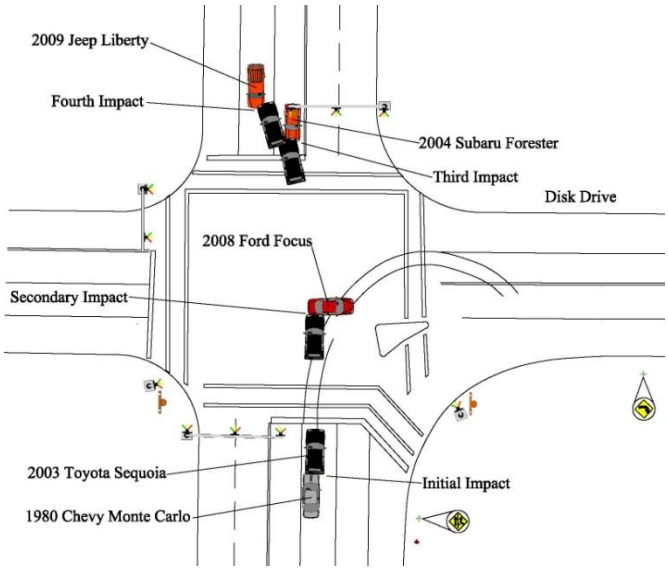
PW081412-17

RAPID CITY
INTERSECTION CRASH REPORT
2009 – 2011



Prepared by:

Engineering Services Division / Traffic Operations Group

Public Works Department

May 2012

PART 1 – SIGNALIZED INTERSECTIONS

Methodology

This analysis used the performance measure of critical rate as the basis for choosing which signalized intersections to review in detail. The process is included in the Highway Safety Manual 1st Edition (American Association of State Highway and Transportation Officials) and key procedural points are as follows:

- A 200 foot radius analysis zone was created for each signalized intersection within the City of Rapid City.

- Using crash location data provided by the State of South Dakota and spatial analysis tools available in ArcGIS, the number of crashes occurring at each signalized intersection was found for the years 2009, 2010, and 2011. Traffic signals that were not yet installed on 01/01/2009 were excluded from further review.

- An average annual crash rate was calculated for each signalized intersection using traffic volume data collected by staff. Crash rates are used to account for exposure at different locations and are expressed in average annual crashes per million entering vehicles (MEV).

- Those signalized intersections that have experienced what is considered to be an abnormally high crash rate were indentified. The basis for determining what is a high rate is a comparison with each intersection's unique "critical crash rate." The critical crash rate is a statistical measure that serves as a screening measure to identify locations where crash occurrence is higher than should be expected due solely to chance. The critical crash rate calculations used in this study assumed a 95% confidence level.

- A critical rate index was calculated for each signalized intersection by dividing the annual rate by the critical rate. The intersections were then ranked by the index and those locations with an index greater than 1.00 were reviewed in detail. The detailed review process entailed reading each available crash report to classify crash types and determine any trends.

Findings

- Table 1 presents the listing of all of the signalized intersections within the City.

- Figure 1 maps the locations of those intersections that were found to have a critical rate index greater than 1.00.

- A detailed summary of crash patterns and recommendations for each intersection that were found to have a critical rate index greater than 1.00 follows:

Main St. & Mt. Rushmore Rd. (U.S.-16) (65 total crashes, 2.03 crashes/MEV)

- Rear end crashes accounted for 37% of all crashes reviewed.

- Northbound left turn crashes accounted for 25% of all crashes reviewed.

- Parking related crashes on Main St. accounted for 12% of all crashes reviewed.

Recommendations:

The South Dakota Department of Transportation (SDDOT) has a road reconstruction project scheduled for FY 2015. It is expected that the project will include some traffic signal improvements that may alleviate the northbound left turn crashes.

Review existing traffic timing to determine if queue lengths on Mt. Rushmore Rd. can be reduced.

Lacrosse St. & I-90 South Ramp (53 total crashes, 2.01 crashes/MEV)

- Rear end crashes accounted for 57% of all crashes reviewed.

    - Rear end crashes occurring in the eastbound right turn channel accounted for 30% of all crashes reviewed.

- Southbound left turn crashes accounted for 15% of all crashes reviewed.

- Driveway related crashes on Lacrosse St. accounted for 10% of all crashes reviewed.

Recommendations:

The SDDOT has an intersection improvement project scheduled for FY 2013. This project will eliminate the eastbound right turn channel and should significantly reduce the number of rear end crashes.

The SDDOT also has a total interchange reconstruction project scheduled for FY 2016. Although a final design has not yet been developed, the alternatives under consideration will reconfigure the left turn operation, which will significantly reduce the number of left turn crashes. It is also expected that some private property accesses may be reconfigured, which may reduce the number of driveway related crashes.

St. Joseph St. & St. Patrick St., (47 total crashes, 1.66 crashes/MEV)

- Driveway related crashes accounted for 34% of all crashes reviewed.
- Angle crashes due to red light running accounted for 21% of all crashes reviewed.
- Rear end crashes accounted for 21% of all crashes reviewed.

Recommendations:

Verify that existing yellow and all-red phase lengths are adequate for operating speed.

Increase enforcement to reduce red light violations.

Lacrosse St. & E. North St. (54 total crashes, 1.48 crashes/MEV)

- Rear end crashes accounted for 35% of all crashes reviewed.
- Angle crashes due to red light running accounted for 17% of all crashes reviewed.
- Left turn crashes accounted for 17% of all crashes reviewed.

Recommendations:

Increase enforcement to reduce red light violations.

The upcoming E. North St. reconstruction project will include some traffic signal improvements that may alleviate the rear end and left turn crashes.

The opening of a second Wal-Mart store and the completion of the E. Anamosa St. project are expected to change traffic volumes and travel patterns in the area. Crash experience should be continued to be monitored to determine if the identified patterns continue.

Cambell St. & E. North St. (47 total crashes, 1.46 crashes/MEV)

- Westbound left turn crashes accounted for 47% of all crashes reviewed.
- Rear end crashes accounted for 23% of all crashes reviewed.

Recommendations:

Investigate whether a protected only left turn operation is feasible for westbound E. North St.

Omaha St. (S.D.-44) & West Blvd. (75 total crashes, 1.36 crashes/MEV)

- Rear end crashes accounted for 65% of all crashes reviewed.
    - Rear end crashes occurring in the right turn channels accounted for 49% of all crashes reviewed.

Recommendations:

The SDDOT has an intersection improvement project scheduled for FY 2014. This project will eliminate the right turn channels on each approach and should significantly reduce the number of rear end crashes.

Lacrosse St. & Anamosa St. (48 total crashes, 1.40 crashes/MEV)

- Rear end crashes accounted for 33% of all crashes reviewed.

- Driveway related crashes accounted for 19% of all crashes reviewed.
- Angle crashes due to red light running accounted for 15% of all crashes reviewed.

Recommendations:

Increase enforcement to reduce red light violations.

The opening of a second Wal-Mart store and the completion of the E. Anamosa St. project are expected to change traffic volumes and travel patterns in the area. Crash experience should be continued to be monitored to determine if the identified patterns continue.

Omaha St. (S.D.-44) & Cambell St. (62 total crashes, 1.34 crashes/MEV)

- Rear end crashes accounted for 42% of all crashes reviewed.
- Angle crashes due to red light running accounted for 31% of all crashes reviewed.

Recommendations:

Verify that existing yellow and all-red phase lengths are adequate for operating speed.

Increase enforcement to reduce red light violations.

E. North St. & Spruce St. (32 total crashes, 1.44 crashes/MEV)

- Rear end crashes accounted for 41% of all crashes reviewed.
- Driveway related crashes accounted for 28% of all crashes reviewed.
- Angle crashes due to red light running accounted for 22% of all crashes reviewed.

Recommendations:

The ongoing E. North St. reconstruction project will include traffic signal improvements that may alleviate the rear end and crashes.

The opening of a second Wal-Mart store and the completion of the E. Anamosa St. project are expected to change traffic volumes and travel patterns in the area. Crash experience should be continued to be monitored to determine if the pattern of crashes related to red light running continues.

Lacrosse St. & I-90 North Ramp (37 total crashes, 1.40 crashes/MEV)

- Rear end crashes accounted for 35% of all crashes reviewed. Almost half of the crashes involved northbound vehicles.

- Northbound angle crashes due to red light running accounted for 16% of all crashes reviewed.

Recommendations:

The SDDOT has a total interchange reconstruction project scheduled for FY 2016. Although a final design has not yet been developed, it is expected that the project should significantly reduce all crash types.

East Blvd. & Main St. (27 total crashes, 1.34 crashes/MEV)

- Angle crashes due to red light running accounted for 37% of all crashes reviewed.

- Sideswipe crashes due to improper lane use accounted for 22% of all crashes reviewed.

- Driveway related crashes accounted for 19% of all crashes reviewed.

- Rear end crashes accounted for 19% of all crashes reviewed.

Recommendations:

Increase enforcement to reduce red light violations.

Install additional lane use signs for Main St.

Determine if it is feasible to install additional traffic signal heads for northbound and westbound traffic.

5th St. & Main St. (37 total crashes, 1.24 crashes/MEV)

- Rear end crashes accounted for 51% of all crashes reviewed.
- Northbound left turn crashes accounted for 22% of all crashes reviewed.

Recommendations:

Determine if it is feasible to install additional traffic signal heads for southbound traffic.

Review existing traffic timing to determine if queue lengths on 5th St. can be reduced.

6th St. & St. Joseph St. (22 total crashes, 1.26 crashes/MEV)

- Parking related crashes on St. Joseph St. accounted for 41% of all crashes reviewed.
- Rear end crashes accounted for 23% of all crashes reviewed.

Recommendations:

None at this time.

Main St. & Mountainview Rd. (S.D.-44) (51 total crashes, 1.09 crashes/MEV)

- Rear end crashes accounted for 35% of all crashes reviewed.
- Driveway related crashes accounted for 24% of all crashes reviewed.

Recommendations:

None at this time.

Omaha St. (S.D.-44) & East Blvd. (41 total crashes, 1.06 crashes/MEV)

- Rear end crashes accounted for 46% of all crashes reviewed.
- Westbound left turn crashes accounted for 24% of all crashes reviewed.

Recommendations:

Work cooperatively with the SDDOT to investigate whether a protected only left turn operation is feasible for westbound Omaha St. (S.D.-44).

Omaha St. (S.D.-44) & 5th St. (52 total crashes, 1.00 crashes/MEV)

- Rear end crashes accounted for 71% of all crashes reviewed.
    - Rear end crashes occurring in the southbound right turn channel accounted for 42% of all crashes reviewed.
- Angle crashes due to red light running accounted for 15% of all crashes reviewed.

Recommendations:

Work cooperatively with the SDDOT to develop a project to eliminate the southbound right turn channel.

PART 2 – NON-SIGNALIZED INTERSECTIONS

Methodology

This analysis used the performance measure of method of moments as the basis for choosing which signalized intersections to review in detail. The process is included in the Highway Safety Manual 1st Edition (American Association of State Highway and Transportation Officials) and key procedural points are as follows:

- A 100 foot radius analysis zone was created for each non-signalized intersection within the City of Rapid City.
- Using crash location data provided by the State of South Dakota and spatial analysis tools available in ArcGIS, the number of crashes occurring at each intersection was found for the years 2009, 2010, and 2011
- The intersections were divided into four control types:
    - ALL-WAY STOP control
    - STOP control
    - YIELD control

- No control

- Within each control group, an adjusted crash frequency was developed for each intersection. This adjusted value is based on the average crash frequency for the group and the sample variance. Like the critical rate, the adjusted crash frequency is an indicator of a specific expected value based on the entire sample.

- A potential improvement index (PII) was calculated for each intersection by subtracting the adjusted crash frequency from the actual crash frequency. The intersections were then ranked by PII and those locations with an index greater than 3 were reviewed in detail. The detailed review process entailed reading each available crash report to determine any crash trends.

Findings

- Figure 2 maps the locations of those intersections that were found to have a potential improvement index greater than 3.

- A detailed summary of crash patterns and recommendations for each intersection that were found to have a potential improvement index greater than 3 follows:

Haines Ave. & Knollwood Dr. (23 total crashes, PII = 6)

- Angle crashes involving vehicles turning or crossing from Knollwood Dr. accounted for 52% of all crashes reviewed.

Recommendations:

This intersection was included in the South Dakota Department of Transportation's 2010 Roadway Safety Improvement Report. That report recommended establishing a westbound left turn prohibition in the "afternoon hours". The current data indicates that crashes occurred from 10:56 to 21:20, thus suggesting the previously recommended limited left turn prohibition be extended to a total left turn prohibition.

E. North St. & Cherry St. (13 total crashes, PII = 3)

No apparent crash pattern observed.

Recommendations:

None at this time.

St. Joseph St. & St. Charles St. (11 total crashes, PII = 3)

- Angle crashes involving vehicles turning St. Charles St. accounted for 55% of all crashes reviewed.

- In 2007 a left turn prohibition was enacted at the intersection based on the number of crashes occurring there. The majority of crashes were found to have occurred when a vehicle turning right from St. Joseph St. blocked sight distance for stopped vehicles at St. Charles St. In 2008 a right turn lane for westbound St. Joseph St. was constructed to mitigate the sight distance problem and the left turn prohibition was rescinded.

Recommendations:

None at this time.

Main St. & Dakota Dr. (11 total crashes, PII = 3)

- Angle crashes involving vehicles turning from one of the (several) adjacent driveways accounted for 64% of all crashes reviewed.

Recommendations:

None at this time.

Anamosa St. & Maple Ave. (10 total crashes, PII = 3)

- Angle crashes resulting from vehicles simultaneously leaving the stopped position accounted for 50% of all crashes reviewed.

Recommendations:

None at this time.

TABLE 1
SIGNALIZED INTERSECTIONS
SORTED BY CRITICAL RATE INDEX

RANK	ROAD 1	ROAD 2	2009 CRASHES	2010 CRASHES	2011 CRASHES		3-YEAR TOTAL	MEV/YEAR	2009 - 2011 TOTAL CRASHES	ANNUAL CRASH RATE (1)	ANNUAL CRITICAL CRASH RATE (2)	CRITICAL RATE INDEX (3)
1	MT RUSHMORE RD	MAIN ST	20	25	19		64	10.51	64	2.03	0.98	2.08
2	LACROSSE	I-90 SOUTH RAMP	13	19	21		53	8.80	53	2.01	1.00	2.02
3	ST JOSEPH ST	ST PATRICK ST	16	11	20		47	9.42	47	1.66	0.99	1.68
4	LACROSSE ST	E. NORTH ST	19	12	23		54	12.19	54	1.48	0.96	1.54
5	CAMBELL ST	E NORTH ST	13	13	21		47	10.75	47	1.46	0.97	1.50
6	OMAHA ST	WEST BLVD	23	22	30		75	18.43	75	1.36	0.92	1.47
7	LACROSSE ST	ANAMOSA ST	7	23	18		48	11.44	48	1.40	0.97	1.45
8	OMAHA ST	CAMBELL ST	23	20	19		62	15.40	62	1.34	0.94	1.43
9	E NORTH ST	SPRUCE	11	8	13		32	7.41	32	1.44	1.02	1.42
10	LACROSSE	I-90 NORTH RAMP	17	10	10		37	8.80	37	1.40	1.00	1.41
11	EAST BLVD	MAIN ST	9	8	10		27	6.72	27	1.34	1.03	1.30
12	5TH ST	MAIN ST	9	10	18		37	9.93	37	1.24	0.98	1.27
13	6TH ST	ST JOSEPH ST	10	7	5		22	5.80	22	1.26	1.05	1.20
14	MAIN ST	MOUNTAINVIEW RD	14	19	18		51	15.55	51	1.09	0.94	1.17
15	OMAHA ST	EAST BLVD	8	13	20		41	12.88	41	1.06	0.95	1.11
16	OMAHA ST	5TH ST	15	19	18		52	17.41	52	1.00	0.93	1.08
17	9TH ST	ST JOSEPH ST	8	7	3		18	5.80	18	1.03	1.05	0.98
18	CAMBELL ST	ST PATRICK ST	6	16	15		37	13.47	37	0.92	0.95	0.96
19	OMAHA ST	LACROSSE ST	6	15	10		31	11.13	31	0.93	0.97	0.96
20	MT RUSHMORE RD	CATHEDRAL BLVD	7	10	10		27	9.56	27	0.94	0.99	0.95
21	5TH ST	ST JOSEPH ST	12	5	14		31	11.39	31	0.91	0.97	0.94
22	US-16	CATRON	6	9	7		22	7.74	22	0.95	1.01	0.94
23	JACKSON BLVD	SHERIDAN LAKE RD	6	10	15		31	11.72	31	0.88	0.96	0.92
24	STURGIS RD	MAIN ST	9	6	5		20	7.19	20	0.93	1.02	0.91
25	5TH ST	CATHEDRAL BLVD	5	8	16		29	11.02	29	0.88	0.97	0.90
26	5TH ST	NEW YORK ST E	5	12	4		21	7.69	21	0.91	1.01	0.90
27	STURGIS RD	W CHICAGO ST	6	6	11		23	8.61	23	0.89	1.00	0.89
28	ANAMOSA ST	HAINES AVE	5	12	8		25	9.64	25	0.86	0.99	0.88

TABLE 1
SIGNALIZED INTERSECTIONS
SORTED BY CRITICAL RATE INDEX

RANK	ROAD 1	ROAD 2	2009 CRASHES	2010 CRASHES	2011 CRASHES		3-YEAR TOTAL	MEV/YEAR	2009 - 2011 TOTAL CRASHES	ANNUAL CRASH RATE (1)	ANNUAL CRITICAL CRASH RATE (2)	CRITICAL RATE INDEX (3)
29	LACROSSE ST	DISK DR	6	4	4		14	5.26	14	0.89	1.06	0.83
30	MAIN ST	WEST BLVD	9	11	5		25	10.44	25	0.80	0.98	0.82
31	MT. RUSHMORE RD	ST JOSEPH ST	8	9	14		31	13.36	31	0.77	0.95	0.81
32	DEADWOOD AVE	W CHICAGO ST	7	7	12		26	11.13	26	0.78	0.97	0.80
33	MT. RUSHMORE RD	ST PATRICK ST	8	10	8		26	11.24	26	0.77	0.97	0.80
34	ELK VALE RD	HOMESTEAD ST	4	5	7		16	6.53	16	0.82	1.03	0.79
35	LACROSSE ST	EGLIN ST	9	9	8		26	11.44	26	0.76	0.97	0.78
36	OMAHA ST	MOUNTAINVIEW RD	9	8	14		31	14.13	31	0.73	0.94	0.77
37	7TH ST	ST JOSEPH ST	5	0	9		14	5.80	14	0.80	1.05	0.77
38	MOUNTAINVIEW RD	CANYON LAKE DR	5	8	4		17	7.26	17	0.78	1.02	0.77
39	JACKSON BLVD	CANYON LAKE DR	8	1	5		14	5.84	14	0.80	1.05	0.76
40	HAINES AVE	I-90	9	7	8		24	10.88	24	0.74	0.97	0.76
41	MAIN	JACKSON	7	8	16		31	14.67	31	0.70	0.94	0.75
42	EAST BLVD	NEW YORK ST E	6	3	3		12	5.00	12	0.80	1.07	0.75
43	HAINES AVE	DISK	10	7	5		22	10.40	22	0.70	0.98	0.72
44	ST PATRICK ST	S VALLEY DR	1	9	1		11	4.71	11	0.78	1.08	0.72
45	E NORTH ST	ANAMOSA ST	8	1	6		15	6.99	15	0.72	1.02	0.70
46	MT. RUSHMORE RD	KANSAS CITY ST	2	6	12		20	9.71	20	0.69	0.98	0.70
47	MT RUSHMORE RD	COLUMBUS ST	4	2	12		18	8.98	18	0.67	0.99	0.67
48	MAIN ST	7TH ST	5	4	4		13	6.21	13	0.70	1.04	0.67
50	ELK VALE RD	CHEYENNE BLVD	4	6	3		13	6.53	13	0.66	1.03	0.64
49	CAMBELL ST	FAIRMONT BLVD	6	6	4		16	8.29	16	0.64	1.00	0.64
51	JACKSON BLVD	32ND ST	3	3	7		13	6.64	13	0.65	1.03	0.63
52	MAIN ST W	SHERIDAN LAKE RD	4	7	6		17	9.13	17	0.62	0.99	0.63
53	CATRON BLVD	SHERIDAN LAKE RD	4	4	3		11	5.58	11	0.66	1.06	0.62
54	5TH ST	NORTH ST	4	9	3		16	8.75	16	0.61	1.00	0.61
55	OMAHA ST	MT RUSHMORE RD	7	12	8		27	15.84	27	0.57	0.93	0.61
56	5TH ST	ST PATRICK ST	3	7	8		18	10.18	18	0.59	0.98	0.60

TABLE 1
SIGNALIZED INTERSECTIONS
SORTED BY CRITICAL RATE INDEX

RANK	ROAD 1	ROAD 2	2009 CRASHES	2010 CRASHES	2011 CRASHES		3-YEAR TOTAL	MEV/YEAR	2009 - 2011 TOTAL CRASHES	ANNUAL CRASH RATE (1)	ANNUAL CRITICAL CRASH RATE (2)	CRITICAL RATE INDEX (3)
57	E NORTH ST	MILWAUKEE	3	3	6		12	6.53	12	0.61	1.03	0.59
58	LACROSSE ST	MERIDIAN LN	7	4	4		15	9.34	15	0.54	0.99	0.54
59	MAIN ST	9TH ST	5	3	2		10	5.95	10	0.56	1.05	0.54
60	E NORTH ST	I-90	4	3	2		9	5.29	9	0.57	1.06	0.53
61	CANYON LAKE DR	SHERIDAN LAKE RD	3	5	4		12	7.48	12	0.53	1.02	0.53
62	OMAHA ST.	MAPLE AVE	3	10	4		17	11.42	17	0.50	0.97	0.51
63	5TH ST	KANSAS CITY ST	3	2	8		13	8.61	13	0.50	1.00	0.50
64	32ND ST	CANYON LAKE DR	3	2	4		9	5.73	9	0.52	1.05	0.50
65	JACKSON BLVD	PARK DR	3	4	3		10	6.61	10	0.50	1.03	0.49
66	HAINES AVE	LINDBURG ST	2	4	5		11	7.59	11	0.48	1.01	0.48
67	DEADWOOD AVE	CEMENT PLANT RD	5	4	1		10	6.86	10	0.49	1.03	0.47
68	HAINES AVE	VAN BUREN ST	2	6	3		11	7.88	11	0.47	1.01	0.46
69	ST JOSEPH ST	WEST BLVD	7	3	5		15	11.24	15	0.44	0.97	0.46
70	DEADWOOD AVE	N PLAZA DR	4	2	2		8	6.02	8	0.44	1.04	0.42
71	MAIN ST	6TH ST	4	4	0		8	6.21	8	0.43	1.04	0.41
72	MAIN ST	3RD ST	4	2	0		6	4.53	6	0.44	1.09	0.41
73	DEADWOOD AVE	UNIVERSAL DR	4	2	2		8	6.35	8	0.42	1.04	0.40
74	MT RUSHMORE RD	FRANKLIN ST	8	1	2		11	9.34	11	0.39	0.99	0.40
75	EAST BLVD	ST JOSEPH ST	3	3	2		8	6.53	8	0.41	1.03	0.39
76	SHERIDAN LAKE RD	CORRAL DR	1	3	3		7	5.66	7	0.41	1.05	0.39
99	SD-44	SCHOOL DR	4	2	4		10	8.87	10	0.38	0.99	0.38
77	W CHICAGO	44TH	3	1	1		5	4.04	5	0.41	1.10	0.37
78	FLORMANN ST	SHERIDAN LAKE RD	3	3	1		7	6.08	7	0.38	1.04	0.37
79	MAIN ST W	SOO SAN DR	4	0	1		5	4.16	5	0.40	1.10	0.36
80	JACKSON BLVD	FULTON ST	2	6	0		8	7.19	8	0.37	1.02	0.36
81	ST PATRICK ST	CREEK DR	1	3	3		7	6.31	7	0.37	1.04	0.36
82	DEADWOOD AVE	COMMERCE RD	4	3	0		7	6.75	7	0.35	1.03	0.34
83	5TH ST	MINNESOTA ST	0	5	0		5	4.78	5	0.35	1.08	0.32

TABLE 1
SIGNALIZED INTERSECTIONS
SORTED BY CRITICAL RATE INDEX

RANK	ROAD 1	ROAD 2	2009 CRASHES	2010 CRASHES	2011 CRASHES		3-YEAR TOTAL	MEV/YEAR	2009 - 2011 TOTAL CRASHES	ANNUAL CRASH RATE (1)	ANNUAL CRITICAL CRASH RATE (2)	CRITICAL RATE INDEX (3)
84	MOUNTAINVIEW RD.	JACKSON BLVD	5	1	3		9	9.53	9	0.31	0.99	0.32
85	CAMBELL ST	MINNESOTA ST	0	3	3		6	6.39	6	0.31	1.04	0.30
86	ELK VALE RD	CONCOURSE DR	3	1	4		8	9.67	8	0.28	0.98	0.28
87	CATRON BLVD	5TH ST	0	3	2		5	5.86	5	0.28	1.05	0.27
88	DEADWOOD AVE	I-90 NORTH RAMP	1	3	2		6	7.30	6	0.27	1.02	0.27
89	5TH ST	COLUMBUS ST	2	2	2		6	7.83	6	0.26	1.01	0.25
90	OMAHA ST	3RD ST	3	1	4		8	10.95	8	0.24	0.97	0.25
91	US-16	SD-79	2	2	2		6	8.21	6	0.24	1.00	0.24
92	SD-44	ST. PATRICK	4	2	1		7	10.11	7	0.23	0.98	0.24
94	HAINES AVE	PAHASAPA RD	0	2	2		4	6.75	4	0.20	1.03	0.19
95	PRAIRIE AVE	ST PATRICK ST	0	0	3		3	4.89	3	0.20	1.07	0.19
96	ELM AVE	FAIRMONT BLVD	0	2	1		3	5.04	3	0.20	1.07	0.19
97	LACROSSE ST	MALL DR	1	0	2		3	5.26	3	0.19	1.06	0.18
102	E. NORTH ST	EGLIN	0	0	4		4	7.30	4	0.18	1.02	0.18
98	SD-44	MICKELSON DR	0	3	1		4	8.76	4	0.15	1.00	0.15
100	ELK VALE RD	I-90	0	2	0		2	6.57	2	0.10	1.03	0.10
101	5TH ST	MEADE ST	1	0	1		2	6.97	2	0.10	1.02	0.09
104	AIRPORT RD	TERMINAL RD	1	0	0		1	3.29	1	0.10	1.14	0.09
106	MAIN ST W	NORDBY LN	0	0	1		1	4.16	1	0.08	1.10	0.07
107	CATHEDRAL	SENIOR HIGH RISE	0	1	0		1	5.40	1	0.06	1.06	0.06

(1) CRASH RATE = TOTAL # CRASHES / MILLION VEHICLES ENTERING INTERSECTION

(2) CRITICAL CRASH RATE : a statistical measure used to identify intersections for review; a typical location would be expected to have a crash rate lower than the critical rate 95 percent of the time (and higher 5 percent of the time).

(3) CRITICAL RATE INDEX = CRASH RATE / CRITICAL CRASH RATE

PW081412-17

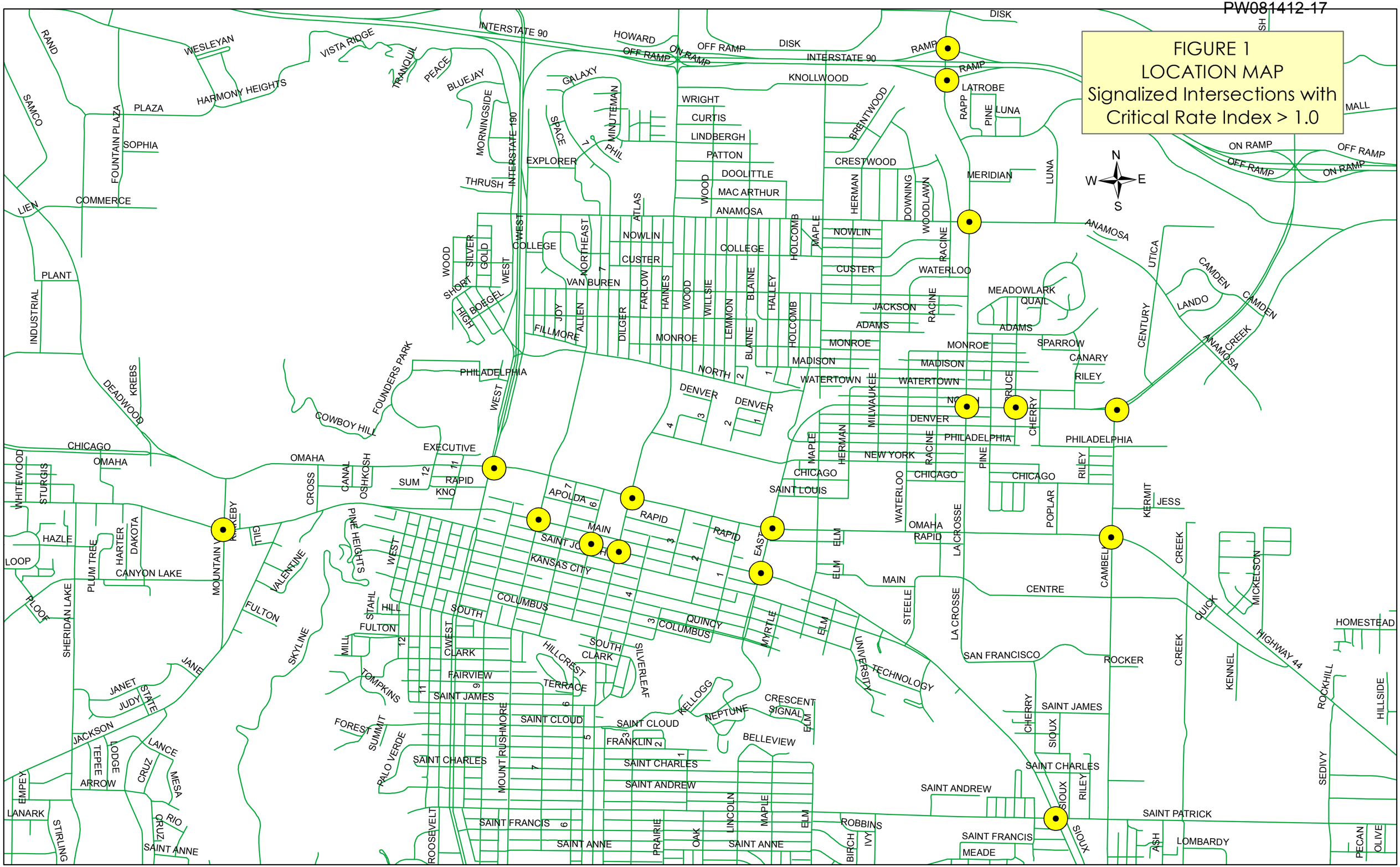


FIGURE 1
LOCATION MAP
Signalized Intersections with
Critical Rate Index > 1.0
N
W
E
S
INTERSTATE 90
INTERSTATE 190
HOWARD
OFF RAMP
ON RAMP
DISK
RAMP
KNOLLWOOD
LATROBE
RAPP
PINE
LUNA
MALL
WESLEYAN
VISTA RIDGE
TRANQUIL
PEACE
BLUEJAY
HARMONY HEIGHTS
PLAZA
SAMCO
RAND
FOUNTAIN PLAZA
SOPHIA
MORNINGSIDE
GALAXY
SPACE
MINUTEMAN
PHIL
EXPLORER
THRUSH
LIEN
COMMERCE
WRIGHT
CURTIS
LINDBERGH
PATTON
DOOLITTLE
MAC ARTHUR
ANAMOSA
WOOD
ATLAS
BRENTWOOD
CRESTWOOD
HERMAN
DOWNING
WOODLAWN
MERIDIAN
LUNA
ON RAMP
OFF RAMP
OFF RAMP
ON RAMP
ANAMOSA
UTICA
CAMDEN
CAMDEN
LANDO
CENTURY
ANAMOSA
CREEK
PLANT
INDUSTRIAL
WEST
COLLEGE
NORTHEAST
NOWLIN
CUSTER
VAN BUREN
SILVER
GOLD
SHORT
HIGH
BOEGEL
JOY
ALLEN
FILLMORE
DILGER
FARLOW
HAINES
WILLSIE
LEMMON
BLAINE
HALLEY
HOLCOMB
MAPLE
NOWLIN
CUSTER
WATERLOO
RACINE
MEADOWLARK
QUAIL
JACKSON
ADAMS
MONROE
MADISON
WATERTOWN
SPARROW
CANARY
RILEY
MILWAUKEE
BRUCE
CHERRY
NORTH
DENVER
DENVER
PHILADELPHIA
NEW YORK
CHICAGO
SAINT LOUIS
PHILADELPHIA
PHILADELPHIA
CHICAGO
CHICAGO
FOUNDERS PARK
COWBOY HILL
KREBS
DEADWOOD
WEST
CHICAGO
OMAHA
WHITEWOOD
STURGIS
EXECUTIVE
OMAHA
CROSS
CANAL
OSHKOSH
SUM
RAPID
KNO
APOLDA
MAIN
RAPID
RAPID
EAST
SAINT JOSEPH
KANSAS CITY
COLUMBUS
QUINCY
COLUMBUS
MYRTLE
ELM
ELM
ELM
WATERLOO
OMAHA
RAPID
LA CROSSE
POPLAR
RILEY
KERMIT
JESS
CAMBELL
CREEK
HAZLE
LOOP
PLUM TREE
HARTER
DAKOTA
CANYON LAKE
MOUNTAIN
KIRKEBY
GILL
VALENTINE
PINE HEIGHTS
WEST
STAHL
HILL
FULTON
FULTON
MILL
SOUTH
CLARK
FAIRVIEW
SAINT JAMES
TOMPKINS
HILLCREST
TERRACE
SOUTH
CLARK
SILVERLEAF
SKYLINE
SHERIDAN LAKE
PLOOF
JANE
JANET
JUDY
STATE
JACKSON
TEPEE
LODGE
LANCE
CRUZ
MESA
ARROW
EMPEY
LANARK
STIRLING
RIO
CRUZ
SAINT ANNE
FOREST
SUMMIT
PALO VERDE
SAINT CHARLES
SAINT CLOUD
SAINT CLOUD
FRANKLIN
SAINT CHARLES
SAINT ANDREW
MOUNT RUSHMORE
ROOSEVELT
SAINT FRANCIS
SAINT ANNE
PRAIRIE
OAK
LINCOLN
MAPLE
ELM
SAINT ANNE
KELLOGG
NEPTUNE
CRESCENT
SIGNAL
ELM
BELLEVIEW
ROBBINS
BIRCH
IVY
UNIVERSITY
TECHNOLOGY
STEELE
LA CROSSE
SAN FRANCISCO
ROCKER
CENTRE
MAIN
CHERRY
SIOUX
SAINT JAMES
SAINT CHARLES
SAINT ANDREW
SAINT FRANCIS
MEADE
SIOUX
RILEY
SAINT PATRICK
ASH
LOMBARDY
KENNEL
MICKELSON
QUICK
HIGHWAY 44
HOMESTEAD
ROCKHILL
HILLSIDE
SEDIVY
PECAN
OLIVE

PW081412-17

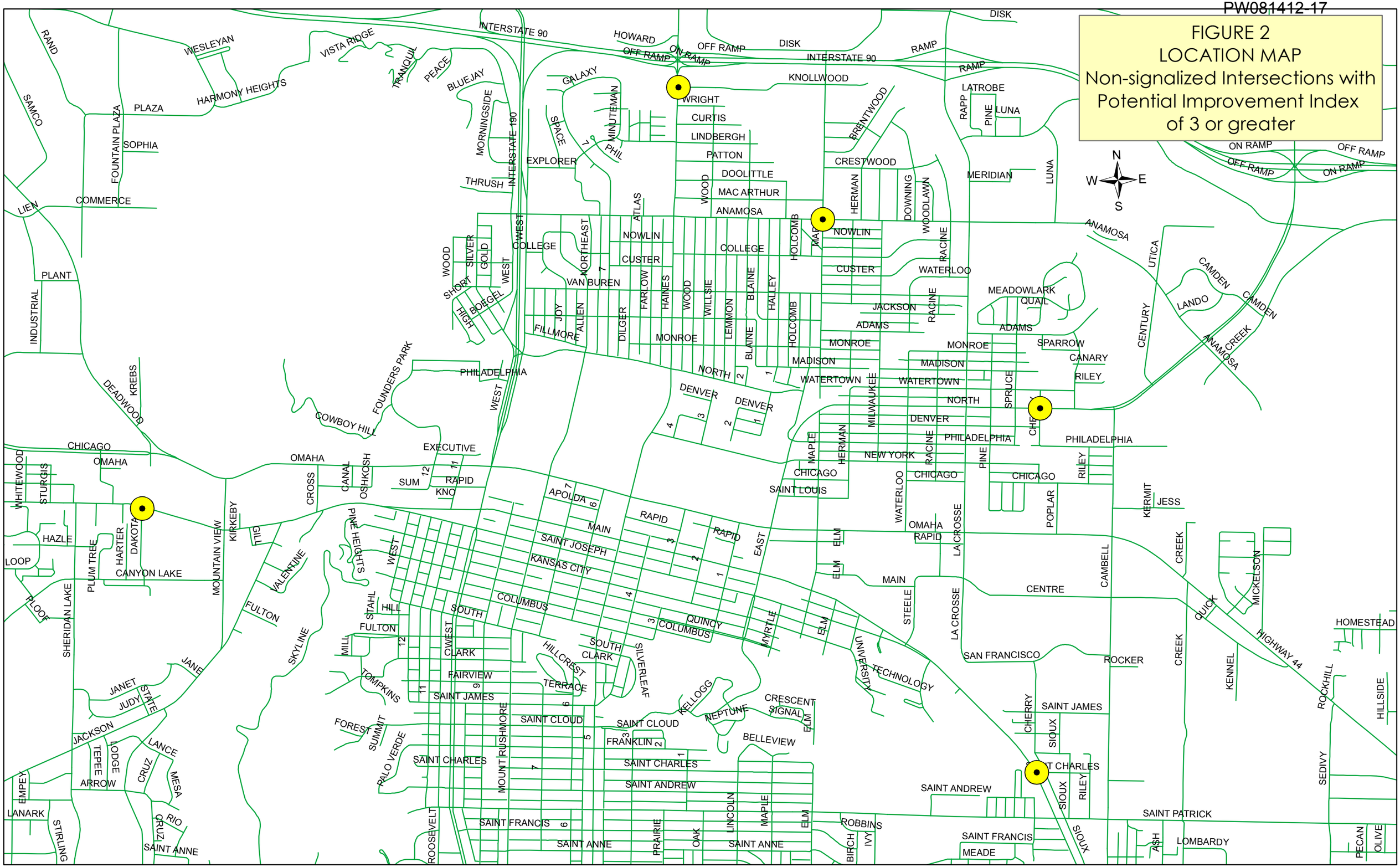



FIGURE 2
LOCATION MAP
Non-signalized Intersections with Potential Improvement Index of 3 or greater