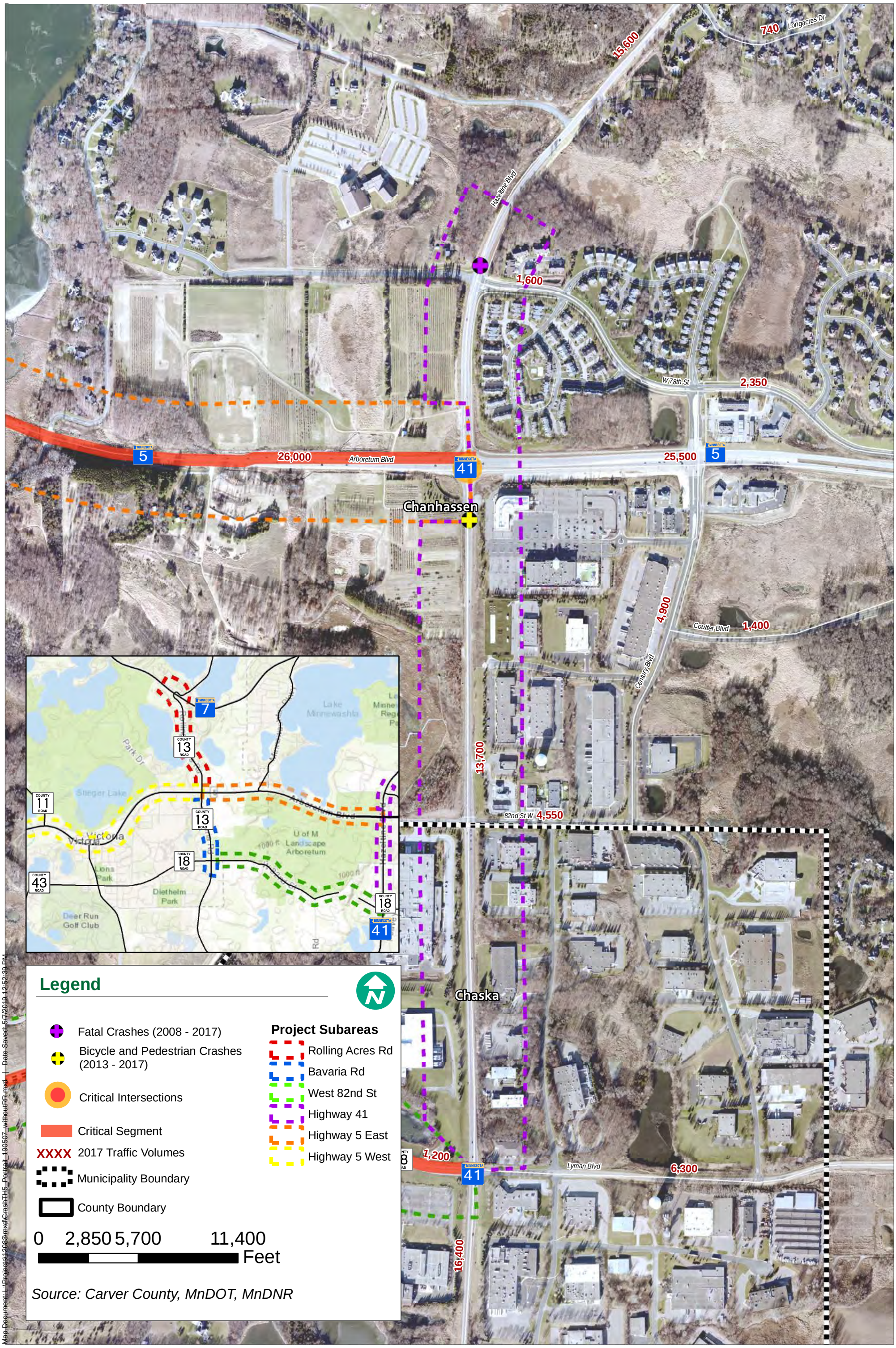
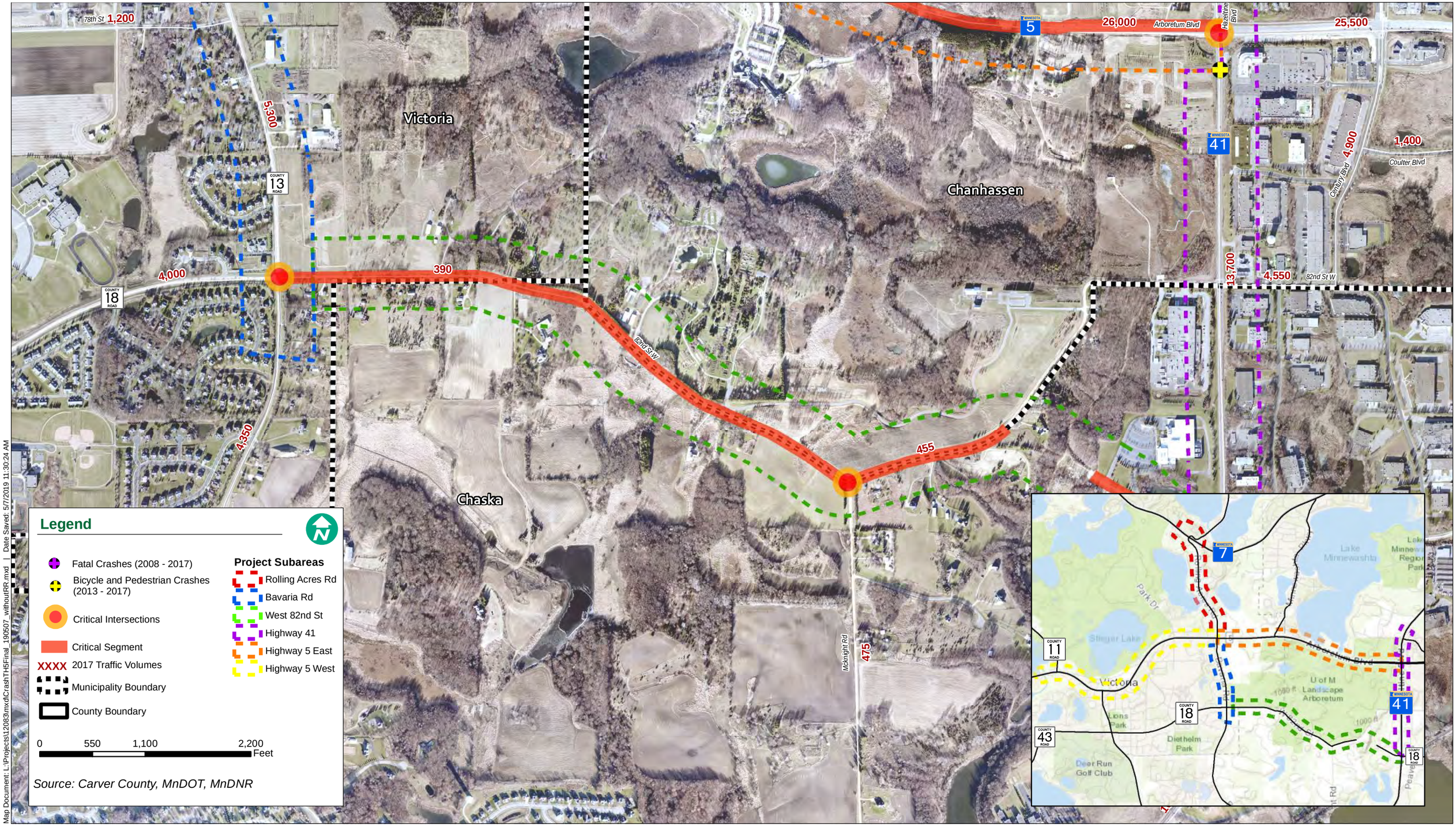
Rolling Acres Rd
11,300
13,900
Arboretum Blvd
26,000
Victoria
7,400
5,300
Kochia St
235
580
80th St
Bavaria Rd
82nd St W
390
4,000
4,350
Chaska
Lake Minnewashta
Stieger Lake
U of M Landscape Arboretum
Lions Park
Diethelm Park
Deer Run Golf Club
Legend
Fatal Crashes (2008 - 2017)
Bicycle and Pedestrian Crashes (2013 - 2017)
Critical Intersections
Critical Segment
XXXX 2017 Traffic Volumes
Municipality Boundary
County Boundary
Project Subareas
Rolling Acres Rd
Bavaria Rd
West 82nd St
Highway 41
Highway 5 East
Highway 5 West
0 2,950 5,900 11,800
Feet
Source: Carver County, MnDOT, MnDNR


740
Longacres Dr
15,600
Hazeltine Blvd
1,600
W 78th St
2,350
5
26,000
Arboretum Blvd
41
25,500
5
Chanhassen
4,900
Coulter Blvd
1,400
Century Blvd
13,700
82nd St W
4,550
Chaska
1,200
41
Lyman Blvd
6,300
16,400
7
13
11
13
18
43
18
41
Lake Minnewashta
Stieger Lake
Victoria
Lions Park
Diethelm Park
Deer Run Golf Club
U of M Landscape Arboretum
Legend
Fatal Crashes (2008 - 2017)
Bicycle and Pedestrian Crashes (2013 - 2017)
Critical Intersections
Critical Segment
XXXX 2017 Traffic Volumes
Municipality Boundary
County Boundary
Project Subareas
Rolling Acres Rd
Bavaria Rd
West 82nd St
Highway 41
Highway 5 East
Highway 5 West
0 2,850 5,700 11,400
Feet
Source: Carver County, MnDOT, MnDNR



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