# CASS COUNTY COMPREHENSIVE HIGHWAY PLAN

2017-2021

Cass County Highway Department
Cass County, North Dakota

This document was prepared pursuant to NDCC 11-31-03(2) and is intended to be used for internal planning purposes. Data used herein is deemed to be accurate, however, is not all-encompassing. Maps within are graphical displays of conditions at the time of preparation and are not to be used as a substitute for an accurate field survey.

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***Plan Purpose***

Cass County operates and maintains a highway system, which in conjunction with local, regional, and state systems, helps to serve the transportation needs of its residents and businesses. The Cass County Comprehensive Highway Plan provides the framework for development of the long range highway and bridge planning guidance for 2017-2021. The Plan describes system principals and standards, evaluates the existing County transportation system, identifies future system needs, develops a maintenance plan, identifies funding sources, and outlines strategies to implement the Plan. The Plan provides the framework for decisions regarding the roadway and bridge infrastructure improvements necessary to develop a safe and efficient highway system.

**Note: Cass County received an additional $13.6 million in transportation funding over the 2015-2016 biennium from the ND Legislature. To ensure adequate planning previous plans assumed a continued state revenue stream of an additional $6.5 million per year from 2016 to 2020. However, based on the current state revenue forecasts, we anticipated lower funding for 2017 and 2018. This reduction in funding is shown in the reduced number of projects we expect to complete in the 2017-2021 time frame. We will continue to be proactive in identifying future projects and will be prepared if state revenues increase and one time funding returns.**

## *Plan Updates and Proponent for Changes in this Plan*

The Cass County Engineer is the chief proponent for updates to the Cass County Comprehensive Highway Plan. Working in conjunction with the Assistant Cass County Engineer and County Planner, updates will be approved through the Road Advisory Committee and the Cass County Commission.

The five year plan will serve as a living document that will be updated annually to maintain a long range focus while allowing for flexibility due to changes in construction costs, revenues, flooding, and other considerations. The plan will be reviewed and updated in June of each year. The updated plan will be forwarded to the Road Advisory Committee for approval during the July rotational meeting. The plan will then be sent to the County Commission for final approval after budget approval. The plan will provide the future project costs and will serve as the basis for the Highway Department's annual highway and bridge budget line items.

***Vision and Mission***

**Vision -** To be recognized as a premiere county road program in the Northern Plains states.

**Mission -** To provide and maintain an efficient, safe, environmentally sensitive, and cost effective county road system that effectively meets the citizen's needs for personal mobility and the movement of freight consistent with the importance of the economy.

**Commitment** - We are committed to community service and providing quality, low cost project construction, engineering, and administration. Through public involvement, working with landowners, townships, and the travelling public, we strive to deliver effective highway and bridge maintenance,

rehabilitation, and new construction. Safety is paramount in everything we do. Whether plowing snow, maintaining traffic signs, gravelling rural roads, or building a new bridge, the safety of our employees and the travelling public always comes first.

***Goals***

Cass County's transportation goals are interdependent, mutually supportive, and apply to our transportation system's infrastructure and services. Our goals are nested with both the NDDOT and FM Metro COG transportation priorities.

1. Safe and secure transportation.
2. Sustainable and reliable mobility through planning and maintenance.
3. Communication and cooperation with landowners, townships, cities, NDDOT, and other stakeholders.
4. Transportation supports economic growth with consideration of environmental, cultural, and social impacts.
5. Cost effective construction with diversified and sufficient funding.

## *Summary*

The 2017-2021 Cass County Comprehensive Highway Plan was prepared to assist staff and decision makers in planning for maintenance and capital improvements to the County Highway System. The plan addresses both funding and project planning, so resources are used carefully to ensure the highest return to taxpayers. The Cass County highway system consists of 628 miles of roadway covering more than 1,700 square miles and 541 bridges of which 241 span a distance of 20 feet in length or greater.

Safe, efficient, and responsive transportation infrastructure is necessary to the incidents of commerce, public safety, recreation, and education. Two goals in the 2005 Cass County Comprehensive Plan describe Cass County's commitment to transportation:

**2005 Cass County Comprehensive Plan Goal Two:** *"To provide the citizens of Cass County with essential public facilities, services, and infrastructure."*

**2005 Cass County Comprehensive Plan Goal Three:** "*To provide an efficient, safe, environmentally sensitive, and cost effective county transportation system to effectively meet citizen's current and future needs for personal mobility and movement of goods."*

This plan has been developed through compiling data from multiple sources including:

- North Dakota Department of Transportation (NDDOT);
- Fargo-Moorhead Metropolitan Council of Governments (FM Metro COG);
- Pavement Testing from Consultant Engineers;
- Cass County Highway Department;
- Cass County Planning Department;
- Cass County GIS Department; and
- Cass County Tax Equalization Office.

The Highway Department is continuing to develop its inventory of data including an analysis of structures under 20 feet in length, inventory of signage on County Highways, geo-locating culverts and approaches on County Highways, inventory of ditch grades of all County Highways, and continued development of characteristics of each road segment. Collecting this data will further improve the County's asset management program.

Further, the plan works in concert with various regional plans and corridor studies. Staff works closely with FM Metro COG, NDDOT, and other entities of the County in planning and programming new projects. The Metropolitan Long-Range Transportation Plan guides development of the transportation system in the Fargo-Moorhead metropolitan area. Along with this larger plan, FM Metro COG has completed a number of complimentary studies that offer guidance to programming.

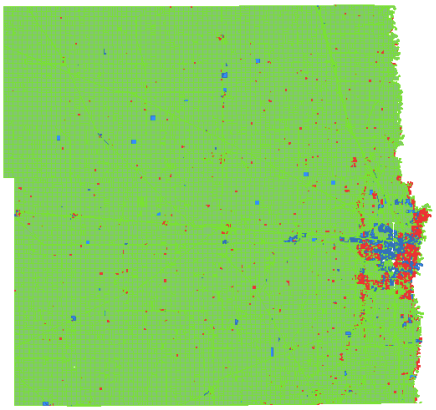
The development of a Regionally Significant Transportation Infrastructure in the Traffic Operations Incident Management Strategy identifies the importance of moving traffic quickly in times of disaster. Some County Highways have been identified in this strategic plan and are noted as new projects and are programmed. FM Metro COG, through the Metro Bike/Ped Committee, also creates a Bicycle and Pedestrian Master Plan every five years which helps identify needs in the system for accommodating alternate modes of traffic. Along with these plans, specific corridor studies in the metro area assist Cass County Highway anticipate or respond to necessary improvements to the system.

## *Existing and Future Land Use*

The Fargo Moorhead metropolitan area has seen tremendous growth in recent years. The economic prosperity of the metro area has contributed to the growth in the surrounding communities. According to the 1990 Census, Cass County population was 102,874, grew to 123,138 in 2000, and increased 21.6% to 149,778 in 2010. The most recent Census data from 2010 to 2013 shows Cass County growing to 162,829, an increase of 8.7%. With significant growth in commercial and residential building permits, Cass County can expect continued growth. In addition to utilizing Census data to project growth, Cass County participates with the FM Metro COG in researching demographic trends as part of its long range transportation planning and modeling. It is anticipated that by the year 2030 population in Cass County could grow to over 200,000. Table 1 illustrates population in the County's largest cities.

| *Table 1 - Population - US Census* | | | | |
|---|---|---|---|---|
| City | 1990 Census | 2000 Census | 2010 Census | 2015 Census Estimated |
| Fargo | 75,111 | 90,559 | 105,549 | 118,523 |
| West Fargo | 12,287 | 14,940 | 25,830 | 33,597 |
| Horace | 662 | 915 | 2,430 | 2,545 |
| Casselton | 1,602 | 1,855 | 2,329 | 2,521 |
| Mapleton | 682 | 606 | 762 | 875 |
| Harwood | 590 | 607 | 718 | 788 |
| Kindred | 569 | 614 | 692 | 728 |

Despite the growth and importance of the metro area, the County as a whole remains primarily agricultural. Ninety-seven percent of the approximately 1.13 million acres of land in Cass County are used for agricultural purposes. Map 1 illustrates this by showing agricultural land uses in green, commercial in blue, and residential in red. It becomes evident that the County's land use is predominately agricultural.



**Map 1: Existing Land Use**

Further, the County has committed to promote development only in areas that can adequately accommodate it. Goal One of the Cass County Comprehensive Plan: *"To achieve orderly, balanced, and sensible development"* includes objectives that pursue this goal and prevent incompatible land uses thus preventing a need for large infrastructure improvements in areas that currently are rural in nature. Goal Five: *"To preserve and maintain Cass County's rural heritage"* further emphasizes the desire of the County to continue its existing land use.

## Highway Safety

Cass County and its agents have committed to maintaining the safest network of roads possible. The planning process takes into account road safety by implementing the most effective practices available. Commitment to educating the public, roadway safety improvements, sign maintenance and improved signing, routine road maintenance, and operational safety are all components of each project.

Cass County uses the systemic approach to highway safety. All new construction and maintenance overlays include the use of edge line rumble strip installation to separate the roadway from the shoulder while leaving on-off gaps for bicycle safety. This method can help reduce accidents that occur from running off the road (roadway departures). As of 2015, nearly all asphalt County Highways have rumble strips. The only remaining roads without rumble strips are those with a projected paving project within the next few years and our older concrete roads. Intersection improvements and safety enhancements also are implemented

where collisions have historically happened or where collisions may be likely. Using a systemic approach, improvements such as flashing signals and stop signs, rumble strips, and improved signage have proven successful in past projects. Striping is performed annually on all paved County Highways.

Highway Access Ordinance #2007-1 was developed to reduce the amount of access points on County Highways for more efficient and safe operation. With design speeds on County Highways at 55 mph and the reduction of accesses to one per ¼ mile, a County Highway is able to operate with less interruption and more predictable intersections. In addition, the Ordinance regulates the design of the approach by increasing the slope of the approach to reduce severity in off road crashes.

Cass County uses crash data provided by the NDDOT in planning and implementing safety enhancements. When significant crashes occur on Cass County Highways, a general reconnaissance is performed by the County Engineer or Highway Superintendent to assess the road condition and variables that may be present.

***Signs and Traffic Control Devices***

Cass County utilizes the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD) from the US Department of Transportation, Federal Highway Administration. The MUTCD is the standard for traffic control devices and has been adopted by the NDDOT. Cass County maintains an inventory of their signs indicating condition and location in a geo-database.

***Local Road Safety Plan***

In 2014 the NDDOT sponsored a statewide Local Road Safety Plan (LRSP) for counties. The purpose of this plan was to develop the following:

1. Establish safety emphasis areas;
2. High priority safety strategies;
3. Identify at-risk locations;
4. Develop safety investment options;
5. Identify high priority safety projects, both proactive and reactive;
6. Position local agencies to compete for safety funds; and
7. Foster safety culture among local stakeholders.

One of the critical issues identified was the higher crash rate on rural paved roads. While gravel roads make up approximately 93% of North Dakota's 97,600 miles of rural local road system, approximately half of the severe crashes are on the paved roads that make up 7% of the rural system.

The LRSP therefore focused on the Cass County paved road network and a Risk Rating Criteria was developed for the paved roads based on: Density of Road Departure Crashes; Traffic Volume; Curve (Critical Radius) Density; Access Density; and Road Edge Risk Assessment.

To develop a comprehensive LRSP, a public workshop was held with an emphasis on the 4 E's: Engineering, Enforcement, Education, and Emergency Medical Services. Through group discussion and review of crash data, participants worked to address severe crashes on the County roadways. Critical

emphasis areas discussed were: Unbelted Vehicle Occupants; Lane Departure Crashes; Alcohol Related Crashes; Excessive Speed or Aggressive Driving; Intersection Crashes; and Crashes Involving Drivers Under Age 21.

Crash data from 2008 to 2012 was used for the countywide crash analysis. For Cass County, there were not enough crashes to be statistically reliable; therefore, decisions were based on the crashes for all cities, statewide data, or national research. The safety emphasis areas for Cass County are consistent with the state's emphasis areas. This process revealed where crashes were overrepresented based on a comparison to statewide averages or where a large enough number of crashes represented an opportunity to substantially reduce crashes. As a result, the following safety emphasis areas were identified as priorities for safety investments:

- Driver Behavior – Young drivers, aggressive drivers, alcohol-related, and unbelted vehicle occupants; and
- Highways – Lane departure and intersection crashes.

Cass County Severe Crashes by Safety Emphasis Areas (2008 to 2012)

| Safety Emphasis Areas | Statewide (% of Total) | 2008 to 2012 Severe Crashes | | | | | |
|---|---|---|---|---|---|---|---|
| | | Cass County | | State Roads | | Local System | |
| | | % | # | % | # | % | # |
| **Total Severe Crashes** | **2,231** | **243** | | **82** | | **161** | |
| Involving Drivers Under Age 21 | 22% | 25% | 60 | 18% | 15 | 28% | 45 |
| Involving Drivers Over Age 64 | 13% | 11% | 26 | 15% | 12 | 9% | 14 |
| Excessive Speed or Aggressive Driving | 26% | 23% | 57 | 33% | 27 | 19% | 30 |
| Alcohol-Related | 30% | 23% | 55 | 26% | 21 | 21% | 34 |
| Distracted, Asleep, or Fatigued Drivers | 9% | 9% | 23 | 10% | 8 | 9% | 15 |
| Unbelted Vehicle Occupants | 48% | 37% | 91 | 40% | 33 | 36% | 58 |
| Pedestrian Crashes | 5% | 12% | 29 | 7% | 6 | 14% | 23 |
| Bicycle Crashes | 2% | 7% | 18 | 6% | 5 | 8% | 13 |
| Motorcycle Crashes | 12% | 13% | 31 | 7% | 6 | 16% | 25 |
| Heavy Vehicle Crashes | 15% | 10% | 25 | 18% | 15 | 6% | 10 |
| Train-Vehicle Collisions | 1% | 0% | 0 | 0% | 0 | 6% | 10 |
| Lane-Departure (Run-Off-the-Road and Head-On) Crashes | 47% | 29% | 71 | 41% | 34 | 23% | 37 |
| ***Head-On*** | ***7%*** | ***6%*** | ***14*** | ***9%*** | ***7*** | ***4%*** | ***7*** |
| ***Run-off-the-Road Crashes*** | ***40%*** | ***23%*** | ***57*** | ***33%*** | ***27*** | ***19%*** | ***30*** |
| Intersection Crashes | 23% | 30% | 74 | 9% | 7 | 42% | 67 |
| Work Zone Crashes | 2% | 2% | 5 | 2% | 2 | 2% | 3 |

Cass County is doing quite well in regards to roadway safety. This is due to Cass County's existing safety strategies including rumble strips, pavement markings, pavement safety edges, and improved signing. Another factor is the low number of curves in our roadways as this reduces the number of roadway departures and other safety issues experienced in other counties in our region with winding roads. With this in mind, our biggest safety issue involves our intersections. Because of adequate signing and lower

traffic volumes, many of our intersections are safe and don't require any improvements. However, several of our intersections along ND 18, ND 38, and ND 46, as well as some intersections of two County Highways could be improved. Overall the biggest safety recommendation includes evaluating street lights, signage, pavement markings, and dynamic warning signs. We will work with the NDDOT to determine the best safety options at the intersections of state highways. We will then submit the critical intersections for safety funding for the required improvements.

## *Permitting*

Related to safety and maintenance, the County relies on various permitting procedures to uphold the mission of the Department. Significant permits include:

1. Over Dimension Vehicles Permits: Ordinance #2005-2 regulates over dimension vehicles to ensure the safe practices and avoidance of damage to County Highways. Similarly the County annually enacts Spring Load Restrictions to avoid damage to the road surface and subgrade during the wet months of spring;
2. Utility Permits: The County also permits use of its right of way for utilities which includes provisions to ensure safe operation during construction activities on or near the roadway;
3. Ditch Cleaning/Drainage Permits: There is also a permitting process for ditch cleaning to better inventory what is being done and to ensure that the water resource district is adequately notified;
4. Access Permits: The County actively permits any new access to County Highways through the Highway Access Ordinance #2007-1; and
5. Subdivision Platting: The County Planning Office administers the Subdivision Ordinance which regulates growth in the County and efficiently accommodates for new roads and land use changes that may affect the County Highway System. The County Engineer reviews all new developments and assists in advising the Planning Commission.

## *Valuation of Highway and Bridge Assets*

Cass County has invested a significant amount of funding in developing and maintaining its transportation network. Since 2000 we have spent $141 million in projects and maintenance on both our highways and bridges.

The current average cost to completely rebuild a paved highway is $1.4 million. To rebuild our 316 miles of paved highway to a width of 32 feet would cost over $442 million.

With 518 structures, our bridges and large box culverts also have a significant asset value. Of the 241 major structures (20 feet in length or greater), the average structure length is 94 feet with an average width of 28 feet. Replacement values for these 241 structures, at a cost of $205 per square foot (cost based on the Upper Great Plains Transportation Institute study) would be just over $140 million.

When factoring the additional cost to replace the 277 minor structures, the total replacement cost of our highway and bridge infrastructure is nearly 2/3 of a billion dollars. While no local government can bear the replacement cost of this large amount of infrastructure, it emphasizes the importance of

funding and sustaining an effective maintenance program. An organized and well planned maintenance and replacement program will keep replacement costs down, efficiently spend the County's resources, extend the life of our infrastructure, and ensure the long term viability of our highway system.

## *Funding Maintenance and Construction*

The County relies upon a combination of the 23 cent state fuel tax, state motor vehicle license fees, federal road and bridge funds, local property tax, and one time state funding. Other items such as permit fees make up a very small portion of the budget. Cass County also continually pursues grant funding opportunities as they become available.

Influencing the cost of construction is the significant rise in the ND Construction Cost Index. From 2005 to 2013, ND's overall Construction Cost Index increased annually by more than 18%. Rebuilding just one mile of road can cost up to $1.4 million. In light of this reality it is important to maintain a road maintenance policy to reduce the need for reconstruction.

While Construction Costs have increased annually at 18% since 2005, Cass County's Highway Distribution Tax Funding (without One Time Funding) has only increased 7%. North Dakota has a state tax that currently collects 23 cents per gallon of gasoline. This tax was last increased in 2005.

Federal funding comes from the federal gas tax of 18.4 cents, last increased in 1993. In 2000, Cass County received $1.25 million in Federal Aid Highway Funds. With the changes from federal Moving Ahead for Progress in the 21st Century Act (MAP-21), we now only receive $900k in Federal Aid Highway Funds, which equates to a 25% decrease. Since 2000 we have continued to receive approximately $700k in Federal Aid Bridge Funds every year. Federal Aid as a percentage of the County's total revenues has continued to decrease. In 2000, Federal Aid made up 21% of Cass County's revenues. From 2000-2005 Federal Aid averaged 19% of our total funding and from 2006-2012 it averaged 13% of our total funding. Now Federal Aid only makes up 8% of our County revenues. While our costs have increased 18% annually since 2000, our Federal Aid has decreased. Over that same time, local and state funding increased from $7.4 million to $19.6 million, an annual average increase of 6%. If it were not for the growth in local and state funding, we would not be able to maintain our existing highway and bridge network. Federal Aid has become a very small component of our overall revenues and can no longer be counted on to fund major projects.

Regarding our asphalt highways, they generally require a maintenance overlay every 15-20 years. Current costs of a typical asphalt overlay in Cass County can range from $200,000-$450,000 per mile, depending on road width and thickness of the asphalt overlay, with the most frequent 36' wide, 2.5" thick overlay being approximately $300,000 per mile. Under the desired maintenance schedule an overlay would occur every 17½ years. Given the current inventory in Cass County we could schedule

approximately 17 miles of asphalt overlay per year. Using the rate of $300,000 per mile we can estimate a cost of $5.1 million per year. If pavements are not overlaid with a new asphalt surface before they deteriorate, they will require full reconstruction.

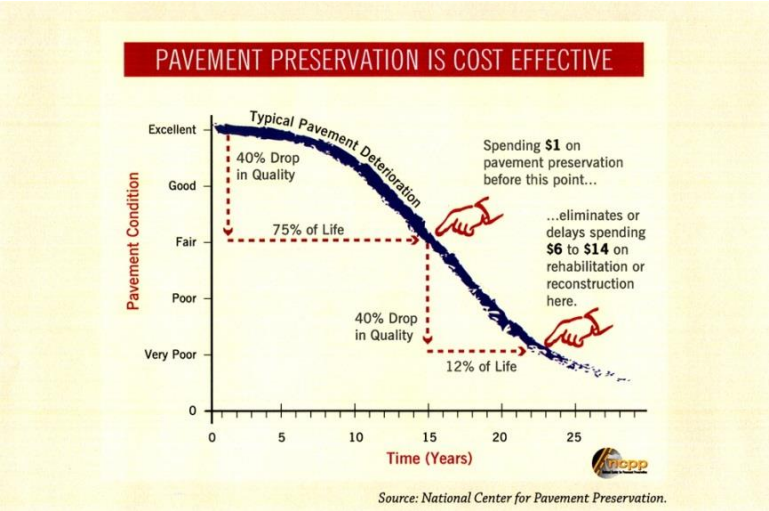



Table 2 shows the estimated revenue for the Cass County Highway Department from 2016 through 2020. These estimates use revenue inflation rates of 1.5% for Federal Funding, 3% for State Funding, and 4% for Local Funding. These inflation rates were developed by Metro COG. In addition, the Operation Cost inflation rate use was 4%. **It includes special Legislative funding similar to what Cass County will receive in 2017 from in the 2015-2016 biennium. Years 2018 to 2021 do not include estimates for additional one time funding. The Highway Distribution Tax totals are an estimate based on past funding.** Estimated annual Federal Aid Highway funding is $900,000. The chart also includes the additional Federal Aid Funding for Bridge projects. Federal Aid Bridge funding is based on need as the NDDOT has $5 million allocated state wide for county bridges (Cass County competes for these funds based on other county needs throughout the state). Federal Aid Bridge Funding for 2016 is allocated. Funding for 2017-2020 is estimated and not allocated.

*Table 2 - Estimated Revenue*

| Revenue Description | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Property Tax | $7,243,014 | $7,387,874 | $7,535,632 | $7,686,344 | $7,840,071 |
| Highway Distribution Tax and Additional State Funding | $9,049,988 | $7,140,000 | $7,282,800 | $7,428,456 | $7,577,025 |
| Other | $132,131 | $134,774 | $137,469 | $140,218 | $143,023 |
| Total Revenues | $16,425,133 | $14,662,648 | $14,955,901 | $15,255,019 | $15,560,119 |
| Estimated Starting Balance | $2,500,000 | $900,000 | $900,000 | $900,000 | $900,000 |
| Federal Aid Highway Funding | $0 | $0 | $1,800,000 | $0 | $1,800,000 |
| Federal Aid Bridge Funding | $0 | $350,000 | $350,000 | $400,000 | $400,000 |
| Total Revenues, Starting Balance, & Federal Aid | $18,925,133 | $15,912,648 | $18,005,901 | $16,555,019 | $18,660,119 |
| Total Operating Cost (not including Road/Bridge Projects) | $5,740,808 | $5,970,440 | $6,209,258 | $6,457,628 | $6,715,933 |
| Total Available for Road/Bridge Projects | $13,184,325 | $9,942,208 | $11,796,643 | $10,097,391 | $11,944,186 |

## *Long Range Funding Estimates*

In 2013-2014, Metro COG updated its Long Range Transportation Plan – Metro 2040. This plan contains Short-Range (2015-2020), Mid-Range (2021-2030), and Long-Range (2031-2040) revenue estimates. These estimates also use revenue inflation rates of 1.5% for Federal Funding, 3% for State Funding, 4%

for Local Funding, and an Operation Cost inflation rate of 4%. Table 3 uses the Metro 2040 revenue estimates. These estimates use standard Highway Distribution Tax funding and do not include additional State funding (this is the difference between the Table 2 2017-2021 total of $80,955,809 and the Table 3 Short-Range total of $47,219,899). With the continued support of one-time funding from the ND Legislature, Cass County could have an additional $34 million in Short-Range funding and more than $300 million over the next 30 years. Unfortunately when looking out to 2045, additional one time state funding only keeps up with maintaining our highway system. Continued funding at the current 2013 Legislative Session rate will allow us to annually overlay 18 miles, reconstruct 3.5 miles, replace 3-4 bridges, and complete seven miles of gravel road construction. If the additional funding was pulled back, as shown below, we would only be able to annually fund 13.5 miles of overlays, 2 miles of reconstruction, 1-2 bridges, and no gravel road construction.

*Table 3 - Long Range Revenue Estimates*

| Revenue Description | Short-Range 2016-2025 | Mid-Range 2026-2035 | Long-Range 2036-2045 | Total |
|---|---|---|---|---|
| Property Tax | $70,652,910 | $94,781,576 | $115,538,212 | $280,972,698 |
| Highway Distribution Tax | $70,332,387 | $91,601,511 | $111,661,731 | $273,595,630 |
| Other | $1,288,889 | $1,729,057 | $2,107,711 | $5,125,657 |
| Total Revenues | $142,274,186 | $188,112,144 | $229,307,654 | $559,693,984 |
| Federal Aid Highway Funding | $7,309,447 | $10,880,439 | $13,263,195 | $31,453,081 |
| Federal Aid Bridge Funding | $3,181,616 | $4,835,751 | $5,894,753 | $13,912,120 |
| Total Revenues & Federal Aid | $152,765,249 | $203,828,334 | $248,465,602 | $605,059,185 |
| Total Operating Cost (not including Road/Bridge Projects) | $60,753,796 | $98,101,419 | $145,214,065 | $304,069,280 |
| Total Available for Road/Bridge Projects | $92,011,453 | $105,726,915 | $103,251,537 | $300,989,905 |

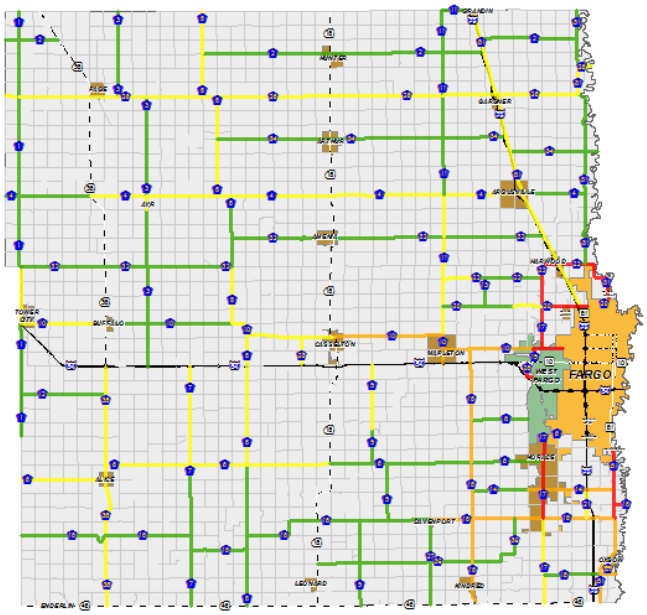
## *Cass County Highways: Design Standards for New or Reconstruction of Existing Facilities*

The typical section of a County Highway is rural in nature with two lanes, either paved or gravel surface. Different modes of travel and location of roadways to population centers, agricultural points of traffic, or schools sometimes require different needs. Further drainage needs may vary from roadway to roadway. Table 4 summarizes the Design Standards for New or Reconstruction of Existing Cass County Highways.

| *Table 4 - Minimum Design Standards for New or Reconstruction of Existing Infrastructure* | | | | | | | |
|---|---|---|---|---|---|---|---|
| Typical Section | Design Speed | Right of Way | Road Width | Turn Lanes | Min. Section Thickness | Access Controls | Bike/Ped Facilities |
| Two-Lane Township Gravel Section | 55 mph | 66 feet | 28 ft | no | 4" Gravel | 1/4 mile spacing | N/A |
| Two-Lane Rural Gravel Section | 55 mph | 200 feet | 28 ft | no | 6" Gravel | 1/4 mile spacing | N/A |
| Two-Lane Rural Paved Section | 55 mph | 200 feet | 32 ft | no | 12" Base + HBP | 1/4 mile spacing | 4 ft paved shoulder |
| Two-Lane Village Paved Section | 25 mph | 200 feet | 32 ft | no | 12" Base + HBP | Varies | 4 ft paved shoulder |
| Two-Lane City Paved Section | 25 mph | 200 feet | 36 ft | no | 12" Base + HBP | Varies | 6 ft paved shoulder |
| Two-Lane Metro Paved Section | 40-55 mph | 200 feet | 36 ft | no | 12" Base + HBP | 1/4 mile spacing | 6 ft paved shoulder |
| Three-Lane Metro Paved Section | 40-55 mph | 200 feet | 50 ft | 1/4 mile spacing | 12" Base + HBP | 1/4 mile spacing | 6 ft paved shoulder and separated path |

*Note: 4:1 minimum inslope, 3:1 minimum backslope, 0.05% ditch grade, 24" minimum culvert, 8' minimum ditch bottom width on all rural highway sections; minimum HS-25 design load, 5 year storm design on all bridges.

Cass County has prioritized roads to assist in such issues as maintenance, striping, and snow removal. Priorities are used to determine which roads are plowed first and the schedule for which maintenance or construction projects will be completed. Priorities are developed by the County Engineer by considering average daily traffic volumes, pavement condition, as well as important points of need such as schools, cities, and commerce. Map 2 displays these priorities; red is priority 1, orange is priority 2, yellow is priority 3, and green is priority 4.




Map 2: Road Priorities

## *Cass County Highways: Current Status of Paved Highways*

Cass County currently maintains 316 miles of paved highways along the rural portions of the county. These highways vary in age and building materials (See Appendix 5 for pavement age), and will deteriorate at varying rates due to these factors. To determine their condition, county roads are inspected every 5 years by an independent testing consultant using a "Falling Weight Deflectometer" and given a PCI (Pavement Condition Index) rating from the results of this test. These results are used by county engineers to help shape decisions for future roadway maintenance/rebuilding. The most recent PCI survey was completed in 2012 and results are shown in Appendix 3 (next PCI testing will be in 2017). Cass County's goal is to have an overall PCI of 93. Additionally, seal coats are applied to asphalt highways two years after paving or overlaying has been

completed to increase the life of the pavement to 15-20 years. Our overall goal is to complete another chipseal around years 8-14 to extend the life of the existing pavement before another overlay is necessary. A map showing the most recent seal coat for each highway is shown in Appendix 6.

## *Cass County Highways: Current Status of Gravel Highways*

Cass County currently maintains 312 miles of gravel highways within the rural portions of the county. These highways vary in age, and some have been widened for future paving. Currently, the roads are maintained with weekly or bi-weekly grading depending on usage. Additionally, a budget for road repairs is prepared every year and additional gravel is added to roads requiring repairs with the allotted funds on a priority system of damage and usage. A more uniform plan for gravel roads has been adopted for the future, where a general standard of 28' road tops with a 4% crown grade will be used for future gravel grading and reshaping projects. In addition to these dimensional standards, areas with weak subgrade are retrofitted with drain tile to remove excess moisture from the subgrade or cement reinforcement sections to increase the structural capacity of the road top. Gravel roads that have become widened or flatter over time from traffic will also be reshaped. Reshaping returns the roadway back to its designed width and crown. As gravel costs and traffic increase, gravel stabilization, dust control, and subgrade stabilization are becoming more important. Over the next several years we anticipate adding more miles of stabilized gravel and more miles of roads with dust control. This will help bridge the gap between gravel roads with 100 ADT or less and paved roads with more than 400 ADT. Our gravel roads with 100-400 ADT have a need for more enhanced gravel treatments, stabilization, and dust control to adequately manage the roadway conditions as traffic increases.

## *Bridge Maintenance and Construction*

Cass County maintains 541 structures of which 241 span a distance of 20 feet in length or greater. Inevitably these bridges will deteriorate over time. Maintenance, reconstruction, replacement, and removal needs to and does occur. The NDDOT conducts bi-annual inspections of all structures greater than 20 feet in length giving County officials an accurate inventory of existing bridge conditions. This inventory is used to conduct` planning for the most effective projects on bridges most in need. The inventory also includes structures that have been identified by inspectors with a "Code 3" status meaning that immediate attention is required. In Cass County the average age of a bridge is 40 years

old. Of the 518 structures, nearly 40% were built before 1960. Designed to the standards of their time, many of these bridges have reached the end of their design life or cannot handle the truck traffic of today. Of our 238 bridges spanning over 20 feet, and 300 bridges spanning under 20 feet, we have 44 that are structurally deficient and 8 that are functionally obsolete. If we assumed a 70 year lifespan for our structures, we need to replace at least seven per year. Since such a large number of bridges are now over 50 years old, over the next twenty years we will have a higher number of bridge replacements, further taxing our finances.

## *Cass County Bridges: Current Status of 20 foot or Longer Bridges on County Highways*

Appendix 7 shows bridges of 20 feet or longer on County Highways. On average, these bridges are in fair condition. As of 2014, we no longer have any bridges with load restrictions on the County Highway network. The NDDOT inspects all 20 foot or longer bridges on a 2 year cycle and rates each on a 0-100 scale. When this sufficiency rating falls below 50, the bridge is eligible for Federal funding. Currently, there are no bridges on County Highways that are below 50, however, there are 2 bridges in the 50-58 range. These would be potential sites for replacement in the near future as their rating falls below 50 or due to width and load restrictions.

## *Cass County Bridges: Current Status of 20 foot or Longer Bridges on Township Roads*

Appendix 8 shows bridges of 20 feet or longer on township highways. These structures vary in condition from poor and in need of replacement to very good. There are approximately 20 bridges with a sufficiency rating below 50. Several of these have a Code 3 rating which requires priority attention. These bridges are replaced or repaired on a priority basis with input from the township officials.

## *Cass County Bridges: Current Status of Bridges less than 20 feet in Length*

There are many minor structures that are less than 20 feet in length. The NDDOT no longer inspects these bridges. The Cass County Highway Department is in the process of developing a 5 year rotation for inspecting these structures.

## *Strategic Long Range 2040 Goals*

Now through the year 2040, Cass County will continue to aggressively design, build, and maintain our future highway network. Below are the goals listed by decade:

***Now through 2020***

- Inventory, inspect, and develop a detailed maintenance/inspection program for Minor Structures (bridges/structures less than 20 feet in length).

- Complete design/plans on 75% of the highway and bridge projects at least 18 months prior to construction.

***2021 to 2030***

- Reconstruct or regrade all paved County highways with inslopes less than 4:1 to a standard slope of 4:1 or flatter and a 32 foot wide paved surface.
- Construct a continuous paved highway running east-west across the County south of Interstate 94.
- Repair, replace, or remove all bridges/structures identified with a sufficiency rating less than 50 within two years of its last inspection.

***2031 to 2040***

- Implement a plan to regrade or reshape all gravel roads within the last 30 years to ensure we maintain a proper 28 foot wide surface, maintain 4:1 inslopes, and maintain ditch drainage and culverts.

## *2017-2021 Paved Highway Improvement Plan*

There are numerous factors that can be and are used to make decisions regarding improvements and maintenance on the County Highway System. Many variables go into prioritizing future projects such as average daily traffic as obtained from the NDDOT and/or the FM Metro COG, PCI ratings, asphalt thickness, last year paved, last year sealed, population within the proximity, and points of commerce or increased traffic. These variables are taken into consideration when scheduling the most efficient construction schedules in upcoming years. Table 5 illustrates the proposed highway projects for the next five years that are a result of these components.

*Table 5 - Proposed Paved Highway Improvements*

| Hwy | Proejct Location | Type of Project | Funding Source (Local/Fed Aid) | Year to be Completed * | Project Cost |
|---|---|---|---|---|---|
| 38 | State Hwy 46 to Hwy 6 West | Grading & Surfacing | Local | 2017 | $7,652,000 |
| 38 | Hwy 6 West to I94 | Grading & Surfacing | Local | 2018 | $6,800,000 |
| 38 | State Hwy 46 to I94 | Bituminous Surfacing | Local | 2019 | $5,950,000 |
| 10 | State Hwy 18 - Hwy 11 | Grading & Surfacing | Local | 2020 | $6,375,000 |
| 16 | State Hwy 18 to Davenport | Gravel Stabilization | Local | 2020 | $4,000,000 |
| 4 | State Hwy 38 to Hwy 3 | Mill and Overlay | Local | 2021 | $800,000 |
| 10 | State Hwy 18 - Hwy 11 | Bituminous Surfacing | Local | 2021 | $2,625,000 |
| 10 | Buffalo to Hwy 5 North | Gravel Stabilization | Local | 2021 | $4,000,000 |

'* Note: Years to be completed are illustrative and subject to change and approved annually and/or as necessary by the Road Advisory Committee.

## *2017-2021 Gravel Road Improvement Plan*

Many factors are used to make decisions regarding improvements and maintenance of our gravel road system. Routine maintenance, motor grader operations, and annual gravelling programs are sufficient in maintaining a consistent, high quality gravel road. However, there are times where excessive moisture, poor drainage, soft subgrade, and other issues must be addressed. In addition, there are times when major reshaping or regrading of gravel roads must occur. Cass County is proactively working to reduce soft roadbeds through drain tile and subgrade repair/cement stabilization. In addition, Cass County will address significant soft spots and subgrade issues through near term drain tile and subgrade repair projects. Long term work will be done to reshape gravel roads that have become widened or flattened over time from traffic, and up to 15 miles of gravel road will be reshaped annually. This reshaping will save money over time by reducing the width of the roadway back to County design standards, which in turn reduces the overall gravel required to resurface the roadway. Table 6 illustrates the proposed gravel highway improvements.

Table 6 - Proposed Gravel Highway Improvements

| Hwy | Project Location | Length (Miles) | Type of Project | Year to be Completed | Funding Source (Local/Fed Aid) | Project Cost |
|---|---|---|---|---|---|---|
| UNK | To Be Determined | | Drain Tile | 2017 | Local | $0 |
| UNK | To Be Determined | | Drain Tile | 2018 | Local | $0 |
| UNK | To Be Determined | | Drain Tile | 2019 | Local | $0 |
| UNK | To Be Determined | | Drain Tile | 2020 | Local | $0 |
| UNK | To Be Determined | | Drain Tile | 2021 | Local | $0 |
| | | | | | | |
| UNK | To Be Determined | | Subgrade Repair | 2017 | Local | $0 |
| UNK | To Be Determined | | Subgrade Repair | 2018 | Local | $0 |
| UNK | To Be Determined | | Subgrade Repair | 2019 | Local | $0 |
| UNK | To Be Determined | | Subgrade Repair | 2020 | Local | $0 |
| 34 | 2 Miles W. of C11 & C11 to I29 | 4.5 | Subgrade Repair | 2021 | Local | $675,000 |
| | | | | | | |
| UNK | To Be Determined | | Reshaping | 2017 | Local | $0 |
| UNK | To Be Determined | | Reshaping | 2018 | Local | $0 |
| UNK | To Be Determined | | Reshaping | 2019 | Local | $0 |
| 16 | C16 Curves | 3 | Reshaping | 2020 | Local | $450,000 |
| UNK | To Be Determined | | Reshaping | 2021 | Local | $0 |
| | | | | | | |
| UNK | To Be Determined | | Gravel Stabilization | 2017 | Local | $400,000 |
| UNK | To Be Determined | | Gravel Stabilization | 2018 | Local | $0 |
| UNK | To Be Determined | | Gravel Stabilization | 2019 | Local | $0 |
| 16 | State Hwy 18 to Davenport | 8 | Gravel Stabilization | 2020 | Local | $2,800,000 |
| 10 | Buffalo to C5N | 8 | Gravel Stabilization | 2021 | Local | $2,800,000 |

## *2017-2021 Bridge Improvement Plan*

The County utilizes bi-annual inspection reports provided by the NDDOT to identify necessary improvements to County and township structures. Funding is allocated annually to account for these necessary improvements. In addition to these improvements the County includes, in the construction schedule, necessary flood repairs which combine local and federal funds. There are approximately 40 bridges currently slated for improvements with additional funding set aside for replacing minor structures. Table 7 illustrates the proposed bridge improvements for 2017-2021.

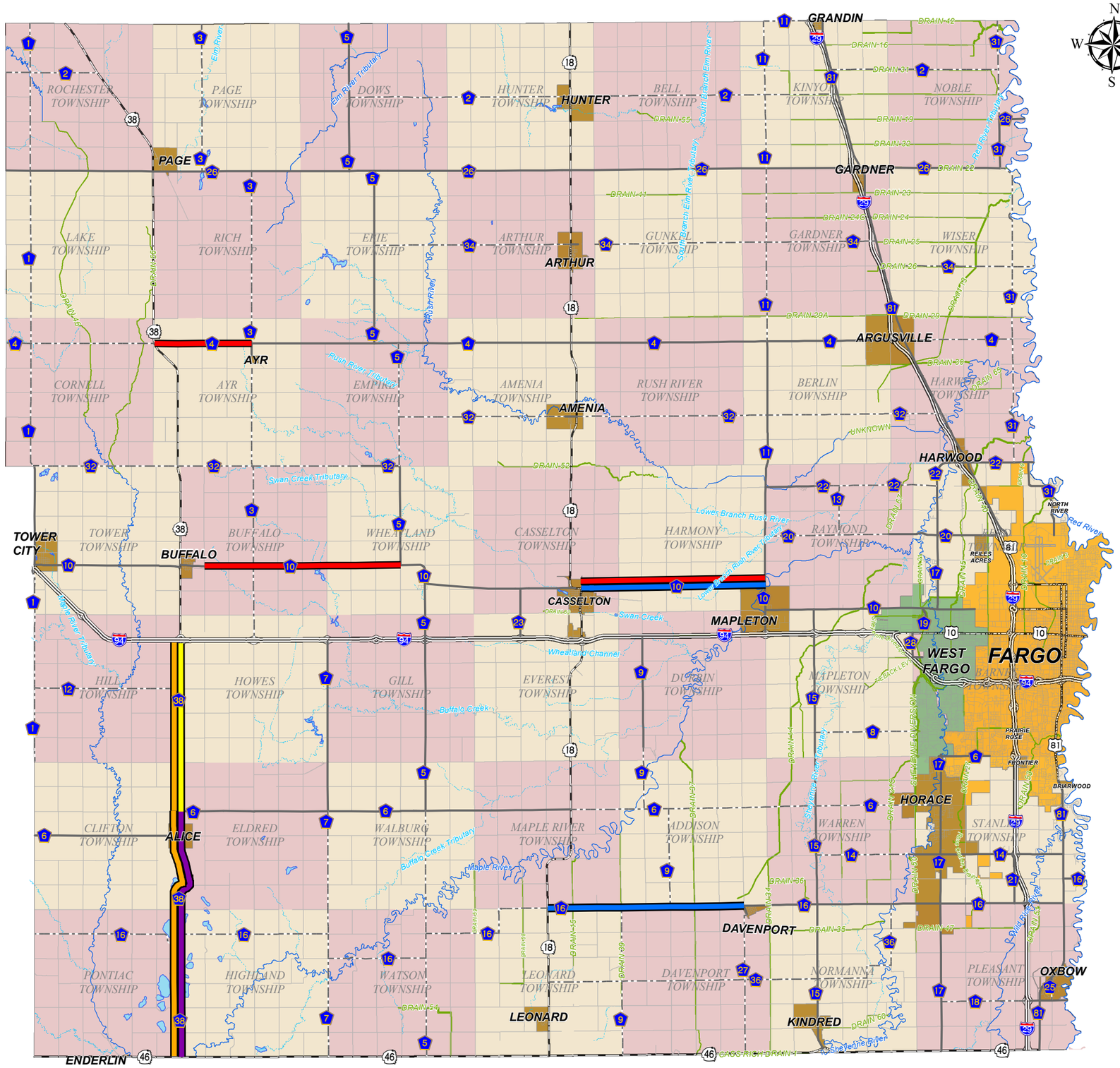
Table 7 - Proposed Bridge Improvements

| HWY | TWP | LOCATION | PROJECT TYPE | STRUCTURE TYPE | YEAR | FUNDING | BUDGET |
|---|---|---|---|---|---|---|---|
| | Stanley | 13/24 Stanley Township - Wild Rice River | Bridge Removal | Major | 2017 | Local | $150,000 |
| | Cornell | 27/34 Cornell Township - Maple River | Box Culvert | Major | 2017 | Local | $400,000 |
| 1 | Tower | C1 - 19 West Tower Twp - Branch of Maple River | Bridge Replacement | Major | 2017 | Local | $200,000 |
| 10 | Tower | C10 - 19/30 Tower Twp - Branch of Maple River | Bridge Replacement | Minor | 2017 | Local | $200,000 |
| | Casselton | 19/20 Casselton Township - Swan Creek | SW Wing Wall | Major | 2017 | Local | $150,000 |
| | | Various Minor Structures - TBD | Box Culverts/CMP's | | 2017 | Local | $250,000 |
| | | | | | Major Structures | | $1,100,000 |
| | | | | | Minor Structures | | $250,000 |
| | Mapleton | 29/32 Mapleton Township - Maple River WRD Drain 14 | Box Culvert | Major | 2018 | Local | $250,000 |
| | Dows | 3 Dows Township - Tributary of Elm River | Bridge Replacement | Major | 2018 | Federal | $300,000 |
| | Erie & Empire | 1 Empire/36 Erie Township - Tributary of Rush River | Box Culvert | Major | 2018 | Local | $200,000 |
| | Erie | 25/36 Erie Townhship - Tributary of Rush River | Box Culvert | Major | 2018 | Local | $200,000 |
| | Tower & Hill | 32 Tower/5 Hill Township - Tributary of Maple River | Box Culvert | Major | 2018 | Local | $200,000 |
| | Maple River | 3/4 Maple River Township - Tributary of Buffalo Creek | Box Culvert | Major | 2018 | Local | $200,000 |
| | Gill & Everest | 25 Gill/30 Everest Township - Buffalo Creek | Box Culvert | Major | 2018 | Local | $300,000 |
| | | Various Minor Structures - TBD | Box Culverts/CMP's | | 2018 | Local | $250,000 |
| | | | | | Major Structures | | $1,650,000 |
| | | | | | Minor Structures | | $250,000 |
| | Walburg & Maple River | 25 Walburg/30 Maple River - Maple River | Bridge Replacement | Major | 2019 | Local | $500,000 |
| | Addison & Durbin | 5 Addison/32 Durbin Township - Maple River | Bridge Replacement | Major | 2019 | Local | $500,000 |
| | Everest & Durbin | 1 Everest/6 Durbin Townships - Swan Creek | Box Culvert | Major | 2019 | Local | $250,000 |
| | Addison & Maple River | 18-19 Addison / 13-24 Maple River - Maple River | Bridge Replacement | Major | 2019 | Federal | $500,000 |
| | | Various Minor Structures - TBD | Box Culverts/CMP's | | 2019 | Local | $250,000 |
| | | | | | Major Structures | | $1,750,000 |
| | | | | | Minor Structures | | $250,000 |
| 26 | Rochestor & Lake | C26 - 34 Rochestor/3 Lake Townships - Maple River | Box Culvert | Major | 2020 | Local | $400,000 |
| | Walburg | 26/35 Walburg Township - Maple River | Bridge Replacement | Major | 2020 | Local | $400,000 |
| 15 | Mapleton | C15 - 8/9 Mapleton Township on Drain 14 | Bridge Replacement | Major | 2020 | Local | $800,000 |
| | Noble | 27/34 Noble - North Cass WRD Drain 32 | Box Culvert | Major | 2020 | Local | $150,000 |
| | Everest | 11/12 Everest Township - Wheatland Channel | Box Culvert | Minor | 2020 | Local | $150,000 |
| | | Various Minor Structures - TBD | Box Culverts/CMP's | | 2020 | Local | $250,000 |
| | | | | | Major Structures | | $1,750,000 |
| | | | | | Minor Structures | | $400,000 |
| | Hill | 28/33 Hill Township - Maple River | Bridge Replacement | Major | 2021 | Local | $350,000 |
| 6 | Barnes & Stanley | C6 - 33 Barnes/4 Stanley Township - Drain 27 | Bridge Replacement | Major | 2021 | Local | $1,000,000 |
| 9 | Durbin | C9 - 17/18 Durbin Township - Tributary of Swan Creek | Bridge Replacement | Major | 2021 | Local | $225,000 |
| | Durbin | 18/19 Durbin Township -Tributary of Swan Creek | Box Culvert | Major | 2021 | Local | $200,000 |
| | Noble | 15/16 Noble - North Cass WRD Drain 18 | Box Culvert | Major | 2021 | Local | $75,000 |
| | Gardner | 9/10 Gardner - North Cass WRD - Drain 23 | Box Culvert | Major | 2021 | Local | $75,000 |
| | | Various Minor Structures - TBD | Box Culverts/CMP's | | 2021 | Local | $250,000 |
| | | | | | Major Structures | | $1,925,000 |
| | | | | | Minor Structures | | $250,000 |
| | | | | | Total Major Structures | | $8,175,000 |
| | | | | | Total Minor Structures | | $1,400,000 |
| | '* Note: Years to be completed are illustrative and subject to change and approved annually and/or as necessary by the Road Advisory Committee. | | | | | | |

## *2017-2021 Revenues vs Project Costs*

Table 8 illustrates the revenue stream and estimated costs of the 2017-2021 Plan. Appendix 2 and 3 illustrate the proposed capital improvements over the 2017-2021 time period.

| *Table 8 - Revenue vs. Project Costs* | | | | | |
|---|---|---|---|---|---|
| Revenue Description | 2017 | 2018 | 2019 | 2020 | 2021 |
| Property Tax | $7,243,014 | $7,387,874 | $7,535,632 | $7,686,344 | $7,840,071 |
| Highway Distribution Tax | $9,049,988 | $7,140,000 | $7,282,800 | $7,428,456 | $7,577,025 |
| Other | $132,131 | $134,774 | $137,469 | $140,218 | $143,023 |
| ***Total Revenues*** | ***$16,425,133*** | ***$14,662,648*** | ***$14,955,901*** | ***$15,255,019*** | ***$15,560,119*** |
| Estimated Starting Balance | $2,500,000 | $900,000 | $900,000 | $900,000 | $900,000 |
| Federal Aid Highway Funding | $0 | $0 | $0 | $1,800,000 | $1,800,000 |
| Federal Aid Bridge Funding | $0 | $350,000 | $350,000 | $400,000 | $400,000 |
| Total Revenues, Starting Balance, & Federal Aid | $18,925,133 | $15,912,648 | $16,205,901 | $18,355,019 | $18,660,119 |
| Total Operating Cost (not including Road/Bridge Projects) | $5,843,000 | $6,076,720 | $6,319,789 | $6,572,580 | $6,835,484 |
| ***Total Available for Road/Bridge Projects*** | ***$13,082,133*** | ***$9,835,928*** | ***$9,886,112*** | ***$11,782,439*** | ***$11,824,636*** |
| Total Paved Highway Project Costs | $7,652,000 | $6,800,000 | $5,950,000 | $10,375,000 | $7,425,000 |
| County Bridge Project Costs | $1,350,000 | $1,900,000 | $2,000,000 | $2,150,000 | $2,175,000 |
| Chipseal, Crackseal, Striping, Reshaping, Subgrade Repair & Draintile | $400,000 | $0 | $0 | $3,250,000 | $3,475,000 |
| ***Total Project Costs*** | ***$9,402,000*** | ***$8,700,000*** | ***$7,950,000*** | ***$15,775,000*** | ***$13,075,000*** |
| ***Differences (Revenues-Costs)*** | ***$3,680,133*** | ***$1,135,928*** | ***$1,936,112*** | ***-$3,992,561*** | ***-$1,250,364*** |




*Appendix 1.*

# Cass County Highway Department

## 2017-2021

## 5 Year Capital Improvement Plan

## Proposed Highway Projects

Planned Year

2017 2018 2019 2020 2021

Table 5 - Proposed Paved Highway Improvements

| Hwy | Project Location | Type of Project | Funding Source (Local/Fed Aid) | Year to be Completed * | Project Cost |
|---|---|---|---|---|---|
| 38 | State Hwy 46 to Hwy 6 West | Grading & Surfacing | Local | 2017 | $7,652,000 |
| 38 | Hwy 6 West to I94 | Grading & Surfacing | Local | 2018 | $8,500,000 |
| 38 | State Hwy 46 to I94 | Bituminous Surfacing | Local | 2019 | $5,950,000 |
| 16 | State Hwy 18 to Davenport | Gravel Stabilization | Local | 2020 | $4,000,000 |
| 10 | State Hwy 18 - Hwy 11 | Grading & Surfacing | Local | 2020 | $6,375,000 |
| 4 | State Hwy 38 to Hwy 3 | Mill and Overlay | Local | 2021 | $800,000 |
| 10 | State Hwy 18 - Hwy 11 | Bituminous Surfacing | Local | 2021 | $2,625,000 |
| 10 | Buffalo to Hwy 5 North | Gravel Stabilization | Local | 2021 | $4,000,000 |

* Note: Years to be completed are illustrative and subject to change and approved annually and/or as necessary by the Road Advisory Committee.

0 5 10 15 20

Miles

*Jason Benson*
*County Engineer, P.E.*

*Richard Sieg*
*Highway Superintendent*

CASS COUNTY GOVERNMENT

*Cass County Highway Dept.*
*1201 West Main Ave.*
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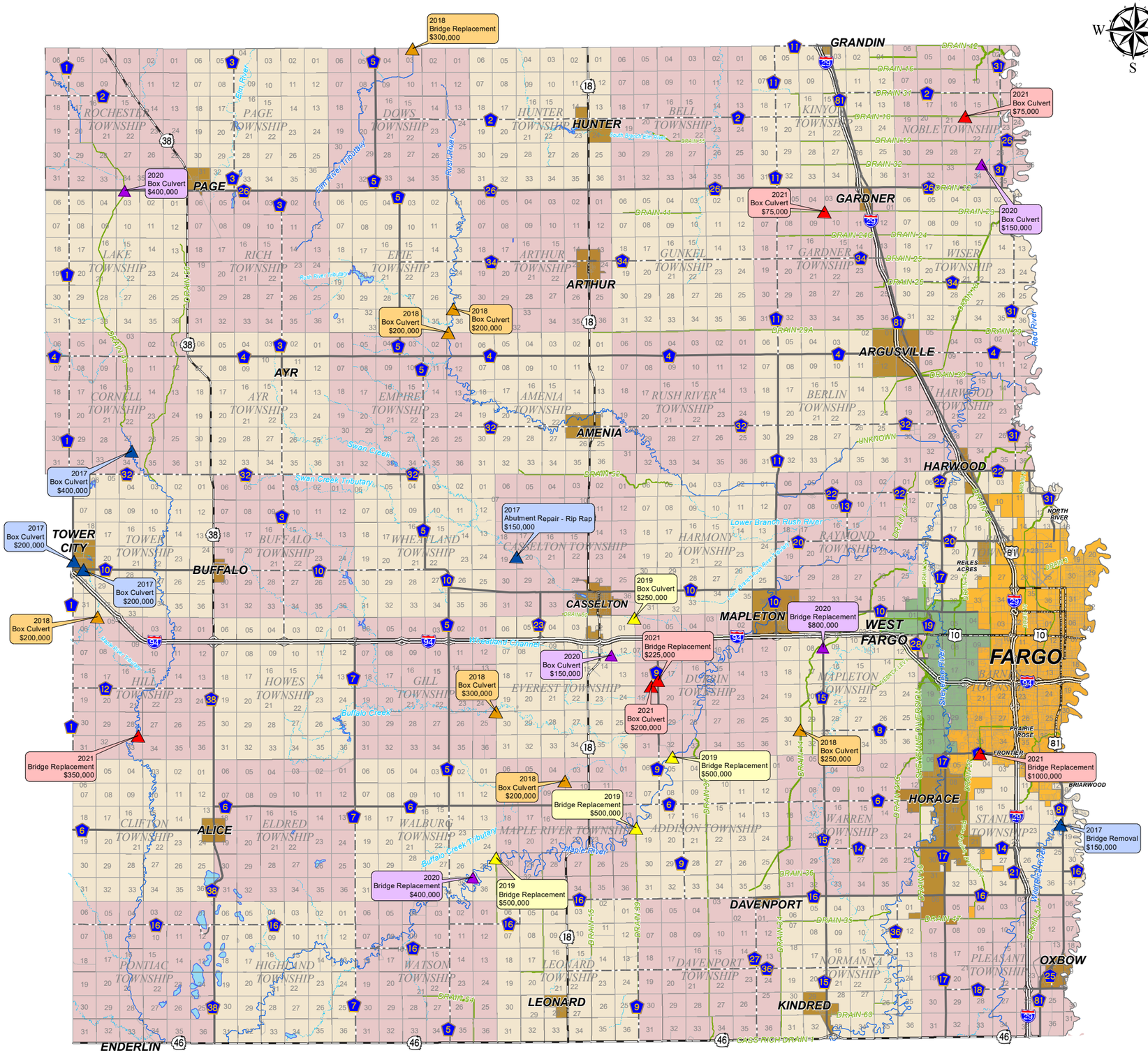
***Updated: June, 2016***


2018 Bridge Replacement $300,000
2021 Box Culvert $75,000
2020 Box Culvert $400,000
2021 Box Culvert $75,000
2020 Box Culvert $150,000
2018 Box Culvert $200,000
2018 Box Culvert $200,000
2017 Box Culvert $400,000
2017 Box Culvert $200,000
2017 Box Culvert $200,000
2017 Abutment Repair - Rip Rap $150,000
2018 Box Culvert $200,000
2019 Box Culvert $250,000
2020 Box Culvert $150,000
2021 Bridge Replacement $225,000
2018 Box Culvert $300,000
2021 Box Culvert $200,000
2020 Bridge Replacement $800,000
2021 Bridge Replacement $350,000
2019 Bridge Replacement $500,000
2018 Box Culvert $250,000
2018 Box Culvert $200,000
2019 Bridge Replacement $500,000
2021 Bridge Replacement $1000,000
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HUNTER
PAGE
GARDNER
ARTHUR
ARGUSVILLE
AYR
AMENIA
HARWOOD
TOWER CITY
BUFFALO
CASSELTON
MAPLETON
WEST FARGO
FARGO
ALICE
HORACE
DAVENPORT
OXBOW
LEONARD
KINDRED
ENDERLIN
NORTH RIVER
REILES ACRES
PRAIRIE ROSE
FRONTIER
BRIARWOOD
ROCHESTER TOWNSHIP
PAGE TOWNSHIP
DOWS TOWNSHIP
HUNTER TOWNSHIP
BELL TOWNSHIP
KINYON TOWNSHIP
NOBLE TOWNSHIP
LAKE TOWNSHIP
RICH TOWNSHIP
ERIE TOWNSHIP
ARTHUR TOWNSHIP
GUNKEL TOWNSHIP
GARDNER TOWNSHIP
WISER TOWNSHIP
CORNELL TOWNSHIP
AYR TOWNSHIP
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BERLIN TOWNSHIP
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TOWER TOWNSHIP
BUFFALO TOWNSHIP
WHEATLAND TOWNSHIP
CASSELTON TOWNSHIP
HARMONY TOWNSHIP
RAYMOND TOWNSHIP
HILL TOWNSHIP
HOWES TOWNSHIP
GILL TOWNSHIP
EVEREST TOWNSHIP
DURBIN TOWNSHIP
MAPLETON TOWNSHIP
CLIFTON TOWNSHIP
ELDRED TOWNSHIP
WALBURG TOWNSHIP
MAPLE RIVER TOWNSHIP
ADDISON TOWNSHIP
WARREN TOWNSHIP
STANLEY TOWNSHIP
PONTIAC TOWNSHIP
HIGHLAND TOWNSHIP
WATSON TOWNSHIP
LEONARD TOWNSHIP
DAVENPORT TOWNSHIP
NORMANNA TOWNSHIP
PLEASANT TOWNSHIP
Elm River
Rush River
Swan Creek
Buffalo Creek
Maple River
Red River
Sheyenne River
Wild Rice River
Lower Branch Rush River
Wheatland Channel
Swan Creek Tributary
Buffalo Creek Tributary
Elm River Tributary
Rush River Tributary
South Branch Elm River
Sheyenne River Diversion
Drain 14
Drain 27
Drain 35
Drain 36
Drain 37
Drain 54
Drain 60
Drain 52
Drain 41
Drain 24
Drain 25
Drain 26
Drain 29A
Drain 29
Drain 23
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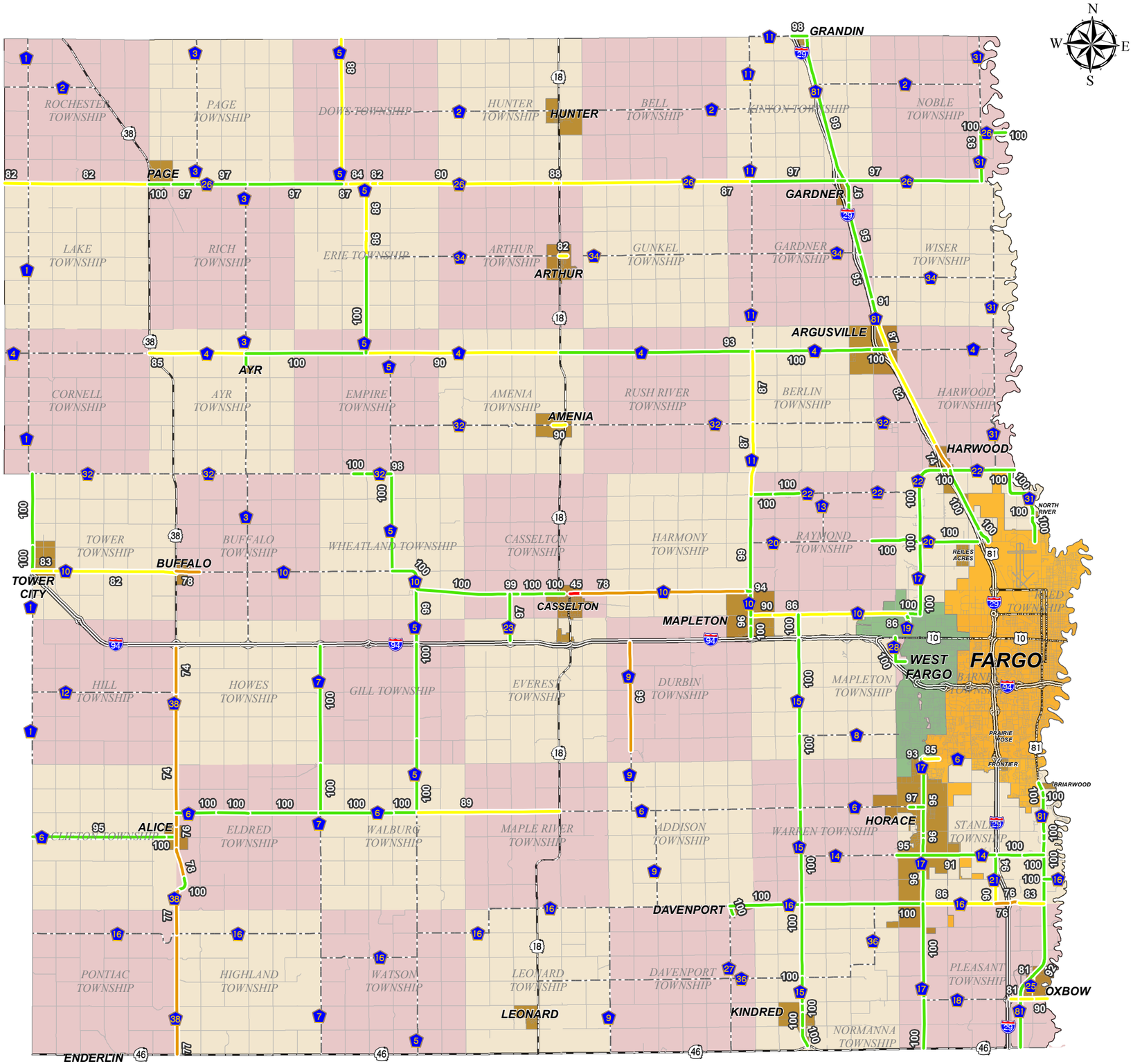


*Appendix 3.*

# Cass County Highway Department

## Pavement Condition Index (PCI)*

Poor — Good — Gravel
Fair — Very Good

*based on PCI Scale

| | Poor 0-65 | Fair 66-80 | Good 81-90 | Very Good 91-100 |
|---|---|---|---|---|
| Miles | 0.50 | 30.62 | 82.69 | 201.21 |
| Average PCI | 45 | 75.33 | 85.97 | 98.71 |
| High PCI | 45 | 78 | 90 | 100 |
| Low PCI | 45 | 66 | 81 | 91 |

**Overall Average PCI = 93.76**

*Pavement Evaluation completed by American Engineering Testing in 2012. The evaluation consisted of deflection testing with a Model 8002E Dynatest Falling Weight Deflectometer. Pavement surface condition assessment based on the Pavement Condition Index (PCI) method developed by the Army Corps of Engineers. The resulting data is analyzed to evaluate the structural and surface condition of the existing pavements on the tested road segments.

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

*Jason Benson*
*County Engineer, P.E.*

*Richard Sieg*
*Highway Superintendent*

*DATE: June, 2016*

CASS COUNTY GOVERNMENT

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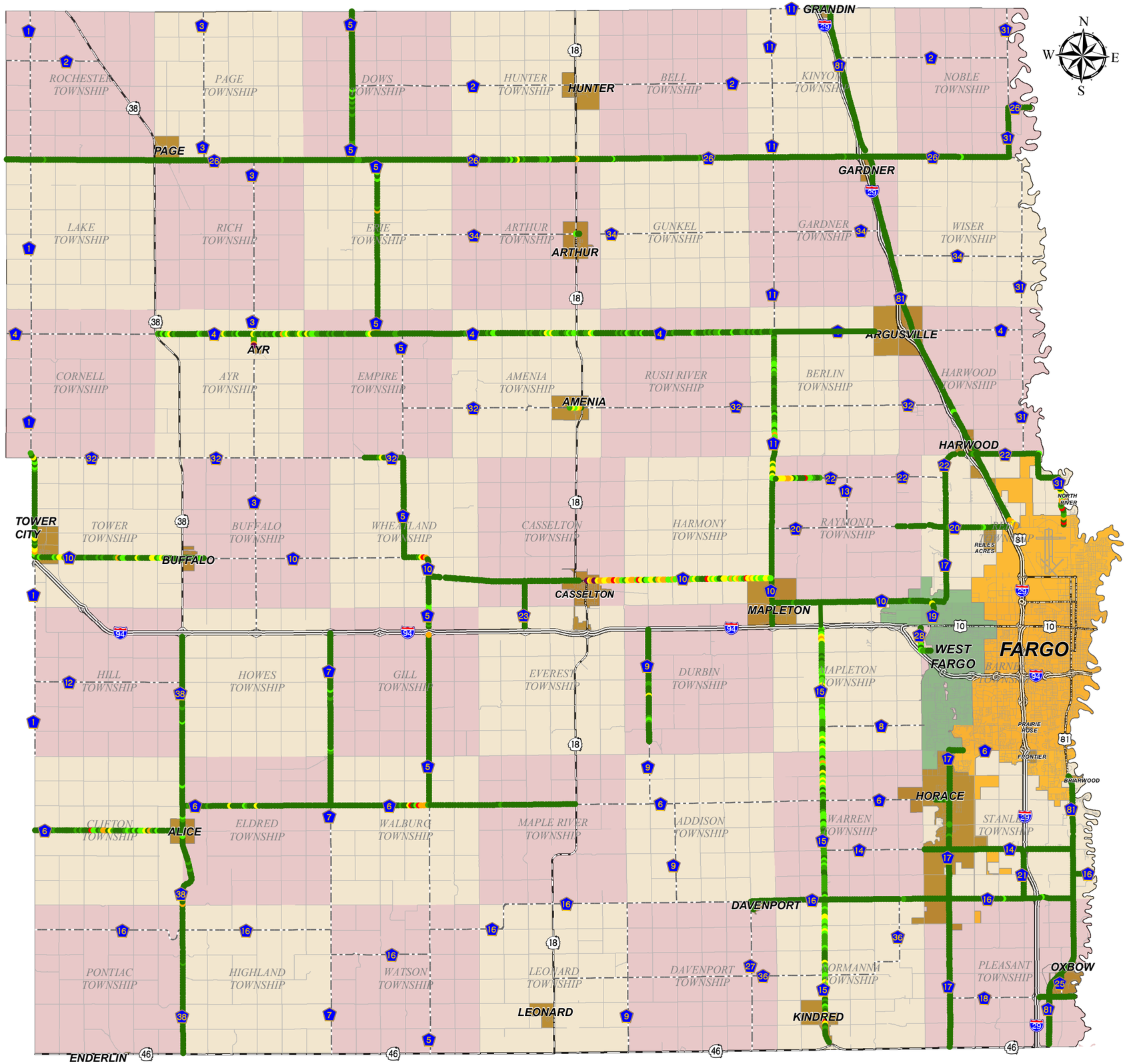


*Appendix 4.*

# Cass County Highway Department

## Highway Load Capacity

- 4 Tons/Axle
- 5 Tons/Axle
- 6 Tons/Axle
- 7 Tons/Axle
- 8 Tons/Axle
- 9 Tons/Axle
- 10 Tons/Axle

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles


*Jason Benson*
*County Engineer, P.E.*

*Richard Sieg*
*Highway Superintendent*

*DATE: June, 2016*

CASS COUNTY GOVERNMENT

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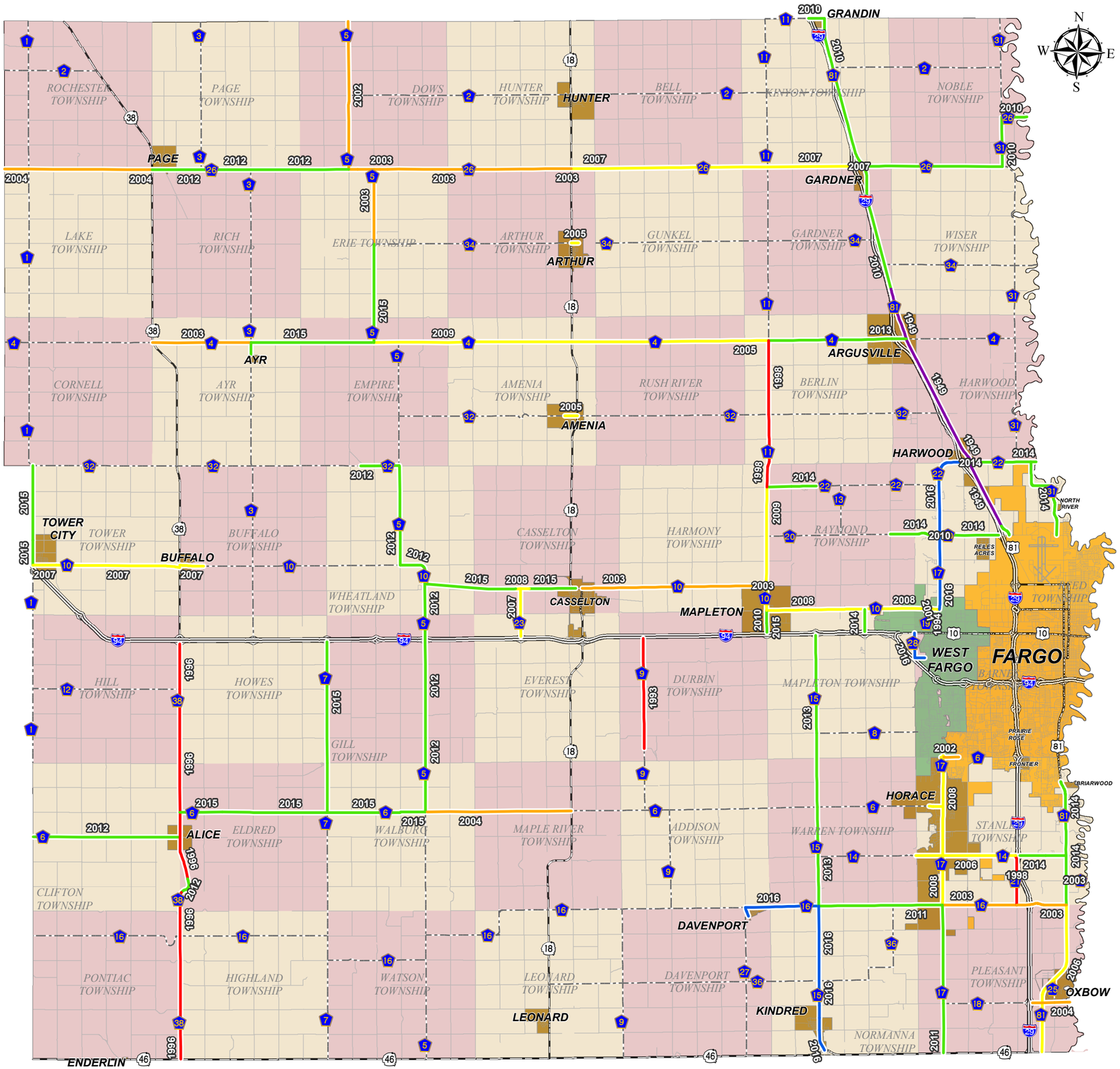


## Appendix 5.

# Cass County Highway Department

## Paving Projects

Year of Last Paving Project

- 1949 - 1974
- 1975 - 1999
- 2000 - 2004
- 2005 - 2009
- 2010 - 2015
- 2016 - 2020
- Gravel

| | 1949-1974 | 1993-1999 | 2000-2004 | 2005-2009 | 2010-2015 | 2016-2020 |
|---|---|---|---|---|---|---|
| Miles | 10.64 | 28.95 | 50.24 | 67.83 | 141.2 | 16.14 |
| Average PCI* | 86.8 | 81.66 | 86 | 92.43 | 99.32 | 100 |

*Pavement Evaluation completed by American Engineering Testing in 2012. The evaluation consisted of deflection testing with a Model 8002E Dynatest Falling Weight Deflectometer. Pavement surface condition assessment based on the Pavement Condition Index (PCI) method developed by the Army Corps of Engineers. The resulting data is analyzed to evaluate the structural and surface condition of the existing pavements on the tested road segments.

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

*Jason Benson*
*County Engineer, P.E.*

*Richard Sieg*
*Highway Superintendent*

*DATE: June, 2016*

CASS COUNTY GOVERNMENT

*Cass County Highway Dept.*
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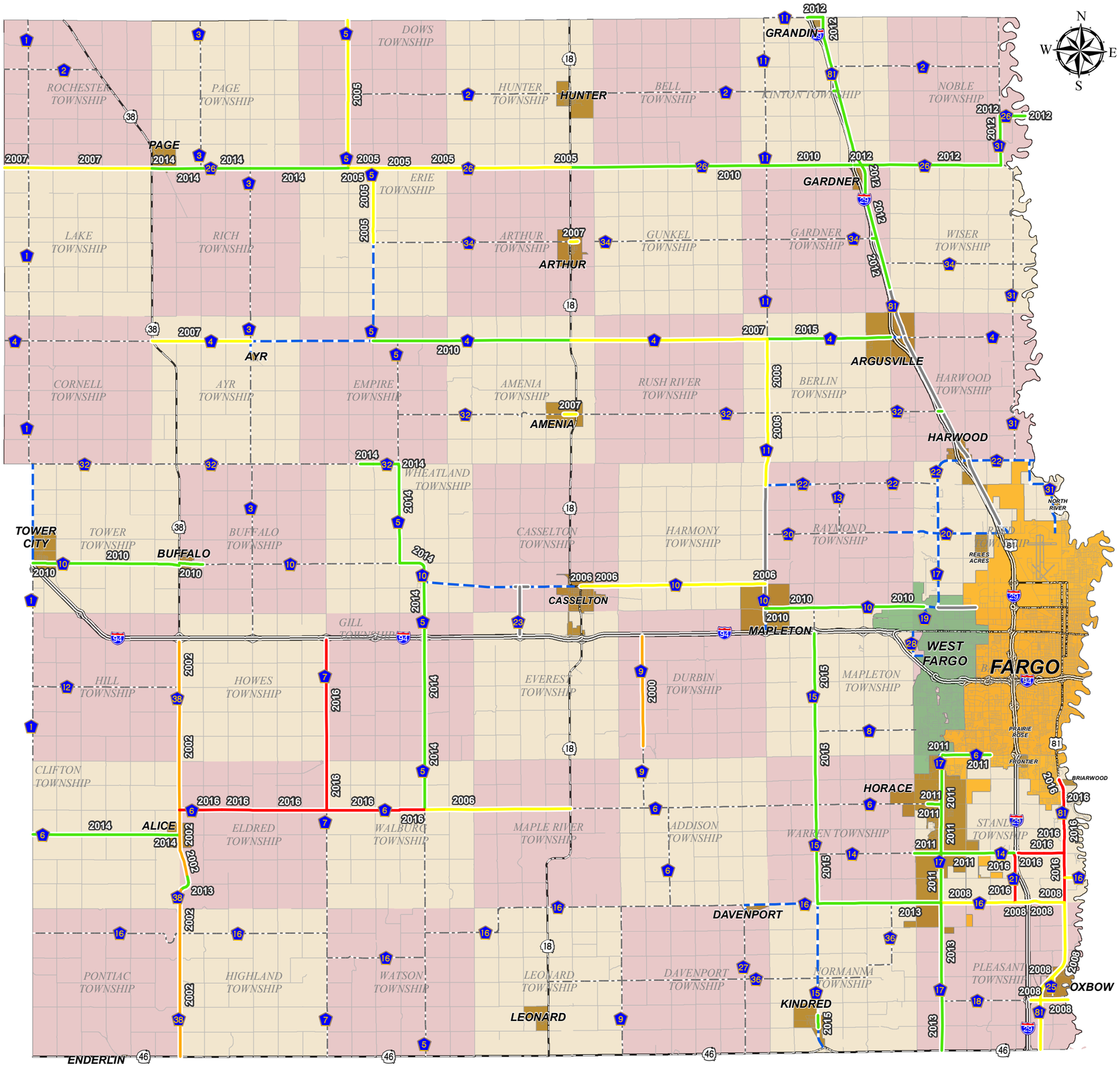


*Appendix 6.*

# Cass County Highway Department

## Seal Coat Projects

Year of Last Seal Coat

- 2000 - 2003
- 2004 - 2008
- 2009 - 2015
- 2016 - 2020
- Asphalt - No Seal Coat
- Concrete Surface
- Gravel

| | Miles |
|---|---|
| 2000-2003 | 20.82 |
| 2004-2008 | 70.17 |
| 2009-2015 | 125.6 |
| 2016-2020 | 25.78 |
| Asphalt - No Seal Coat | 52.38 |
| Concrete Surface | 20.16 |

*Pavement Evaluation completed by American Engineering Testing in 2012. The evaluation consisted of deflection testing with a Model 8002E Dynatest Falling Weight Deflectometer. Pavement surface condition assessment based on the Pavement Condition Index (PCI) method developed by the Army Corps of Engineers. The resulting data is analyzed to evaluate the structural and surface condition of the existing pavements on the tested road segments.

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles


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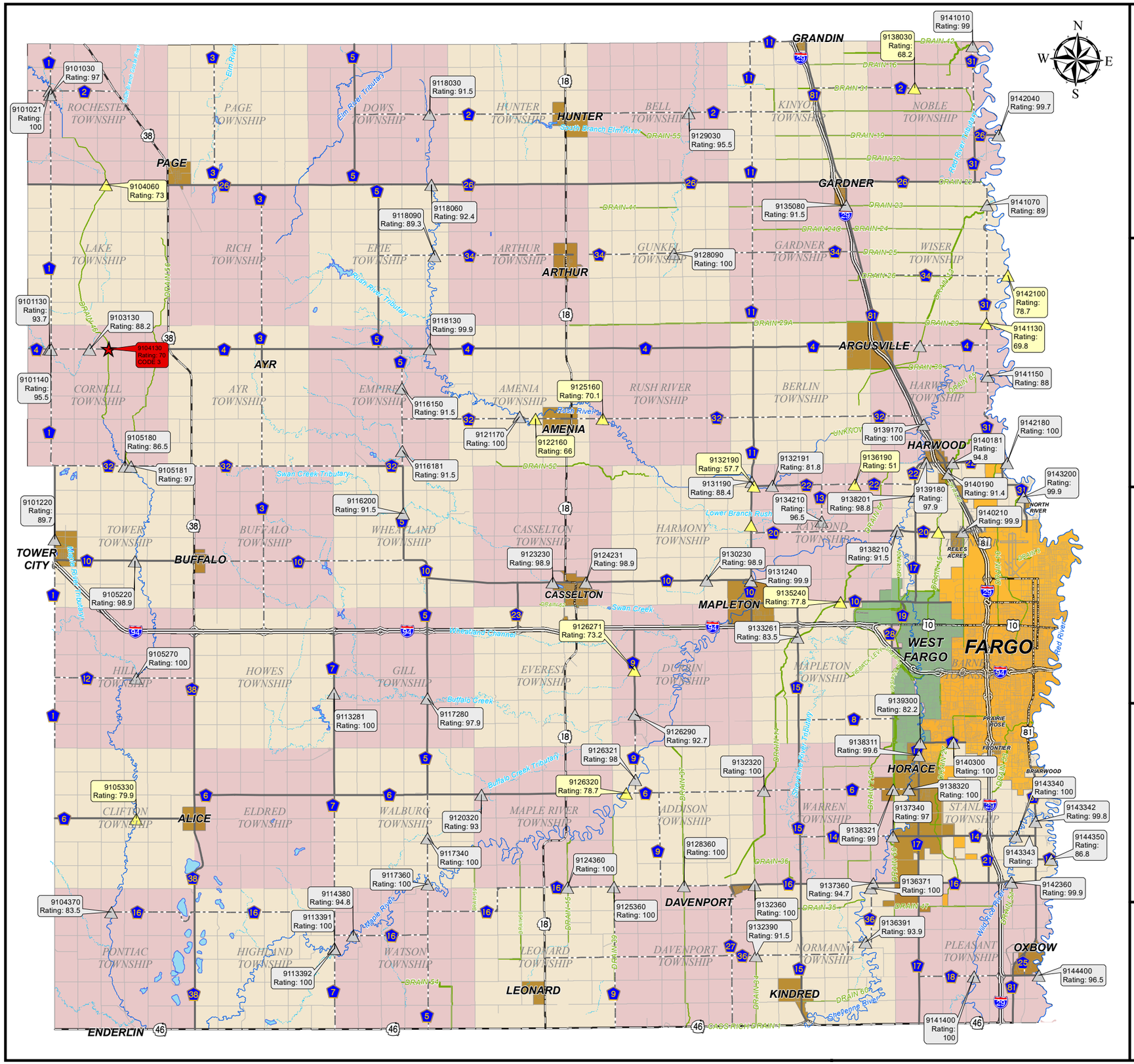


*Appendix 7.*

# Cass County Highway Department

## ND DOT 2015/2016
## Bridge Inspection and Appraisal
## Bridges on County Roads

Bridge Sufficiency Rating Categories

- 0-49.9 Sufficiency
- 50-79.9 Sufficiency
- 80+ Sufficiency
- Code Three Structure

| | 80+ | 50-79.9 | 0-49.9 | Code 3 |
|---|---|---|---|---|
| Total | 75 | 14 | 0 | 1 |
| Average | 95.7 | 70.86 | N/A | 70 |
| Low | 81.8 | 51 | N/A | 70 |
| High | 100 | 79.9 | N/A | 70 |

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles


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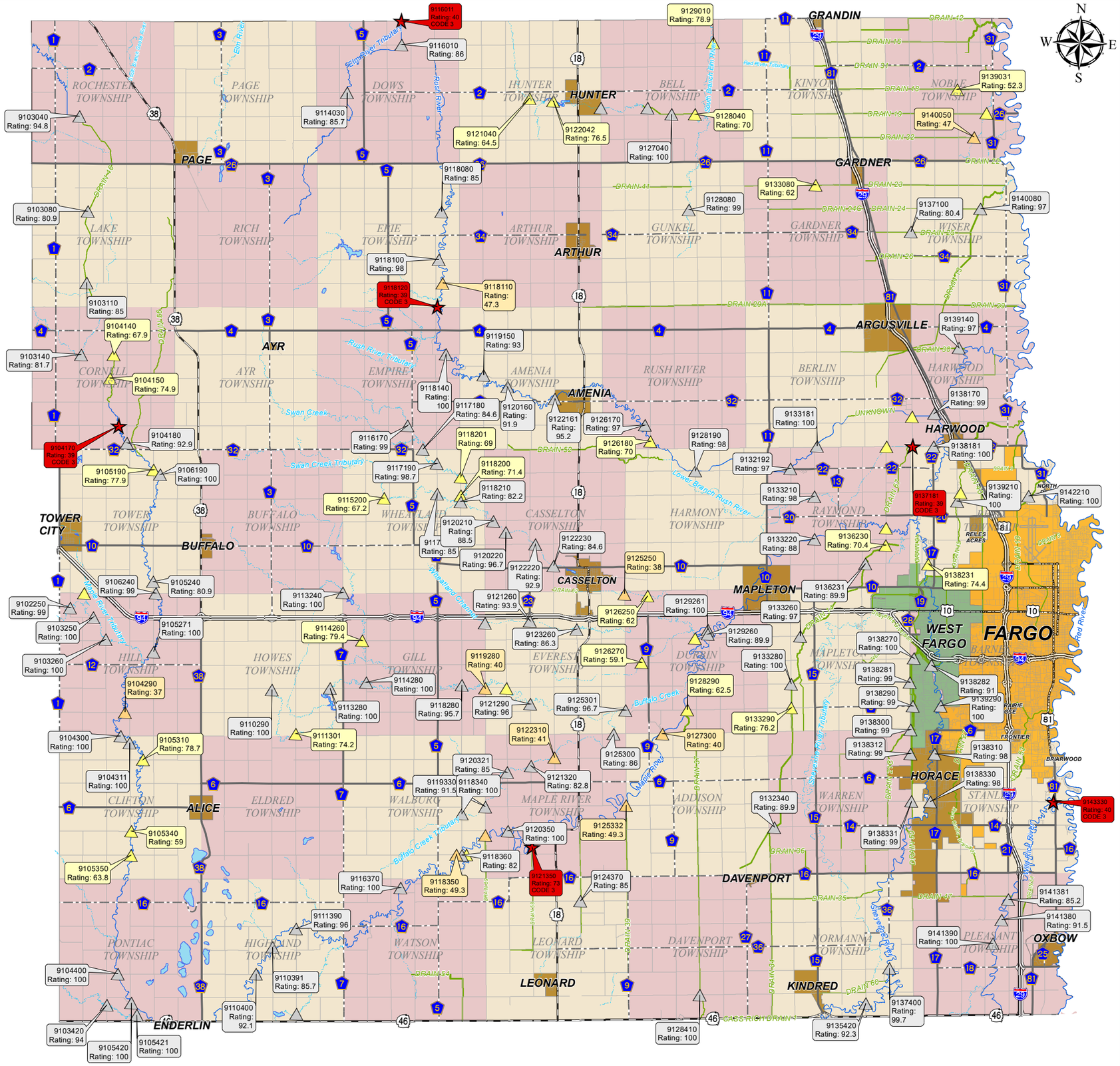


*Appendix 8.*

# Cass County Highway Department

## ND DOT 2015/2016
## Bridge Inspection and Appraisal
## Bridges on Township Roads

Bridge Sufficiency Rating Categories

- 0-49.9 Sufficiency
- 50-79.9 Sufficiency
- 80+ Sufficiency
- Code Three Structure

| | 80+* | 50-79.9* | 0-49.9* | Code 3 |
|---|---|---|---|---|
| Total | 97 | 33 | 10 | 6 |
| Average | 94.59 | 67.7 | 43.42 | 45 |
| Low | 80.4 | 52 | 37 | 39 |
| High | 100 | 79.4 | 49.3 | 73 |

*Not including Code 3 Structures

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles


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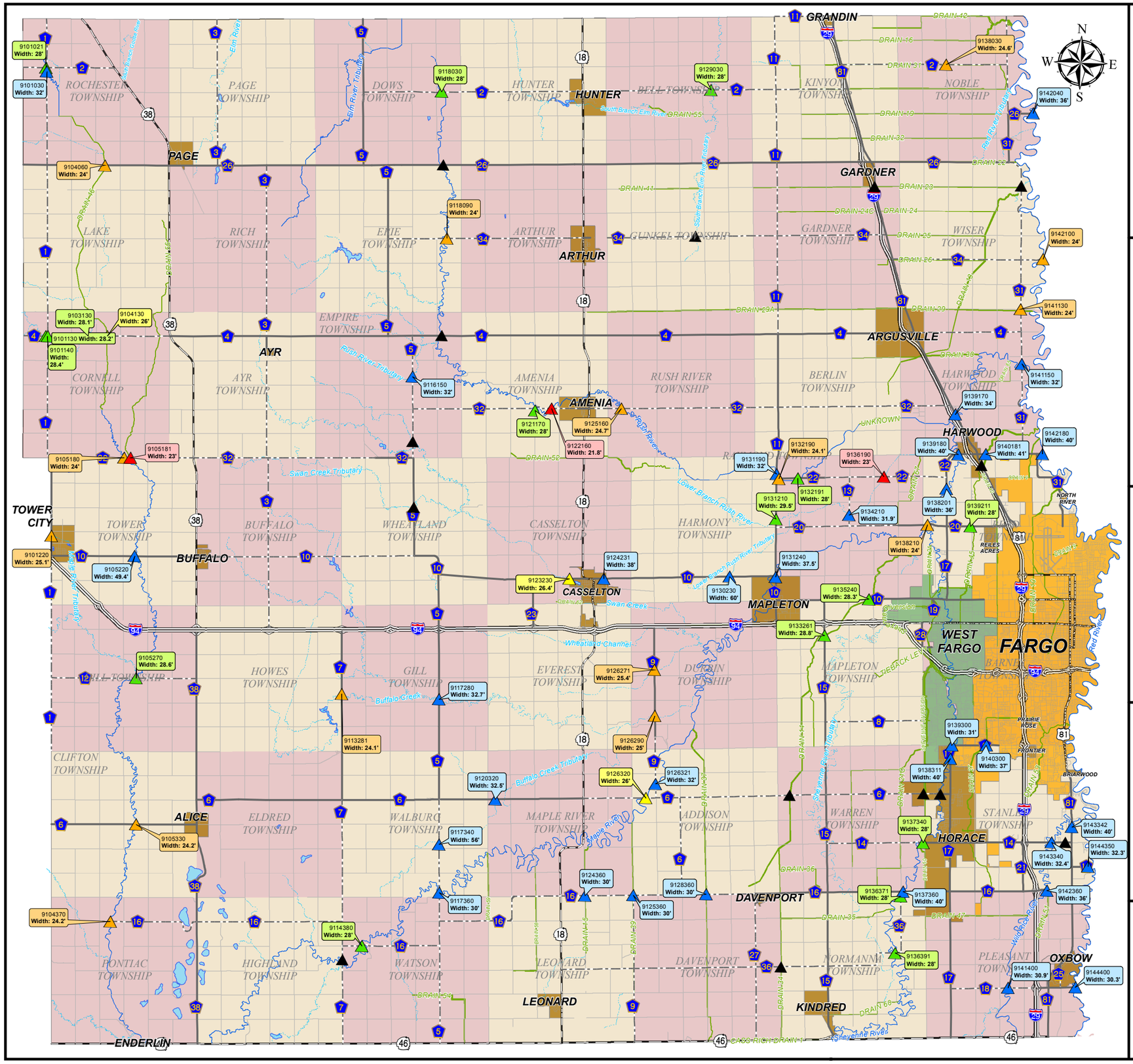


*Appendix 9.*

# Cass County Highway Department

## ND DOT 2015/2016
## Curb to Curb Roadway Width
## Bridges on County Roads

Roadway Width (Feet)

- Under 24'
- 24' - 25.9'
- 26' - 27.9'
- 28' - 29.9'
- 30' and Over
- Culvert

| | Number of Bridges |
|---|---|
| Under 24' | 3 |
| 24' - 25.9' | 15 |
| 26' - 27.9' | 3 |
| 28' - 29.9' | 17 |
| 30' and Over | 33 |

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles


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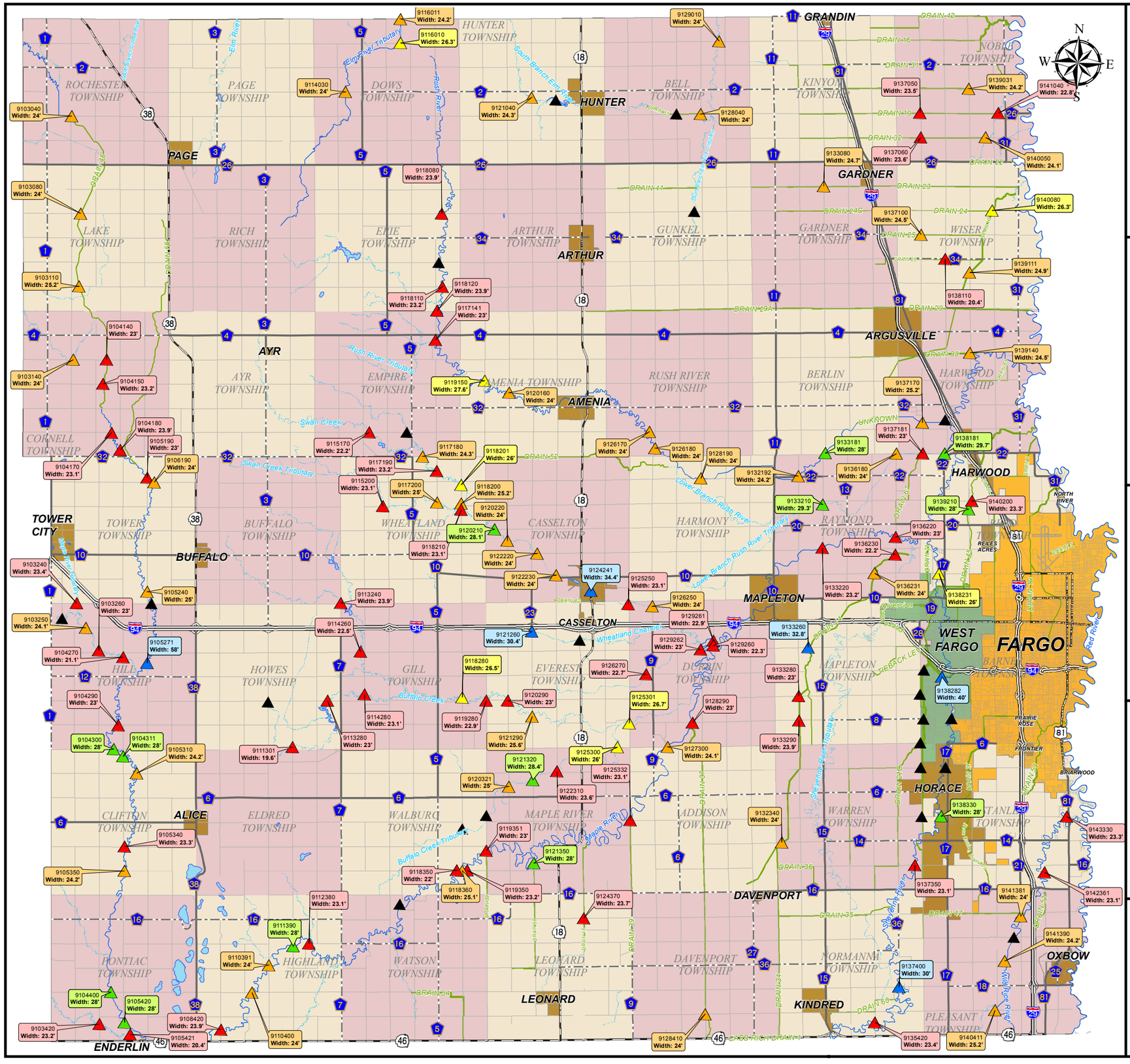


*Appendix 10.*

# Cass County Highway Department

## ND DOT 2015/2016
## Curb to Curb Roadway Width
## Bridges on Township Roads

Roadway Width (Feet)

- Under 24'
- 24' - 25.9'
- 26' - 27.9'
- 28' - 29.9'
- 30' and Over
- Culvert

| | Number of Bridges |
|---|---|
| Under 24' | 57 |
| 24' - 25.9' | 46 |
| 26' - 27.9' | 8 |
| 28' - 29.9' | 13 |
| 30' and Over | 6 |

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles


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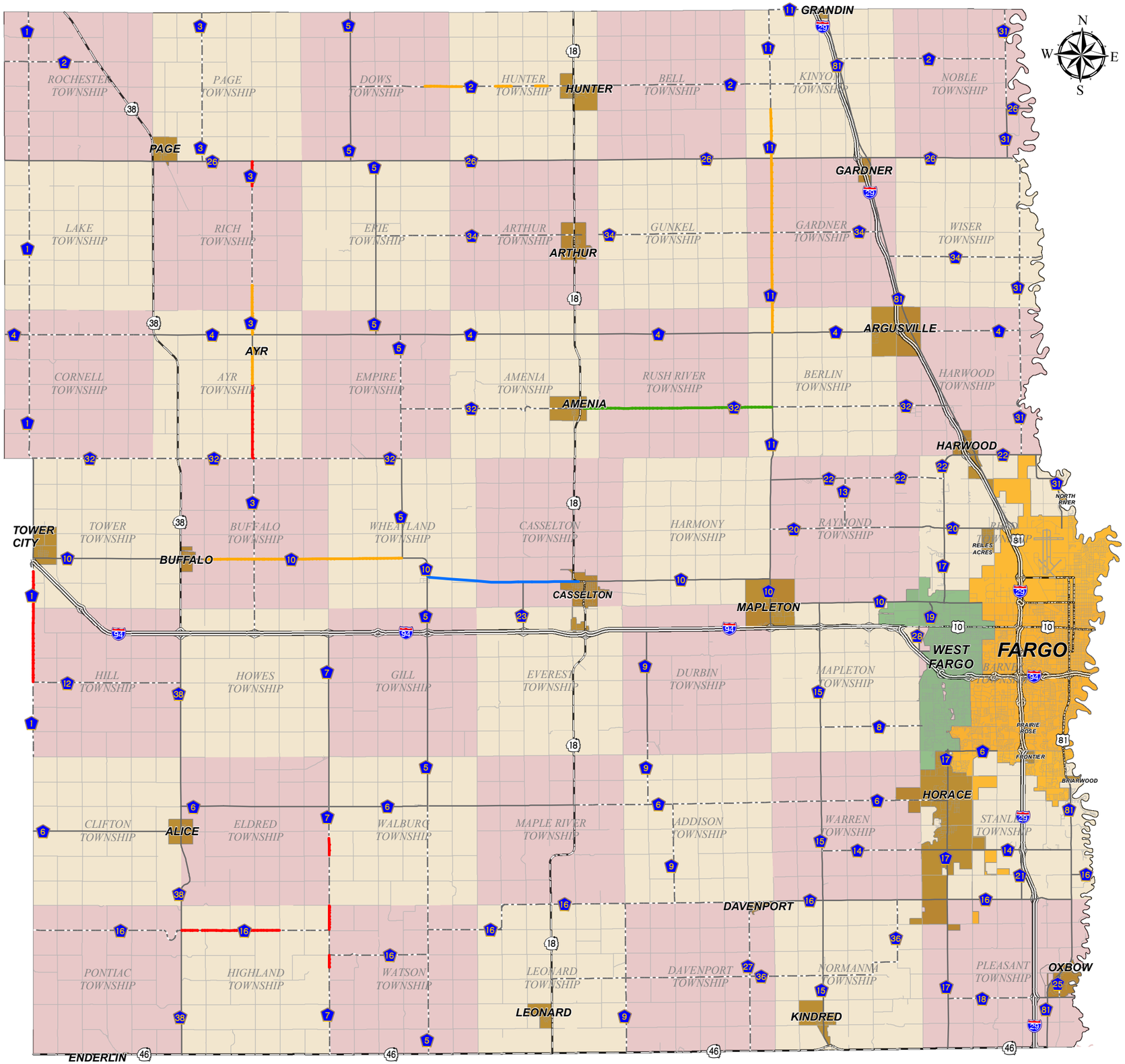
*Appendix 11.*

# Cass County Highway Department

## Drain Tile Projects




Year of Last Drain Tile Project

- 2011
- 2012
- 2014
- 2015
- Gravel

| | Miles |
|---|---|
| 2011 | 22.88 |
| 2012 | 13.22 |
| 2014 | 7.58 |
| 2015 | 6.23 |

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles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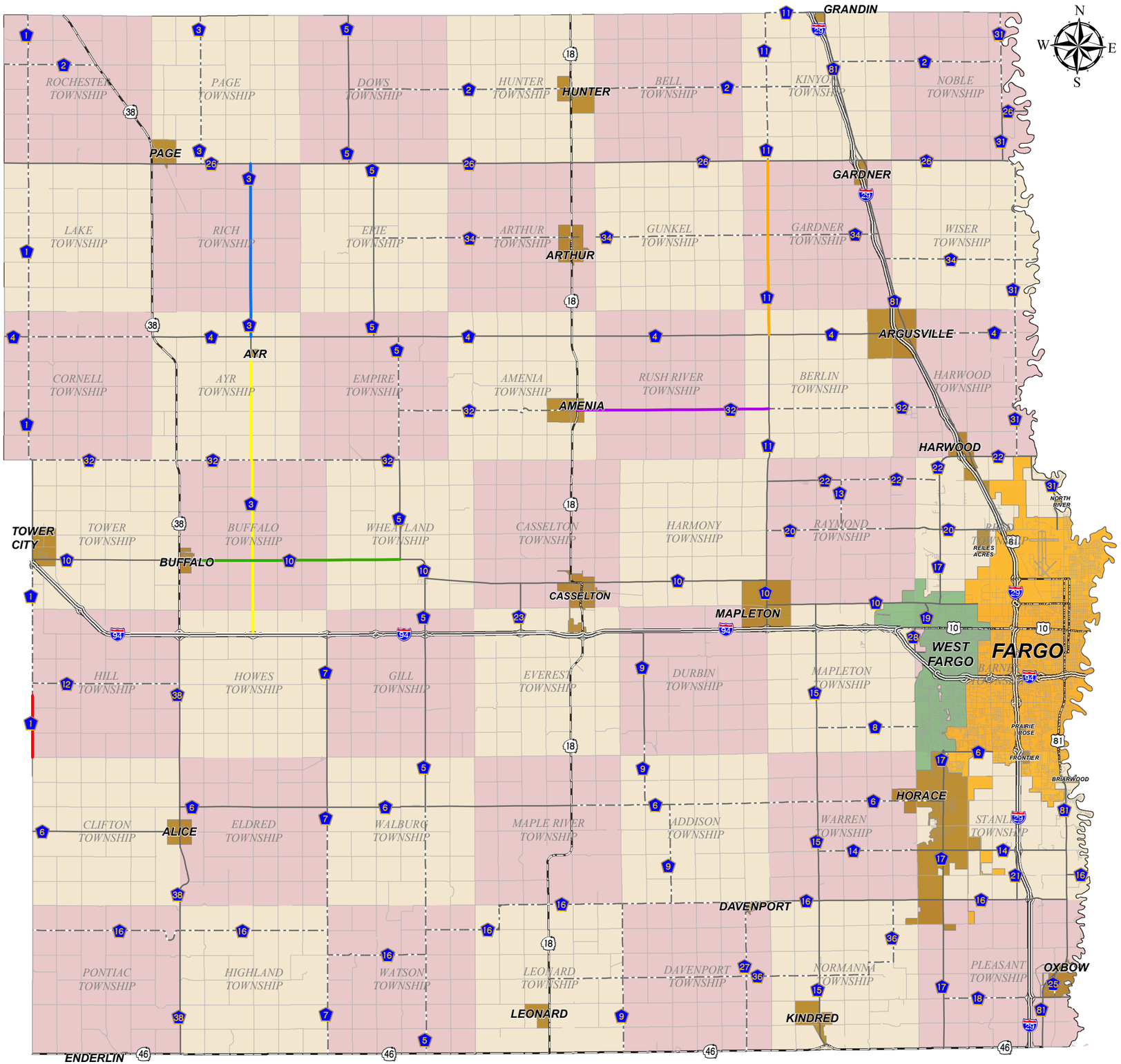
*Appendix 12.*

# Cass County Highway Department

## Sub Grade Repair Projects




Year of Last Sub Grade Repair Project

- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- Gravel

| | Miles |
|---|---|
| 2011 | 7.04 |
| 2012 | 2.5 |
| 2013 | 7.98 |
| 2014 | 7.02 |
| 2015 | 7.77 |
| 2016 | 10.99 |

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles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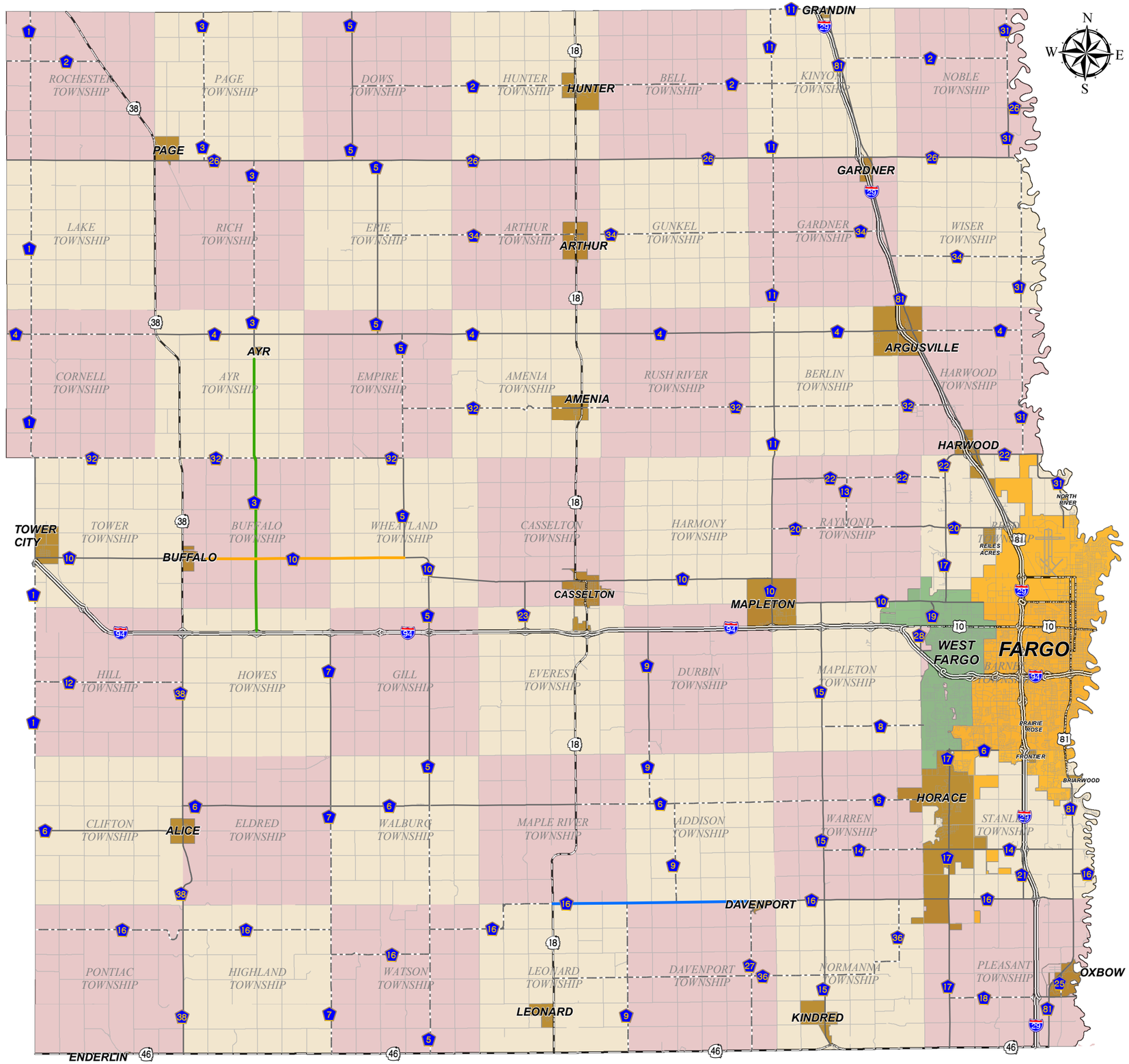


*Appendix 13.*

# Cass County Highway Department

## Gravel Stabilization Projects

Year of Last Gravel Stabilization Project

2016 — 2020
Gravel — 2021

| | Miles |
|---|---|
| 2016 | 10.99 |
| 2020 | 7.98 |
| 2021 | 7.98 |

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles


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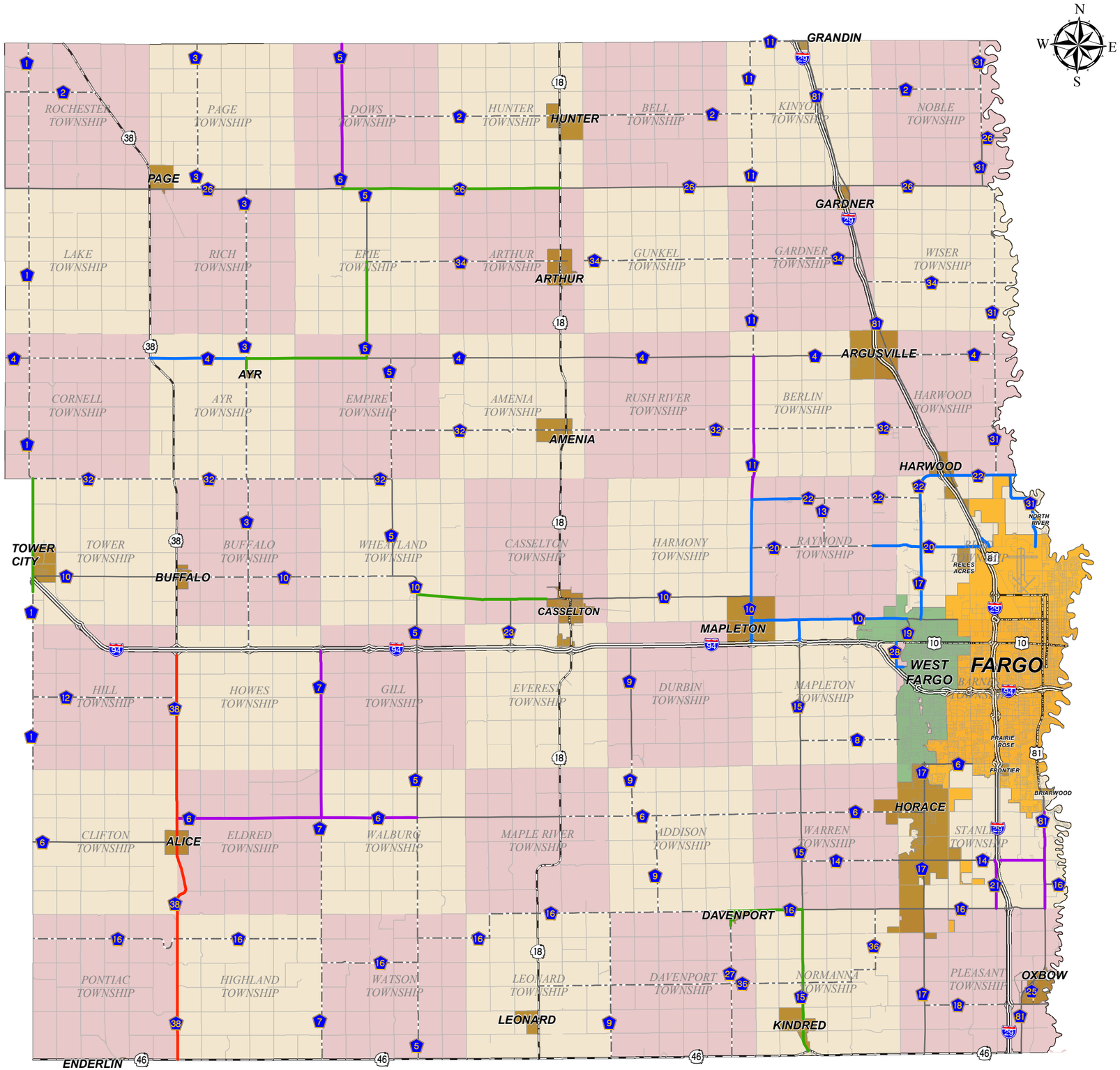
*Appendix 14.*

# Cass County Highway Department

## Chip Seal Projects




Year of Chip Seal Project

- 2016
- 2017
- 2018
- 2020

| | Miles |
|---|---|
| 2016 | 37 |
| 2017 | 38.3 |
| 2018 | 39.6 |
| 2020 | 17 |

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles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