

Monitoring Report

Chapter 4

TRAVEL

Updated March 2016



The Bismarck-Mandan Monitoring Report is considered a “living” document. Timely updates of each chapter are made as data becomes available. Each chapter of the Monitoring Report lists the month and year of its last revision.

Table of Contents

Existing Conditions & Recent Trends.....	1
Figure 4.1 Means of Transportation to Work for Various Jurisdictions, 2014.....	1
Figure 4.2 Mean Travel Time to Work (in Minutes) for Various Jurisdictions 2000-2010.....	2
Figure 4.3 Travel Time to Work (in Minutes) for Various Jurisdictions, 2014.....	2
Figure 4.4 Time Leaving Home to Get to Work for Various Jurisdictions, 2014.....	3
Figure 4.5 Vehicles Available by Household for Various Jurisdictions, 2014.....	3
Figure 4.6 County to County Commuting Patterns of Burleigh County Residents, 2000-2010.....	4
Figure 4.7 County to County Commuting Patterns of Morton County Residents, 2000-2010.....	4
Motorized Travel.....	5
Figure 4.8 MPO Counties: Urban and Rural Comparison of Vehicle Miles Traveled Change.....	5
Figure 4.9 MPO Counties Per Capita Vehicle Miles Traveled.....	5
Figure 4.10 Burleigh and Morton VMT per Capita Compared to National Annual Average Fuel Price.....	6
Freight.....	6
Figure 4.11 Potential Freight Generators by NAICS in the Bismarck-Mandan MPO Area.....	6
Map 4.1 Change in Average Daily Traffic Counts from 2012-2014 (Map 1).....	7
Map 4.2 Change in Average Daily Traffic Counts from 2012-2014 (Map 2).....	8
Map 4.3 Change in Average Daily Traffic Counts from 2012-2014 (Map 3).....	9
Figure 4.12 Significant Freight Corridors in the Bismarck-Mandan MPO Area, 2014.....	10
Functional Classification of Roadways.....	10
Figure 4.13 Bismarck-Mandan MPO Functionally Classified Roadways in Comparison to FHWA Recommended Guideline.....	10
Map 4.4 Possible Freight Generators (2011).....	11
Map 4.5 Percent Truck Traffic of Total Average Daily Traffic (ADT). (2014).....	12
Map 4.6 Percent Change of Average Daily Truck Traffic Cunts (2012-2014).....	13
Map 4.7 Functionally Classified Roadways (2014).....	14
Bridge Structures.....	15
Figure 4.14 Functionally Obsolete and Structurally Deficient Bridges in the Bismarck-Mandan MPO Area.....	15
Safety.....	15
Figure 4.15 Ranking of 3 Year Major High Crash Locations in Bismarck, ND 2011-2013, 2012-2014.....	15
Figure 4.16 North Dakota Identified Urban High Crash Locations Report Trends.....	16
Figure 4.17 Comparison of Fatalities and Incapacitating Injuries per 100 Million VMT.....	16
Map 4.8 Deficient Bridge Locations (2015).....	17
Map 4.9 3 year Urban High Crash Locations (2012-2014).....	18
Map 4.10 Crashes by Severity 2013-2015.....	19
Public Transportation.....	20
Figure 4.18 Total Annual Unlinked Trips for Paratransit and Fixed Route (2004-2013).....	20
Figure 4.19 Total Annual Unlinked Trips per Vehicle Revenue Miles (2004-2013).....	20
Map 4.11 Capital Area Transit (CAT) Routes (2015).....	21
Bicycle and Pedestrian Transportation.....	22
Figure 4.20 Summary of Cyclist or Pedestrian and Motor Vehicle Crashes by Severity.....	22
Map 4.12 Bicycle and Pedestrian Network.....	23
Map 4.13 Cyclist & Pedestrian Crash Locations (2013-2015).....	24

4 TRAVEL

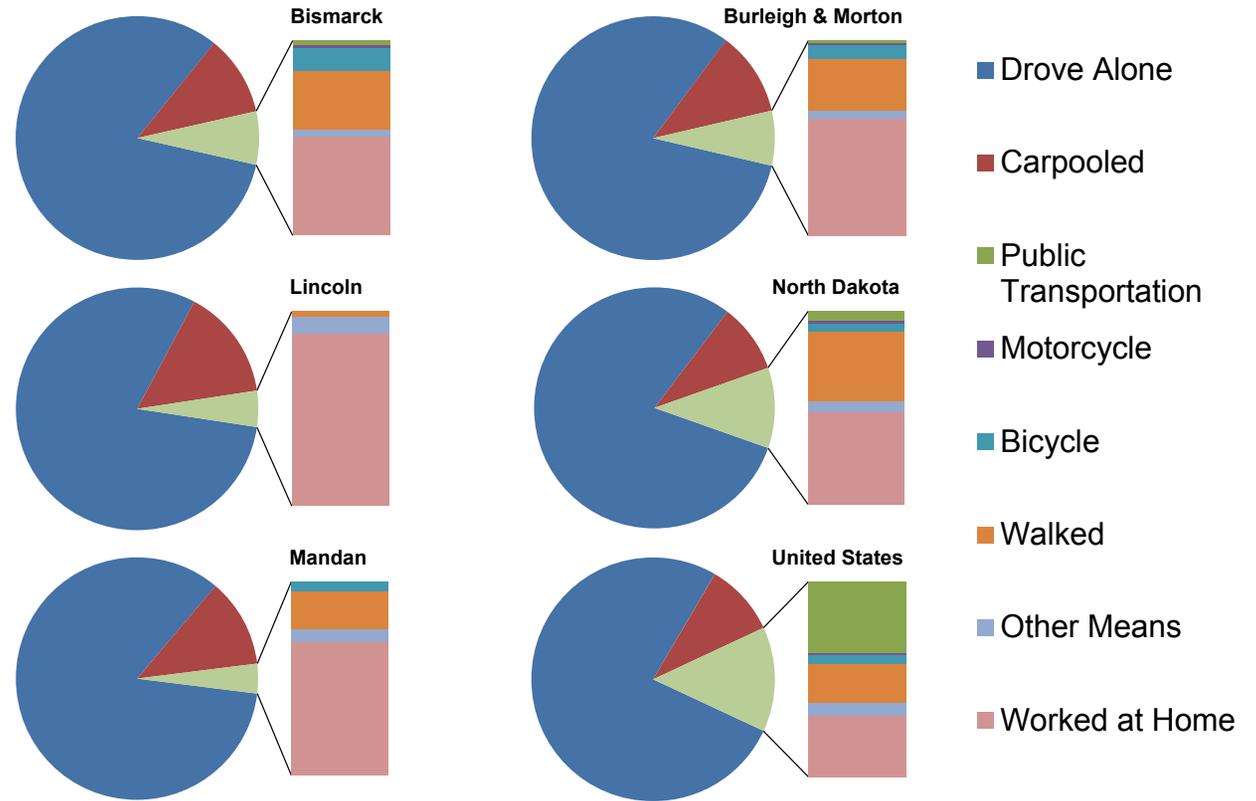
The Bismarck-Mandan Metropolitan Planning Organization is tasked with planning and programming of transportation within the region. Therefore an understanding of transportation conditions and trends is necessary to consider improvements to travel in the area.

EXISTING CONDITIONS & RECENT TRENDS

Means of Transportation

Figure 4.1 identifies the most commonly used modes of transportation used to get to work for jurisdictions in the Bismarck-Mandan MPO area, in comparison to North Dakota and the United States based on Census Bureau estimates. Generally, for all jurisdictions, individuals driving alone is the most common means of transportation to work. It appears that a slightly higher percentage of individuals drove alone in the Bismarck-Mandan MPO area and North Dakota compared to the United States. Considering the United States, a significantly higher percentage of individuals used public transportation in comparison to the Bismarck-Mandan MPO area and North Dakota. Estimates for Lincoln indicate that a higher percentage of people carpool or work from home. Further the percentage of people who drove alone or carpooled has remained relatively consistent since the 2010 Decennial Census. The percentage of those surveyed indicating they had walked has decreased slightly since 2010. The estimated percentage of people who bicycle to work in Bismarck has increased nearly four times since 2000, from .17% to .82%.

Figure 4.1: Means of Transportation to Work for Various Jurisdictions, 2014



Means of Transportation	Bismarck	Lincoln	Mandan	Burleigh & Morton County	North Dakota	US
Drove Alone	82.30%	80.41%	84.23%	81.60%	79.95%	76.49%
Carpooled	10.63%	14.78%	11.83%	11.16%	9.25%	9.60%
Public Transportation	0.19%	0.00%	0.00%	0.11%	0.55%	5.07%
Motorcycle	0.10%	0.00%	0.00%	0.06%	0.13%	0.21%
Bicycle	0.82%	0.00%	0.21%	0.54%	0.48%	0.59%
Walked	2.13%	0.12%	0.76%	1.91%	3.87%	2.79%
Other Means	0.27%	0.44%	0.27%	0.28%	0.63%	0.88%
Worked at Home	3.57%	4.24%	2.69%	4.35%	5.14%	4.37%

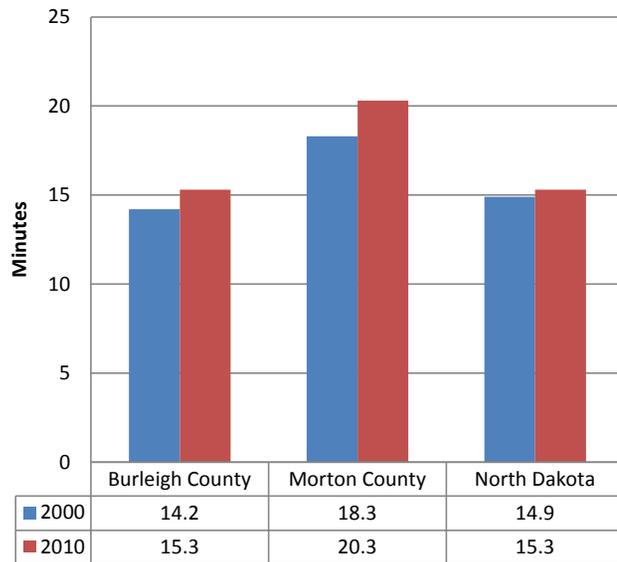
Based on the US Census Bureau American Community Survey 2010-2014 Means of Transportation to Work (B08301) data.

Travel Time to Work

Figures 4.2 and 4.3 represent various characteristics of travel time in the Bismarck-Mandan MPO area compared to North Dakota and the United States. From 2000 to 2010 the mean travel time increased by one minute in Burleigh County and in Morton County by two minutes.

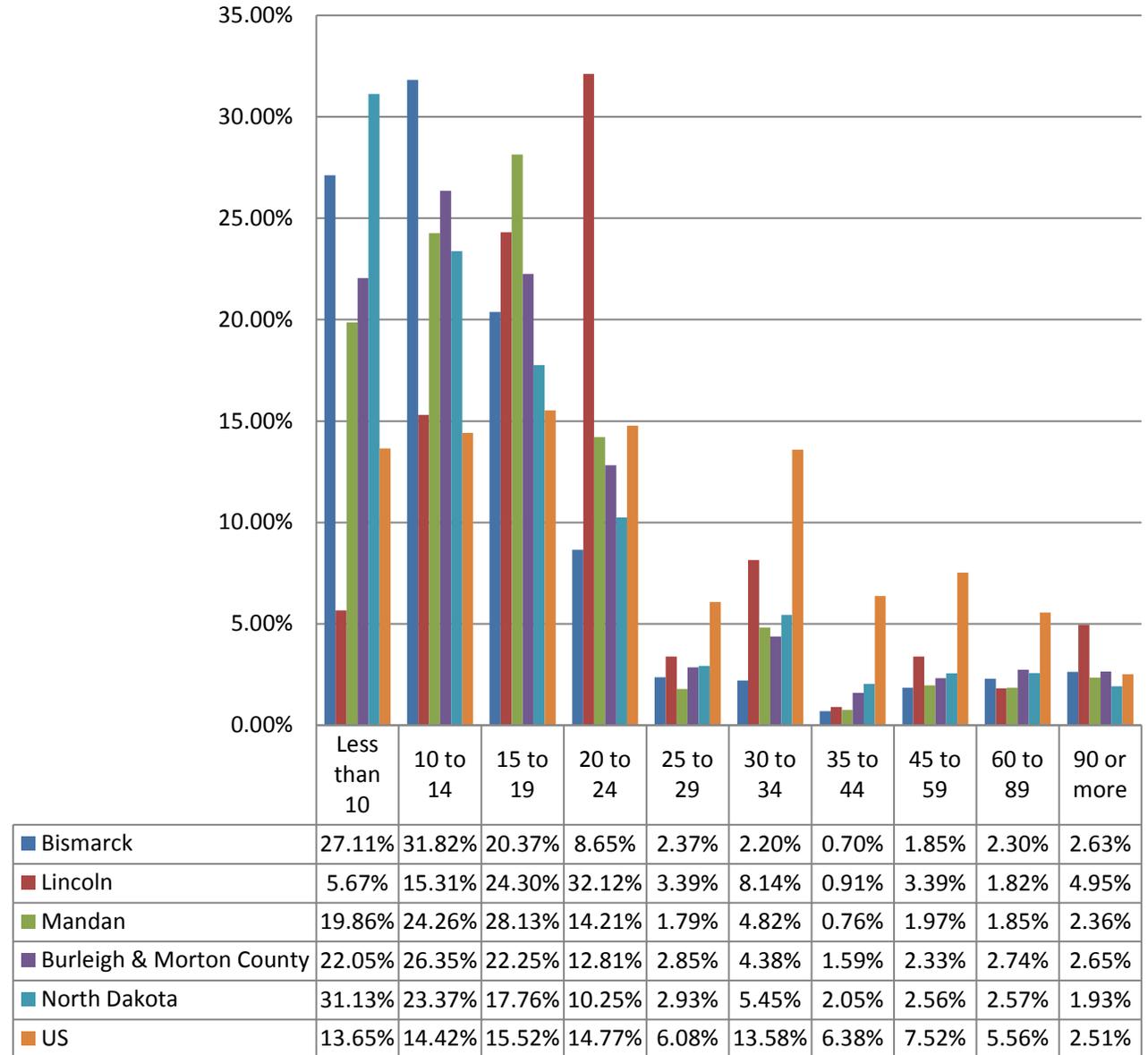
It generally takes the majority of individuals in the Bismarck-Mandan MPO area less than 20 minutes to travel to work. A greater percentage of individuals in Lincoln and Mandan travel more than 20 minutes to work when compared to Bismarck. As the highest concentration of employment in the region is located in Bismarck, it is likely that workers living in Lincoln and Mandan are commuting to jobs in Bismarck leading to slightly longer commute times in the respective communities.

Figure 4.2: Mean Travel Time to Work (in Minutes) for Various Jurisdictions 2000-2010



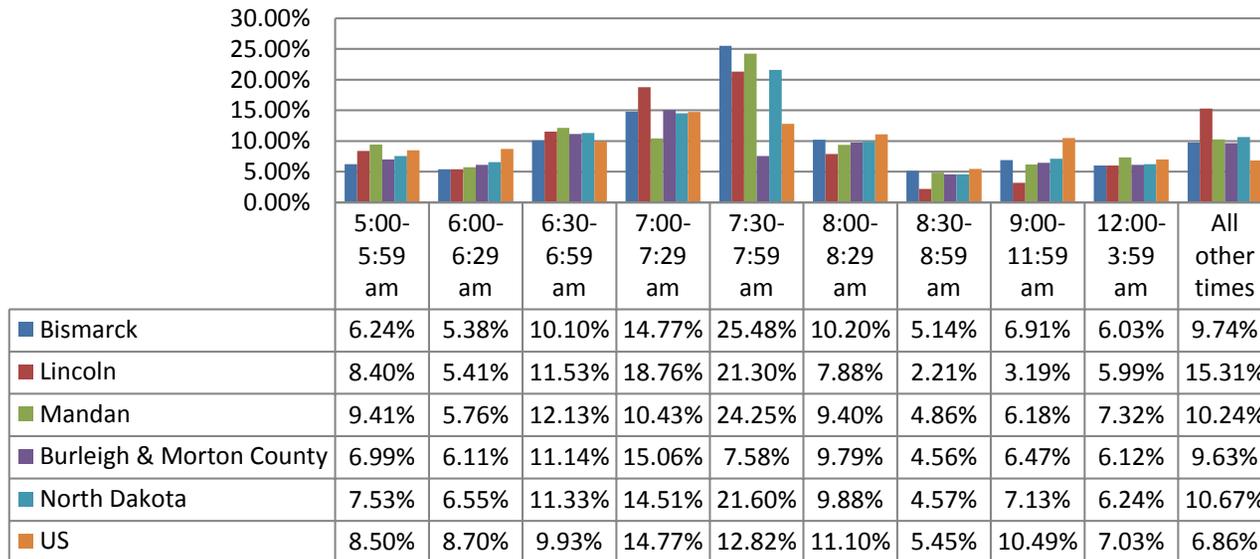
Based on US Census Bureau 2000 and 2010 Travel Time to Work data

Figure 4.3: Travel Time to Work (in Minutes) for Various Jurisdictions, 2014



Based on US Census Bureau American Community Survey 2010-2014 Travel Time to Work (B08303) data

Figure 4.4: Time Leaving Home to Get to Work for Various Jurisdictions, 2014

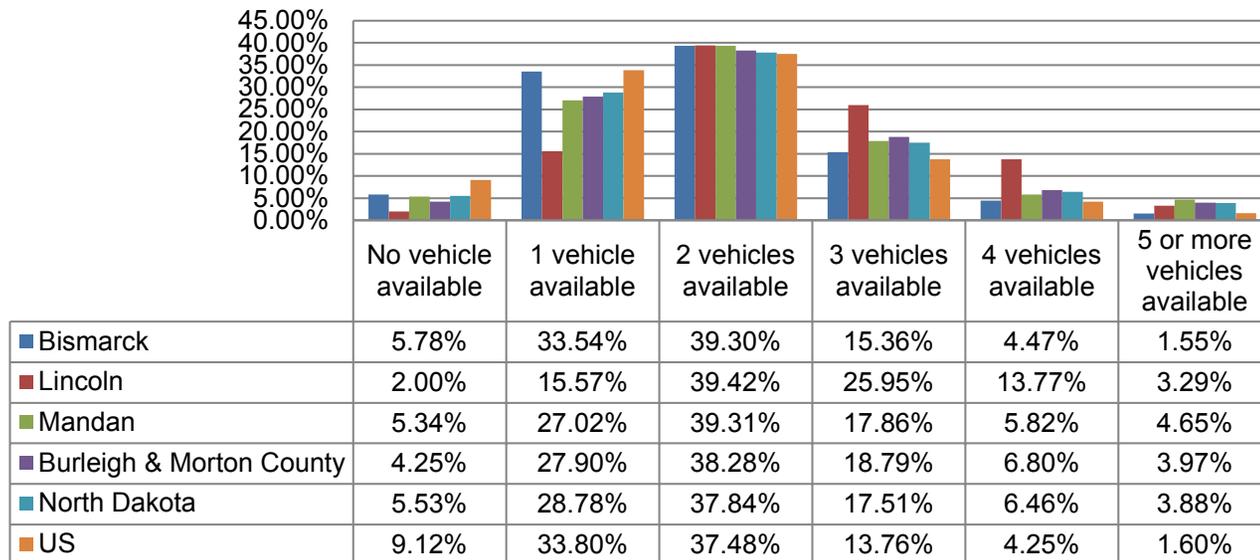


Based on the US Census Bureau American Community Survey 2010-2014 Time Leaving Home to Go to Work (B08302) data.

Time Leaving to Go to Work

Peak travel times impact the efficiency of the transportation system within the region. **Figure 4.4** represents times individuals left their homes to travel to their place of employment in various Bismarck-Mandan MPO jurisdictions compared to the State of North Dakota and the United States. The highest concentration of times leaving to go to work in the Bismarck-Mandan MPO area and the State of North Dakota was between 7:30am-7:59am, followed by 7:00am-7:29am. As commute times are less than 30 min for the majority of employees in the Bismarck-Mandan MPO, these events indicate that a high percentage of commuters have 8:00am-5:00pm work schedules within the region.

Figure 4.5: Vehicles Available by Household for Various Jurisdictions, 2014

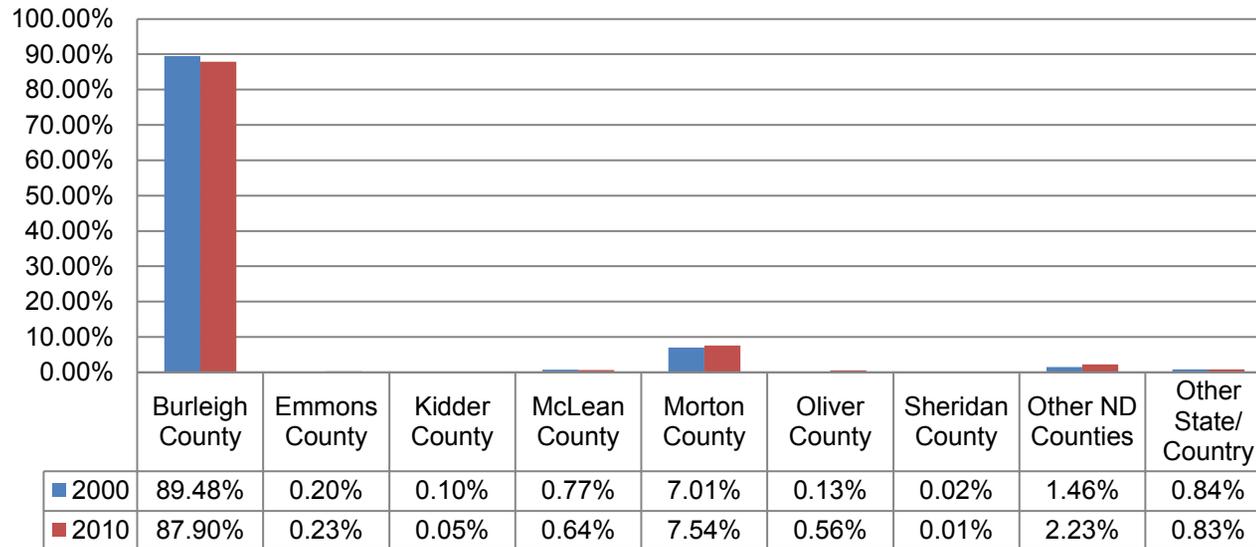


Based on the US Census Bureau American Community Survey 2010-2014 Means of Transportation to Work (B08301) data.

Vehicles Available by Household

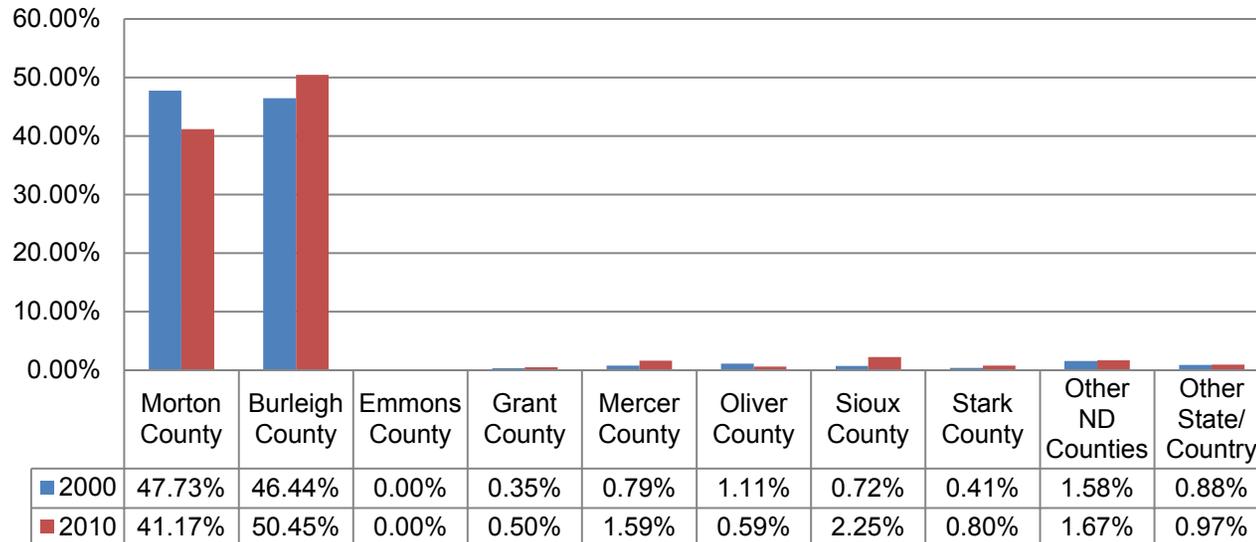
Figure 4.5 represents the vehicles available by household for jurisdictions associated with the Bismarck-Mandan MPO compared to the State of North Dakota and the United States. For all locations identified, 2 vehicles available per household represent the highest concentration of vehicles available. The United States, North Dakota, and the City of Bismarck have a higher concentration of 0 vehicle available by household compared to other jurisdictions associated with the Bismarck-Mandan MPO. Additionally, within the urban MPO jurisdictions, 14.13% of renter occupied households have no vehicle available, 49.84% of renter occupied households have 1 vehicle available and 25.45% have 2 vehicles available. The number of vehicles per renter occupied households in the MPO urban jurisdictions indicate a higher percentage of households with no or 1 vehicle available.

Figure 4.6: County to County Commuting Patterns of Burleigh County Residents, 2000-2010



Based on the US Census Bureau 2000 and 2006-2010 American Community Survey Residence County to Workplace County Flows for North Dakota Sorted by Residence State and County for Burleigh and Morton Counties.

Figure 4.7: County to County Commuting Patterns of Morton County Residents, 2000-2010



Based on the US Census Bureau 2000 and 2006-2010 American Community Survey Residence County to Workplace County Flows for North Dakota Sorted by Residence State and County for Burleigh and Morton Counties.

County to County Commuting Patterns

The following figures represent county to county commuting patterns for residents of Burleigh and Morton Counties from 2000-2010 in comparison to neighboring North Dakota counties, other North Dakota counties, neighboring states, and other states and countries. As the data indicates most Burleigh and Morton County residents are living and working within the two county area. A small percentage of Burleigh and Morton County residents are commuting to other North Dakota counties or other states/other countries for work.

Figure 4.6 depicts the locations that Burleigh County residents are commuting to for work from 2000 to 2010. The majority of Burleigh County residents work within Burleigh County. The number of Burleigh County residents working within Burleigh County reduced slightly from 89.48% in 2000 to 87.90% in 2010, while the number of Burleigh County residents working in Morton County increased slightly from 7.041% in 2000 to 7.54% in 2010.

Figure 4.7 depicts the locations that Morton County residents are commuting to for work from 2000 to 2010. The majority of Morton County residents (47.73%) commuted to Burleigh County for employment in 2010, which was an increase from 46.44% in 2000. The percentage of Morton county residents working within Morton County decreased from 47.73% in 2000 to 41.17% in 2010. The significant percentage of Morton County residents traveling to Burleigh County likely results in eastbound morning travel and westbound evening travel at the Missouri River crossings to be more predominate.

Note: The US Census Bureau has not provided an updated count and/or estimate of these characteristics since the 2006-2010 American Community Survey.

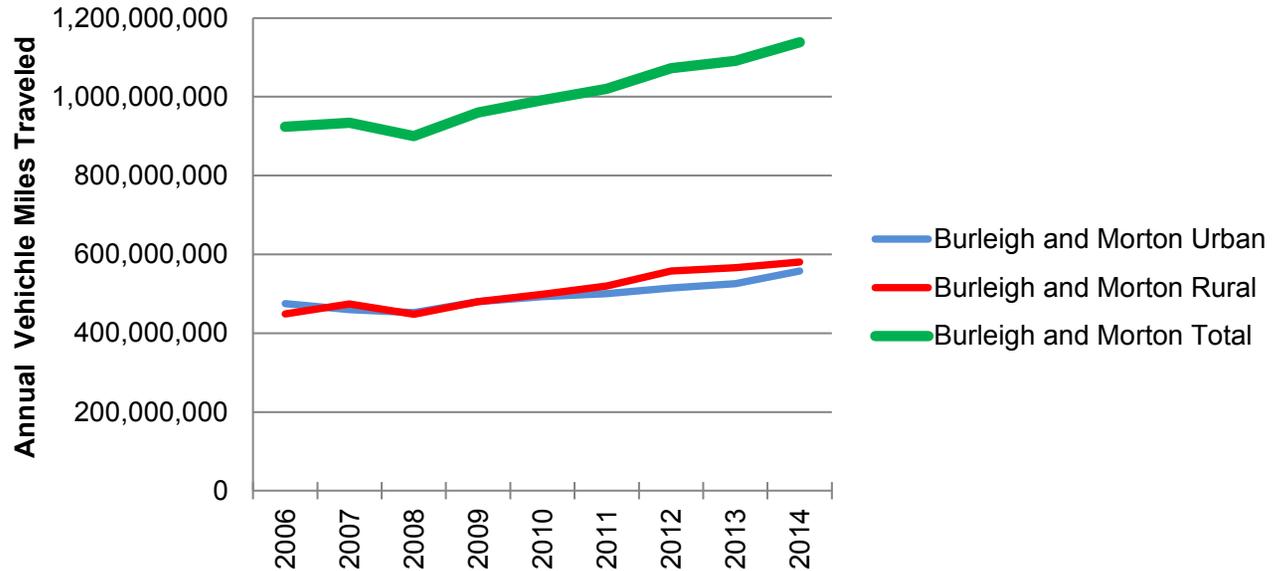


Motorized Travel

Vehicle miles traveled (VMT) is a measure of the total vehicle miles traveled within a given geographic location. They can be used to depict motorized vehicular travel trends within an area. Annually the North Dakota Department of Transportation (NDDOT) calculates VMT information for reporting purposes to the national Highway Performance Monitoring System (HPMS). NDDOT utilizes Average Daily Traffic (ADT) counts, which they collect on a periodic basis throughout the State, as a factor in daily and annual vehicle miles traveled. In the Burleigh and Morton County area, recent ADT counts were taken in 2006, 2009, and most recently in 2012, in addition to permanent monitoring stations. Estimates based on projections and permanent monitoring station counts are calculated for VMT during years ADT is not collected. Based on annual vehicle miles traveled in Burleigh and Morton County, VMT has increased significantly in recent history as shown in **Figure 4.8**. In both counties, rural VMT grew faster than VMT in the urbanized areas of Bismarck and Mandan. This could be due to an increase in housing units locating outside of the urbanized areas of Bismarck or Mandan, or an increase in the amount of travel passing through Burleigh and Morton County or both.

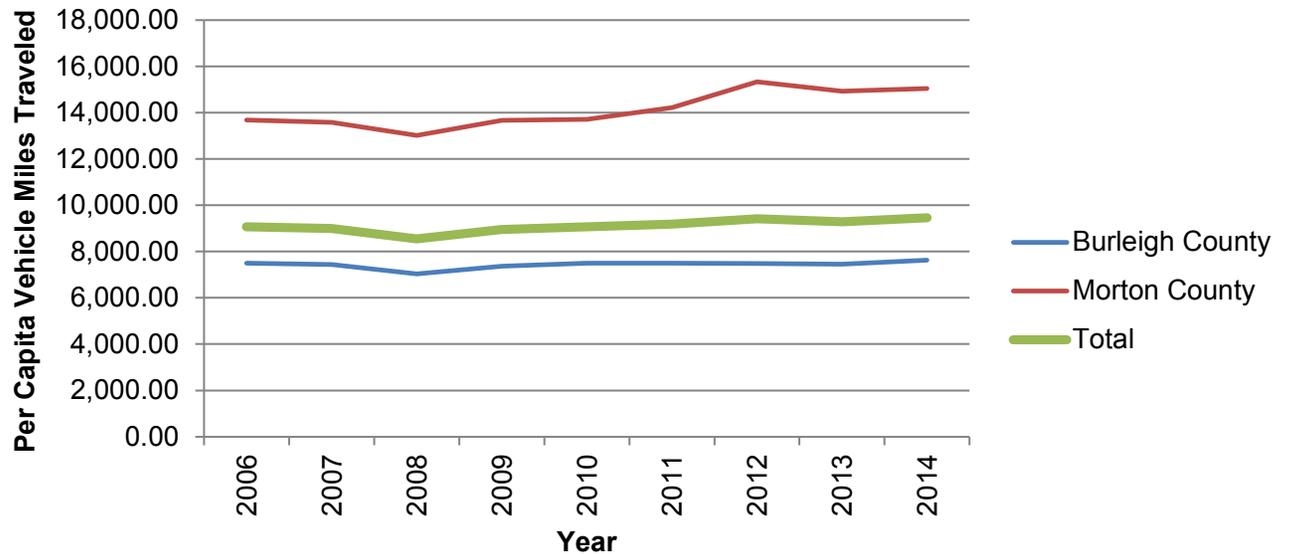
Figure 4.9 represents Per Capita Annual VMT in Burleigh and Morton Counties, which compares Annual VMT (calculated by the NDDOT) to annual population estimates (developed by the US Census Bureau). As identified in **Figure 4.9** per capita VMT has remained relatively stable in Burleigh County and it has increased significantly in Morton County, for the period between 2006 and 2014. Total per capita VMT in Burleigh and Morton County has increased slightly since 2006 which may indicate that motorists are traveling further from origin to destination within the region, that vehicular traffic passing through the region has increased, or both.

Figure 4.8: MPO Counties: Urban and Rural Comparison of Vehicle Miles Traveled Change



Based on North Dakota Annual Traffic Reports 2006-2014

Figure 4.9: MPO Counties Per Capita Vehicle Miles Traveled

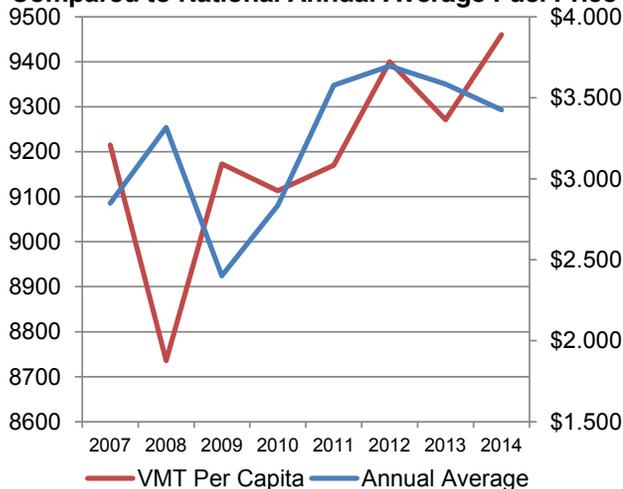


Based on US Census Bureau annual population estimates and North Dakota Annual Traffic Reports 2006-2014

Average Daily Traffic (ADT) counts are another tool used to measure traffic pattern change in a given area. The NDDOT collects ADT counts, typically, once every two years in a given location. Recent ADT counts were collected, in the Bismarck-Mandan area, in 2012 and again in 2014. The following maps (Map 4.1 to 4.3) depict ADT count locations and the percent change in growth from 2012 to 2014. The ADT count information shown on these maps indicate patterns of growth within the area. Generally, the newly developing areas of the communities, such as the northern and southern portions of both Bismarck and Mandan have experienced significant growth in ADT, while the mature centralized locations of the communities have remained relatively consist with some minor increase.

An evaluation of VMT per capita versus national average gas prices shows that gas prices peaked in 2008 and 2008 VMT dropped. However since then, VMT has continued to track fuel cost as shown in Figure 4.10.

Figure 4.10: Burleigh and Morton VMT per Capita Compared to National Annual Average Fuel Price



Based on information from North Dakota Annual Traffic Reports 2007-2014, US Census Bureau & US Bureau of Labor Statistiss

Freight

Goods are transported into, out of, and through the Bismarck-Mandan MPO area generally either by rail, air, truck, or a combination of these modes. Freight “generators,” or producers/attractors of freight, are considered when analyzing freight movements in a given area. The Bismarck-Mandan MPO area has a variety of freight generators. **Figure 4.11** identifies a general list of industries, classified by the North American Industrial Classification System (NAICS) group, which may have a propensity for freight movements. Businesses associated with the following NAICS groups are also identified in the map on the following page.

The Bismarck-Mandan MPO area also has two primary locations, where differing modes connect to transfer freight. The Northern Plains Commerce Centre is a transload facility where rail and truck freight are exchanged. The Bismarck Municipal Airport provides a link between freight shipped between air and truck movements.

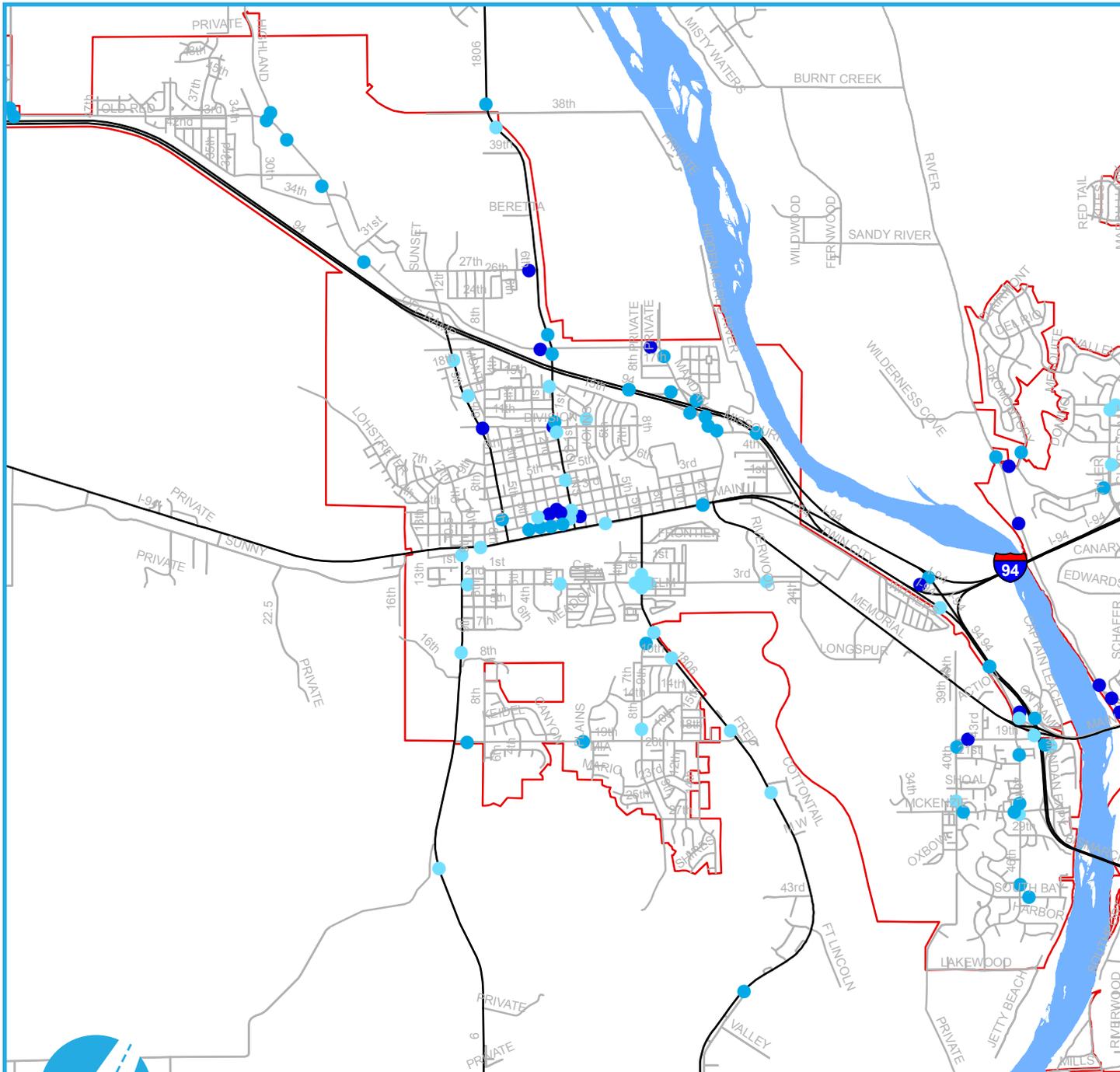
Figure 4.11: Potential Freight Generators by NAICS in the Bismarck-Mandan MPO Area

112	Animal Production
212	Mining (Except Oil and Gas)
221	Utilities
236	Construction of Buildings
237	Heavy and Civil Engineering Construction
238	Specialty Trade Contractors
321	Wood Product Manufacturing
322	Paper Manufacturing
324	Petroleum and Coal Product Manufacturing
325	Chemical Manufacturing

327	Nonmetallic Mineral Product Manufacturing
332	Fabricated Metal Product Manufacturing
333	Machine Manufacturing
335	Electrical Equipment, Appliance, and Component Manufacturing
337	Furniture and Related Product Manufacturing
423	Merchant Wholesalers, Durable Goods
424	Merchant Wholesalers, Nondurable Goods
425	Wholesale Electronic Marks and Agents and Brokers
441	Motor Vehicle and Parts Dealers
442	Furniture and Home Furnishings Stores
444	Building Material and Garden Equipment and Supplies Dealers
445	Food and Beverage Stores
446	Health and Personal Care Stores
451	Sporting Goods, Hobby, Book, and Music Stores
452	General Merchandise Stores
453	Miscellaneous Store Retailers
454	Nonstore Retailers
481	Air Transportation
484	Truck Transportation
485	Transit and Ground Passenger Transportation
487	Scenic and Sightseeing Transportation
488	Support Activities for Transportation
491	Postal Service
493	Warehousing and Storage
562	Waste Management and Remediation Services

Based on select sectors of the North American Industrial Classification (NAICS)





Map 4.1: Change in Average Daily Traffic Counts from 2012-2014 (Map 1)

-  MPO Boundary
-  Corporate Limits

Percent Change in ADT

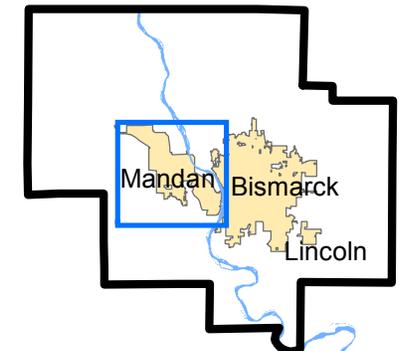
-  0% to 9%
-  10% to 29%
-  30% or greater

0 0.35 0.7 1.4 Miles



Map created December 2015 by W.R.H. Average Daily Traffic Count (ADT) information obtained from the North Dakota Department of Transportation. Additional data maintained by the City of Bismarck and the MPO.

W:\MPO\GIS\Monitoring Report\2015 Monitoring Report Map Documents\Chapter

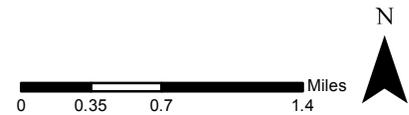


Map 4.2: Change in Average Daily Traffic Counts from 2012-2014 (Map 2)

-  MPO Boundary
-  Corporate Limits

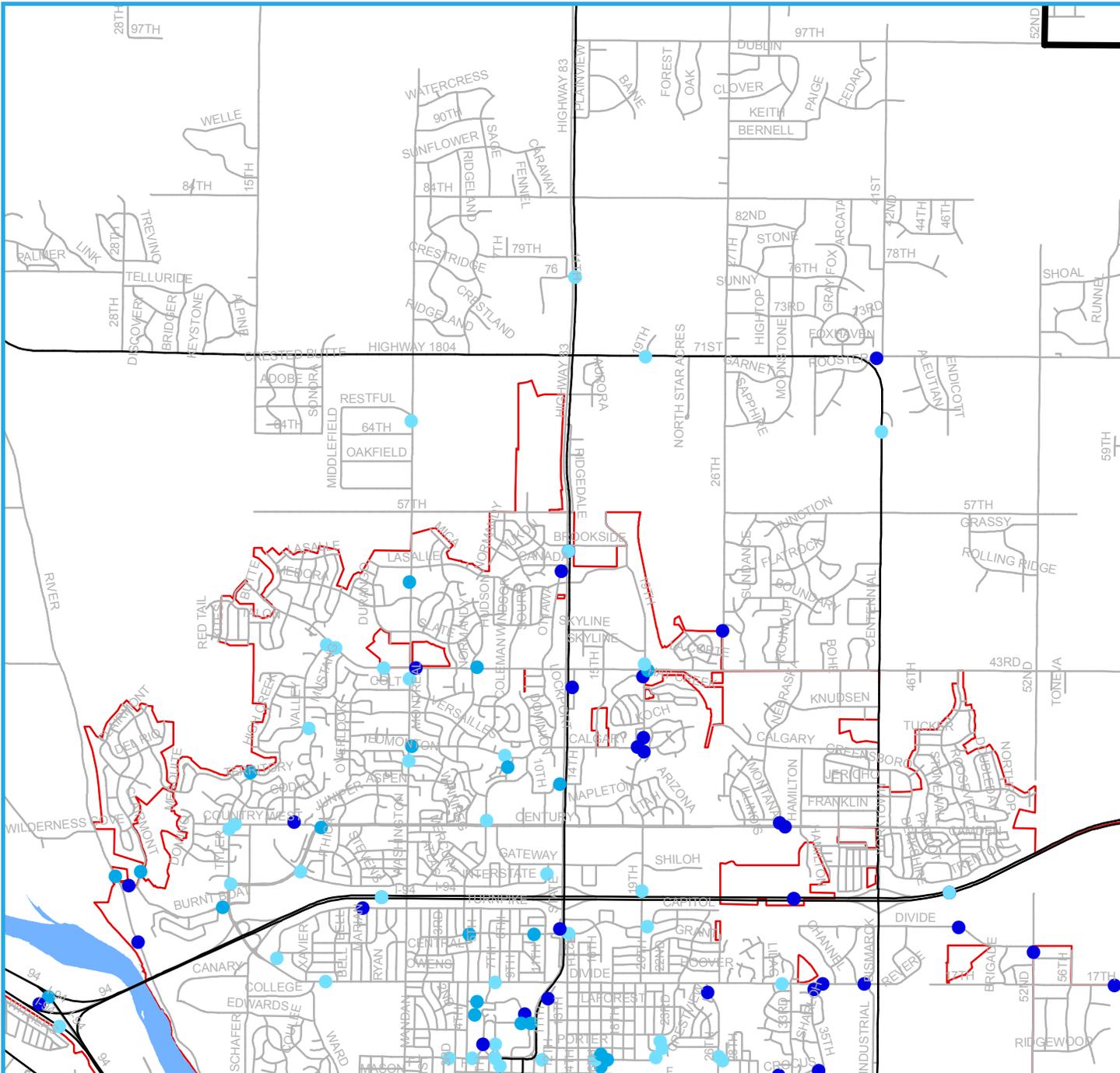
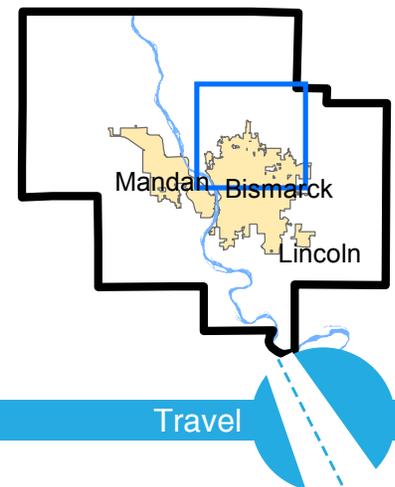
Percent Change in ADT

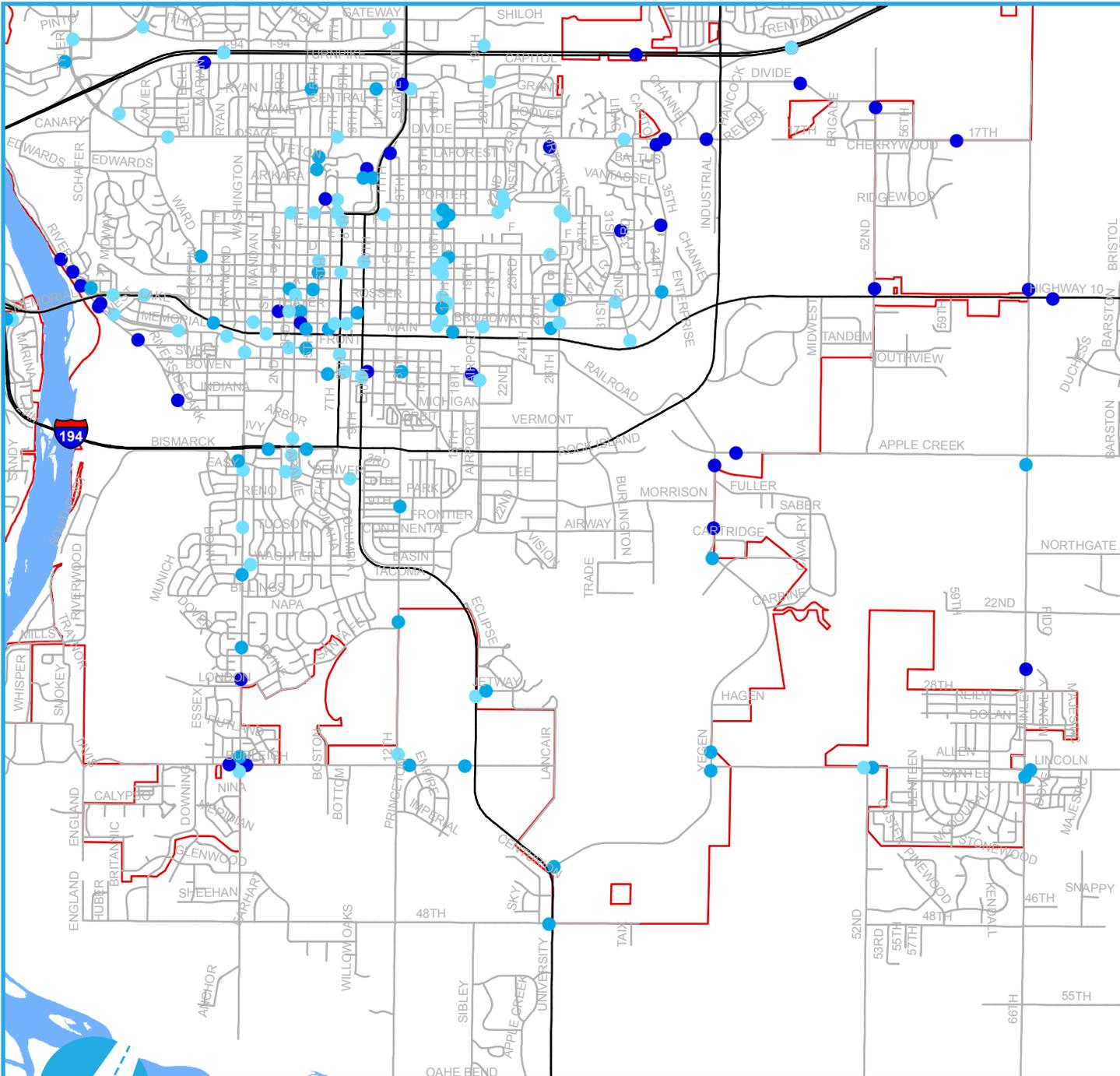
-  0% to 9%
-  10% to 29%
-  30% or greater



Map created December 2015 by W.R.H.
Average Daily Traffic Count (ADT) information obtained from the North Dakota Department of Transportation. Additional data maintained by the City of Bismarck and the MPO.

W:\MPO\GIS\Monitoring Report\2015
Monitoring Report Map Documents\Chapter
5\5.2percChangeADT12-14_1.mxd



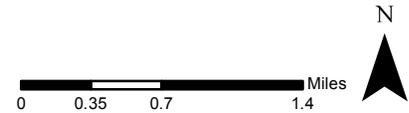


Map 4.3: Change in Average Daily Traffic Counts from 2012-2014 (Map 3)

- MPO Boundary
- Corporate Limits

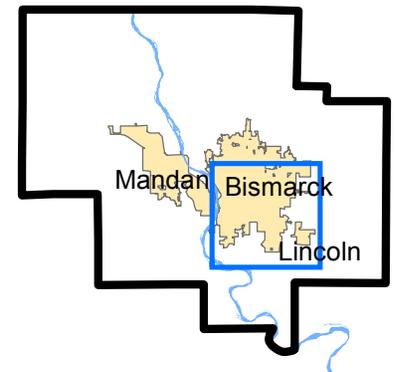
Percent Change in ADT

- 0% to 9%
- 10% to 29%
- 30% or greater



Map created December 2015 by W.R.H. Average Daily Traffic Count (ADT) information obtained from the North Dakota Department of Transportation. Additional data maintained by the City of Bismarck and the MPO.

W:\MPO\GIS\Monitoring Report\2015 Monitoring Report Map Documents\Chapter 5\5.3percChangeADT12-14_1.mxd



Map 4.4 depicts locations of possible freight generators throughout the region. The following **Figure 4.12** represents significant freight corridors that evaluated 2014 traffic counts, in the Bismarck-Mandan MPO area, based on the percentage of truck traffic compared to overall traffic. **Map 4.5** represents the percent truck traffic compared to the total traffic by location. Truck counts occur every two years in the Bismarck-Mandan area. However member jurisdictions and NDDOT do not evaluate truck traffic at the same ADT locations every count year; therefore this list does not identify all roadways that

Figure 4.12: Significant Freight Corridors in the Bismarck-Mandan MPO Area, 2014

Corridor	% Range of Truck Traffic Compared to Total Traffic
I-94 (through the Bismarck-Mandan MPO Area)	10% - 35%
I-194 (in Mandan/Morton)	10% - 25%
Main St / Business Loop 94 (in Mandan/Morton)	10% - 25%
Old Red Trail (Mandan)	5% - 25%
46th Ave. SE (in Mandan)	5% - 10%
40th Ave. SE (in Mandan)	10% - 25%
Main Ave (in Bismarck)	5% - 25%
71st/Centennial Road (in Bismarck/Burleigh)	10% - 25%
Calgary Ave (between Washington St. and US Highway 83 in Bismarck)	5% - 10%
ND Highway 1806 (in Mandan)	5% - 25%
ND Highway 6 (in Mandan/Morton)	10%-25%

Based on Average Daily traffic count information obtained from the NDDOT

have been known to carry freight in the Bismarck-Mandan area.

The **Map 4.6** represents the percent change in truck traffic between 2012 and 2014. Corridors within the Bismarck-Mandan MPO area have experienced both growth and decline in truck traffic during this period. Corridors such as I-94, ND 1804, 71st/Centennial, North Washington Street, ND Highway 1806, and portions of Old Red Trail have experienced significant growth in truck traffic. Few corridors have experienced significant decline in truck traffic from 2012 to 2014. These corridors are primarily along the I-194, between Memorial Highway and the I-94 Interchange. Due to the lack of truck counts done during the 2014 count year, several corridors that are well known freight corridors have not been evaluated including US Highway 83 and Bismarck Expressway in Bismarck and Memorial Highway in Mandan.

Functional Classification of Roadways

The 1989 Federal Highway Administration (FHWA) defines roadway classifications and establishes procedures to update these systems at local and state levels. Roadways are generally grouped into the following categories: Interstate, Arterial, Collector or Local. Subcategories such as Principal, Major and Minor may be applied to better define the roadway and reflect road usage. Roadways that are functionally classified as an Interstate, Collector or Arterial are eligible to receive federal transportation funds. **Map 4.7** identifies the functionally classified roadways within the Bismarck-Mandan MPO area.

FHWA has established guidelines for the amount of functionally classified mileage permitted within an Urbanized Area. **Figure 4.13** shows the functionally classified centerline mileage of roadways within the Bismarck-Mandan MPO area in comparison to the FHWA recommendations. As indicated in Figure

Figure 4.13: Bismarck-Mandan MPO Functionally Classified Roadways in Comparison to FHWA Recommended Guideline

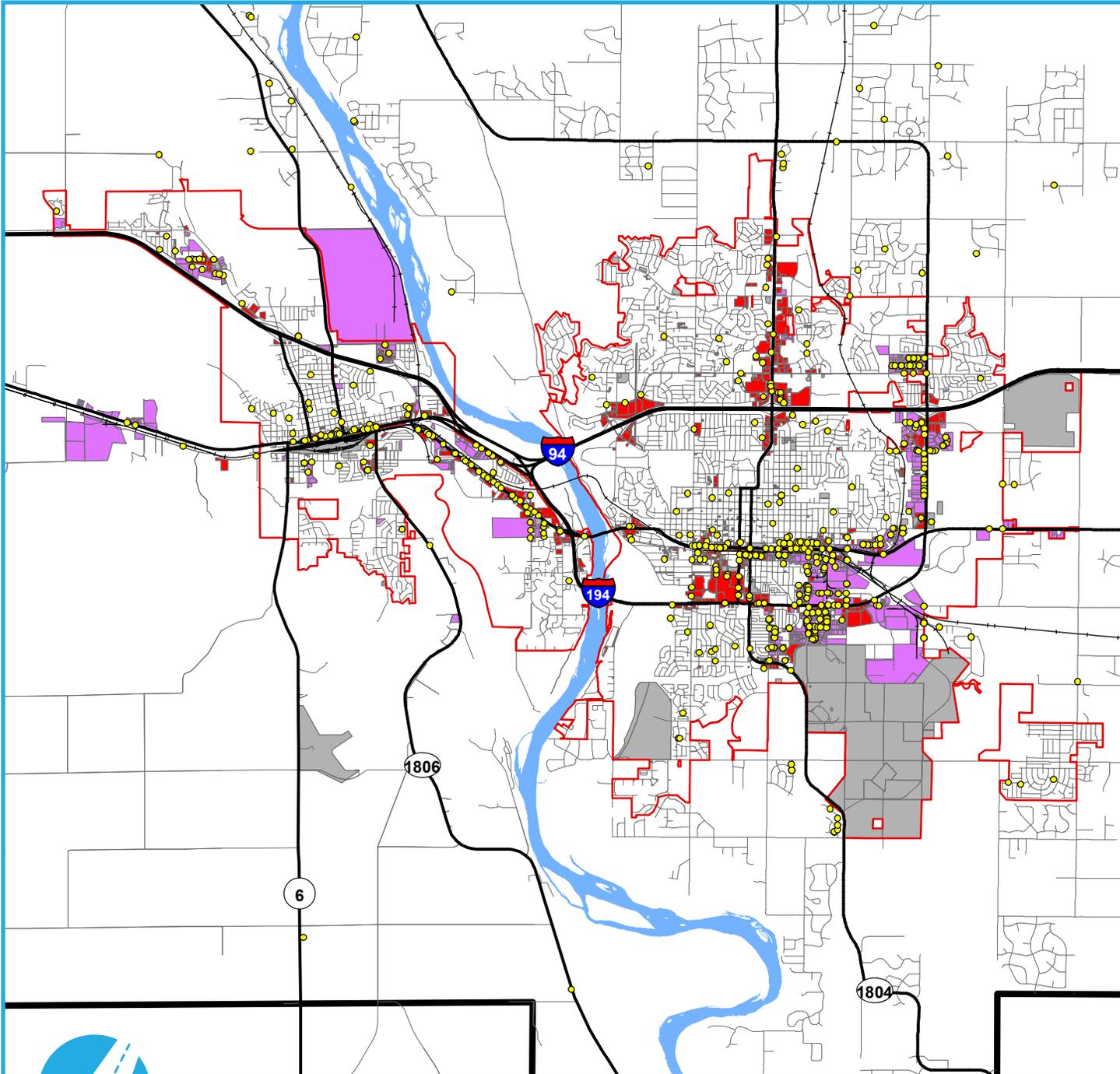
Network	Length (in Miles)	% of Total Network	*FHWA Recommended % of Total Network Range
Local	656.9	77.3%	65-80%
Collector	67.2	7.9%	5-10%
Minor Arterial	51.4	6.0%	15-25%
Principal Arterial	59.4	7.0%	
Interstate	15.4	1.8%	NA
Total	850.3	100.0%	

*Based on centerline and functional classification data maintained by the City of Bismarck, Morton County, and Bismarck-Mandan MPO as well as recommend Functional Classification ranges from FHWA *1989 guidelines*

4.13 the current functionally classified system of the Bismarck-Mandan MPO complies with the recommended FHWA guidelines.

In spring 2015 the MPO started the process to update the MPO Urbanized Functional Classification System based on new FHWA guidelines. The updated guidelines outline new parameters for inclusion of roadways on functional classification systems. With the cooperation of all MPO jurisdictions, an updated list of changes has been compiled and currently await NDDOT and FHWA review. Pending review, the changes will be brought to the MPO Policy Board for final approval before submission and acceptance by the Governor of North Dakota.

Map 4.4: Possible Freight Generators (2011)



-  MPO Boundary
-  Corporate Limits
-  Possible Freight Generators
- Land Use Categories**
-  Commercial
-  Industrial
-  Transportation & Infrastructure

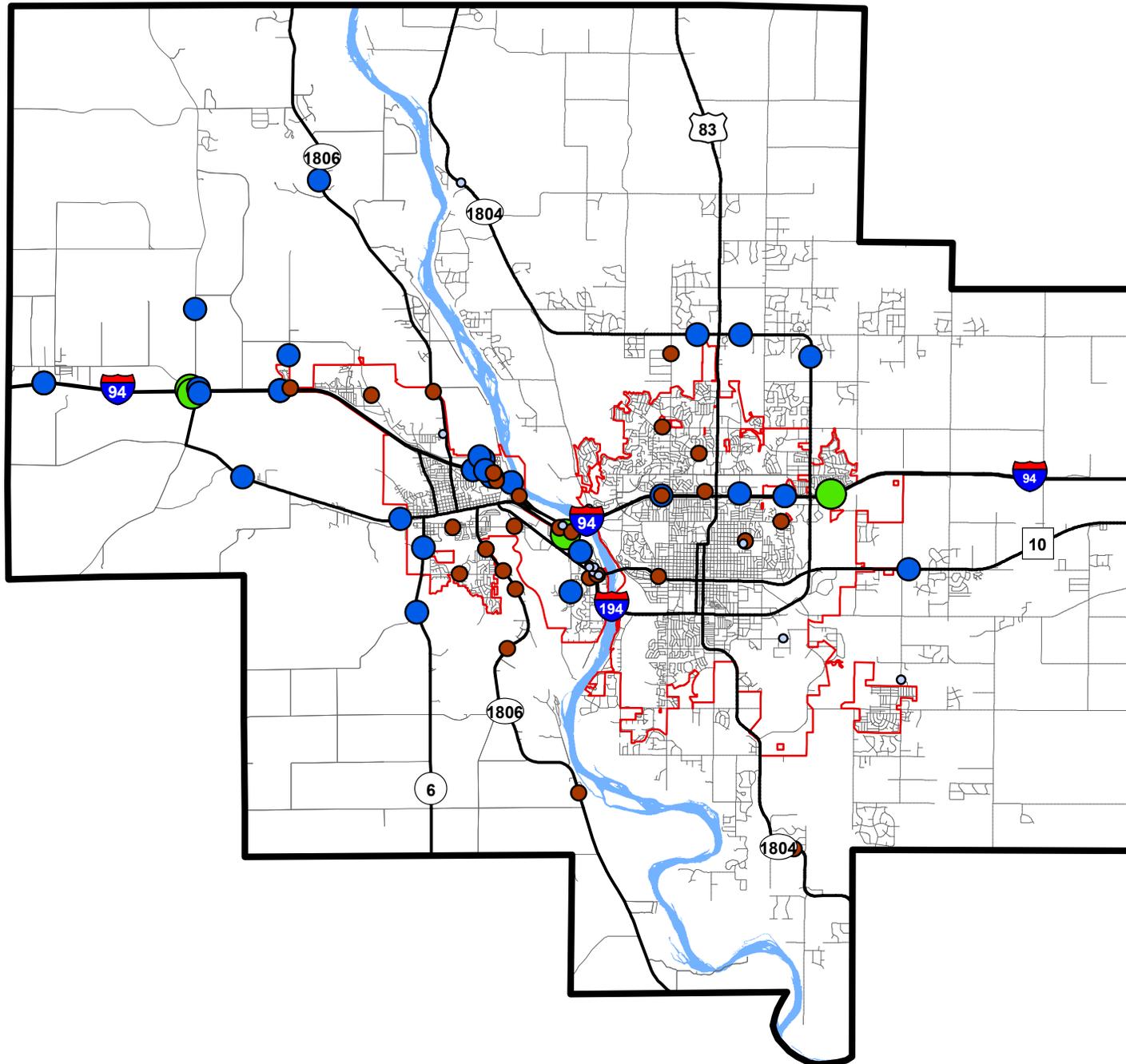
0 0.5 1 2 Miles



Map created by R.A.D., Nov. 2013 (updated Dec. 2015). Based on data maintained by the City of Bismarck, the Bismarck-Mandan MPO and the US Federal Government. Freight generator information obtained from InfoGroup USA 2011 data set for Burleigh and Morton Counties.

W:\MPO\GIS\Monitoring Report\2015 Monitoring Report Map Documents\Chapter 5\5.4PossibleFreightGenerators.mxd

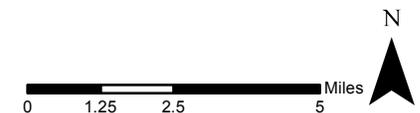
4.5: Percent Truck Traffic of Total Average Daily Traffic (ADT). (2014)



-  MPO Boundary
-  Corporate Limits

Percent Truck Traffic

-  0% to 5%
-  5% to 10%
-  10% to 25%
-  25% to 35%

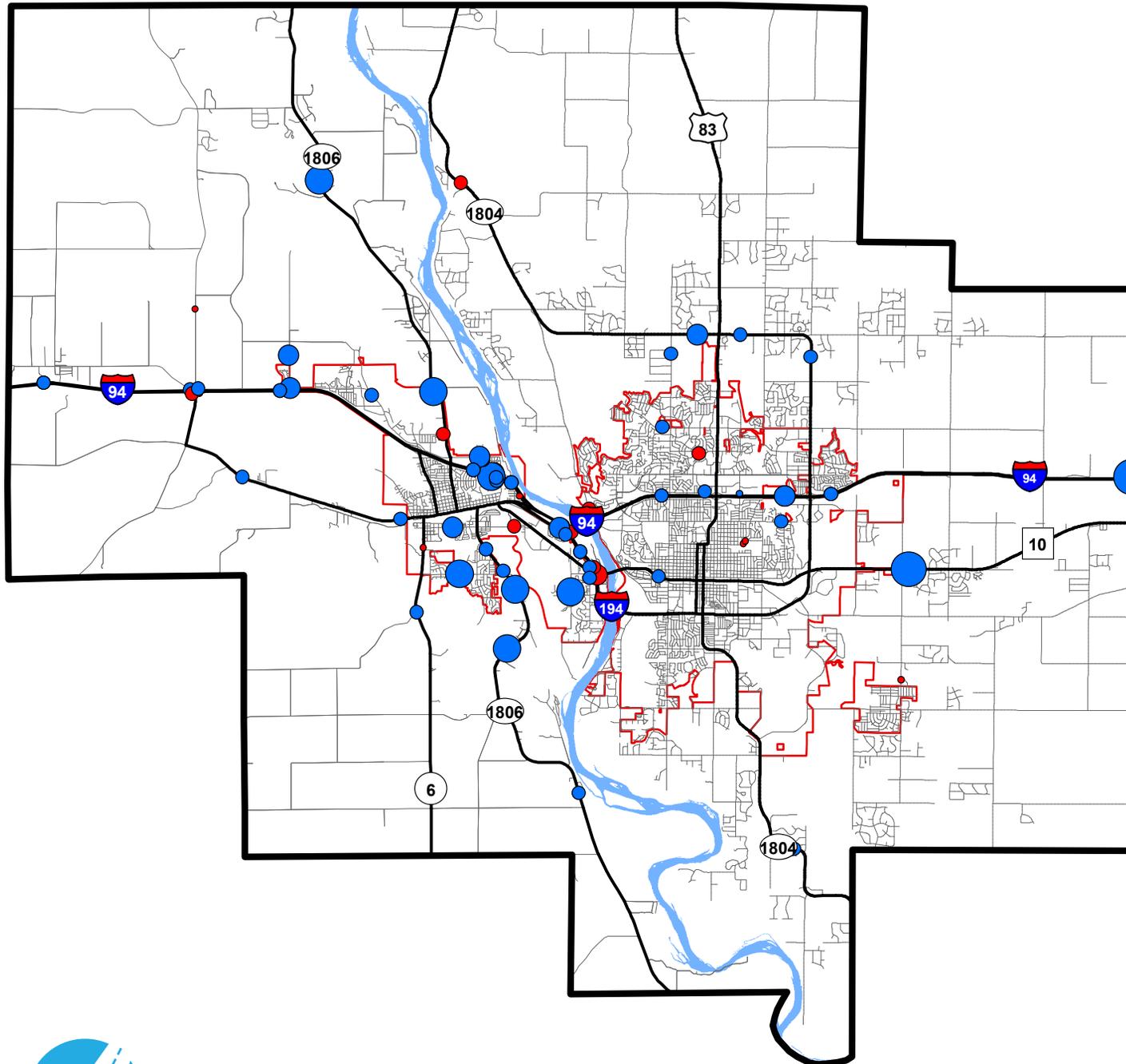


Average Daily Traffic Count (ADT) information obtained from the North Dakota Department of Transportation. Map created by W.R.H. January 2015 based on information maintained by the City of Bismarck, Bismarck-Mandan MPO and North Dakota Department of Transportation.

W:\MPO\GIS\Monitoring Report\2015 Monitoring Report Map Documents\Chapter 5\5.5PercentTruckADT.mxd



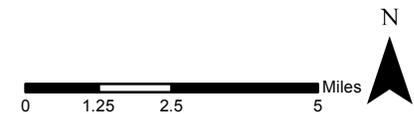
4.6: Percent Change of Average Daily Truck Traffic Counts (2012-2014)



MPO Boundary
 Corporate Limits

Percent Change: Truck Traffic

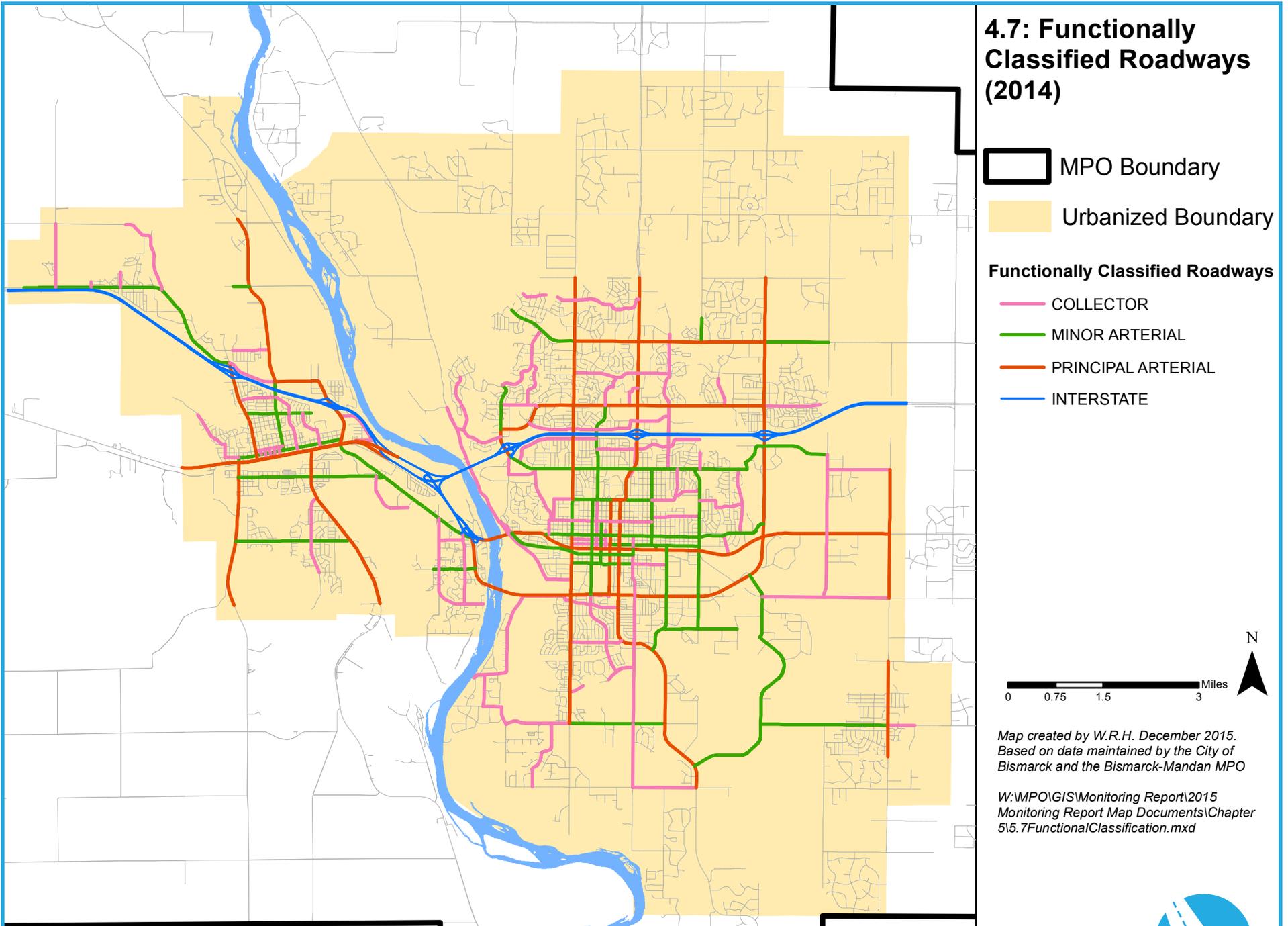
- -90% to -50%
- -49% to -5%
- -4% to 0%
- 0% to 4%
- 5% to 49%
- 50% to 99%
- 100% to 149%
- 150% to 199%



Average Daily Traffic Count (ADT) information obtained from the North Dakota Department of Transportation. Map created by W.R.H. December 2015 based on information maintained by the City of Bismarck, Bismarck-Mandan MPO and North Dakota Department of Transportation.

W:\MPO\GIS\Monitoring Report\2015 Monitoring Report Map Documents\Chapter 5\5.6PercentChangeTruckADT.mxd

4.7: Functionally Classified Roadways (2014)



Map created by W.R.H. December 2015.
Based on data maintained by the City of
Bismarck and the Bismarck-Mandan MPO

W:\MPO\GIS\Monitoring Report\2015
Monitoring Report Map Documents\Chapter
5\5.7FunctionalClassification.mxd

Bridge Structures

The Federal Highway Administration manages and defines bridge sufficiency ratings using the National Bridge Inventory (NSI) Ratings Scale. Under these guidelines, bridges are evaluated on multiple factors. A composite of these measurements, known as a Sufficiency Rating, ranges from 100% (entirely sufficient structures) to 0% (an entirely deficient structure). The percentage relays how well a structure meets current traffic demands.

A Structural Evaluation is one component of the Sufficiency Rating and comments on the condition of a bridge's structural fitness. Poor status is categorized under two themes: 'Functionally Obsolete' or 'Structurally Deficient'. A functionally obsolete classification means that the structure does not meet current design standards. Due to physical limitations (e.g.: lane width, clearance), the structure cannot adequately meet traffic demands and frequently impedes traffic. This status does not imply a safety issue, only functional deficiency. Structural deficiency is a more serious status and indicates the presence of structural defects. A bridge is classified as structurally deficient if one or more of a bridge's main components has been rated in poor condition (0-4 on the NBI Rating Scale), the load carrying capacity has been surpassed, or water frequently overflows the deck and impedes traffic. Though structures with this classification typically need repair, it is not intended to comment on the severity of the bridges deficiency or label the bridge as unsafe. The NDDOT is the agency responsible for evaluating the sufficiency of bridges throughout the State of North Dakota.

Figure 4.14 shows the number and percentage of functionally obsolete and structurally deficient bridges in the Bismarck-Mandan MPO area. There are 119 bridges within the MPO boundary and 11 have an insufficient rating. According to 2015 inspection

reports, roughly 4.2% of these bridges are identified as functionally obsolete and approximately 5% are structurally deficient. This is a slight reduction from previous year's calculations.

The **Map 4.8** identifies the locations of functionally obsolete and structurally deficient bridges within the Bismarck-Mandan MPO area.

Figure 4.14: Functionally Obsolete and Structurally Deficient Bridges in the Bismarck-Mandan MPO Area

Status	Number of Bridges	% of Total (119)
Functionally Obsolete	5	4.2%
Structurally Deficient	6	5.0%

Bridge Sufficiency data was obtained from the NDDOT GIS Shapefile: Bridge Inventory, MPO Area 2015.

Safety

Safety is a top priority for the Bismarck-Mandan MPO. The 2014 North Dakota Crash Summary (developed by the NDDOT) indicated that Burleigh County still had the highest crash rate of all counties in the State with 3.64 crashes per million vehicle miles traveled, compared to a State crash rate of 1.55 crashes per million vehicle miles traveled.

Annually the NDDOT determines "High Crash" locations for Urbanized Areas across the state, considering the past three years of crash data. The NDDOT Urban High Crash Location Report lists a total of 50 intersections in each 3 year report. In looking at the "3 Year High Crash Locations" for Urbanized Areas across the state, 5 of the top 20 locations occurred in Bismarck between 2012 and

2014. A review of the past reports shows a decrease in the number of high crash intersections in Bismarck. The total locations listed have reduced by 9 since 2011 (2009-2011, 2010-2012, 2011-2013 and 2012-2014). **Figure 4.15** shows the identified locations and their associated statewide rank. Mandan has had no severe issues with high urban crash locations. Overall the total number of intersections listed in the MPO area on the complete report has been steadily declining, specifically in Bismarck. **Figure 4.16** shows a trending decline in the number intersections located in Bismarck. However, Bismarck along with Fargo, still hold a significant amount of the identified intersections in the latest report.

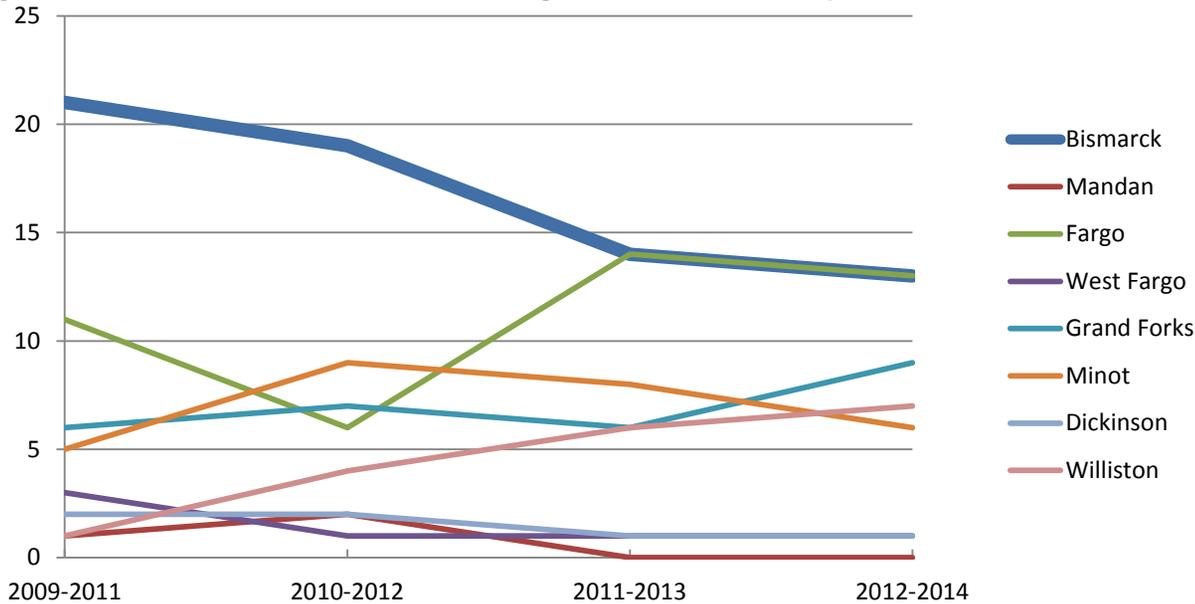
Figure 4.15: Ranking of 3 Year Major High Crash Locations in Bismarck, ND 2011-2013 vs 2012-2014

INTERSECTION	2011-2013 RANK	2012-2014 RANK
State St & Century Ave	5	5
State St & Interstate Ave	8	7
State St & Capitol Ave	7	8
Bismarck Expwy & Washington St	16	10
Bismarck Expwy & 7th St	12	18

Based on the NDDOT identified Urban 3-year High Crash Locations 2011-2013 and 2012-2014

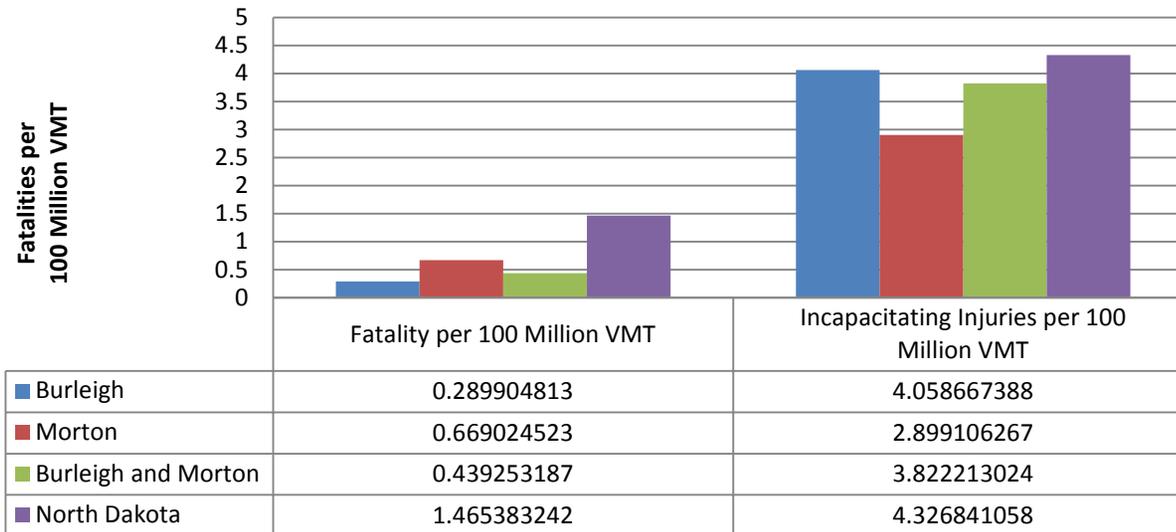
The locations identified within the top 20 of the NDDOT Urban High Crash Report are identified on **Map 4.9**. It should be noted that a variety of projects have either recently been completed or are programed to be completed in the near future that address some of the locations identified.

Figure 4.16: North Dakota Identified Urban High Crash Locations Reports Trends



Based on the NDDOT identified Urban 3-year High Crash Location Reports 2009-2011 to 2012-2014.

Figure 4.17: Comparison of Fatalities and Incapacitating Injuries per 100 Million VMT



Based on information from North Dakota Traffic Report and the North Dakota Crash Summary 2014

Between 2011 and 2013 there were 19 automobile collisions involving fatalities and 129 involving incapacitating injuries in Burleigh and Morton County.¹ A common measure of fatal and incapacitating injuries is to compare the total number of each type of crash to 100 million vehicle miles traveled (VMT). The following **Figure 4.17** identifies the 2013 fatal and incapacitating injuries per 100 million vehicle miles traveled in Burleigh and Morton County compared to the State of North Dakota. As the figure indicates, fatalities per 100 million VMT are slightly higher on a statewide basis compared to Burleigh and Morton County. However, Incapacitating Injuries were significantly higher (per 100 Million VMT) in Burleigh County compared to the State in 2014.

Map 4.10 highlights the locations of Crashes involving a Fatality and Crashes involving an Incapacitating Injury within the MPO area between 2012-2014. Most crashes are located along major corridors within the region and significantly at major intersections.

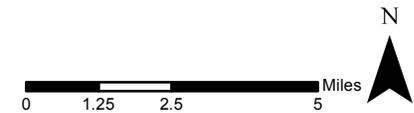
¹Incapacitating injuries are defined as any serious injury other than fatal which results in one or more of the following: Severe laceration resulting in exposure of underlying tissues/muscle/organs or resulting in significant loss of blood; Broken or distorted extremity, Crush injuries; Suspected skull, chest or abdominal injury other than bruises or minor lacerations; Significant burns (second and third degree burns over 10% or more of the body); Unconsciousness when taken from the crash scene; Paralysis.

4.8: Deficient Bridge Locations (2015)

-  MPO Boundary
-  Urbanized Boundary

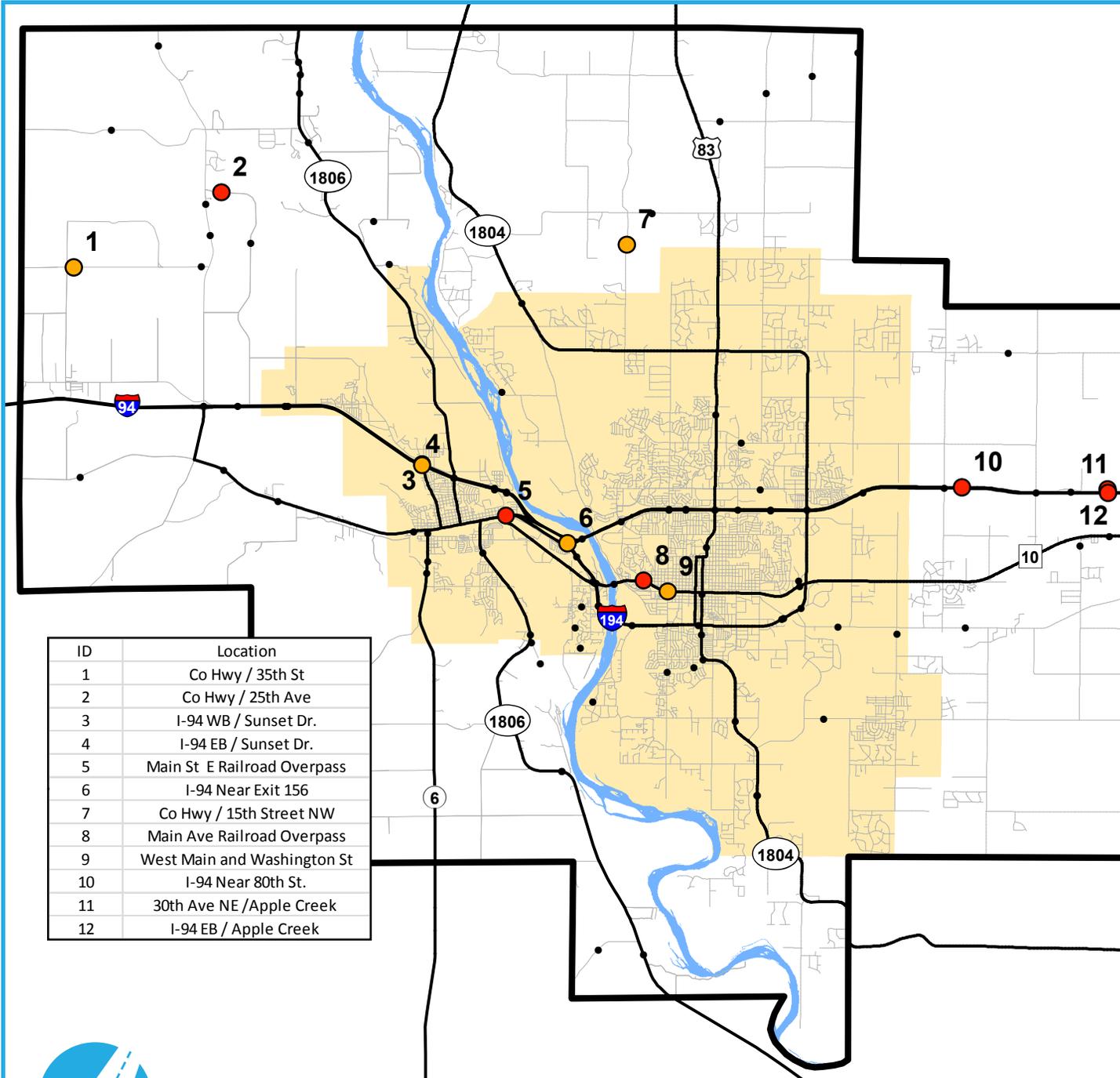
Deficiency Classifications

- Not Deficient
-  Functionally Obsolete
-  Structurally Deficient



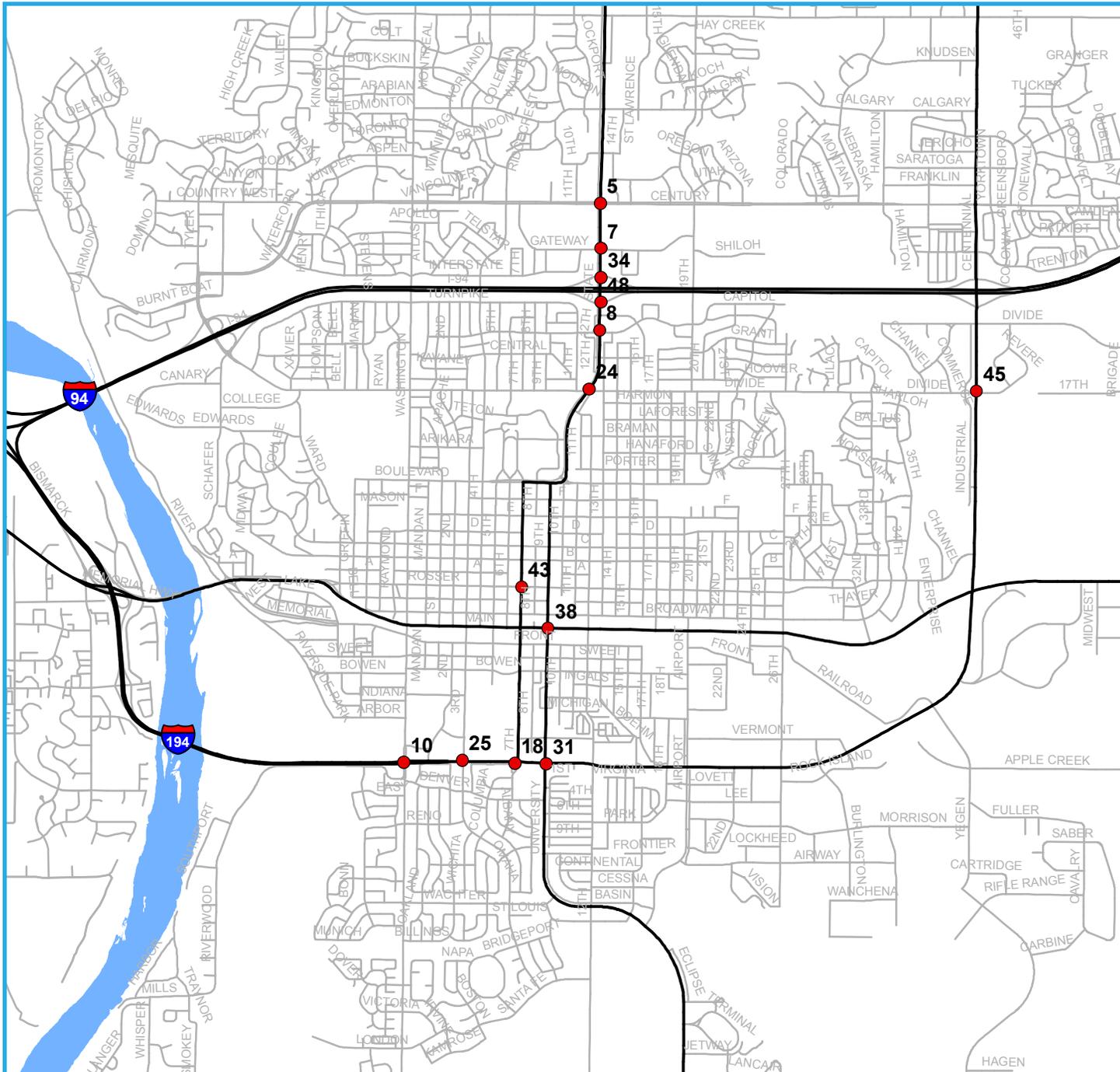
Structurally deficient and functionally obsolete are defined by the Federal Highway Administration. Structurally deficient indicates the deck, superstructure, substructure, or culvert have been rated in 'poor' condition (0-4 on the NBI Rating Scale). It may also indicate that the load carrying capacity is below current standards or that a waterway frequently overflows the deck and impedes traffic. Functionally obsolete indicates that the structure's design elements are outdated, but that the bridge is not considered structurally deficient.

Map created by W.R.H. January 2016. Based on information maintained by the City of Bismarck, Bismarck-Mandan MPO and North Dakota Department of Transportation. Bridge Sufficiency data was obtained from an NDDOT



ID	Location
1	Co Hwy / 35th St
2	Co Hwy / 25th Ave
3	I-94 WB / Sunset Dr.
4	I-94 EB / Sunset Dr.
5	Main St E Railroad Overpass
6	I-94 Near Exit 156
7	Co Hwy / 15th Street NW
8	Main Ave Railroad Overpass
9	West Main and Washington St
10	I-94 Near 80th St.
11	30th Ave NE / Apple Creek
12	I-94 EB / Apple Creek

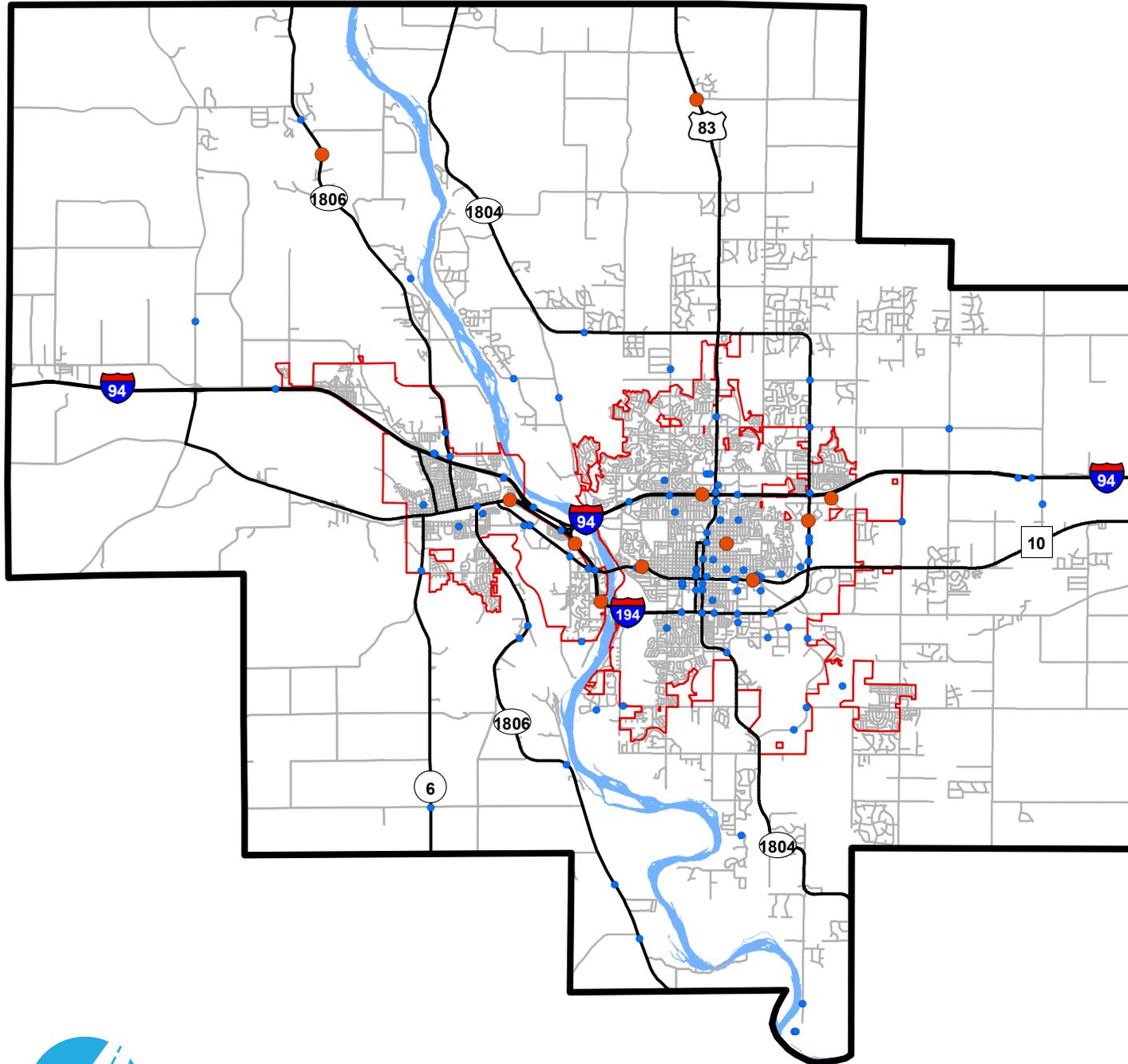
Map 4.9: 3 year Urban High Crash Locations (2012-2014)



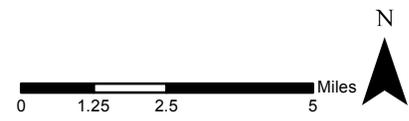
Map created by W.R.H., December 2015. Based on data maintained by the City of Bismarck, the Bismarck-Mandan MPO and the North Dakota Department of Transportation. Crash data obtained from the ND DOT report '2012-2014 (3yr) High Urban Crash Locations' Report - Statewide Intersections. *Urban is defined as a population of 5,000 or greater.

W:\MPO\GIS\Monitoring Report\2015 Monitoring Report Map Documents\Chapter

Map 4.10: Crashes by Severity 2013-2015



- MPO Boundary
- Corporate Limits
- Crash Severity**
- **Fatal** (11)
- **Incapacitating Injury** (112)



Map created by W.R.H., January 2016. Based on data maintained by the City of Bismarck, the Bismarck-Mandan MPO and the North Dakota Department of Transportation.

W:\MPO\GISMonitoring Report\2015 Monitoring Report Map Documents\Chapter 5\5.10CrashesbySeverity2013-2015.mxd

Public Transportation

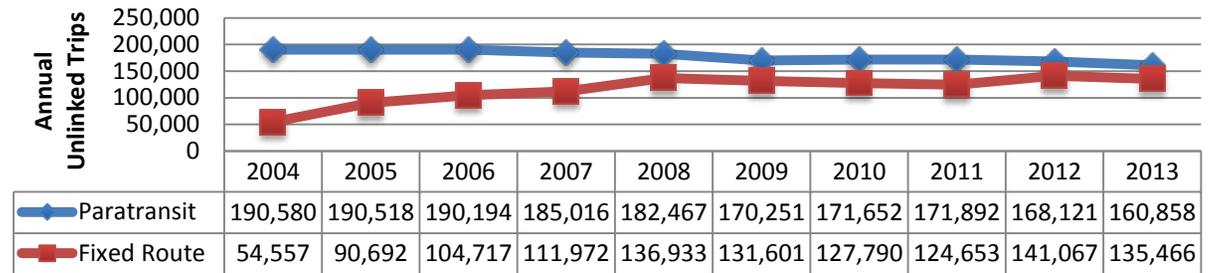
Bis-Man Transit is the area public transportation provider. It operates both a paratransit (Bis-Man Transit) door to door service and a fixed route bus service (Capital Area Transit or CAT). ParaTransit requires pre-eligibility: to confirm a disability or that individuals are 60 years of age or older. The ParaTransit service operates 24 hours a day 7 days a week. The CAT buses are eligible for all individuals to ride and operate on a route structure identified in **Map 4.11**. The CAT service operates from approximately 6am to approximately 7pm (dependent on route) Monday through Saturday (although not all routes are available on Saturday). CAT service is a “flag stop” service which means riders can flag the bus down at most points along the route to board or depart. The current CAT structure is comprised of a series of one way loops which operate out of two hubs, Gateway or Kirkwood Mall, both located in Bismarck. The current route structure provides relatively comprehensive geographic coverage throughout the area.

The City of Bismarck is the designated recipient of Federal Transit Administration (FTA) funds and owns the public transportation related facilities, vehicles, and equipment; however management and operation is contracted out.

The fixed route bus service began operating in 2004. **Figure 4.18** depicts ridership trends comparing paratransit service to fixed route service. Since 2004 annual trips associated with the paratransit service have slightly declined while annual trips associated with the fixed route service have increased. However, there are still more annual trips provided by the paratransit service in comparison to the fixed route service.

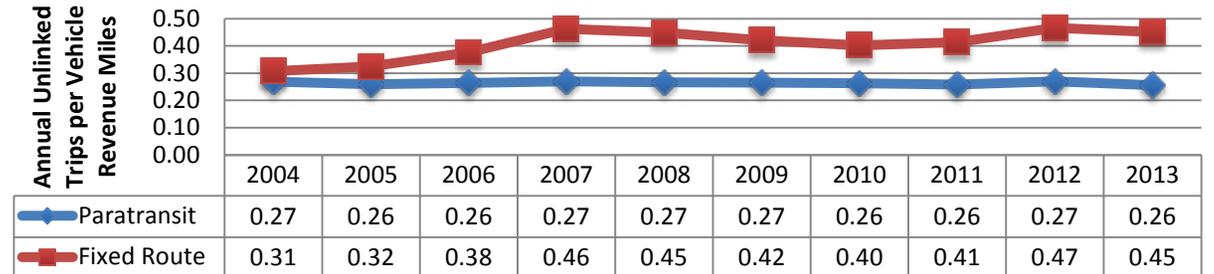
Vehicle revenue miles are a measure of vehicle miles traveled by a transit vehicle while in service. In attempting to understand the level of efficiency of

Figure 4.18: Total Annual Unlinked Trips for Paratransit and Fixed Route (2004-2013)



Based on data reported to the National Transit Database from 2004-2013

Figure 4.19: Total Annual Unlinked Trips per Vehicle Revenue Miles (2004-2013)



Based on data reported to the National Transit Database from 2004-2013

a service, annual trips per annual vehicle revenue miles traveled may be compared. **Figure 4.19** compares annual trips per vehicle revenue mile for the paratransit service and the fixed route service. As the figure indicates the fixed route service has consistently provided more trips per vehicle revenue mile in comparison to the paratransit service.

The 2014 transit fleet of vehicles was comprised of 20 ParaTransit and 10 CAT buses. In assessing the condition of a fleet, a comparison can be made to FTA identified “Useful Life Standards”, which indicate the typical useful life of a vehicle based on a variety of characteristics such as length, seating capacity, and average cost. The Bis-Man Transit Fleet was compared to the age and mileage FTA useful life standards in Table 2-8 in the FTA document, “Useful Life of Transit Buses and Vans” April 2007 (Report

No. FTA VA-26-7229-07.1). For paratransit Vehicles the FTA useful life standards are generally five years and/or 150,000 miles. As of December 31, 2014, the average age of the Bis-Man paratransit fleet was approximately 6.7 years with an average mileage of 179,458.

Approximately 40% of the Bis-Man Paratransit Fleet exceeded FTA useful life standards in both age and mileage. The useful life standards for fixed route buses are generally 7-10 years and/or 200,000-350,000 miles depending on vehicle characteristics. The average age of the CAT fleet was approximately 7.2 years with an average mileage of 282,353. No CAT vehicles exceeded useful life standards in terms of age however 50% of the CAT fleet exceeded useful life mileage standards.

Map 4.11: Capital Area Transit (CAT) Routes (2015)

 MPO Boundary

CAT Routes

-  Bismarck & Mandan M-1
-  E Bismarck A-1
-  E Bismarck A-2
-  Gateway to Kirkwood E-1
-  Kirkwood to Gateway E-2
-  Mandan & Bismarck M-2
-  NE Bismarck C-1
-  NE Bismarck C-2
-  NW Bismarck D-1
-  NW Bismarck D-2
-  SW Bismarck B-1
-  SW Bismarck B-2

 BusStops_2013

 Transit Service Area

 Miles
0 0.75 1.5 3



Map created by W.R.H., February 2016.
Based on data maintained by the City of Bismarck, the Bismarck-Mandan MPO and Bis-Man Transit.

W:\MPO\GIS\Monitoring Report\2015
Monitoring Report Map Documents\Chapter
5\5.11CAT_Routes.mxd

Bicycle and Pedestrian Transportation

The Bismarck-Mandan MPO area has a well-developed bicycle and pedestrian network. This network facilitates movement within each city, offers protected travel across the Missouri River, and allows access to remote recreational areas such as Fort Lincoln State Park. The network is comprised of both on-street and off-street sections. The paved off-street network includes multi-use paths that are at least 8 feet wide. These areas are accessible to pedestrians and cyclists, as well as, other active modes of travel (e.g.: rollerblading, running, etc.). The City of Bismarck has also incorporated on-street bicycle facilities, which include a combination of bicycle lane and “Share the Road” signage and pavement markings. Solid white lines, signs, and painted bike symbols denote protected bike lanes and indicate the correct riding direction (with the flow of traffic). Share the Road signs and pavement markings indicate that motorist should allow adequate space for themselves and cyclists to travel safely. Share the Road signs and Sharrows are used when roadways are too narrow to accommodate a protected bike lane. It should be noted that cycling is allowed on all city streets. However, certain streets have been marked or striped with sharrows or dedicated lanes to encourage bicycle travel.

The communities of Bismarck and Mandan have relatively extensive sidewalk coverage, throughout the communities. The City of Bismarck has an ordinance requiring the installation of sidewalks as adjacent development occurs. Additionally, the City of Bismarck has a program, which annually focuses on specific parts of the community, to fill “gaps” in the existing sidewalk network.

Map 4.12 depicts the paved pedestrian and bicycle network (excluding sidewalks), comprised of 110.55 miles of on and off street facilities. There are 100.5

miles of off-street network, denoted as multi-use trails. This is the largest portion comprising approximately 90.9% of the bicycle/pedestrian network. There are approximately 4.3 miles or 3.9% of the system comprised of striped bicycle lanes and signage. Share the Road Signage and pavement markings consist of approximately 5.75 miles or 5.2% of the network.

Map 4.13 shows crash locations between 2013 and 2015 that involved either a pedestrian or cyclist and a motor vehicle. There were a total of 138 reported crashes and the majority occurred within the central cities of Bismarck and Mandan. 9 out of 51 crash locations involving a cyclist occurred on an on-street bicycle facility, indicating that further safety improvements may be necessary.

Figure 4.20 breaks down the number of crashes by crash severity and type recorded between 2013-

Figure 4.20: Summary of Cyclist or Pedestrian and Motor Vehicle Crashes by Severity

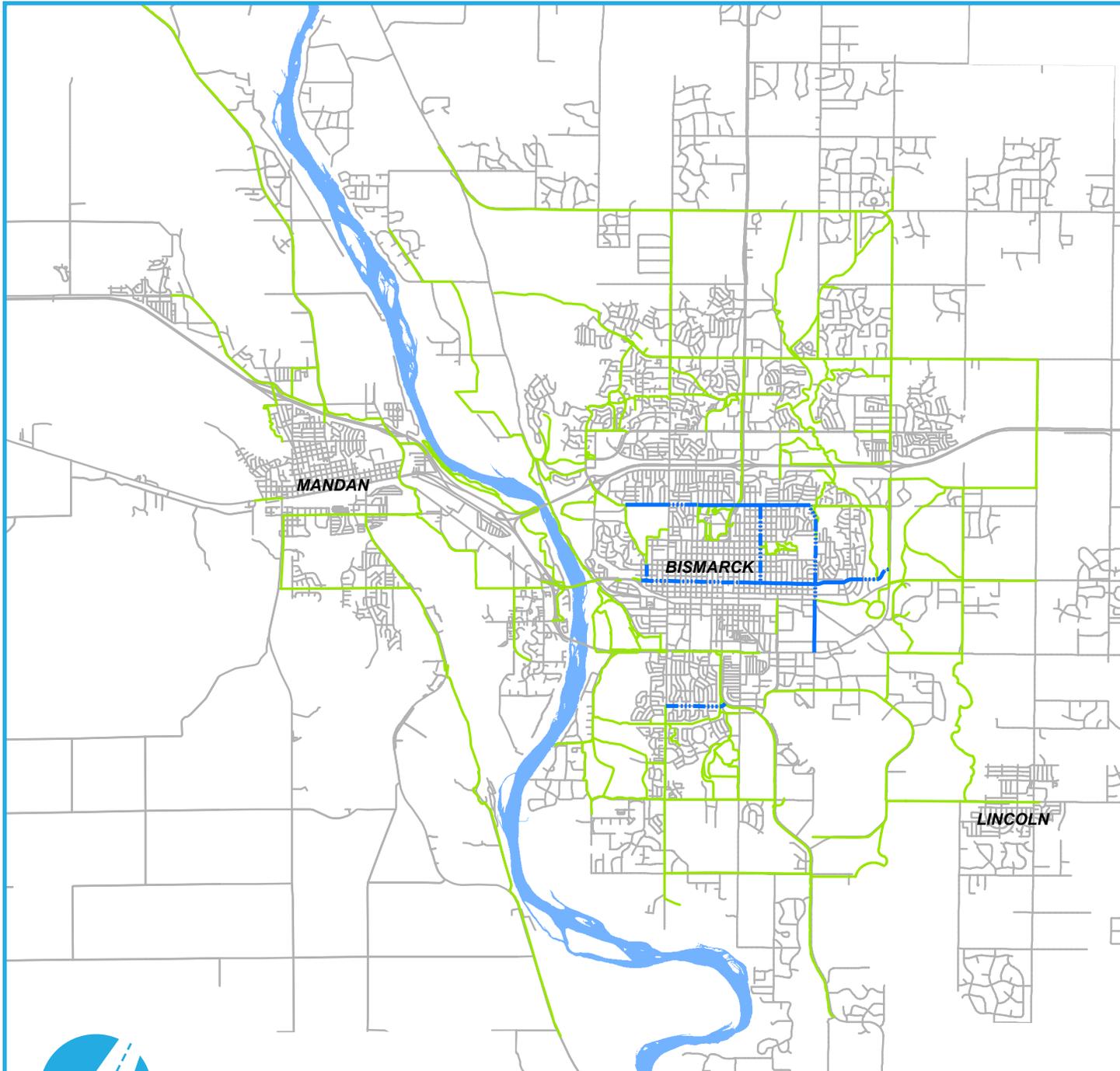
Crashes involving a Cyclist	
Fatal	0
Incapacitating Injury	2
Non-incapacitating injury	20
Possible Injury	27
Property Damage Only	2
Total	51
Crashes involving a Pedestrian	
Fatal	1
Incapacitating Injury	8
Non-incapacitating injury	34
Possible Injury	44
Property Damage Only	0
Total	87

Based on Crash Data provided by NDDOT (2013-2015)

2015. During this period there were over one and half times more incidents involving a pedestrian.

In August 2015, the MPO assembled a taskforce that met monthly to complete an application for area wide recognition as a Bicycle Friendly Community from the League of American Bicyclists. The criteria for the application is based on the 5E’s: Engineering, Education, Enforcement, Encouragement and Evaluation/Planning. The completed application was submitted in February 2016 and award determination is expected in May 2016. The award designation will also provide information and recommendations on ways to make bicycling related improvements.

Map 4.12: Bicycle and Pedestrian Network



Bicycle / Pedestrian Network

-  Bike Lanes
-  Share the Road Signage
-  Multi-Use Paths

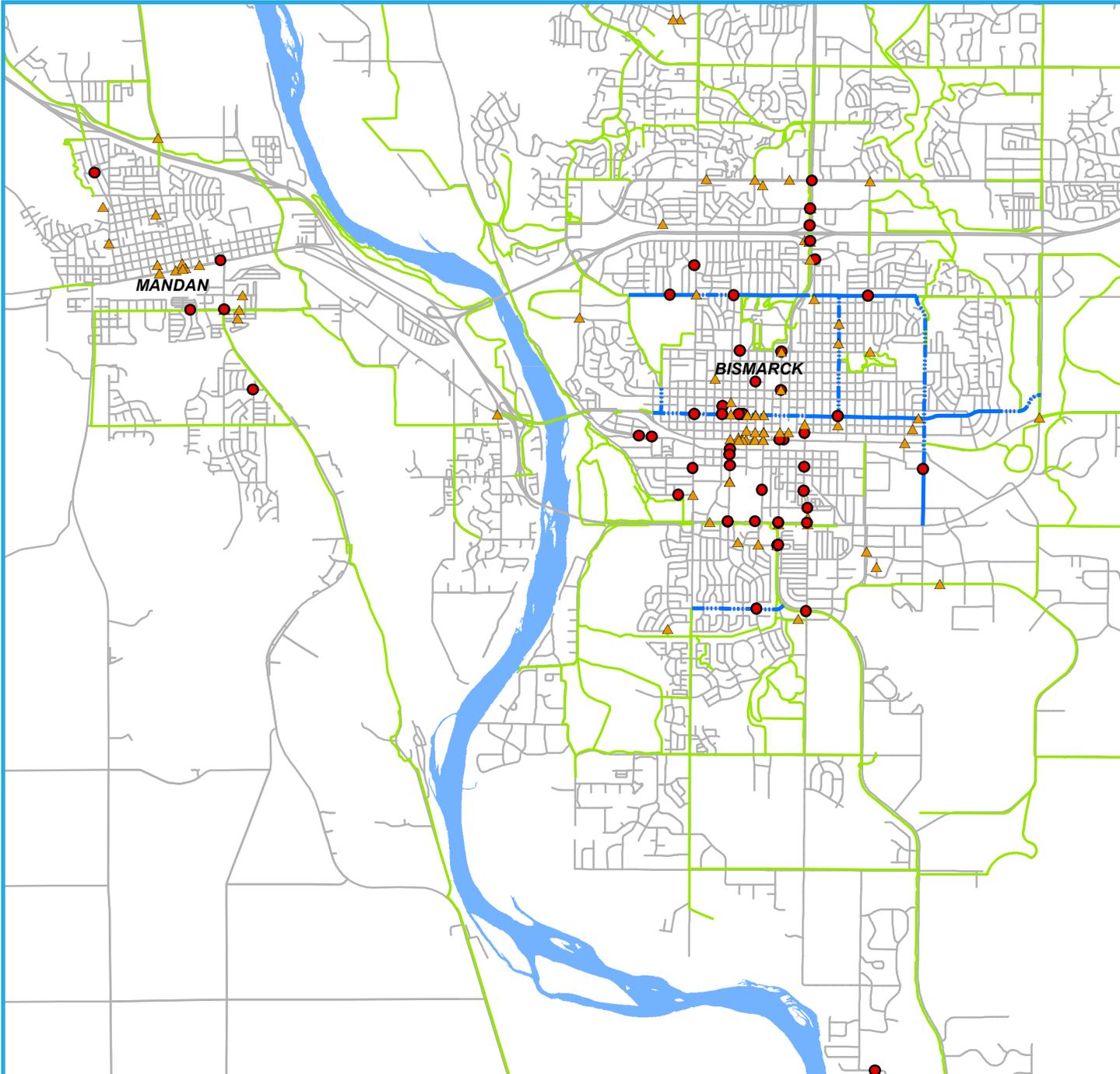
0 0.75 1.5 3 Miles



Map created by W.R.H., February 2016.
Based on data maintained by the City of
Bismarck, the Bismarck-Mandan MPO.

W:\MPO\GIS\Monitoring Report\2015
Monitoring Report Map Documents\Chapter
5\5.12BicyclePed.mxd

Map 4.13: Cyclist & Pedestrian Crash Locations (2013-2015)



Bicycle / Pedestrian Network

Bike Lanes

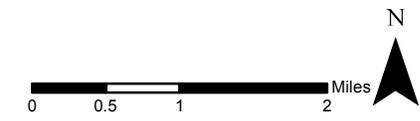
— Share the Road Signage

— Multi-Use Paths

CRASH TYPE

● Cyclist

▲ Pedestrian



Map created by W.R.H., February 2016.
Based on data maintained by the City of Bismarck, the Bismarck-Mandan MPO and the North Dakota Department of Transportation

W:\MPO\GISMonitoring Report\2015
Monitoring Report Map Documents\Chapter
5.13BicyclePedCrash.mxd

