Memo

Date:	Tuesday, August 06, 2019
Project:	US14-US14B Corridor Study
To:	Study Advisory Team
From:	HDR
Subject:	Crash History Review

Introduction

The purpose of this memorandum (memo) is to analyze the crash history of the US14 – US14B corridor within the project study area MRM 402.94 to MRM 423.24. The information presented in this memorandum will be utilized to identify crash trends and specific locations of safety concerns. It will also be used in conjunction with the IHSDM safety analysis (to be performed at a future date) to help identify overall safety needs along the corridor and support the development of recommended alternatives.

Crash History Review

Crash data was provided by the South Dakota Department of Transportation (SDDOT) for the inclusive years 2014 through 2018. The following sections summarize findings from reviews of high-crash frequency intersections and roadway segments.

Crash rates were calculated for all intersections and segments within the project area. Traffic volume was acquired from SDDOT and was used to develop critical crash rates to account for total vehicle exposure. Segments were also analyzed based on the severity by converting all crashes into property damage only (PDO) equivalencies.

These equivalent Property Damage Only (EPDO) rates were developed as outlined in the Highway Safety Manual (HSM) based on segment crash history and severity weight factors provided by SDDOT. The EPDO rate considers the distribution of crash severity for each site under consideration. It attaches great importance, or weight, to crashes resulting in a serious injury or a fatality, and lesser importance to slight injury or property-damage-only crashes. By converting all crashes to property-damage-only equivalents, a fair comparison can be made between all segments in terms of where the most crashes are occurring in relation to exposure.

Overall Corridor Summary

A total of 288 crashes were reported along the corridor between 2014 and 2018. 80 of those crashes were identified as intersection crashes while 208 were identified as segment crashes. **Figure 1** shows the total crashes for both intersections and segments on a yearly basis. Over the past five-year period, segment crashes have been decreasing by an approximate average of

5 crashes annually. Total yearly intersection crashes have remained mostly constant over the five-year study period, averaging about 16 crashes annually.

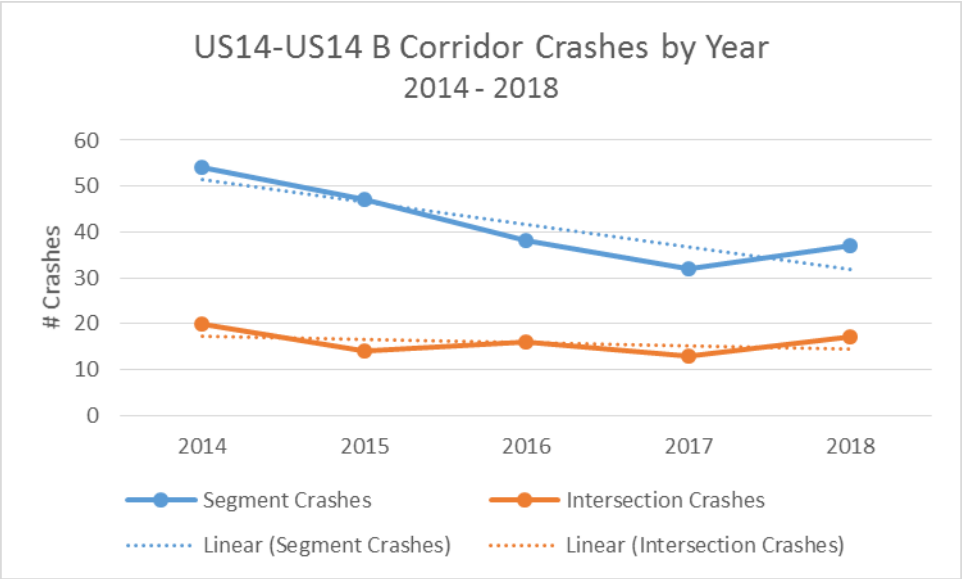


Figure 1. US14-US14B Yearly Crashes

Figure 2 provides a summary of yearly crashes by severity. While the overall total number of crashes have declined over the five-year study period, with regard to severity crashes have remained fairly constant. There was one fatal injury crash per year between 2016 and 2018. Incapacitating injury-related crashes have ranged annually from zero to two crashes. The majority of overall crashes consisted of property damage only (PDO) crashes, which are classified as no injury. Annually, these PDO crashes ranged from 37 to 64 over the five-year study period, averaging about 45 crashes per year.

Fatal and incapacitating crashes, which are generally considered the most severe, totaled to 12 crashes for the study area between 2014 and 2018. 11 (92%) of these 12 severe crashes were identified as roadway departure crashes, meaning the vehicle either crossed the median/centerline or completely ran off the road. One resulted in an overturn/rollover.

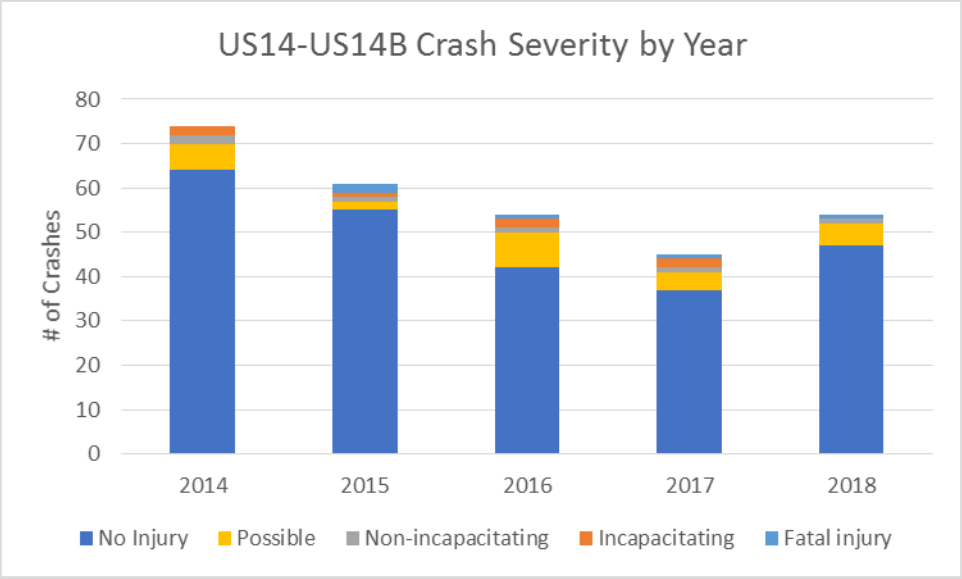


Figure 2. US14-US14B Yearly Crashes by Severity

Additional trends that were identified when analyzing the overall total corridor crashes include:

- 131 (45%) of the 288 crashes occurred during dark – not lighted conditions. In comparison, 122 (42%) of 288 crashes occurred during daylight conditions.
- 12 (4%) crashes were drug and/or alcohol-related.
- 218 (76%) of the 288 crashes occurred on dry roads, while 20 (7%) were on wet roadway conditions and 50 (17%) occurred on slush/snow/ice covered roadways.
- The majority (40%) of crashes took place between the three-month window of November to January. November experienced the highest number of crashes of any month, totaling to 53 crashes.
    - 34 (64%) of the 53 crashes that occurred in November were attributed to Wild Animal Hits.
    - 16 (47%) of the 34 crashes that occurred in December were attributed to Wild Animal Hits.
    - 10 (34%) of the 29 crashes that occurred in January were attributed to Wild Animal Hits.

Maps displaying intersection and segment crash locations along the corridor are provided in **Appendix A** and **Appendix B** of this memo.

Intersection Crashes

There were a total of 80 intersection crashes that occurred in the study area during the five-year period. A summary of the crashes at each of the 25 study intersections is shown in **Table 1**.

57 (71%) of the 80 total intersection crashes located along the study corridor occurred during daylight conditions. In addition, most intersection crashes were identified as single vehicle crashes and occurred on dry roadway conditions.

To identify which intersections held the highest safety concern, crash rates, including critical crash rate and injury weighted crash rate, were calculated for all major intersections located within the study area. Traffic volumes were acquired to calculate exposure for each intersection. For comparing critical crash rates, a study-wide average was calculated for all intersections of the same control type. This study-wide average crash rate was found to be 0.25 crashes per million entering vehicles (MEV) and was used as the basis for calculating the critical crash rates. There were only two signalized intersections located within the study area and were not included in the study-wide average crash rate calculation. An average for the two signalized intersections was also not calculated due to the sample size being too small.

Critical crash rates could not be calculated for intersections where traffic volumes were not known for all approaches.

The three intersections with the highest crash rates were identified as:

- US14/US 81 (0.77 crashes/MEV)
- US 14/US14B (west) (0.55 crashes/MEV)
- US 14B/22nd Ave (0.50 crashes/MEV)

The intersections with the highest critical crash rates were identified as:

- US 14/Brookings CR 11/458th Ave (0.60 crashes/MEV)
- US 14/Brookings CR 1/459th Ave (0.60 crashes/MEV)
- US 14B/32nd Ave (0.59 crashes/MEV)

The intersections of US 14/US 81, US 14/US14B (west), and US 14B/22nd Ave were found to have crash rates higher than their associated critical crash rates.

Table 1. Intersection Crash Rates

Intersection No.	Mainline	Crossroad	Total # of Crashes	Actual Crash Rate (Crashes/MEV)	Critical Crash Rate (Crashes/MEV)
1	US 14	US 81	7	0.77	0.58
2	US 14	Brookings CR 11 / 458th Ave	3	0.37	0.60
3	US 14	Brookings CR 1 / 459th Ave	2	0.25	0.60
4	US 14	460th Ave	1	-	-
5	US 14	461st Ave	2	-	-
6	US 14	463rd Ave	1	-	-
7	US 14	Brookings CR 5 / 464th Ave	2	0.14	0.50
8	US 14	Kasan Ave	2	0.14	0.50
9	US 14	Hansina Ave	-	-	0.51
10	US 14	Caspian Ave	8	0.48	-
11	US 14	Brookings CR 7 / 466th Ave	-	-	0.49
12	US 14	467th Ave	2	-	-
13	US 14	468th Ave	2	-	-
14	US 14	Brookings CR 9 / 16th Ave W / 469th Ave	1	0.06	0.49
15	US 14	US 14 B (west)	6	0.55	0.54
16	US 14	Western Ave	3	0.20	0.49
17	US 14 B	Medary Ave	7	0.31	-
18	US 14 B	Stadium Rd	3	0.17	0.47
19	US 14 B	Jackrabbit Ave	2	0.11	0.47
20	US 14 B	22nd Ave	11	0.50	0.45
21	US 14 B	I-29 SB Ramp Terminal	6	0.32	0.47
22	US 14 B	I-29 NB Ramp Terminal	2	0.20	0.55
23	US 14 B	32nd Ave	3	0.36	0.59
24	US 14 B	34th Ave	1	0.10	0.56
25	US 14 B	US 14 B (east)	3	0.25	0.53

Intersection of US 14/US 81

The intersection of US 14 and US 81 is a radial T intersection. The mainline (US14) is a divided highway and the minor approach (US 81) is a two-lane rural highway. The intersection experienced seven total crashes during the five-year study period, shown in **Figure 3**. The intersection crash summary is provided in **Table 2**.

Figure 3. US 14 and US 81 Intersection Crash Locations

Table 2. Intersection of US 14/US 81 Crash Severity by Manner of Collision

Manner of Collision	Severity			
	Fatal injury	Incapacitating	No injury	Total
Angle	1	1	4	6
Single Vehicle Crash	-	-	1	1

The most severe crashes included one fatality and one resulting in an incapacitating injury. The remaining five crashes were property damage only. The fatal crash took place during dark-roadway not lit conditions and was attributed to the vehicle crossing the median and colliding with another vehicle. The incapacitating injury crash occurred during daylight conditions and resulted from the driver failing to yield to another vehicle. Winter weather conditions were not reported as being a factor for either severe crash. All but one crash for this intersection, equating to 86%, were angle crashes. The majority of angle crashes, including the fatal crash, involved vehicles on the eastbound and northbound approaches.

The majority of crashes at this intersection (71%) occurred during daylight conditions. Only one crash took place during dark-not lighted conditions, as shown in **Table 3**. Two crashes occurred during winter weather conditions (snow, ice or slush) shown in **Table 4**, although both resulted in property damage only. **Table 5** provides a summary of potential contributing factors to the intersection crashes at US 14/US 81. Drugs and alcohol contributed to two crashes, as well as

winter driving conditions. Driver fatigue and/or drowsiness were not reported as factors contributing to any of the crashes this intersection. Also, no crashes at this intersection were reported to involve pedestrians or bicycles during the study period.

Table 3. Intersection of US 14/US 81 Crashes by Lighting Conditions

Lighting Conditions	Total # of Crashes	
Dark - Lighted Roadway	-	-
Dark - Roadway Not Lighted	1	14%
Dawn	-	-
Daylight	5	71%
Dusk	1	14%

Table 4. Intersection of US 14/US 81 Crashes by Roadway Conditions

Roadway Conditions	Total # of Crashes	
Dry	5	71%
Wet	-	-
Snow/Ice	2	29%

Table 5. Potential Contributing Factors for Intersection US 14/US 81 Crashes

Contributing Factors	# Crashes Yes	# Crashes No
Drugs and/or Alcohol	2	5
Winter Conditions (Snow, Ice, Slush)	2	5
Driver Fatigue or Drowsy Driving	-	7
Distracted Driving	-	7

Intersection of US14/US14B (west)

The intersection of US 14 and US 14B (west) experienced six crashes during the study period. **Figure 4** shows the crash locations for this intersection. All six crashes resulted in property damage only and all six were classified as rear-end collisions, as shown in **Table 6**. Four (67%) of the six rear-end collisions occurred on the southbound approach and two (33%) rear-end collisions took place on the westbound approach. Once again, most of the crashes happened during daylight conditions, as shown in **Table 7**. Five (83%) of the six crashes also occurred during dry conditions. Only one crash occurred during winter conditions (snow, ice, or slush), as shown in **Table 8**. **Table 9** provides a summary of potential contributing factors that were reported with the crashes. Drugs and/or alcohol were not recorded as being factors in any of the crashes at this intersection, nor was driver fatigue/drowsiness. One (17%) crashes was attributed to distracted driving. No crashes at this intersection reported involvement of pedestrians or bicycles.

Figure 4. Intersection US14/US14B (west) Crash Locations

Table 6. Intersection of US14/US14B Crash Severity by Manner of Collision

Manner of Collision	Severity				
	Incapacitating	Non-incapacitating	Possible	No Injury	Grand Total
Rear-end (front to rear)	-	-	-	6	6

Table 7. Intersection of US14/US14B (west) Crashes by Lighting Conditions

Lighting Conditions	Total # of Crashes	
Dark - Lighted Roadway	-	-
Dark - Roadway Not Lighted	2	33%
Dawn	-	-
Daylight	4	67%
Dusk	-	-

Table 8. Intersection of US14/US14B (west) Crashes by Roadway Conditions

Roadway Conditions	Total # of Crashes	
Dry	5	83%
Wet	-	-
Snow/Ice	1	17%

Table 9. Potential Contributing Factors for Intersection US14/US14B (west) Crashes

Contributing Factors	# Crashes Yes	# Crashes No
Drugs and/or Alcohol	-	-
Winter Conditions (Snow, Ice, Slush)	1	5
Driver Fatigue or Drowsy Driving	-	6
Distracted Driving	1	5

Intersection of US 14B/22nd Ave

The intersection of US14B and 22nd Ave experienced 11 total crashes between 2014 and 2018. The crash locations for this intersection are shown in **Figure 5**. The crash summary is provided in **Table 10**.

Table 10. Intersection US 14B/22nd Ave Crashes Severity by Manner of Collision

Manner of Collision	Severity				
	Incapacitating	Non-incapacitating	Possible	No Injury	Grand Total
Angle	2	2	-	4	8
Head-on (front to front)	-	-	-	2	2
Rear-end (front to rear)	-	-	1	-	1

The summary shows that there were two incapacitating injury-related crashes, as well as two non-incapacitating injury-related crashes that occurred at this intersection. The majority of crashes were angle collisions, while two were head-on collisions. Six of the eight angle collisions, as well as both head-on collisions, involved vehicles on the eastbound and northbound approaches. The rear-end collisions took place on the northbound approach.

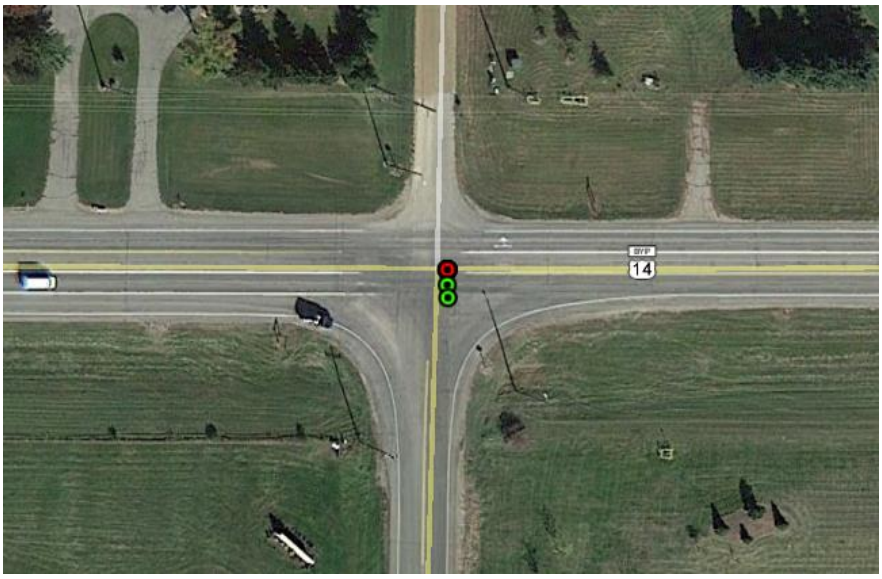


Figure 5. Intersection US14B and 22nd Ave Crash Locations

Crashes at this intersection took place during many different lighting conditions, summarized in **Table 11**. While the majority occurred during daylight conditions, four crashes (36%) took place during dark conditions or when visibility was compromised.

Table 11. Intersection US 14B/22nd Ave Crashes by Lighting Conditions

Lighting Conditions	Total # of Crashes	
Dark - Lighted Roadway	1	9%
Dark - Roadway Not Lighted	1	9%
Dawn	1	9%
Daylight	7	64%
Dusk	1	9%

Three (27%) of the 11 total crashes occurred during winter weather conditions (snow, ice, or slush), shown in **Table 12**. The contributing factors summary provided in **Table 13** shows that drugs and alcohol were not recorded as being involved in any of the 11 reported crashes at this intersection. Driver fatigue/drowsiness and distracted driving were attributed to three (27%) crashes during the study period. Once again, no crashes at this intersection were reported to have pedestrian or bicycle involvement.

Table 12. Intersection of US14B/22nd Ave Crashes by Roadway Conditions

Roadway Conditions	Total # of Crashes	
Dry	6	55%
Wet	2	18%
Snow/Ice	3	27%

Table 13. Potential Contributing Factors for Intersection US14B/22nd Ave Crashes

Contributing Factors	# Crashes Yes	# Crashes No
Drugs and/or Alcohol	-	-
Winter Conditions (Snow, Ice, Slush)	3	8
Driver Fatigue or Drowsy Driving	1	10
Distracted Driving	2	9

Corridor Segments

There were a total of 208 segment crashes during the study period. 19 segments were identified along the corridor where these crashes took place. In contrast to the intersection crashes, 118 (57%) of the 208 segment crashes occurred in dark, unlit lighting conditions. Most segment crashes occurred during dry roadway conditions. There were a few segments which showed higher rates of wild animal collisions when compared to other segments along the corridor. Segment 1 from the Project Beginning MRM 402.95 had a higher wild animal cash per mile average, as well as did Segment 8 between Caspian Ave and Brookings CR 7/466th Ave and Segment 10 between Brookings CR 9/469th Ave and US 14B (west).

A summary of the segment crash rates is provided in **Table 14**. Statewide averages based on functional classification were utilized to calculate the critical crash rates for segments, measured in million vehicle miles traveled (MVMT).

The segments with crash rates of higher values than their critical weighted crash rate, measured in million vehicle miles traveled (MVMT), include:

- Project beginning MRM 402.94 to US 81 (5.36 crashes/MVMT)
- Brookings CR 9/469th Ave to US 14B (west) (3.75 crashes/MVMT)

EPDO crash rates were developed based on injury severity of crashes, crash totals for each segment, severity weight coefficients assigned by SDDOT, and exposure. These EPDO rates are provided in **Table 15**, listed from highest to lowest.

The top three segments with the highest EPDO crash rates include:

- Project Beginning MRM 402.94 to US 81 (7.15 crashes/MVMT)
- Brookings CR 11/458th Ave to Brookings CR 1/459th Ave (4.31 crashes/MVMT)
- Brookings CR 9/469th Ave to US 14B (west) (3.75 crashes/MVMT)

Table 14. Segment Crash Rates

Segment No.	Mainline	From	To	Length (miles)	Total # of Crashes	Actual Crash Rate (Crashes/ MVMT)	Critical Crash Rate (Crashes/ MVMT)
1	US 14	Project Beginning MRM 402.94	US 81	0.15	6	5.36	2.24
2	US 14	US 81	Brookings CR 11 / 458th Ave	3.96	26	0.83	1.82
3	US 14	Brookings CR 11 / 458th Ave	Brookings CR 1 / 459th Ave	1.04	13	1.58	2.20
4	US 14	Brookings CR 1 / 459th Ave	Brookings CR 5 / 464th Ave	4.90	34	0.84	1.77
5	US 14	Brookings CR 5 / 464th Ave	Kasan Ave	0.09	-	-	2.03
6	US 14	Kasan Ave	Hansina Ave	0.27	-	-	2.03
7	US 14	Hansina Ave	Caspian Ave	0.63	3	0.36	2.03
8	US 14	Caspian Ave	Brookings CR 7 / 466th Ave	1.19	32	1.80	1.95
9	US 14	Brookings CR 7 / 466th Ave	Brookings CR 9 / 16th Ave W / 469th Ave	2.93	70	1.55	1.76
10	US 14	Brookings CR 9 / 16th Ave W / 469th Ave	US 14 B (west)	0.09	5	3.75	2.00
11	US 14	US 14 B (west)	Western Ave	0.77	7	0.73	2.70
12	US 14 B	Western Ave	Medary Ave	0.97	7	0.55	2.68
13	US 14 B	Medary Ave	Jackrabbit Ave	0.49	2	0.24	2.60
14	US 14 B	Jackrabbit Ave	22nd Ave	0.41	1	0.14	2.60
15	US 14 B	22nd Ave	I-29 SB Ramp Terminal	0.39	1	0.16	2.61
16	US 14 B	I-29 SB Ramp Terminal	I-29 NB Ramp Terminal	0.19	-	-	2.77
17	US 14 B	I-29 NB Ramp Terminal	32nd Ave	0.20	-	-	3.00
18	US 14 B	32nd Ave	34th Ave	0.22	-	-	3.00
19	US 14 B	34th Ave	US 14 B (east) MRM 423.24	1.41	1	0.11	2.17

Table 15. Injury Weighted Segment Crash Rates

Segment No.	Mainline	From	To	Length (miles)	Total # of Crashes	EPDO Rate (Crashes/MVMT))
1	US 14	Project Beginning MP MRM 402.94	US 81	0.15	6	7.15
3	US 14	Brookings CR 11 / 458th Ave	Brookings CR 1 / 459th Ave	1.04	13	4.31
10	US 14	Brookings CR 9 / 16th Ave W / 469th Ave	US 14 B (west)	0.09	5	3.75
8	US 14	Caspian Ave	Brookings CR 7 / 466th Ave	1.19	32	1.51
11	US 14	US 14 B (west)	Western Ave	0.77	7	1.15
12	US 14 B	Western Ave	Medary Ave	0.97	7	0.86
9	US 14	Brookings CR 7 / 466th Ave	Brookings CR 9 / 16th Ave W / 469th Ave	2.93	70	0.72
7	US 14	Hansina Ave	Caspian Ave	0.63	3	0.36
13	US 14 B	Medary Ave	Jackrabbit Ave	0.49	2	0.24
2	US 14	US 81	Brookings CR 11 / 458th Ave	3.96	26	0.24
4	US 14	Brookings CR 1 / 459th Ave	Brookings CR 5 / 464th Ave	4.90	34	0.19
15	US 14 B	22nd Ave	I-29 SB Ramp Terminal	0.39	1	0.16
14	US 14 B	Jackrabbit Ave	22nd Ave	0.41	1	0.14
19	US 14 B	34th Ave	US 14 B (east) MRM 423.24	1.41	1	0.08
5	US 14	Brookings CR 5 / 464th Ave	Kasan Ave	0.09	-	-
6	US 14	Kasan Ave	Hansina Ave	0.27	-	-
16	US 14 B	I-29 SB Ramp Terminal	I-29 NB Ramp Terminal	0.19	-	-
17	US 14 B	I-29 NB Ramp Terminal	32nd Ave	0.20	-	-
18	US 14 B	32nd Ave	34th Ave	0.22	-	-

Segment 1 – Project Beginning MRM 402.94 to US 81

The segment between Project Beginning MRM 402.95 to US 81 is 0.15 miles in length. **Table 16** shows the summary of the six total crashes that occurred on this segment during the five-year study period, with one being reported as a possible injury. Four (67%) of the six crashes were due to collisions with wild animals. The remaining two crashes were categorized as an angle collisions and sideswipe, opposite direction. The majority of crashes on this segment occurred during dark, unlighted conditions, as shown in **Table 17**.

Table 16. Segment 1 Crash Severity by Manner of Collision

Manner of Collision	Severity					Total
	Fatal injury	Incapacitating	Non-incapacitating	Possible	No injury	
Single Vehicle	-	-	-	-	4	4
Angle	-	-	-	-	1	1
Sideswipe, opposite direction	-	-	-	1	-	1

Table 17. Segment 1 Crashes by Lighting Conditions

Lighting Conditions	Total # of Crashes	
Dark - Lighted Roadway	-	-
Dark - Roadway Not Lighted	4	67%
Dawn	-	-
Daylight	2	33%
Dusk	-	-

Weather and roadway conditions for all six crashes on this segment were recorded as clear and dry, as shown in **Table 18**. Drugs and alcohol were not recorded as being contributing factors for any of the Segment 1 crashes, nor were driver fatigue or distraction as shown in the **Table 19** contributing factors summary. Also, no recorded crashes on this segment involved pedestrians or bicycles.

Table 18. Segment 1 Crashes by Roadway Conditions

Roadway Conditions	Total # of Crashes	
Dry	6	100%
Wet	-	-
Snow/Ice	-	-

Table 19. Summary of Potential Contributing Factors for Segment 1 Crashes

Contributing Factors	# Crashes Yes	# Crashes No
Drugs and/or Alcohol	-	6
Winter Conditions (Snow, Ice, Slush)	-	6
Driver Fatigue or Drowsy Driving	-	6
Distracted Driving	-	6

Segment 3 – Brookings CR 11 to Brookings CR 1

Segment 3 is located between Brookings CR 11/458th Ave and Brookings CR 1/459th Ave and was 1.04 miles in length. There were 13 total crashes that occurred along this segment between 2014 and 2018, two of which were fatal. A summary of crashes for this segment is provided in **Table 20**.

Table 20. Segment 3 Crashes by Severity and Manner of Collision

Manner of Collision	Severity					Total
	Fatal injury	Incapacitating	Non-incapacitating	Possible	No injury	
Single Vehicle	-	-	-	-	7	7
Angle	1	-	1	-	1	3
Sideswipe, opposite direction	-	-	-	-	2	2
Head-on	1	-	-	-	-	1

The most severe crashes resulted in fatalities and non-incapacitating injuries. These severe crashes consisted of angle and head-on collisions. This particular segment had the most fatalities than any other segment in the study area. Both fatalities resulted from cross median/centerline lane departure collisions due to the following driver contributing factors: driving too fast for conditions, failure to keep in proper lane, and driving the wrong way or direction. The single non-incapacitating crash was due to cross median/centerline lane departure as well and was described as driver driving too fast for conditions.

Seven (54%) of the 13 crashes occurred during dark, unlighted conditions as shown in **Table 21.** The remaining crashes occurred during daylight. Four (31%) of the 13 crashes occurred during winter conditions consisting of snow and/or ice, as shown in **Table 22**. Drugs and alcohol were not described as being contributing factors to any of the 13 crashes on Segment 3, as shown in **Table 23**. Only one crash was designated as having driver fatigue or drowsiness as a contributing factor. Zero of the 13 crashes on this segment involved pedestrians or bicycles.

Table 21. Segment 3 Crashes by Lighting Conditions

Lighting Conditions	Total # of Crashes	
Dark - Lighted Roadway	-	-
Dark - Roadway Not Lighted	7	54%
Dawn	-	-
Daylight	6	46%
Dusk	-	-

Table 22. Segment 3 Crashes by Roadway Conditions

Roadway Conditions	Total # of Crashes	
Dry	9	69%
Wet	-	-
Snow/Ice	4	31%

Table 23. Summary of Potential Contributing Factors for Segment 3 Crashes

Contributing Factors	# Crashes Yes	# Crashes No
Drugs and/or Alcohol	-	13
Winter Conditions (Snow, Ice, Slush)	-	9
Driver Fatigue or Drowsy Driving	1	12
Distracted Driving	-	13

Segment 10 – Brookings CR 9 to US 14B (west)

Segment 10 experienced five total crashes and was only 0.09 miles in length. All crashes occurring on this segment were property damage only, as shown in **Table 24**. Three (60%) of the five crashes were single vehicle only. The remaining two crashes consisted of a rear-end collision and sideswipe, same direction. **Table 25** shows that the majority of these crashes occurred during the daylight conditions as well. While there were no injury-related crashes on this segment, it still ranks high in terms of EPDO crash rate because of its length. This segment is only 0.09 miles in length. The low exposure and total number of crashes experienced in the five-year study period gives this segment a higher ranking in terms of EPDO crash rates.

Table 24. Segment 10 Crashes by Severity and Manner of Collision

Manner of Collision	Severity					Total
	Fatal injury	Incapacitating	Non-incapacitating	Possible	No injury	
Single Vehicle	-	-	-	-	3	3
Rear-end	-	-	-	-	1	1
Sideswipe, same direction	-	-	-	-	1	1

Table 25. Segment 10 Crashes by Lighting Conditions

Lighting Conditions	Total # of Crashes	
Dark - Lighted Roadway	-	-
Dark - Roadway Not Lighted	1	20%
Dawn	1	20%
Daylight	3	60%
Dusk	-	-

No crashes located on this segment occurred during winter conditions, as shown in **Table 26**. **Table 27** provides a summary of the number of affected crashes from various potential contributing factors. Drugs and alcohol were not recorded as being factors contributing to any of the five crashes as well. Two (40%) of the five crashes were attributed to driver fatigue/drowsiness and distracted driving. Zero crashes located on this segment involved pedestrians or bicycles.

Table 26. Segment 10 Crashes by Roadway Conditions

Roadway Conditions	Total # of Crashes	
Dry	4	80%
Wet	1	20%
Snow/Ice	-	-

Table 27. Potential Contributing Factors for Segment 10 Crashes

Contributing Factors	# Crashes Yes	# Crashes No
Drugs and/or Alcohol	-	5
Winter Conditions (Snow, Ice, Slush)	-	5
Driver Fatigue or Drowsy Driving	1	4
Distracted Driving	1	4

Crash Trends

Bypass Trends

The intersections within the bypass area were evaluated further to identify any overarching trends that may support modifications on a corridor level rather than limited to specific locations. These bypass intersections include:

- US 14/Western Ave
- US 14B/Medary Ave
- US 14B/Stadium Rd
- US 14B/Jackrabbit Ave
- US 14B/22nd Ave
- US 14B/I-29 SB Ramp Terminal
- US 14B/I-29 NB Ramp Terminal
- US 14B/32nd Ave
- US 14B/34th Ave

There were a total of 38 crashes at the bypass intersections. 10 of those crashes were categorized as rear-end collisions, and 21 were categorized as angle collisions. Rear-end intersection crashes occurred mostly in the westbound direction, although no intersection in particular appears to be experiencing a higher rate of westbound rear-ends than others. There were a total of seven rear-end crashes in the westbound direction within the bypass intersection area and zero rear-end crashes in the eastbound direction.

Angle crashes were shown to be more predominant in the eastbound direction, totaling 15 crashes for the bypass intersection area while there was only one angle crash reported in the westbound direction. The majority of eastbound angle crashes involved vehicles traveling in eastbound and northbound directions. The intersection of US 14/22nd Ave had the highest number of eastbound angle crashes, accounting for seven crashes of the total 15 eastbound area crashes during the study period.

Winter Trends

50 (17%) of the 288 total study area crashes were attributed to winter-related roadway conditions, which include ice, slush, or snow covered roads. **Table 28** provides a yearly summary of winter-related crashes by severity.

Table 28. Winter-Related Crash Summary

Winter Conditions (Ice, Slush, Snow)	2014	2015	2016	2017	2018	Total
Fatal injury	-	1	-	-	-	1
Non-incapacitating	2	-	-	-	-	2
Possible	-	1	-	1	2	4
No injury	13	7	6	5	10	41
Wild animal hit	-	1	-	-	1	2
Total	15	10	6	6	13	50

Winter-related crashes resulting in severe injuries appear to have declined over the five-year period. 41 (82%) of the 50 winter-related crashes reported having no injuries and resulted in property damage only. **Appendix C** provides a visual representation of where the winter-related crashes occurred along the study corridor between the years 2014 and 2018. As can be seen from the winter-related crash map, there are two location ranges that appear to have higher frequencies of winter-related crashes than the rest the corridor.

First, Segment 3 between CR 11/458th Ave and CR 1/459th Ave had a total of seven winter weather-related crashes, four resulting in injuries including one fatality. Three (43%) of the seven winter crashes were reported as being angle collisions. The two most severe injury crashes, including the fatality and the non-incapacitating injury, resulted from angle collisions in this segment. Two (29%) crashes were reported as rear-end collisions, followed by sideswipe, opposite direction and single vehicle crash attributing to one crash each.

The second range stretched between the City of Volga and the City of Brookings, or Caspian Ave/465th Ave and CR 9/469th Ave (Segments 8 and 9). The 26 winter-related crashes along this section of corridor were reported as resulting in property damage only. 16 (62%) of the 26 weather-related crashes between Volga and Brookings were single vehicle collisions (running off the road and colliding with a fixed object or ditch), six (23%) were reported as rear-end collisions and four (15%) were characterized as sideswipe, same direction collisions.

Crashes between Volga and Brookings

There was a large grouping of rear-end segment crashes between the cities of Volga and Brookings, specifically between Caspian Ave and CR 9/469th Ave (Segments 8 and 9) shown in **Table 29**. For these two segments, there were nine rear-end crashes that occurred during the study period, as well as 68 wild animal collisions. The 68 crashes related to wild animals for these two segments contributes to 52% of all wild animal segment crashes for the entire study corridor. Of the nine rear-end crashes that occurred on Segments 8 and 9, six were in the eastbound direction and three were in the westbound direction.

Also, while not located between Volga and Brookings, it important to note that Segment 3, which is located between CR 11/458th Ave and CR 1/459th Ave, had the highest number of head-on/opposite direction collisions. Of the 13 segment crashes that occurred on this segment, three (23%) were categorized as either being head-on or sideswipe, opposite direction. The head-on collision was recorded as a fatal crash. Only one of the three were recorded to involve winter weather road conditions.

Table 29. Segment Crash Summary by Manner of Collision

Segment No.	Angle	Rear-End	Sideswipe, Same Direction	Sideswipe, Opp Direction	Head-On	Single Vehicle – No Animal	Single Vehicle – Wild Animal	Total
1	1	-	-	1	-	-	4	6
2	-	1	1	2	-	7	15	26
3	3	-	-	2	1	1	6	13
4	1	-	-	-	-	3	30	34
5	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-
7	-	1	-	-	-	2	-	3
8	-	1	1	-	-	7	23	32
9	2	8	3	-	-	12	45	70
10	-	1	1	-	-	3	-	5
11	-	1	1	-	-	3	2	7
12	-	1	-	-	-	2	4	7
13	-	-	-	-	-	1	1	2
14	1	-	-	-	-	-	-	1
15		-	-	-	-	1	-	1
16	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	1	1

Attachments:

Appendix A – US14-US14B Intersection Crashes 2014-2018

Appendix B – US14-US14B Segment Crashes 2014-2018

Appendix C – Winter-Related Crashes (All Crashes) 2014-2018

US HWY 14 E
455 AVE
456 AVE
457 AVE
Brookings CR 11
458 AVE
Brookings CR 1
459 AVE
Begin Project MRM 402.94
US HWY 14 W
211 ST
US HWY 14
US HWY 81
457 AVE

Legend

- Fatal injury
- Incapacitating
- Non-incapacitating
- Possible
- No injury
- StudyArea
- City Limits

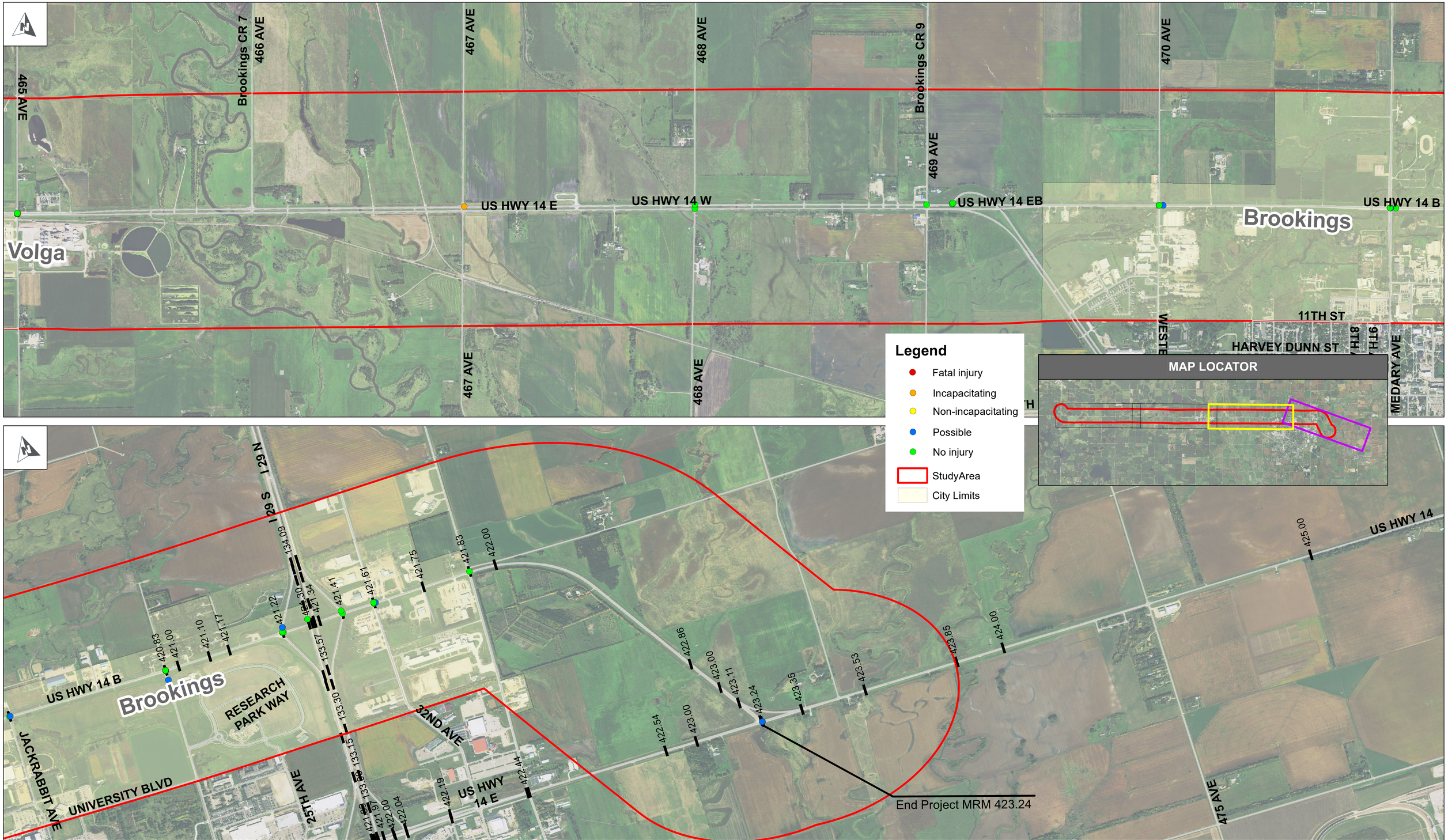
MAP LOCATOR

462 AVE
Brookings CR 5
410.00
411.00
411.86
412.00
412.73
413.00
413.08
413.22
413.35
413.39
413.97
US HWY 14
1ST ST
2ND ST
SAMARA AVE
KASAN AVE
ASTRACHAN AVE
Volga
4TH ST
5TH ST
6TH ST
211A ST
461 AVE
462 AVE
463 AVE
212 ST

APPENDIX A - US HIGHWAY 14 - US HIGHWAY 14B

INTERSECTION CRASHES - 2014-2018

PATH: S:\GIS\PROJECTS\SDDOT\US14_CORRIDORSTDY\MAP_DOCS\DRAFT\TRAFFIC_CRASH\2019-0717_CRASH_MAP_INTERSECTIONS.MXD - USER: MLANGER - DATE: 7/18/2019



APPENDIX A - US HIGHWAY 14 - US HIGHWAY 14B

INTERSECTION CRASHES - 2014-2018

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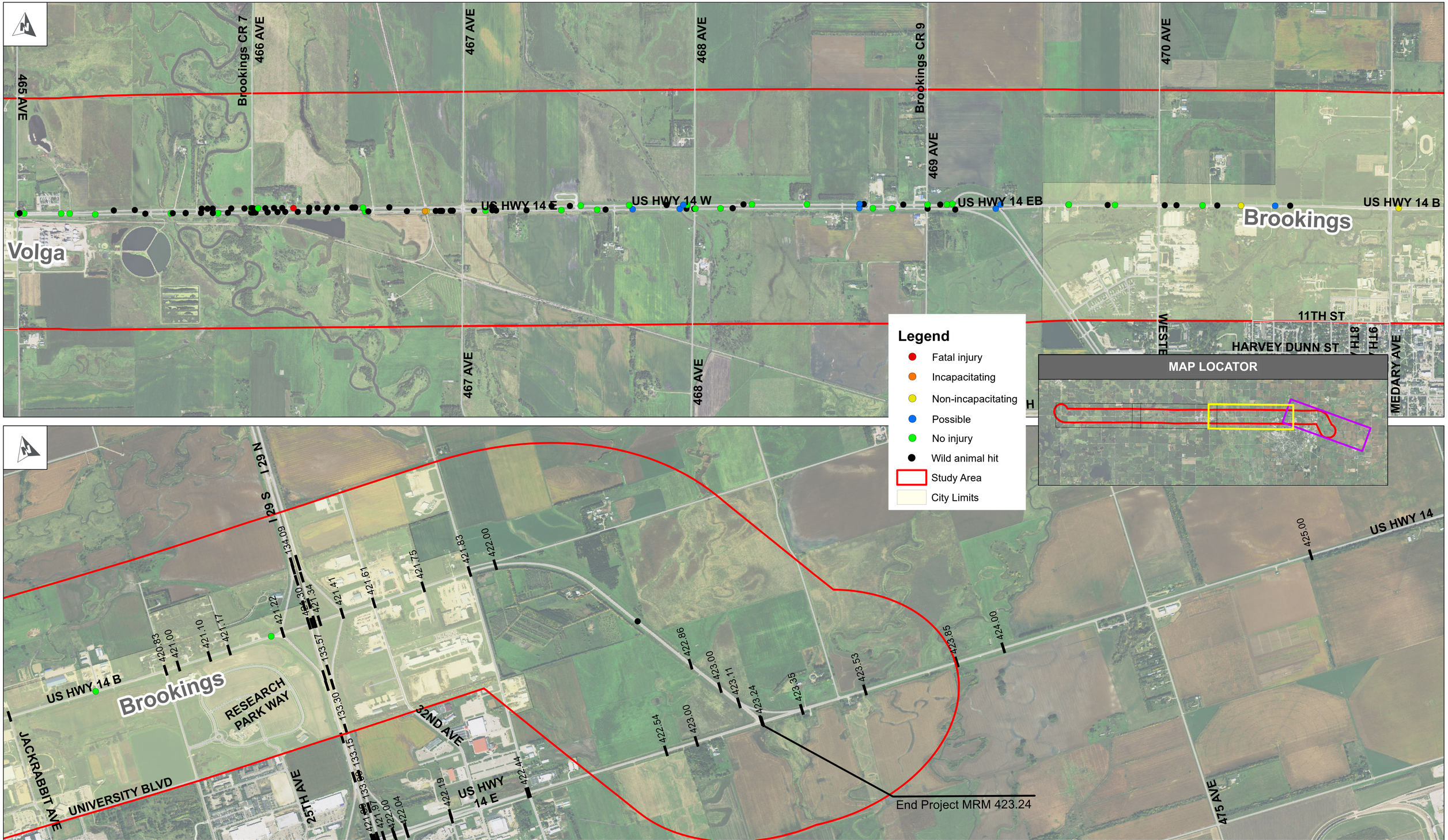
APPENDIX B - US HIGHWAY 14 - US HIGHWAY 14B

SEGMENTS CRASH DATA - 2014-2018

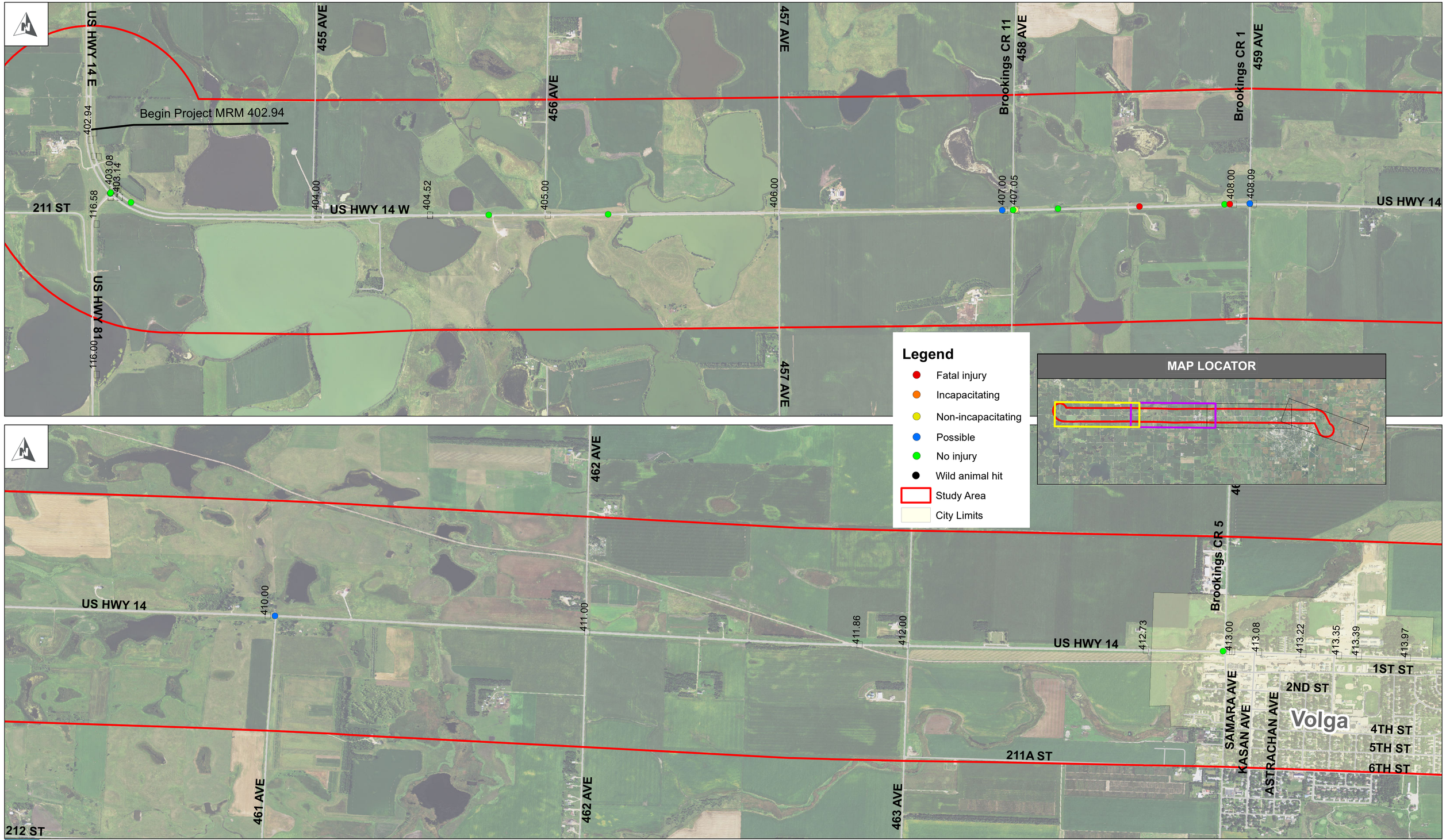
PATH: S:\GIS\PROJECTS\SDDOT\US14_CORRIDORSTDY\MAP_DOCS\DRAFT\TRAFFIC_CRASH\2019-0717_CRASH_MAP_SEGMENTS.MXD - USER: MLANGER - DATE: 7/18/2019



APPENDIX B - US HIGHWAY 14 - US HIGHWAY 14B

SEGMENTS CRASH DATA - 2014-2018

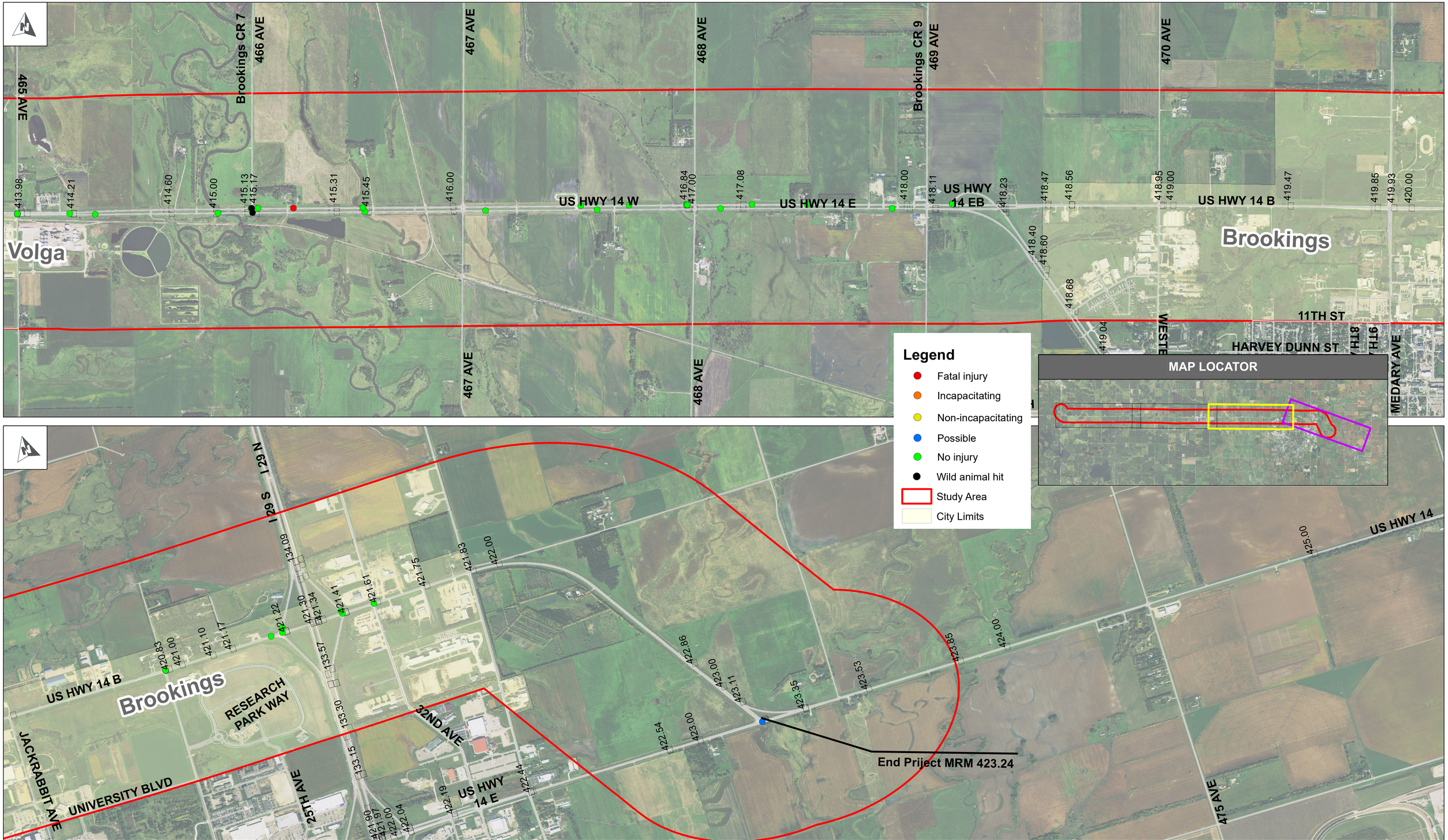
PATH: S:\GIS\PROJECTS\SDDOT\US14_CORRIDORSTDY\MAP_DOCS\DRAFT\TRAFFIC_CRASH\2019-0717_CRASH_MAP_SEGMENTS.MXD - USER: MLANGER - DATE: 7/18/2019



APPENDIX C - US HIGHWAY 14 - US HIGHWAY 14B

WINTER-RELATED CRASHES (ALL CRASHES) - 2014-2018

PATH: S:\GIS\PROJECTS\SDDOT\US14_CORRIDORSTDY\MAP_DOCS\DRAFT\TRAFFIC_CRASH\CRASH_MAP_WINTERCONDITIONS.MXD - USER: MLANGER - DATE: 7/18/2019



APPENDIX C - US HIGHWAY 14 - US HIGHWAY 14B

WINTER-RELATED CRASHES (ALL CRASHES) - 2014-2018

PATH: S:\GIS\PROJECTS\SDDOT\US14_CORRIDORSTDY\MAP_DOCS\DRAFT\TRAFFIC_CRASH\CRASH_MAP_WINTERCONDITIONS.MXD - USER: MLANGER - DATE: 7/18/2019