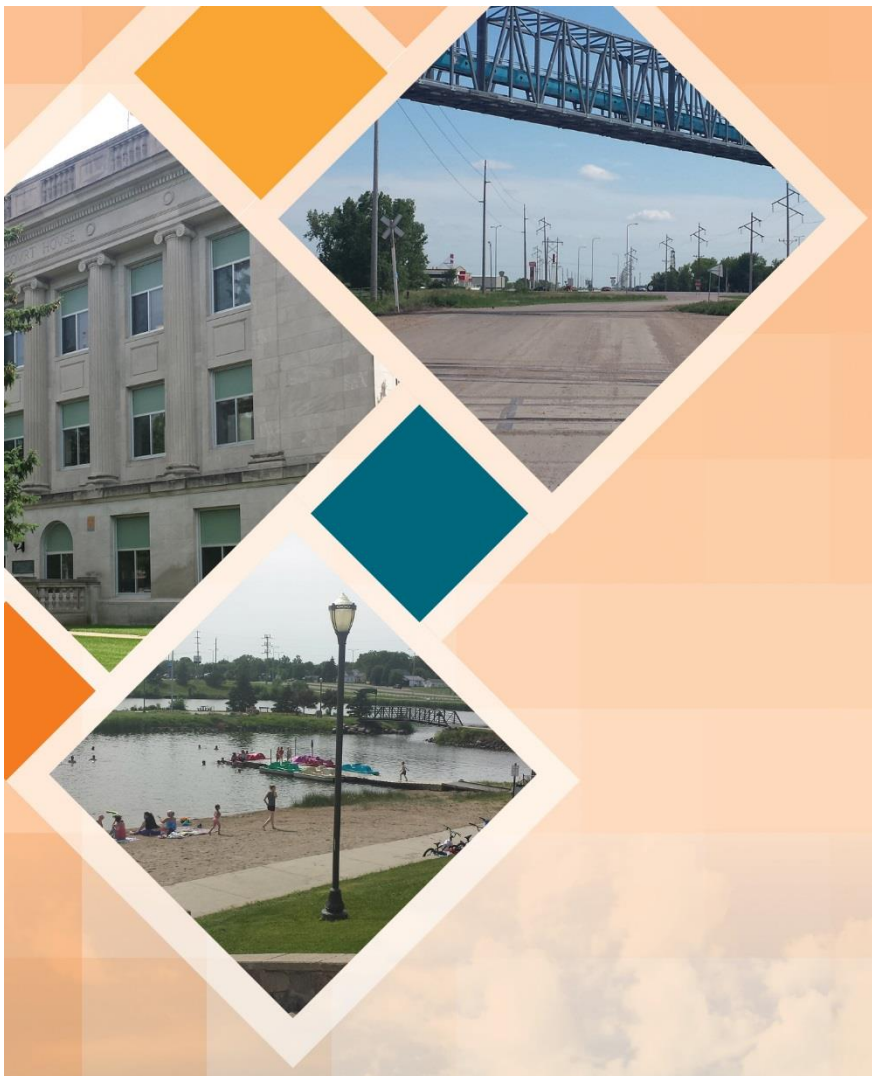

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Beadle County Master Transportation Plan

Final Report October 2016

FHWA Disclaimer

The preparation of this report has been financed in part through grant(s) from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation

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Chapter 1: Existing Conditions

Study Purpose

The Beadle County Master Transportation Plan (MTP) provides a 20 year planning framework for addressing future transportation needs within Beadle County, South Dakota. As a multimodal transportation plan, the MTP provides a comprehensive strategy to address roadway, bridge, bicycle, pedestrian, freight, air and rail issues in Beadle County.

With more than 573 miles of county roadway and 138 bridges throughout the county, road and bridge infrastructure is one of Beadle County's largest assets. The Beadle County MTP will focus on maintenance and preservation of the road and bridge assets in Beadle County. The Beadle County MTP will address existing needs and develop a proactive program to address projected needs based upon system forecasts.

The first element of any transportation plan is the development of existing conditions. The following element of the Beadle County MTP serves as the existing conditions summary, or Existing Baseline System Inventory (EBSI). The EBSI will include an overview of the following Beadle County road and bridge features:

- General Demographic and Economic Overview
- Existing Roadway Functional Classification
- Current Average Daily Traffic (ADT)
- Existing Roadway Surface Type
- Inventory and Assessment of County Maintained Bridges (both on- and off-system)
- Review of Existing Plans and Programs Addressing Transportation Needs in Beadle County

Based on a robust public participation plan (PPP), the Beadle County MTP developed and refined a set of identified needs and issues into a strategic listing of short-term and long-term transportation infrastructure investments. Public involvement techniques such as online surveys, public input meetings, stakeholder outreach and five (5) meetings with the Study Advisory Team (SAT) were used to ensure political, technical and stakeholder input was considered during development of the Beadle County MTP.

Given the generally rural nature of Beadle County, a very concise set of needs was identified through the planning process, major points of analysis included in the MTP will involve three primary components:

- Pavement Management Program
- Bridge Condition Evaluation and Improvement Program
- Financial and Investment Plan

Each element is developed with the following intent and outcome.

Pavement Management Program

With nearly 220 miles of paved roadway, a major point of analysis for Beadle County is the development of a Pavement Management Plan (PMP). The MTP includes the development of a 20 year PMP for Beadle County. Nearly 40 percent of the roadways under county jurisdiction are paved roadways, which require a diligent program of ongoing maintenance. The balance

of roadways are currently gravel surface and also require a regular and ongoing system of maintenance and management.

The PMP is based on an evaluation of existing pavement conditions in Beadle County as of Fall 2015. Additionally, baseline assumptions for an ongoing maintenance and construction program for Beadle County roadways were developed through an analysis of the approved 2016-2020 Capital Improvement Plan (CIP).

The PMP for Beadle County developed a 2017-2021 CIP for Beadle County to reflect both technical analysis and public input. Beyond the short range element of the PMP, the MTP develops two additional improvement bands for future roadway investments covering the years 2022-2026 and 2027-2037.

Bridge Condition Evaluation and Improvement Program

Beadle County currently has 138 bridges on both county and township roadways for which it is responsible for maintenance. As part of the MTP, a detailed system review used the most current National Bridge Inventory (NBI) data and existing needs identified by Beadle County Highway Department to develop a bridge improvement program to address the most pressing needs facing Beadle County's bridge infrastructure.

Based on current data, nearly 40 percent (or 48) of the Beadle County bridges had a sufficiency rating of 60 or less (on a scale from 0 to 100). These structures were considered to be of the highest priority for consideration as part of the MTP development.

Similar to how investments were developed for the PMP, a Bridge Improvement Program (BIP) was developed for Beadle County that addressed bridge investment priorities for short-term (2017-2021), intermediate (2022-2026) and long range needs (2027-2037).

A large part of the BIP investment strategy was developed based on balancing existing and projected Beadle County revenue options between the BIP and PMP. Additionally, the BIP developed for Beadle County used the recent guidance from SDDOT for the Bridge Improvement Grant (BIG) Program. Given the potential for new investment in statewide bridge infrastructure with the SDDOT BIG program, BIG criteria factored significantly into the prioritization of future Beadle County bridge investments.

Financial and Investment Plan

The Financial and Investment Plan (FIP) for the Beadle County MTP was developed to be nearly fiscally constrained. The FIP is used to sew together both the PMP and the BIP to ensure they are financially reasonable with a strategic implementation plan to maintain Beadle County transportation infrastructure over the next 20 years.

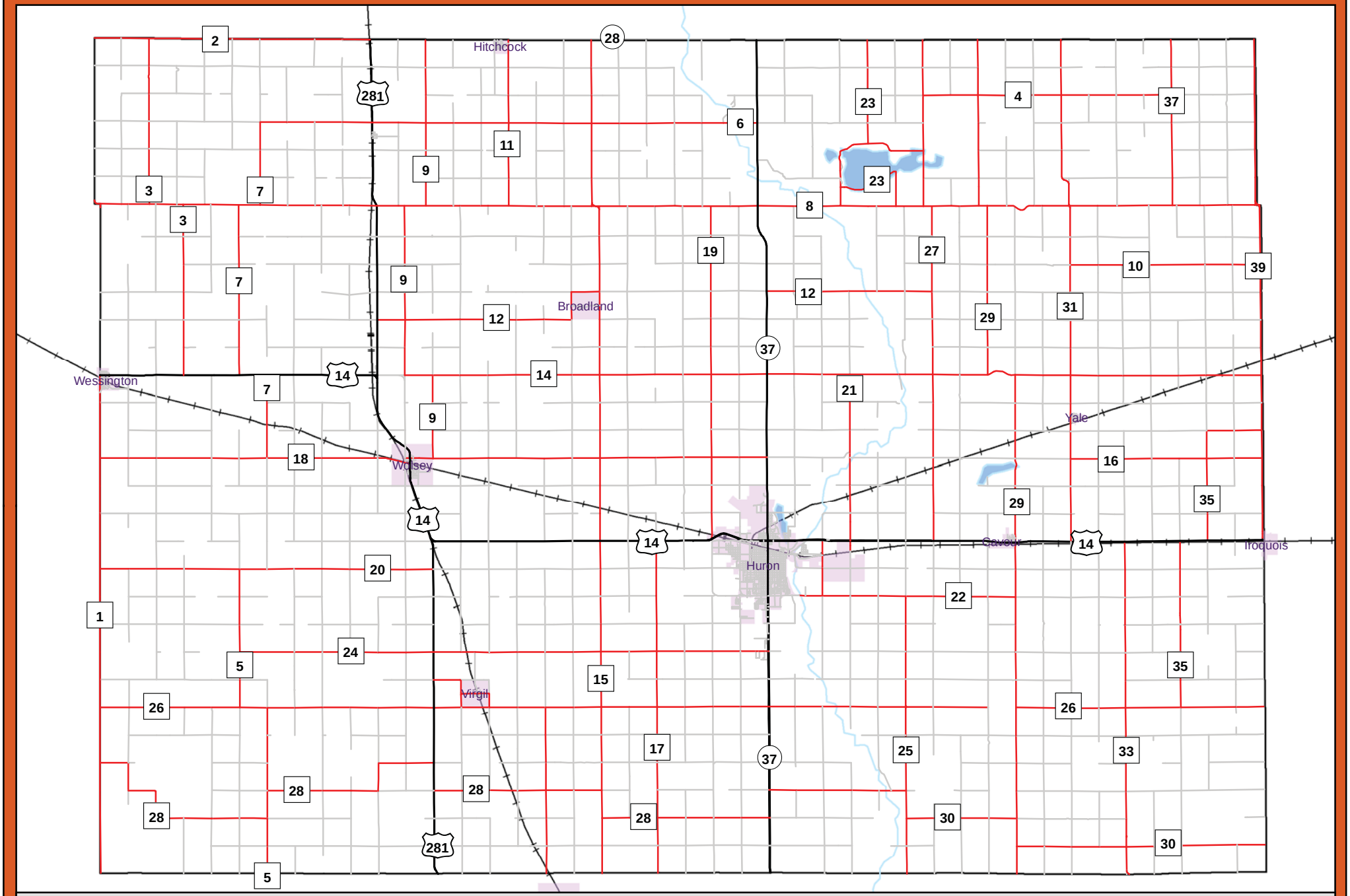
The FIP provides a clear understanding of future financial capacity for investment in the PMP and the BIP. Beyond those improvements, constrained in the FIP for the PMP and the BIP, a clear set of "system needs" were developed that demonstrated high-priority unmet needs in Beadle County. During development of the MTP, a referral vote on a proposed wheel tax ordinance was defeated. The framework for the FIP was developed to show the importance of the proposed wheel tax increase, as well as other funding sources, are to addressing unmet Beadle County transportation needs.

Study Area

Beadle County is located in east-central South Dakota. US Highway 14 crosses the county from east-to-west and US Highway 281 traverses the county from north-to-south. The City of Huron is Beadle County's largest city and also the county seat. Other smaller communities within Beadle County include Iroquois, Wessington, Wolsey, Virgil, Broadland, Cavour, Yale and Hitchcock.

The study area for the Beadle County MTP will include the entirety of Beadle County. The Beadle County MTP will focus exclusively on the 573 miles of roadways and the 138 bridges currently listed on the county system under Beadle County jurisdiction. Analysis will not occur inside of a current corporate limit (E.g. City Huron, City of Wolsey) and will exclude SDDOT roadways and bridges. Analysis within an existing corporate limit would be related exclusively to bridge or roadway infrastructure owned by the county but located within an existing corporate limit or within the Huron Urban Area Boundary (UAB). Where necessary, the Beadle County MTP may include a small overlap with SDDOT corridors when evaluating potential safety or operational needs related to existing or future county roadways.

Figure 1-1 shows an overview of the Beadle County MTP study area. The intent of the Beadle County MTP is primarily limited to roadway and bridge needs owned and operated by Beadle County. Therefore, consideration of other city, township and SDDOT road and bridges in the study were not a focus of the MTP development. The only exception would be cases where there are issues of interrelated or concurrent jurisdiction of a roadway or transportation facility. As a multimodal plan, the MTP did take into consideration issues and needs related to People's Transit, Huron Regional Airport and related railroad infrastructure in Beadle County.



Beadle County Master Transportation Plan
Figure 1-1: Beadle County Study Area

Beadle County Demographic Profile

Beadle County had a 2013 population of 18,299 including 8,356 households, according to the US Census Bureau (American Community Survey 2010-2014 estimates). 72 percent of the county's population is centered in Huron, the Beadle County seat. Beadle County has experienced a 4.4 percent annual growth rate since 2010. The median age is approximately 39 years old, which is 2 years older than the median age for all South Dakota residents.

Table 1-1: Beadle County Demographic Overview

	Beadle County	City of Huron	South Dakota
Population	18,299	13,097	853,175
Median Age	39.1	37.9	36.9
Mean Travel Time to Work (min.)	13	11.9	16.9
Median Household Income	$42,196	$39,084	$49,495
Land Area (sq. mi.)	1,258.70	9.48	75,811
Population Density (persons/sq. mi.)	14.5	1381.5	11.3

Within Beadle County, agriculture is the primary land use and economic driver outside of the City of Huron. As of 2012, Beadle County was home to 754 farms, encompassing 1,240 square miles or 98 percent of Beadle County's land. Beadle County's ten largest employers by number of employees can be seen in Table 1-2.

Table 1-2: Beadle County Top 10 Employers by Number of Employees

Employer	# of Employees	Service
Dakota Provisions	867	Food Processing
Huron Public Schools	363	Education
United States Government	290	Government
HRMC	286	Hospital
Center for Independence	232	Human Services
Terex	206	Manufacturing
Sunquest Healthcare	200	Senior Healthcare
Banner Engineering	175	Manufacturing
Wal-Mart	173	Retail
City of Huron	129	Government

Transportation System Conditions Assessment

The following element of the Existing Baseline System Inventory (EBSI) contains an overview of the primary features of the Beadle County Transportation system, including the following:

- Existing Roadway Functional Classification
- Current Average Daily Traffic (ADT)
- Existing Roadway Surface Type;
- Inventory and Assessment of County Maintained Bridges (both on and off system)

The transportation system conditions assessment will summarize a concise summary of the current conditions of the primary transportation infrastructure in Beadle County. The system conditions assessment provides the building block for the development of the 20 year MTP by establishing a framework for system needs by functional area.

FEDERAL FUNCTIONAL CLASSIFICATION

Functional class defines the role that a roadway will play in servicing the flow of traffic through the road network using factors such as access, mobility and overall roadway system connectivity. Each class requires a different traffic management system due to the nature of traffic operations on the roadway. The basis for determining an existing and eventual future functional classification system for Beadle County roadways is driven by existing roadway conditions and geometrics.

Beadle County maintains 573 miles of roadway. Based on the *Federal Functional Classification* system most of the county system is classified as rural, however, approximately six miles of the County system near Huron is classified as urban. Major collectors make up the highest proportion of the county system, followed by local roadways, then minor collectors. Arterial roadways make up only 0.3 percent of the county roadway network.

The primary purpose for the determination and maintenance of a functional classification system relates directly back to eligibility for the programming of federal-aid funds through SDDOT. All public roads functionally classified at least as a rural major collector or higher are eligible for federal assistance provided by Fixing America's Surface Transportation Act (FAST Act). These roads are referred to as "Federal-Aid Highways" or "on-system".

The federal functional classification of county maintained roadways as well as the federal and non-federal-aid eligible roadways can be seen in Figure 1-2. As discussed in the financial element of the MTP, recent changes by SDDOT regarding how Surface Transportation Program (STP) funds are distributed to counties gives Beadle County more flexibility in spending state provided funds on roadways classified as less than major collectors.

A well maintained functional classification system allows the county to prioritize maintenance, construction and other financial responsibilities within the county roadway system. Beadle County roadways are organized into the following classes:

- **Major Collector** - Provide service to any county seat not on an arterial route, to the larger towns not directly served by the higher systems and to other major traffic generators.
- **Minor Collector** - Link local traffic generators with nearby larger towns or with routes of higher classification.
- **Local Roads** - Rural local roads should primarily provide access to adjacent land and service to travel relatively short distances. In Beadle County, these would be almost exclusively on township roadways and city streets.

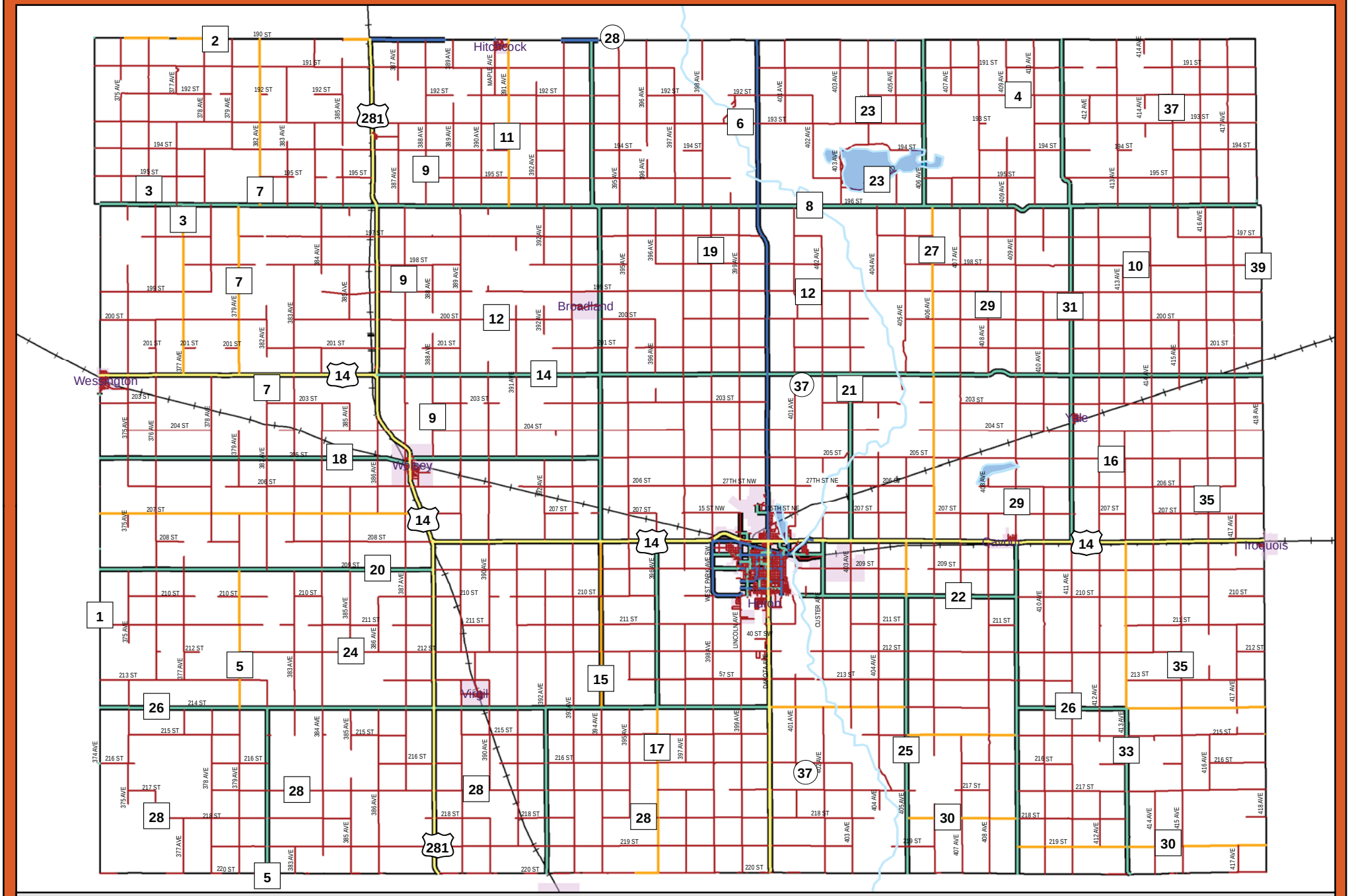
Table 1-3: Beadle County Roadway System by Functional Classification

Functional Classification	Mileage	Percentage
Local	210.9	36.8%
Minor Collector	89.2	15.6%
Major Collector	271	47.3%
Minor Arterial	1.9	0.3%
Total	573	100%

CORRIDOR OF REGIONAL SIGNIFICANCE

Beyond the Federal Functional Classification system, the Beadle County MTP recommends a system of Regionally Significant Corridors (RSCs). The RSC was developed in consultation with the Federal Functional Classification System, however also considered a number of more nuanced local conditions regarding existing and future conditions.

The RSC as discussed later assists in programming the expenditure of local and state revenue sources for both pavement management and bridge improvement investments in Beadle County. The RSC network developed as part of the Beadle County MTP is more thoroughly discussed in Chapter 5 of this document.



Beadle County Master Transportation Plan
Figure 1-2: Existing Federal Functional Class

Traffic Volumes & Safety

Due to the rural nature of Beadle County, county roadways generally experience low traffic volumes. Traffic traveling through Beadle County predominately uses state routes. County routes are mainly used by local traffic to access homes or farm properties. Average daily traffic volumes (ADT) along Beadle County roadways were obtained from SDDOT.

To estimate the approximate percentage of county road mileage falling within various daily traffic thresholds, data in SDDOT's Non-State Trunk Road Inventory (NSTRI) was used. Where no traffic data was provided on County roads, this analysis assumes those roads carry less than 500 ADT. Based on this assumption, approximately 94 percent of County roadway mileage carries less than 500 ADT. The percentage of county roadway mileage broken down by ADT ranges from NSTRI data can be seen in Table 1-4.

Table 1-4: Beadle County Average Daily Traffic

ADT Range	Percent of County Roadway Mileage
Less Than 500	94.0%
500 to 1,000	2.0%
1,000 to 2,500	1.9%
2,500 to 5,000	1.5%
5,000+	0.6%

A separate traffic data set containing the most recently collected traffic counts was obtained from SDDOT to identify average daily traffic at specific locations throughout Beadle County. This data can be seen in Figures 1-3 and Figure 1-4. It also shows that outside of Huron, all county roads carry less than 1,000 ADT.

Truck Movements

Beadle County is mainly an agricultural county with large farming operations, regional grain elevators, an ethanol production plant and food processing operations that generate a significant amount of heavy truck traffic on rural roadways. Weight restrictions on the county roadways allow the county to limit the impact of heavy vehicles on roadways that are not designed for such heavy loads. An SDDOT scale facility is currently located on US 281 north of Wolsey.

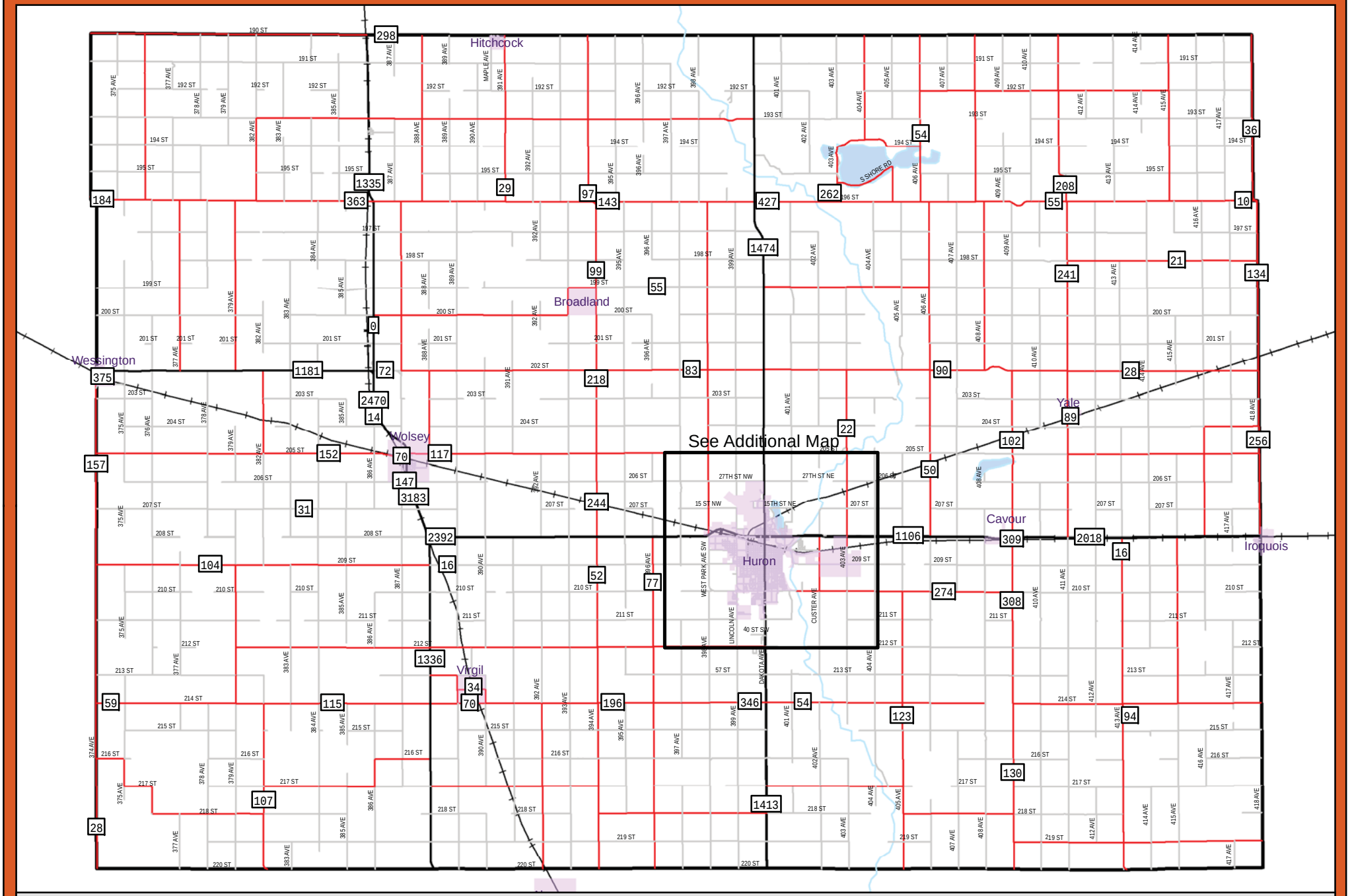
All asphalt roads within Beadle County are posted at six tons per axle and 40 miles per hour for trucks, with the exception of:

- **Yale Road (411 Avenue and County Road 31)** – Yale Road from Highway 14 north to the Correction Line (196th Street - County Road 8) is posted at eight tons per axle and 40 miles per hour for trucks. From the Correction Line north to South Dakota Highway 28, Yale Road is posted at six tons per axle and 40 miles per hour for trucks.
- **County Road 22 (Custer Avenue and 210th Street)** – Posted at legal load limits and trucks at 40 miles per hour.
- **Morningside Main Street** - Posted at legal load limits and 30 miles per hour.

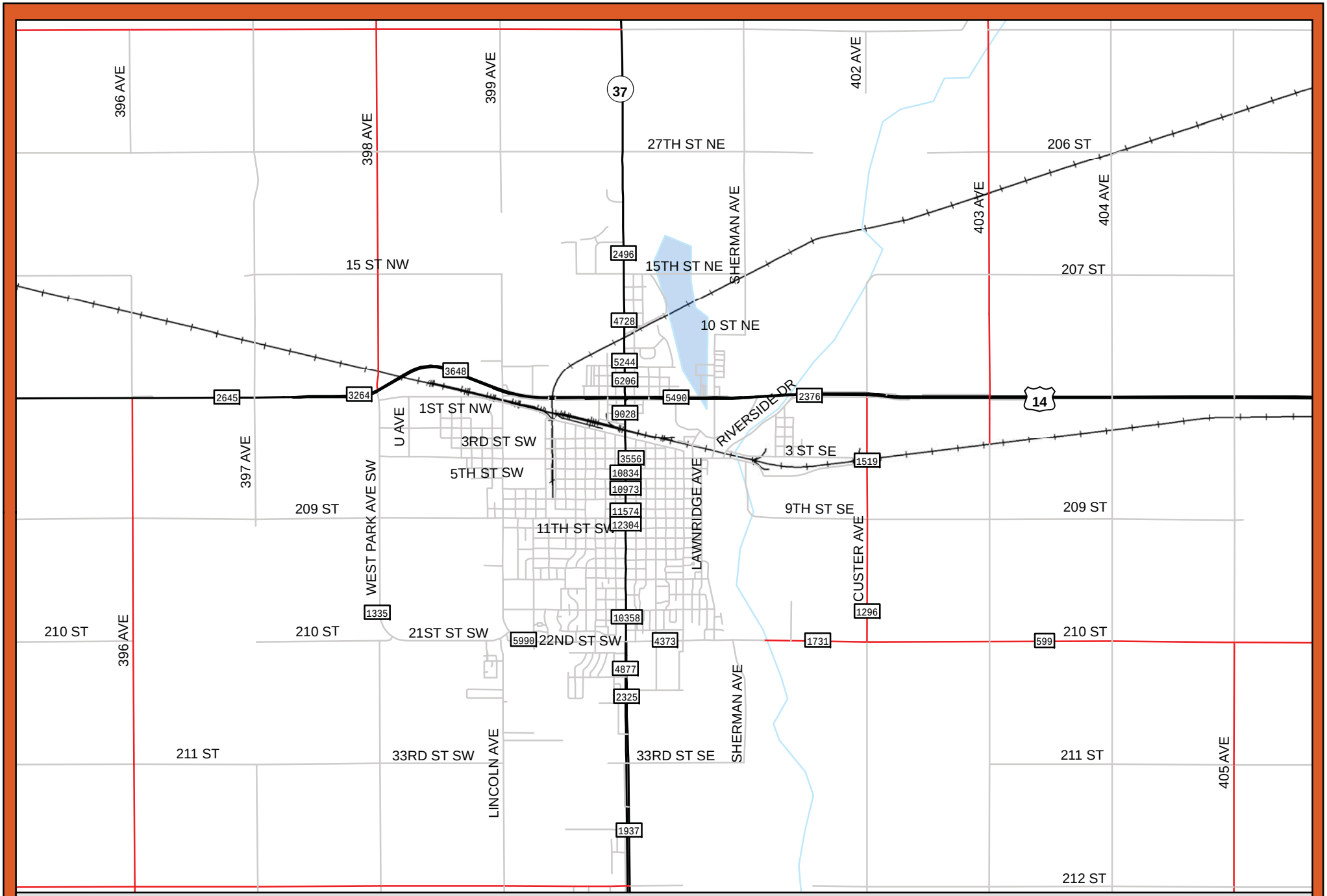
In 2014, SDDOT estimated trucks traveled 3.2 million miles on the local highway system. Of the total truck Vehicle Miles Traveled (VMT) in Beadle County, 61.5 percent of this truck traffic was on roadways functionally classified as major collectors. The remaining 31.5 percent of the miles traveled were on roadways classified as minor collectors and local roadways, which would typically be roadways maintained by the county.

Safety

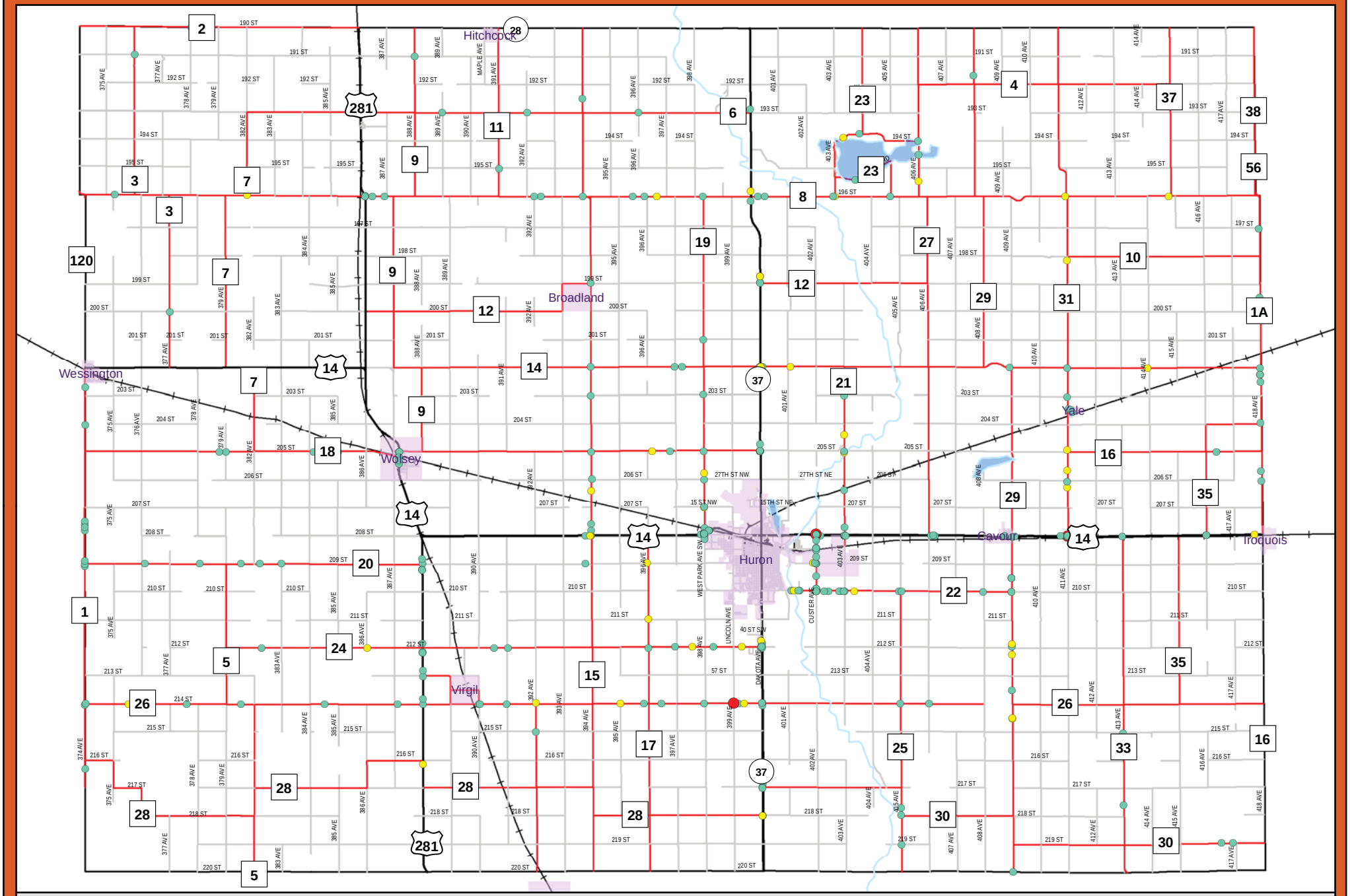
Beadle County crash locations occurring from 2010 through 2014 can be seen in Figure 1-5. This crash data along with public involvement, coordination with Beadle County Highway Department and the SDDOT allowed for identification of possible future issue mitigation opportunities.



Beadle County Master Transportation Plan
Figure 1-3: Beadle County ADT Overview



Beadle County Master Transportation Plan
Figure 1-4: Huron Area ADT



Beadle County Master Transportation Plan

Figure 1-5: Beadle County Crash Inventory 2010-2014

Pavement Inventory

The Beadle County Highway Department is responsible for approximately 573 mile roadways within Beadle County. The composition of county roadways are either gravel/crushed rock roadways (349 miles) or bituminous/paved roadways (221 miles).

There is a total of 0.5 miles of concrete roadways along County Roads 19 and 21 as they approach US 14 in Huron.

Table 1-5 shows a breakdown of pavement types on Beadle County roads. Pavement types on Beadle County roads can also be seen in Figure 1-7.

Table 1-5: Beadle County Pavement Inventory

Pavement Type	Mileage	Percentage
Gravel/Crushed Rock	349.2	60.90%
Bituminous	221.3	38.60%
Concrete	0.5	0.10%
Total	**573**	**100.00%**

Pavement Condition

METHODOLOGY

As part of this study, Pavement Surface Evaluation and Rating (PASER) survey was conducted. This technique was a two day windshield survey of the paved roadways in Beadle County. PASER ratings are performed in order to assist agencies in identifying roadway conditions and prioritizing improvements based on a range of factors including roughness (ride), surface distress (condition), surface skid characteristics, and structural characteristics (potholes, cracking, etc.).

Based on the PASER rating, different maintenance tasks are required to maintain or raise the rating for a particular section of roadway. By continuing to ensure that a good roadway remains a good roadway, the life of a roadway can be extended for a far lower upfront cost than by waiting until a more intensive maintenance task is required. On September 28 and 29, 2015, a windshield survey was completed for all paved roadways in Beadle County. Approximately 240 miles of county roadway were assigned PASER (Pavement Surface Evaluation and Rating) ratings. Every segment of paved roadway in Beadle County was given a PASER rating between 1 and 10 based on existing conditions. All gravel roadways were rated as a 1.

Each mile of study area county roads was mapped out and driven. As each route was driven, a windshield survey of the road condition was noted and pictures were taken in order to help document where and why each PASER rating was given. Factors such as the amount of cracking, potholes, rutting, shoulder condition, ability to drive at full speed, and the presence of gravel all were considered in rating the road segments.

The process always included two people: a driver and passenger marking the ratings. Rating values were conferred by both parties. The roadways were segmented every mile or shorter. All instances of shorter segments were driven by differing conditions. For example, while

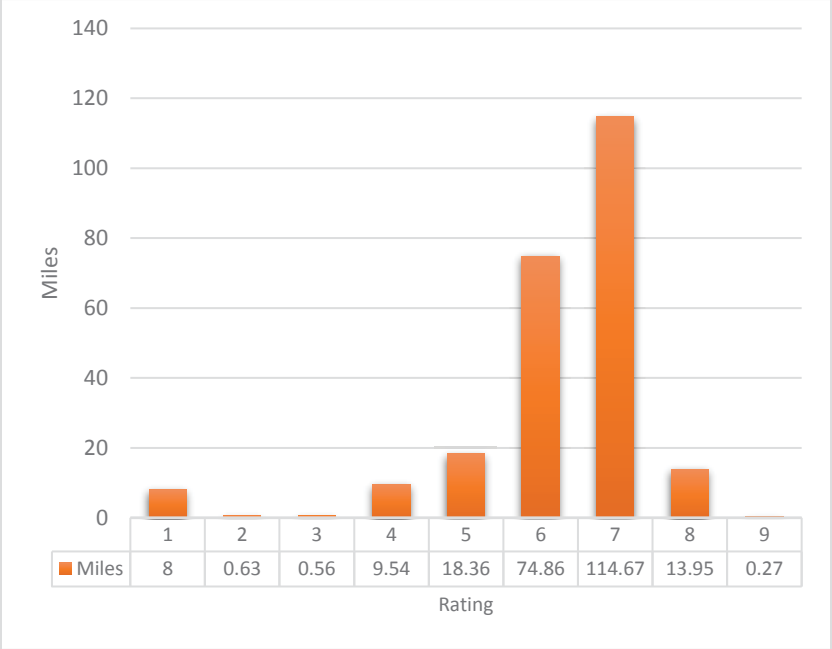
driving down Beadle County Highway 15 the pavement condition was much worse for a section of a few hundred feet. This several hundred foot section was segmented and scored differently than the neighboring roadway. Similar conditions existed in every case of shorter segments.

Consistency was important in the rating. Each of the rating values was defined and kept consistent throughout the PASER rating process. For example, severe cracking on a roadway rated it as a six and each instance of severe cracking was rated as a six consistently.

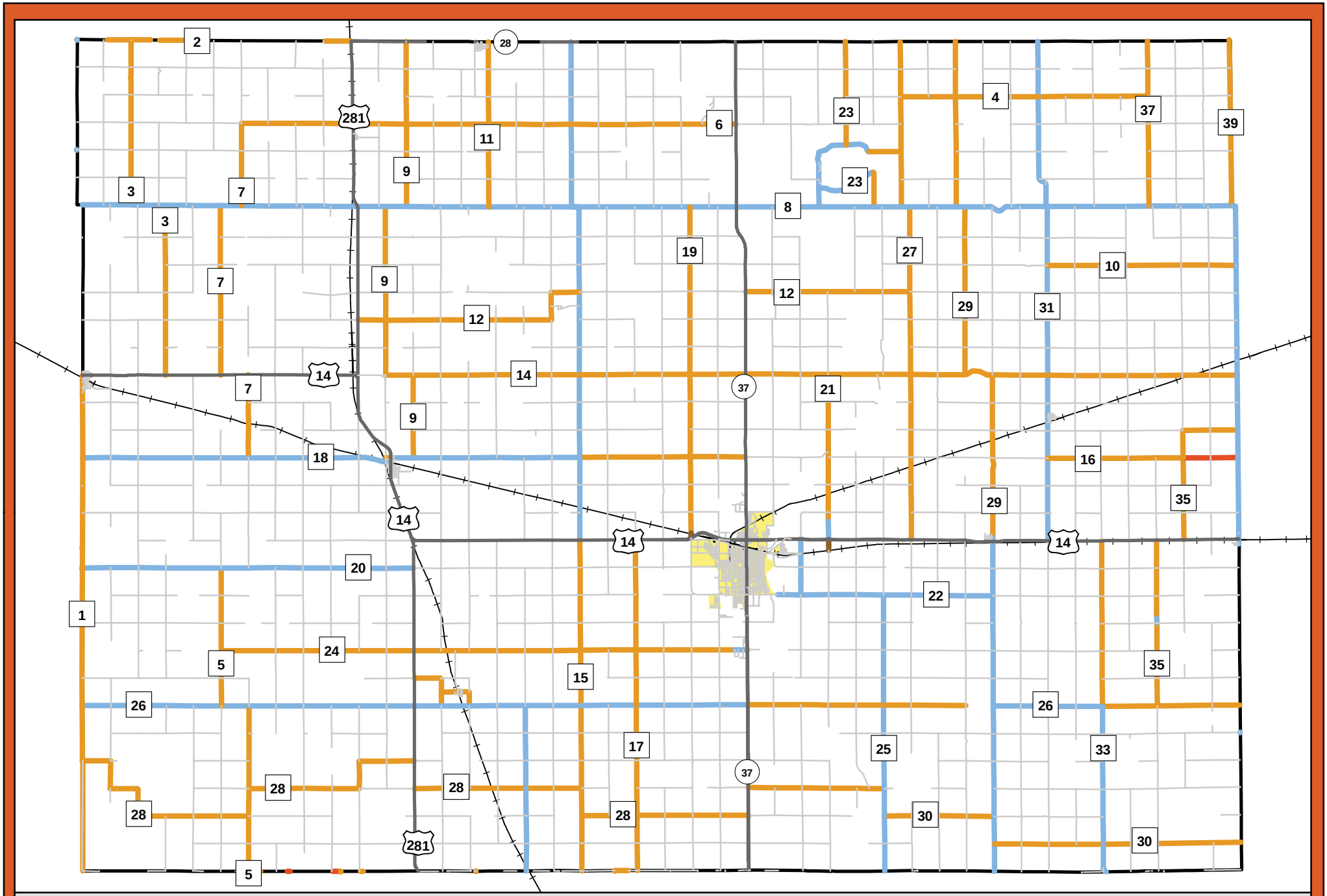
RESULTS

The average (mean) rating for Beadle County's roadways was 6.25. That rating indicates that the Beadle County roads evaluated tended to towards good condition. In fact, if a rating of five is to be considered the minimum acceptable pavement condition, (able to drive at posted speed limit) then 92 percent of scored roads meet that standard today. Currently, there are eight miles of paved roadway rated a one. These miles were exclusively on County Highway 15 where the pavement is being milled and have already been reconstructed. These ratings will be a critical factor in the development of the PMP to address ongoing maintenance of existing paved roadways in Beadle County.

Figure 1-6: PASER Rating Distribution



The individual PASER ratings values are described in Figures 1-8 through 1-17 and an example of each is provided.


Beadle County Master Transportation Plan
Figure 1-7: Existing Pavement Surface Type
N
W
E
S
Miles
0
2.5
5
Township Roads
State Roads
Huron Urban Boundary
Primitive County Road
Bituminous County Road
Gravel or Crushed Rock County Road
Concrete County Road

PASER Rating 10:

Perfect. A brand new road with appropriate striping and shoulders. This roadway was reconstructed or overlaid in the last year. Example: State Highway 14 east of Huron.

Figure 1-8: PASER Rating 10

PASER Rating 9:

Excellent. A like new road with new striping. This roadway was reconstructed or overlaid recently. Example: County Highway 8 near 397th Avenue.

Figure 1-9: PASER Rating 9

PASER Rating 8:

Great. No cracking, raveling or rutting. No patches or sealed cracks are visible. This roadway is not in need of repair. Example: County Highway 18 near 385th Avenue.

Figure 1-10: PASER Rating 8

PASER Rating 7:

Good. Some cracking, no raveling and little rutting. No patches are visible. Cracks are sealed. This roadway is not in need of immediate repair. Example: County Highway 20 near 384th Avenue.

Figure 1-11: PASER Rating 7

PASER Rating 6:

Fair. Moderate to heavy cracking or some raveling and rutting. Moderate polishing with occasional patches are visible. Cracks are mostly sealed. Example: County Highway 8 near 398th Avenue.

Figure 1-12: PASER Rating 6

PASER Rating 5:

Fair. Moderate to heavy cracking with moderate rutting. Moderate patching with some patches on old patches. Limited striping. Cracks are mostly unsealed. You can still drive this road at the posted speed limit. Example: County Highway 22 near U.S. Highway 14.

Figure 1-13: PASER Rating 5

PASER Rating 4:

Poor. Heavy cracking and rutting with moderate visible potholes. Heavy patching with some patches on old patches. Limited striping. Shoulders are deteriorated. Cracks are not sealed. You cannot drive this entire road at the posted speed limit. Drivers need to slow down in areas. Example: County Highway 15 near 192nd Street.

Figure 1-14: PASER Rating 4

PASER Rating 3:

Very poor. Severe cracking and rutting with moderate visible potholes. Heavy patching with some patches on old patches. Limited striping. Shoulders are deteriorated. Areas are marked with flags. You cannot drive this road at the posted speed limit. Drivers need to slow down. Example: County Highway 15 near 195th Street.

Figure 1-15: PASER Rating 3

PASER Rating 2:

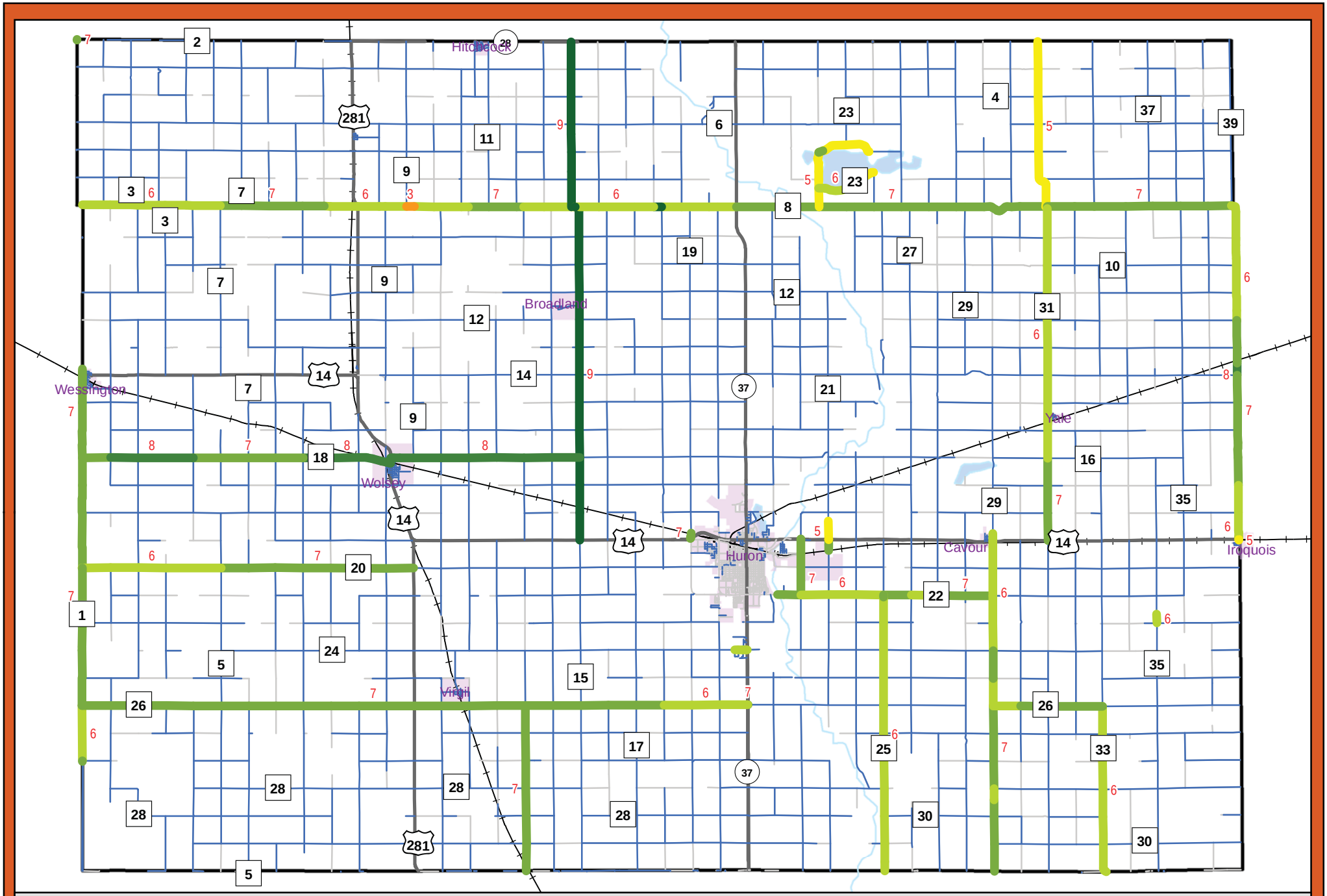
Terrible. Heavy patching with gravel patches on failed asphalt. Limited pavement intact. No striping. Shoulders are deteriorated. You cannot drive this road at the posted speed limit. Drivers need to slow down. Example: County Highway 15 near 194th Street.

Figure 1-16: PASER Rating 2

PASER Rating 1:

No pavement. A PASER rating of 1 indicates a gravel road section with no visible pavement.

Figure 1-17: PASER Rating 1



Beadle County Master Transportation Plan
Figure 1-18: Beadle County PASER Conditions

Bridge Inventory

Beadle County is responsible for 138 bridge structures throughout the primary and secondary county road system. As of the fall of 2015, five county bridges were closed and townships have been notified of intent to close three additional bridges in the spring or summer of 2016. There are 24 additional bridges in the county that are owned by SDDOT, local governments or railroads.

Bridges maintained by Beadle County can be seen in Figure 1-19.

To evaluate the conditions of Beadle County bridges, the National Bridge Inventory (NBI) was obtained from SDDOT. The NBI contains a unified database for bridges including:

- identification information
- bridge types and specifications
- operational conditions
- bridge data including geometric data, functional description, inspection data, etc.
- bridge location
- type of routes carried on and/or under the structure

Further, the NBI:

- defines standard categories for classification of bridges
- describes material components of the bridge, deck and deck surface
- provides information about the age of the structure, rehabilitation year, average daily traffic, average daily truck traffic and information regarding to bypass and detours

In aggregate the NBI provides a uniform inventory of information regarding current inspection data, ratings assigned by inspectors and appraisal results.

BRIDGE SUFFICIENCY RATINGS

The principal metric used to evaluate bridge conditions is the bridge sufficiency rating. The bridge sufficiency rating is a numeric value used to describe bridge conditions, with a score of 100 indicating an entirely sufficient bridge, and a score of zero indicating a completely deficient bridge. These ratings are assigned to bridges as part of federally mandated biennial bridge inspection process which results in the development of the NBI.

The sufficiency rating is an overall score based on several bridge characteristics, including structural adequacy and safety, age, serviceability and functional obsolescence and suitability for continued public use.

Based on sufficiency ratings from the NBI bridges are generally classified as:

- Not deficient;
- Structurally deficient;
- Functionally obsolete.

FHWA defines a structurally deficient bridge as:

- *"Structural deficiencies are characterized by deteriorated conditions of significant bridge elements and potentially reduced load-carrying capacity"*

- *"A structurally deficient designation does not imply that a bridge is unsafe, but such bridges typically require significant maintenance and repair to remain in service, and would eventually require major rehabilitation or replacement to address the underlying deficiency".*

FHWA defines a functionally obsolete bridge as:

- *"Bridge does not meet current design standards (for criteria such as lane width), either because the volume of traffic carried by the bridge exceeds the level anticipated when the bridge was constructed and/or the relevant design standards have been revised. Addressing functional deficiencies may require the widening or replacement of the structure".*

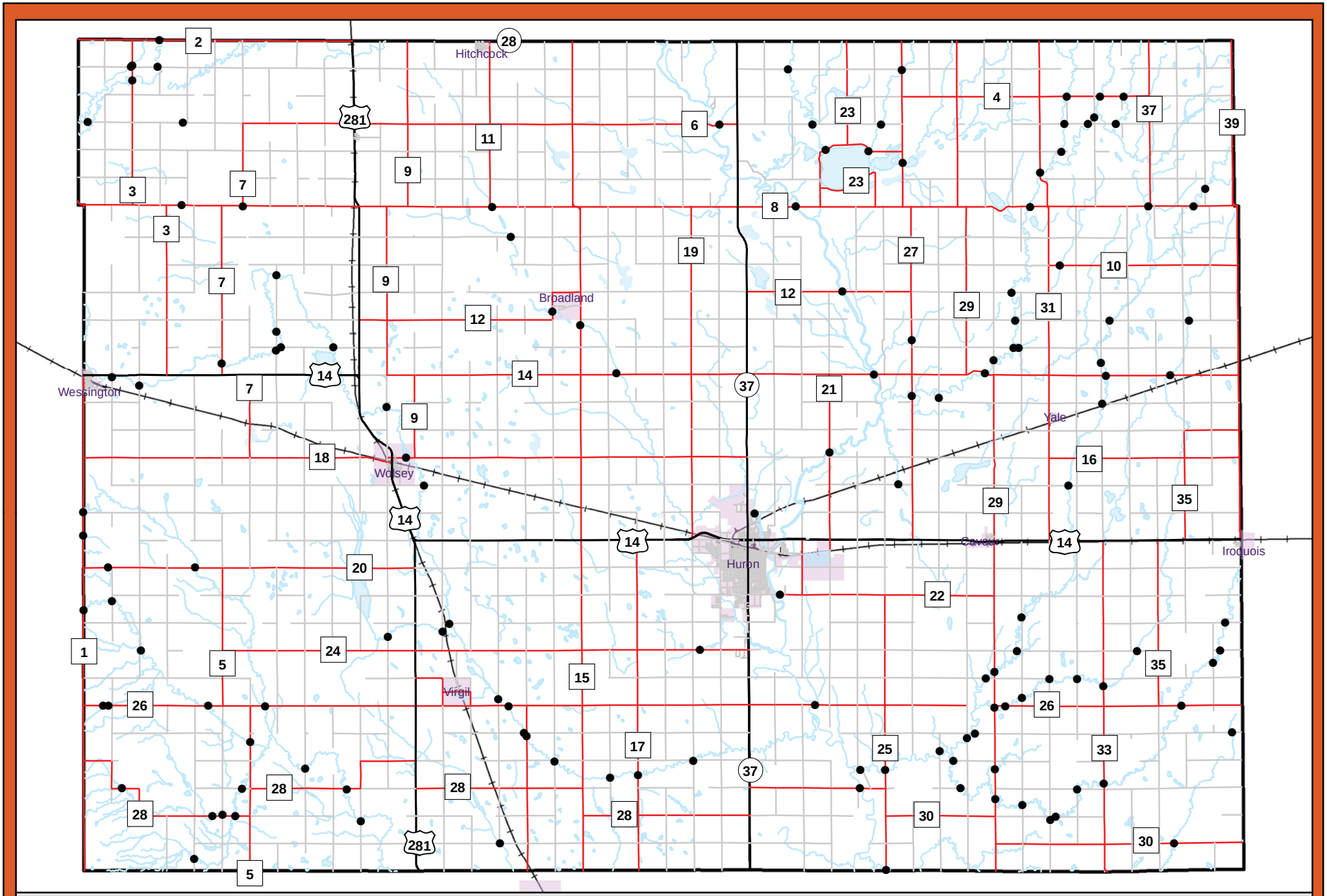
Bridge sufficiency ratings are also used to determine if a bridge is eligible for federal or state bridge rehabilitation or bridge reconstruction funding. Bridges with sufficiency ratings below 80 are eligible for rehabilitation and bridges with sufficiency ratings below 60 are eligible for replacement. As discussed later in the financial element of the MTP, SDDOT has revised statewide programming guidance pursuant to MAP-21 to increase the threshold for replacement eligibility from 50 to 60 for federal funds. This new criteria will also apply for replacement funding starting in fiscal year 2016 through the SDDOT Bridge Improvement Grant (BIG) Program.

Of the 130 Beadle County bridges expected to remain in operation following completion of the Beadle County MTP, 48 (37 percent) have an NBI sufficiency rating less than 60. The average NBI rating of all Beadle County bridges is 66.3. Of those Beadle County bridges with a sufficiency rating less than 60, the average rating is 37.8. The statewide SDOT-owned bridge sufficiency rating average is 90.6.

The current sufficiency rating for bridges in Beadle County can be seen in Table 1-6. A further breakdown of bridge sufficiency ratings can be seen in Figures 1-20 and 1-21.

Table 1-6: Beadle County Bridge Sufficiency Ratings

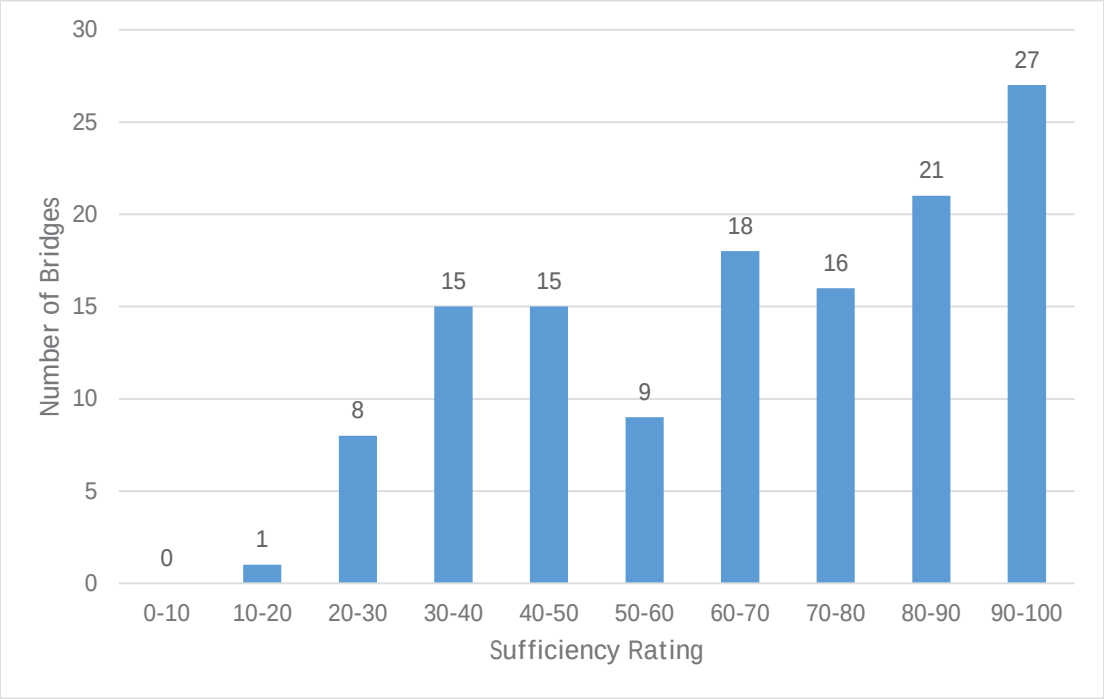
Bridge Sufficiency Rating	Number of Bridges	Percentage
80+	48	37%
60 to 80	34	26%
Less Than 60	48	37%
Total	130	100%



Beadle County Master Transportation Plan
County-Maintained Bridges

Figure 1-19: County-Maintained Bridges

Figure 1-20: Beadle County Bridge Sufficiency Ratings

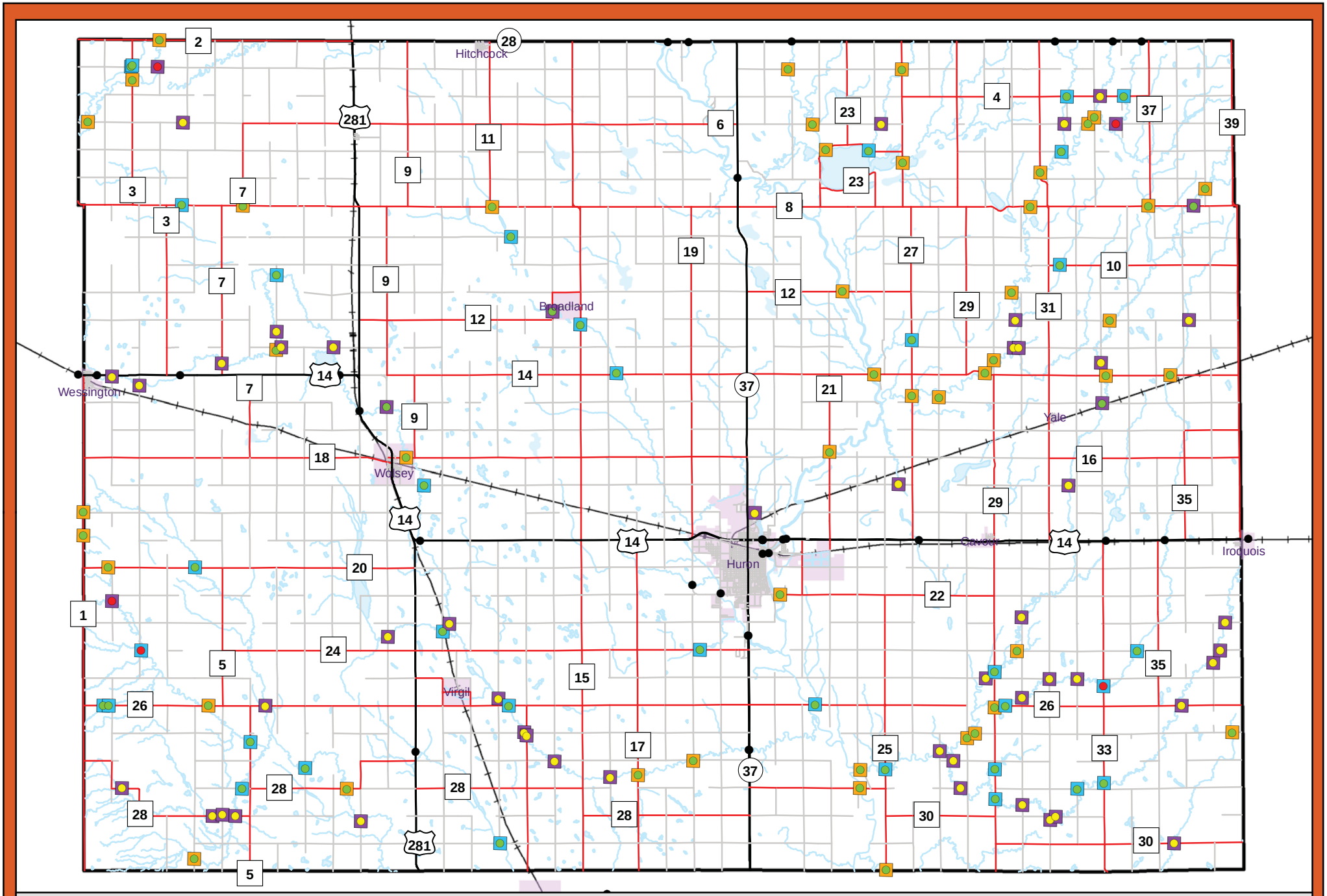


BEADLE COUNTY BRIDGE DEFICIENCIES

Table 1-7 shows a breakdown of the condition of bridges owned by Beadle County. Of the total county wide system, 49 bridges (35 percent) are considered deficient. Additionally, another 3 percent are considered functionally obsolete. Nationwide, 21.9 percent of bridges are considered deficient (from 2009 FHWA data). Statewide in South Dakota, 24.7 percent of bridges are considered deficient (from SDDOT national bridge inventory data).

Table 1-7: Bridge Deficiencies on Beadle County Bridges

Condition	Number of Bridges	Percentage
No Deficiency	85	62%
Structurally Deficient	49	35%
Functionally Obsolete	4	3%
Total	138	100%


Hitchcock
Broadland
Wessington
Wolsey
Huron
Virgil
Yale
Iroquois
Cavour
Beadle County Master Transportation Plan
Figure 1-21: Bridge Sufficiency & Deficiency
N
W
E
S
0
2.5
5
Miles
County System Roads
Other Roads
City Limits
Non-County Bridges
Bridge Deficiency
Not Deficient
Structurally Deficient
Functionally Obsolete
Bridge Sufficiency
Replacement Needed (39%)
Potential Rehab (37%)
Good (34%)

Chapter 2: Issues Identification & Public Input Summary

Public Input Summary and Overview

A public input meeting and a series of small-group stakeholder meetings were held in late October, 2015 to gather opinions regarding the development of the MTP. Concurrent to the early public involvement meetings, an online survey was deployed to assist in collecting feedback and observations concerning transportation needs in Beadle County. As a result of the early input process, a series of issues emerged regarding the current transportation system within Beadle County. This set of key issues was refined based on the information collected as part of these early public input and stakeholder meetings, consultation with the Study Advisory Team (SAT) and the online survey. These issues reflect the more significant concerns facing the Beadle County transportation system.

Public Input Meetings

The MTP development process is to include a simple yet comprehensive PPP. The PPP gathered input from Beadle County officials, county residents, SDDOT, township officials and other key stakeholders throughout Beadle County. The transportation system of Beadle County impacts each resident regardless of age or location.

The SDDOT, Beadle County and KLJ hosted the first public input meeting (PIM) on October 27, 2015 at the Huron Campus Center. As part of the first public input meeting, existing condition information was presented; 31 participants at the meeting provided feedback on countywide transportation needs.

The second PIM was held on September 8th, 2016, also at the Huron Campus Center. Participants were informed of the plan's findings and recommendations including pavement and bridge programming priorities.

Stakeholder Meetings

As part of the public involvement process, a series of meetings with potential stakeholders, including a mix of public and private stakeholders, existing County Commissioners and each of the smaller cities within Beadle County were held on October 28, 2015. The purpose of this stakeholder meeting was to gather information on community needs and desires as input into a long-range, multi-modal plan to provide a blueprint that will address the future transportation needs of Beadle County.

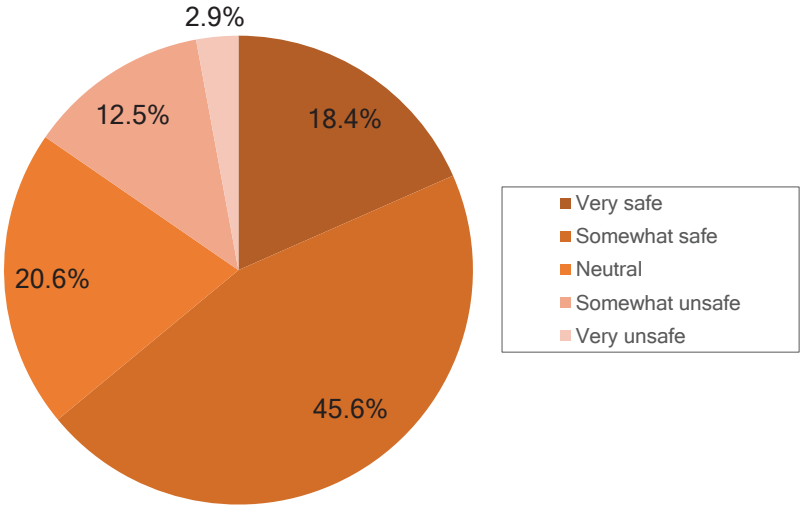
Online Survey Results

An online survey was made available via SurveyMonkey to identify additional transportation needs. The survey included 35 questions about the Beadle County transportation system. Of the 155 individuals participating in the survey, 82.8 percent of the participants live in Beadle County while 94.2 percent stated that they work within the Beadle County townships of Clyde, Custer, Huron, Theresa, and Valley townships. The key results of the survey are as follows:

SAFETY ISSUES

Overall, the traffic operations in Beadle County were considered to be safe by the majority of survey participants. 64 percent of survey takers rated overall traffic safety in Beadle County as very safe or somewhat safe. Only 2.9 percent felt as though overall traffic operations were very unsafe.

Figure 2-1: Overall Traffic Safety Summary



Traffic safety concerns identified through the survey include:

- Intersection of US 14 and West Park Avenue
- 27th Street Northwest corridor
- Intersection of Custer Avenue and US 14
- Distracted Driving
- Increasing truck traffic

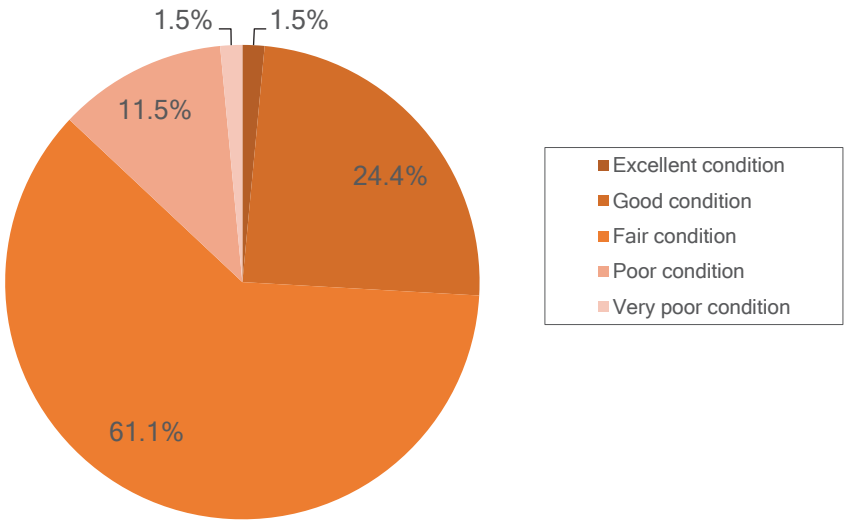
ROADWAY CONDITIONS

Survey takers were asked to rate both paved and unpaved Beadle County roadways. As seen in the charts below, gravel roadways were perceived to be in slightly better condition than paved roadways.

Gravel Roadways

87 percent of survey participants rated gravel roadways throughout Beadle County as fair to good condition.

Figure 2-2: Gravel Road Conditions Summary



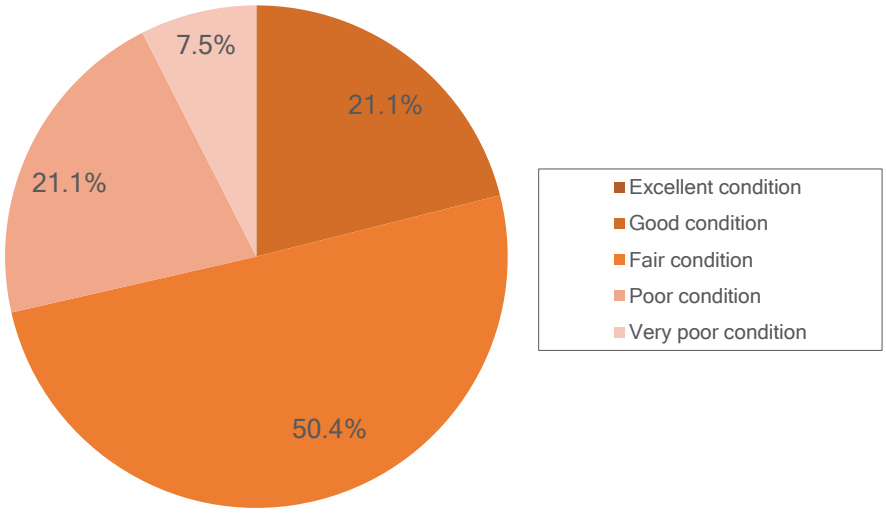
Gravel roadway concerns identified through the survey include:

- 391st Street corridor
- 211th Street corridor
- 395th Street corridor
- Hoover Road
- Farmland Road

Paved Roadways

71.5 percent of participants felt as though Beadle County's paved roadway conditions were in fair to good condition.

Figure 2-3: Paved Road Conditions Summary



Reoccurring pavement concerns identified through the survey include:

- 214th Street
- 196th Street
- 394th Avenue
- 405th Avenue (210th Street to 220th Street)

PUBLIC TRANSIT

87.6 percent of participants responded that they do not use public transit services within Beadle County. 73.3 percent of the participants using public transit stated that school was their primary reason for public transit usage.

PEDESTRIAN ISSUES

78.8 percent of participants stated that they walk or bike in Beadle County. 54.8 percent perceived their safety as a pedestrian to be very safe or somewhat safe while only 17.1 percent felt somewhat unsafe or unsafe.

Participants were asked to identify issues regarding pedestrian facilities and safety within Beadle County. The following were the most frequent responses:

- Lack of Lake Byron shared-use pedestrian path
- Pedestrian safety issues caused by high speeds of heavy vehicles on gravel roadways
- Lack of bicycle accommodations on paved roadways
- Lack of pedestrian facilities connecting western Huron to the parks on the eastern edge of Huron

Safety Concerns

As seen in the public survey results, Beadle County roadways are perceived to be relatively safe. However, several safety concerns were identified by both the public and technical staff for consideration as part of the Beadle County MTP.

US ROUTE 14 & WEST PARK AVENUE INTERSECTION

The intersection of US Route 14 and West Park Avenue was identified as a potential safety concern during the public involvement process. Based on economic development patterns both north and southeast of the intersection, there is potential for increased traffic at this intersection in the future.

Figure 2-4: US 14 & West Park Avenue Intersection Overview

A preliminary signal warrant analysis shows that signalization is currently unwarranted at this intersection. However, a trend was discovered during the crash review process; 85 percent of all crashes occurring at the intersection of US 14 and West Park Avenue took place at dawn. Possible visibility issues would require further analysis to determine applicable mitigation strategies.

Table 2-1: US 14 & West Park Avenue Intersection Crashes

Total Intersection Crashes (2010-2015)	13
Crashes Occurring at Dawn	11
Percent of Crashes Occurring at Dawn	85%

CUSTER AVENUE & 21ST STREET CORRIDOR

With the planned economic development, the de facto eastern Huron truck bypass will likely experience higher levels of personal and heavy vehicle traffic. Current accident trends indicate an issue with wild animal crashes. 41 percent of crashes within this corridor over the last five years have involved wildlife. Nearly all of the wildlife-vehicle crashes occurred during the night or early morning hours. Possible mitigation methods could include increased lighting, updated signage or upgraded roadside fencing.

Table 2-2: Custer Ave & 21st Street Corridor Crashes

Total Corridor Crashes (2010-2015)	39
Crashes Involving Animals	16
Percent of Crashes Involving Animals	41%

COUNTY ROAD 8 OFFSET INTERSECTIONS

Early in the planning process three skewed intersections along County Road 8 (196th Street) were identified as safety concerns. These intersections are at north-south section line realignments, with s-curves in place on north-south roadways to create a continuous road instead of two offset intersections at these correction lines. Concerns at these intersections were voiced by the School District's Transportation Director (also a former law enforcement officer). These intersections were noted to be most problematic during the summer growing season when the fields are full of crops reducing visibility of oncoming cross traffic.

Figure 2-5: County Road 8 Offset Intersections Overview

These intersections include:

- County Road 8 and County Road 15
- County Road 8 and County Road 31
- County Road 8 and County Road 39

With only two crashes between the three intersections over the past five years, the three s-curve intersections on County Road 8 are not a pressing safety concern. Low-cost basic signage and marking improvements would likely improve the recognition of the stop-controlled intersection during both daytime and nighttime conditions. Given the low traffic

volumes at each study intersection and a lack of documented safety issues, it may be most appropriate to consider any intersection geometry revisions as part of future pavement rehabilitation or reconstruction projects. Preliminary discussions with the SAT indicated that the curves at the two eastern intersections should remain given the distance between the intersections. The potential to revert to an offset intersection exists at County Road 15 and County Road 8.

Pavement Conditions

Through the initial Beadle County MTP development process, pavement conditions were generally found to be in fair to good condition. However, several corridors were noted as areas needing more significant consideration. These areas are further studied as part of the MTP for more significant maintenance or overlay projects. Beadle County does not currently have a detailed program which schedules routine maintenance or structural overlays.

As part of the MTP, a detailed list of significant rehabilitation projects was to be developed for corridors identified as concerns. The list was based on both existing and projected conditions as well as existing and future traffic volumes. The rehabilitation program includes at least one major rehabilitation project every two to three years (for a total of four to five projects). Each project is assumed to cost approximately $150,000 to $200,000 per mile.

Corridors receiving comments as part of the early public input process are as follows:

COUNTY ROAD 20

From US 281 to the western county line, County Road 20 has experienced an increase in traffic volumes. Increasing truck traffic volumes could be attributed to drivers trying to avoid the scales located north of Wolsey. This corridor should be considered for a future rehabilitation project due to the deteriorating condition of its pavements. The most recent work on this corridor was completed in 2015. Maintenance work on County Road 20 is scheduled for 2020 in the current Beadle County five-year CIP.

COUNTY ROAD 25

This corridor was identified as a potential candidate for a future major rehabilitation project from County Road 22 to the southern county line. The most recent repair work on this corridor was completed in 2013. Maintenance work is scheduled for 2018 in the current Beadle County five-year CIP.

COUNTY ROAD 26

Through the public involvement process, this corridor between US 281 and SD 37 and between county roads 29 and 33 was identified as an area experiencing increased truck traffic volumes. This roadway has been recently patched but users have expressed the need for a more comprehensive maintenance and rehabilitation program. The most recent work on this corridor was completed in 2014 and it is scheduled for maintenance in 2019 in the current Beadle County five-year CIP.

COUNTY ROAD 29

County Road 29 from US 14 to county road 26 was identified as another corridor in need of pavement rehabilitation. The most recent work on this corridor was completed in 2013. A pavement maintenance project is currently anticipated in 2018.

COUNTY ROAD 33

County Road 33 from county road 26 south to the county line was also recognized as a corridor needing pavement rehabilitation. The most recent work on this corridor was completed in 2013 and a rehabilitation project is currently scheduled for 2018.

Recreational Trails

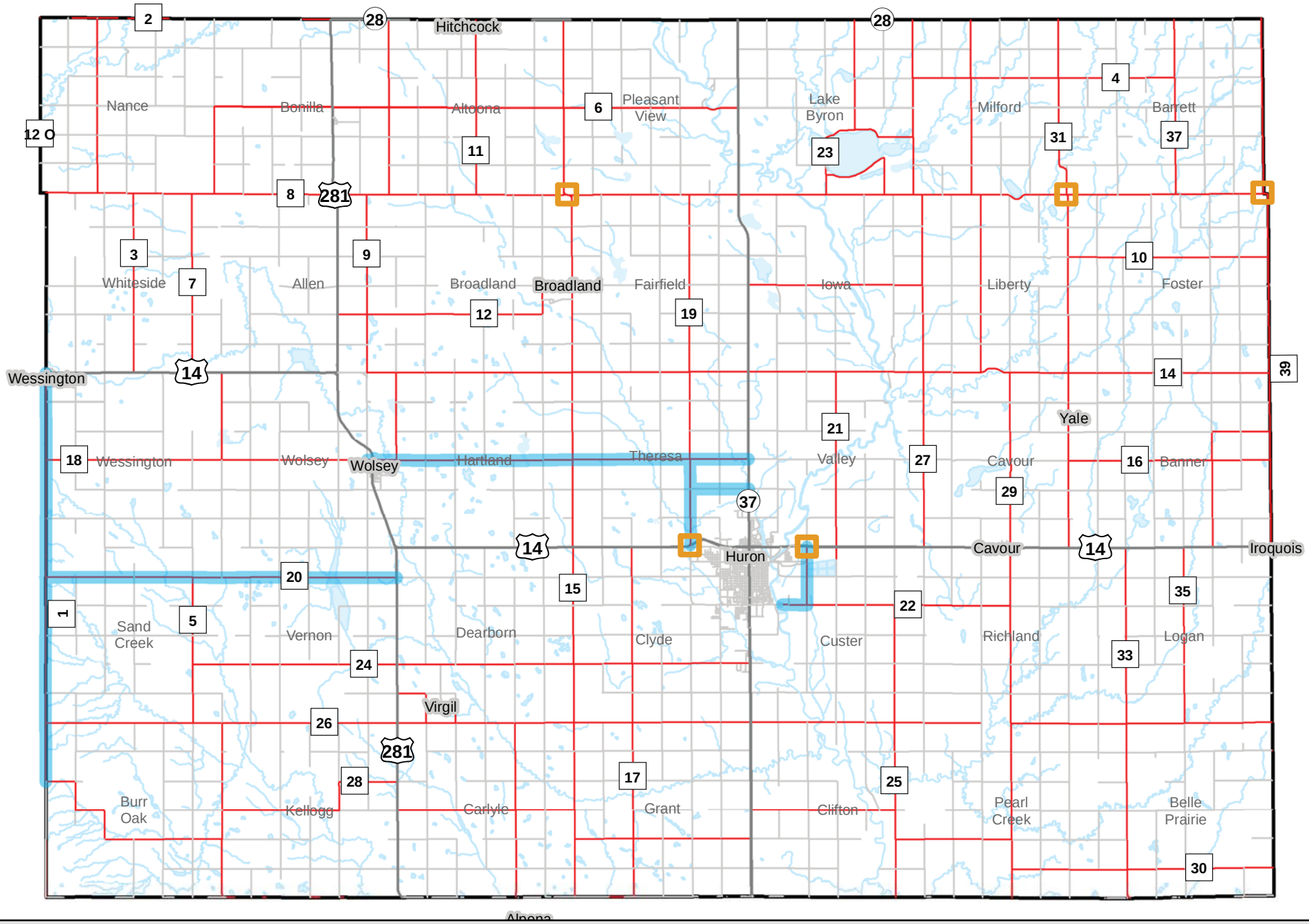
Through the early public involvement process, participants indicated support for continued discussion regarding the possibility of developing a recreational trail system around Lake Byron. Limitations which presented themselves during prior attempts involved right of way and adjacent property owners. There are no improvements planned to the County Road 23 (South Shore Road) in the current Beadle County CIP. The most recent improvements made to County Road 23 were in 2011 as part of a chip seal project.

Heavy Vehicle Related Issues

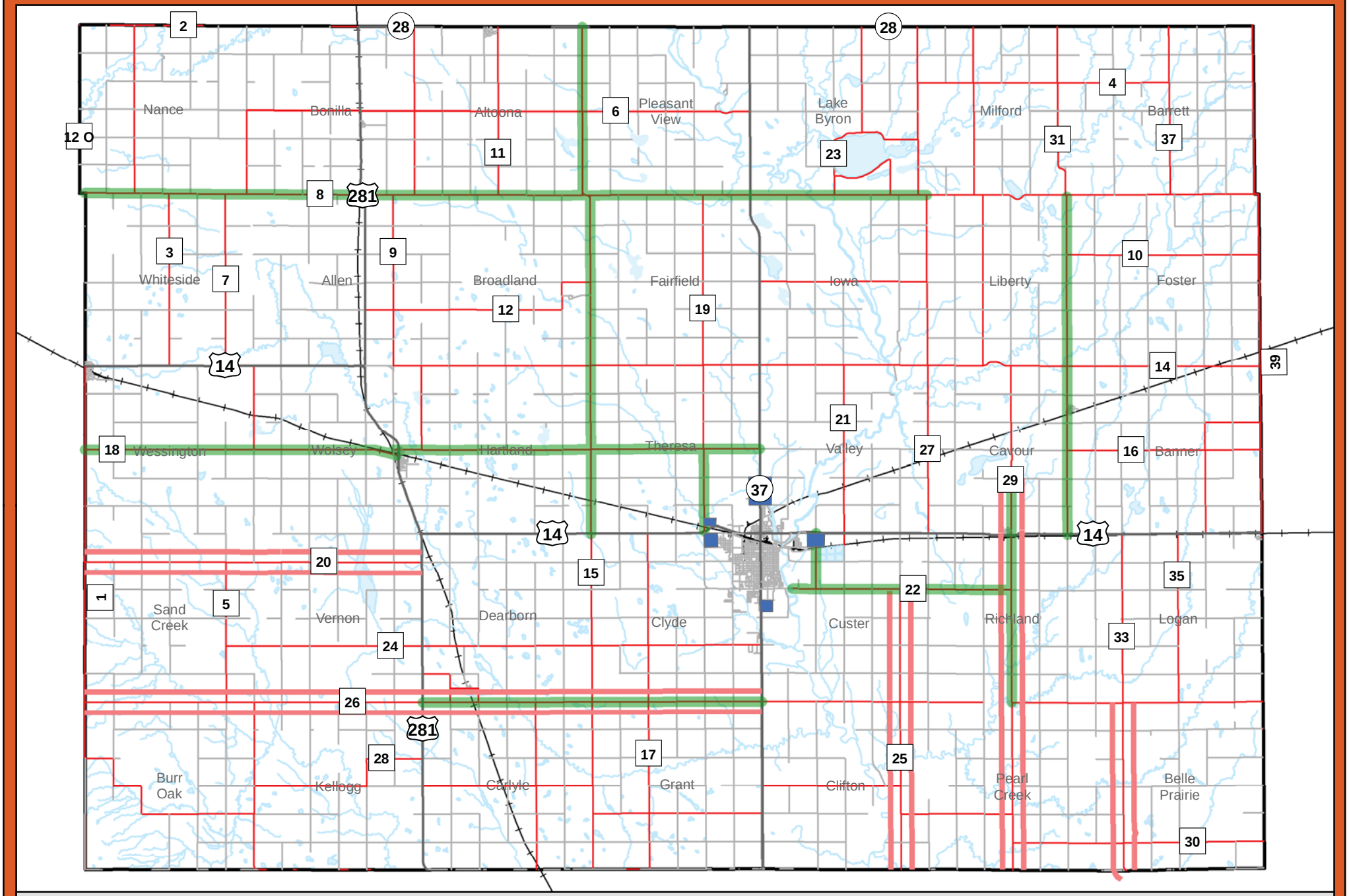
Increasing truck volumes and increasingly heavier truck loads were common concerns expressed during the Beadle County MTP public input process. Roadways identified as concerns included Park Avenue (County Road 19) and 205th Street (County Road 18) and the increased truck volumes along these corridors. Continued development on the southern and eastern edges of Huron will likely increase the amount of traffic using the Southeast SD 37 Local Truck Bypass. Future improvements should be explored to accommodate the growing volume of bypass traffic off of SD 37 and US 14, as safety concerns were noted at the intersection of US 14 and SD 37. The county is interested in pursuing a maintenance and operations agreement with the city (and/or SDDOT) for this portion of 21st Street and Custer Avenue, recognizing that these routes are essentially serving as the local SD 37 bypass.

Several public meeting participants stated that trucks may be taking alternate routes to avoid the scales north of Wolsey on US 281. Comments from the public indicated that truckers may be using bypass routes such as County Road 1, County Road 18 and County Road 20.

Based upon the input collected through the early public input process, the following issue maps have been prepared which summarize most of the significant transportation concerns and issues raised by the public and the SAT.



Beadle County Master Transportation Plan
Figure 2-6: Truck Related Issues



Beadle County Master Transportation Plan
Figure 2-7: Pavement-Related Issues

Economic Development & Expansion

A number of areas are currently being marketed and actively developed by the Greater Huron Economic Development Corporation. These existing and expanding economic development nodes impact interregional truck movements which indirectly impacts the county road system.

The recently completed Rural Development Site Analysis for Beadle County explored the suitability of a Concentrated Animal Feeding Operation (CAFO) or an Agriculturally-Related Industrial Development (AID) within Planning and Development District III. This conceptual analysis was completed at the township level. However, the results of the study indicated an opportunity to construct an AID or a CAFO within Beadle County near existing county (or state) paved roadways.

There is a general public perception of increased rail volumes through Beadle County on the Rapid City, Pierre & Eastern (RCP&E) rail line. Increased train volumes may present issues for current at-grade rural intersections within Beadle County, specifically on the RCP&E mainline. According to the South Dakota State Rail Plan, the Beadle County RCP&E mainline currently carries six to 10 trains per day. These rail segments carry bulk trains that move grain from/to/within South Dakota; alcohol (mainly corn ethanol), aggregates and nonmetallic mineral products from the state; and coal, fertilizers and nonmetallic minerals to the state. The Huron subdivision of the RCP&E line is likely to face agricultural shipment trends with a moderate two percent annual growth rate for train volumes. General merchandise trains are expected to overtake bulk trains on this segment. At-grade rail crossings in Beadle County are considered to be relatively safe under existing rail conditions as only two crashes involving railway vehicles have occurred in the past five years. TIGER funding was recently awarded to improve track siding along the RCP&E mainline just west of Huron. These improvements are expected to help ease occasional train blockages at Lincoln Avenue in Huron.

Revenue and Investment

Development of the Beadle County MTP will focus on a balanced investment approach between maintenance, pavement management and bridge rehabilitation and replacement. The current five-year plan for Beadle County includes only dollars earmarked for improvements to the roadway pavements. Public input indicated a preference for a more balanced approach in how future funding is split between pavement management and bridge replacement/rehabilitation efforts in the development of the County MTP. Development of more diversified projects would allow the use of available funding to benefit a larger set of Beadle County residents.

WHEEL TAX ORDINANCE

More detailed analysis on variations in implementing the ordinance (exceptions, etc.) is needed. Future revenue opportunities would likely need to focus on alternatives that ensure users who contribute the most to the deterioration of Beadle County roadways also carry a larger financial burden. As the County proceeds with future attempts at passing the wheel tax ordinance, the transportation plan should be used to prepare an imminent list of investment needs which would be supported by the new fees generated by a revised wheel tax ordinance.

Chapter 3: Financial Assessment

Introduction

A major component of the Beadle County MTP is the development of a fiscally responsible financial program of projects. While not required to be fiscally constrained pursuant to 23 CFR 450, the Beadle County MTP aims to be fiscally reasonable. This element of the MTP provides a review of projected revenues and expenses based on the status quo approach to transportation investments in Beadle County.

Revenue assumptions were developed based on the approved Calendar Year (CY) 2016 budget for the Beadle County Highway Department. Based on the CY 2016 Highway Department budget, the Study Advisory Team (SAT) approved a base year revenue assumption for the Beadle County transportation system that included local, state, and Federal revenue sources.

Once approved, base year revenue assumptions were projected for the 20 year planning horizon of the Beadle County MTP. Revenue estimates were developed in time bands: 1) short range (2017-2021); 2) mid-range (2022-2026); and 3) long range (2027-2037). In all cases, future revenue estimates were assumed to increase at 1.5 percent annually.

Base Revenue Summary & Analysis

Federal Funds

SDDOT has recently developed a statewide programming strategy which provides the non-urbanized Surface Transportation Program (STP) funds directly to each county in South Dakota as non-federal state funds. This transition of STP funds to state funds gives South Dakota counties more flexibility in the use of funding given by the state, and removes some of the complication previously involved in the project development phase for activities funded with federal funds.

Currently Beadle County receives about $250,000 annually in STP funds (converted to state funds) from SDDOT.

State Funds

In CY 2016 Beadle County received $1,900,000 in what is titled State Aid within the FIP element of the Beadle County MTP. *While listed as State Aid, some of these funds are also state fees and taxes collected at the County level which are retained by the County.* The balance of these funds are those typically distributed to Beadle County through the South Dakota *Local Government Highway and Bridge Fund*. In aggregate, State Aid funding for Beadle County generates about $1,900,000 in revenue for the Beadle County Highway Department.

The 2015 South Dakota Legislative session increased the fuel tax by six cents per gallon, increased the vehicle excise tax from 3 to 4 percent and increased license plates fees by 20 percent for noncommercial vehicles. All three of these are primary revenue inputs into the *State Highway Fund* and the *Local Government Highway and Bridge Fund*. These new revenue streams open up the potential to address existing and future road and bridge needs in Beadle County.

As discussed, based on recent efforts of the South Dakota legislature, this revenue stream may increase going forward. The amount to which State Aid distributed to political

subdivisions though the Local Highway and Bridge Fund in South Dakota will increase because of SB 1 is not yet known.

For conservative purposes, State Aid for Beadle County transportation through the Local Government Highway and Bridge Fund is projected to only increase at 1.5 percent percent annually.

State Bridge Improvement Grant (BIG) Program

The Bridge Improvement Grant (BIG) program was created by the 2015 legislative session in Senate Bill 1 (SB 1). SB 1 states that to be eligible for a BIG grant, a county must pass and implement a wheel tax ordinance. In addition, a county must have a County Highway and Bridge Improvement Plan. The plan should detail proposed county highway and bridge improvement projects in the county for the next five years.

SB 1 dedicated $7 million per year for the BIG program. This money comes as a transfer from the *Local Government Highway and Bridge Fund*. In addition, SDDOT will set aside $8 million per year from the *State Highway Fund*, for a total of $15 million available for the BIG grants. However, the full $15 million per year will not be available until FY 2019 once all existing committed bridge projects are completed.

For the purposes of developing a revenue projection for potential future revenue from the BIG program, it was assumed that Beadle County would receive 80 percent of three $300,000 bridges every five years. This equates to $720,000 for the years 2017-2021; $720,000 2022-2026; and $1,440,000 for the years 2027-2037.

In aggregate, over the life of the Beadle County MTP, total revenue from the BIG program is estimated at $2,880,000.

Local/County Funds

Wheel Tax

Currently Beadle County imposes a wheel tax of $2.00 per wheel, with a per vehicle maximum of $8.00. A recent ordinance to increase the wheel tax to state maximums authorized by SB 1 was defeated in November of 2015 by a referral vote.

For the purposes of developing the Beadle County MTP, annual revenue of $215,000 from the wheel tax was assumed. A 1.5 percent inflation factor is applied to future wheel tax revenue.

Going forward, Beadle County should evaluate opportunities to reconsider a change to its wheel tax ordinance or other local mechanisms to increase funding for transportation in Beadle County. This evaluation would be considered part of the strategy as addressing future transportation needs in Beadle County.

General Fund

Historically, the General Fund contribution to the annual budget of the Highway Department has been variable based on system needs and fluctuations in other funding sources.

For the purposes of developing the revenue forecasts for the Beadle County MTP, it was assumed that Beadle County would contribute $1,600,000 annually in general fund contributions to support the overall budget of the County Highway Department.

Going forward Beadle County will evaluate future general fund contributions to the Highway Department to assist in addressing a broader range of pavement and bridge needs in Beadle County.

System Revenue Summary

Based on baseline revenue assumptions for Beadle County, it is projected the County will generate $3,965,000 annually in revenue to support its County Highway Department.

However, about 55 percent of this total is assumed for the day-to-day operations of the department, leaving about $1,800,000 available for roadway maintenance and operations efforts, including bridge related investments.

Table 3-1 shows the existing assumptions for base year investment in the Beadle County transportation infrastructure. The amount applied to maintenance and construction appears to match historic and projected expenses for the years 2011-2020 based on data provided by Beadle County.

Table 3-1: CY 2016 (Base Year) Revenue for Maintenance & Construction

Source	Amount
Wheel Tax	$215,000
State Aid (incl. fee/taxes collected locally)	$1,900,000
General Fund	$1,600,000
STP Funds	$250,000
Total Highway Department Revenue	**$3,965,000**
Revenue Applied Maintenance & Construction (45%)	**$1,784,250**

Funding Summary

Table 3-2 shows projected revenue for transportation within Beadle County for each time band summarized by the revenue sources discussed as part of the FIP. As discussed total revenues are calculated by source of revenue to the Highway Department.

On the right hand side of Table 3-2 the 45 percent assumption is applied to each year's total revenue to determine amount of funds applied to maintenance and construction.

Table 3-2: Summary of Revenue Projections for Beadle County MTP Development - Base

Year	Wheel Tax	State Aid	General Fund	STP Funds	BIG	Total	Dedicated to MTP Analysis	Revenue by Time Band
2016	$215,000	$1,900,000	$1,600,000	$250,000		$3,965,000	$1,784,250	
2017	$218,225	$1,928,500	$1,624,000	$253,750	$720,000	$4,024,475	$1,811,014	
2018	$221,498	$1,957,428	$1,648,360	$257,556		$4,084,842	$1,838,179	
2019	$224,821	$1,986,789	$1,673,085	$261,420		$4,146,115	$1,865,752	
2020	$228,193	$2,016,591	$1,698,182	$265,341		$4,208,306	$1,893,738	
2021	$231,616	$2,046,840	$1,723,654	$269,321		$4,271,431	$1,922,144	**$10,050,826**
2022	$235,090	$2,077,542	$1,749,509	$273,361	$720,000	$4,335,503	$1,950,976	
2023	$238,617	$2,108,705	$1,775,752	$277,461		$4,400,535	$1,980,241	
2024	$242,196	$2,140,336	$1,802,388	$281,623		$4,466,543	$2,009,944	
2025	$245,829	$2,172,441	$1,829,424	$285,847		$4,533,541	$2,040,094	
2026	$249,516	$2,205,028	$1,856,865	$290,135		$4,601,544	$2,070,695	**$10,771,950**
2027	$253,259	$2,238,103	$1,884,718	$294,487	$1,440,000	$4,670,568	$2,101,755	
2028	$257,058	$2,271,675	$1,912,989	$298,905		$4,740,626	$2,133,282	
2029	$260,914	$2,305,750	$1,941,684	$303,388		$4,811,735	$2,165,281	
2030	$264,827	$2,340,336	$1,970,809	$307,939		$4,883,911	$2,197,760	
2031	$268,800	$2,375,441	$2,000,371	$312,558		$4,957,170	$2,230,727	
2032	$272,832	$2,411,073	$2,030,377	$317,246		$5,031,528	$2,264,187	
2033	$276,924	$2,447,239	$2,060,833	$322,005		$5,107,001	$2,298,150	
2034	$281,078	$2,483,947	$2,091,745	$326,835		$5,183,606	$2,332,623	
2035	$285,294	$2,521,206	$2,123,121	$331,738		$5,261,360	$2,367,612	
2036	$289,574	$2,559,025	$2,154,968	$336,714		$5,340,280	$2,403,126	
2037	$293,917	$2,597,410	$2,187,293	$341,764		$5,420,384	$2,439,173	**$25,893,676**
Total	**$5,340,080**	**$47,191,402**	**$39,740,128**	**$6,209,395**	**$2,880,000**	**$98,481,004**	**$44,316,452**	**$46,716,452**

Table 3-3 shows the projected revenue assumptions for the short, mid and long range time bands for the Beadle County MTP.

Table 3-3: Revenue Projections by Time Band

Time Band	Revenue
2017-2021	$10,050,826
2022-2026	$10,771,950
2027-2037	$25,893,676
Total	**$46,716,452**

Baseline Expense Analysis

To determine reasonableness of the existing revenue assumptions and projections for the Beadle County MTP, a review and analysis was completed of the current 2016-2020 Beadle County CIP. Table 3-4 shows the baseline investment in Beadle County transportation infrastructure.

Table 3-4: Base Year Investment by Beadle County Transportation Category

Category	Average Investment	Percent of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$970,000	56.6%	100.0%
Gravel	$425,000	24.8%	
Miscellaneous Maintenance	$320,000	18.7%	
Overlay/AST	$0	0.0%	
Bridge	$0	0.0%	0.0%
Total	**$1,715,000**	100.0%	100.0%

Based on a review of the CIP for Beadle County, the current five year CIP was extrapolated out to the full 2037 planning horizon to determine future estimates of financial need. Table 3-5 summarizes a comparison between projected revenue to expenses for roadway maintenance and construction in Beadle County. As noted, this is purely a status quo estimate of revenue and expenses.

Table 3-5: Revenue vs. Expenses Analysis – Base Scenario

Time Band	Revenue	Expenses	Difference
2017-2021	$10,050,826	$9,791,843	$258,983
2022-2026	$10,771,950	$10,714,579	$57,371
2027-2037	$25,893,676	$31,532,286	-$5,638,610
Total	**$46,716,452**	**$52,038,708**	**-$5,322,256**

In the first 10 years of the MTP planning horizon (2017-2026), revenue outpaces expense. However, this assumes only a status quo level of investment, and minimal new revenue for bridges and no new revenue for more significant pavement management efforts are included within the current expense projections. Towards the final 10 years of the planning horizon for the Beadle County MTP, a more significant gap is realized between revenue and expenses. Again, this is without new commitments to pavement improvement projects, or bridges beyond those assumed as part of the BIG program.

Chapter 4: Bridge Evaluation & Investment Review

Bridge Improvement Program

A major component of the Beadle County MTP is the development of the Bridge Investment Strategy. Based on a review and assessment of existing bridges in Beadle County, the Bridge Investment Strategy results in a prioritization list of investments to address bridges needs throughout Beadle County over the life of the 20 year MTP.

SUMMARY OF EXISTING BRIDGE DEFICIENCIES IN BEADLE COUNTY

A more generalized summary of the entire bridge inventory of Beadle County was presented as part of the Existing Conditions Analysis. This element of the MTP provides a more refined evaluation of the current bridge inventory to develop an investment and technical evaluation process to address the most critical needs in Beadle County.

Based on a review of the bridges in Beadle County, there are 41 bridges listed as structurally deficient and another 4 which are functionally obsolete. This total excludes 5 bridges which the County has recently closed, and another 3 which the county has notified the township of an intent to close, which were previously listed in Table 1-7 as structurally deficient.

Therefore, the most immediate needs facing Beadle County is on 33 percent of its bridge inventory, or a total of 45 bridges. Table 4-1 provides a summary of bridge deficiency in Beadle County.

Table 4-1: Summary of Deficiency in Beadle County

Condition	Number of Bridges	Percentage
No Deficiency	85	62%
Structurally Deficient	41	30%
Functionally Obsolete	4	3%
Closed or Intent to Close by County (Deficient)	*8*	*6%*
Total	138	100%

Relationship of Sufficiency & Deficiency to Roadway System

In addition to structural factors, a factor in prioritizing funding for bridges in Beadle County will be the overall function and utility of the bridge structure. As noted earlier, only bridges on roadways functionally classified as Major Collector or higher (e.g. County "On System") are eligible for Federal funding under the FAST Act. Even under the new SDDOT BIG funding program, obtaining funding for bridges on lower volume township roads will be more difficult.

As is shown in Table 4-2, the largest percentage of bridge needs in Beadle County (as expressed by bridges with a sufficiency rating less than 60) are located on township roadways. Conversely, only about 10 percent of County "On-" and "Off-" system bridges are currently rated at or below 60.

Table 4-2: Percentage of Total System Need Based on Sufficiency Rating

Bridge Classification	Sufficiency Rating			
	<60	61 - 79	>80	Total
County "On System"	2.9%	9.4%	15.9%	**28.3%**
County "Off System"	7.2%	8.0%	5.8%	**21.0%**
Township	28.3%	6.5%	15.9%	**50.7%**

Accordingly, the largest percentage of structurally deficient bridges is on the township system. Not surprisingly, fewer than 10 percent of all structural deficient bridges in Beadle County are on the County System. Table 4-3 shows the distribution of bridge deficiency by bridge classification.

Table 4-3: Percentage of Total System Based on Deficiency Rating

Bridge Classification	Deficiency Rating				
	Closed	Functionally	Structurally	Not	Total
County "On System"	0.0%	0.0%	2.2%	26.1%	**28.3%**
County "Off System"	0.0%	0.7%	6.5%	13.8%	**21.0%**
Township	3.6%	2.2%	23.2%	21.7%	**50.7%**

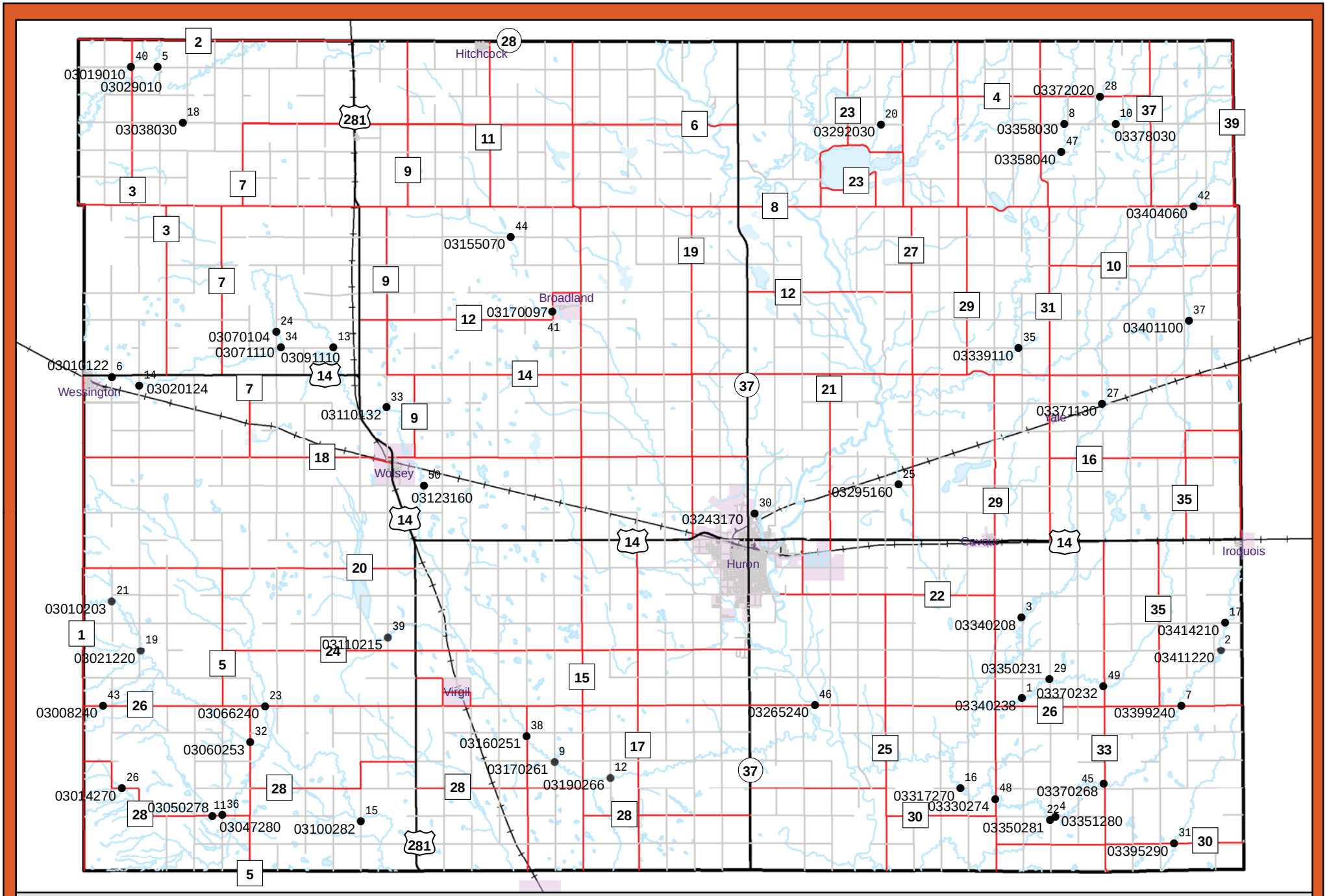
DEFINING A BRIDGE INVESTMENT PROGRAM

In order to accomplish a system investment targets, bridge needs were classified as high, medium or low. The determination for classifying the needs are as follows

- High Need – Bridges with a sufficiency rating < 60 and deficiency listed as either structural or functional. Major rehabilitation or replacement of the structure; if on the township system, these structures should be candidates for closure.
- Medium Need – Bridges with a sufficiency rating between 60 and 79. Rehabilitation project; if needed consider full replacement as a box culvert (if feasible).
- Low Need – Bridges with a deficiency rating over 80 and listed as not having a deficiency. No identifiable investment needed in the short or medium term; address needs through long term preventative maintenance program.

Table 4-4: Bridge Investment Needs

Bridge Classification	System Need			
	High	Medium	Low	Total
County "On System"	2.6%	4.8%	21.4%	**28.8%**
County "Off System"	7.4%	4.1%	10.0%	**21.4%**
Township	27.3%	3.3%	19.2%	**49.8%**
Total	**37.3%**	**12.2%**	**50.6%**	**100%**


Hitchcock
Broadland
Wessington
Wolsey
Virgil
Huron
Cavour
Iroquois
Tale
03019010
03029010
03038030
03155070
03170097
03070104
03071110
03091110
03010122
03020124
03110132
03123160
03243170
03295160
03371130
03372020
03292030
03358030
03378030
03358040
03404060
03401100
03339110
03010203
03021220
03110215
03008240
03066240
03060253
03160251
03170261
03190266
03265240
03340208
03414210
03411220
03350231
03370232
03340238
03399240
03014270
03050278
03047280
03100282
03317270
03330274
03370268
03350281
03351280
03395290
Beadle County Master Transportation Plan
Figure 4-1: Bridges High, Medium, and Low Investment Needs
N
W
E
S
0
2.5
5
Miles
County System Roads
Other Roads
City Limits
Bridge Location
xx Bridge Rank
03xxxxxx Bridge ID Number

Technical Evaluation of High & Medium Bridge Needs

A more detailed technical planning level analysis was developed to assist in prioritizing bridge needs in Beadle County. Given imminent financial constraints for addressing bridge replacement needs in Beadle County and the desire to develop a firm list of high priority needs, only the worst 50 bridges (based on sufficiency rating) were carried forward for an evaluation as part of the Beadle County MTP. Figure 4-1 shows only those high priority bridges integrated in the detailed technical evaluation.

Of this initial 50, 39 were either structurally or functionally obsolete. The remaining 11 were not deficient, however had a sufficiency rating of 64.5 or less. In total all 39 structurally and functionally deficient bridges in Beadle County were included. This list also excluded the 8 bridges currently closed or pending closure, 3 bridges programmed for replacement in the current SDDOT STIP and 5 bridges which are already planned to be replaced with pipe or culvert (however not yet programmed).

Table 4-5 summarizes the inventory of bridges considered as part of the BIP analysis for the Beadle County MTP.

Table 4-5: Bridges Integrated into BIP Evaluation & Prioritization

Need Status	Bridges	Percentage
High Need	39	28%
Medium Need	11	8%
Subtotal	*50*	*36%*
Excluded (Medium + Low Need)	88	64%
Total	**138**	**100%**

The remaining 88 bridges in Beadle County were excluded from this ranking and evaluation, primarily because they have a sufficiency rating above 80, and were classified as a Low Need for investment.

BRIDGE EVALUATION PROCESS

BIG Scoring

Early in the development of the Beadle County MTP, all existing bridges in Beadle County were scored based upon the approved SDDOT BIG Program scoring criteria. The BIG Score is what will be used by SDDOT in evaluating and selecting projects submitted to SDDOT in future funding years. The BIG Score can be dramatically increased for a potential bridge by either increasing the amount of local match (3 points for each additional 5 percent) or by submitting projects which are shovel ready (10 points if the project can be bid in 6 months).

BIG Scoring is an important factor in prioritizing bridges. However an additional layer of technical and qualitative scoring was applied to the 50 most deficient bridges in Beadle County to provide a preliminary list of system investment priorities.

Technical Evaluation

A two tiered evaluation process was used to prioritize the 50 most deficient bridges in Beadle County. The first scoring process was based on technical criteria including Sufficiency Rating, Posting and Detour. The evaluation process rated bridges on a sliding scale of sufficiency <20, <30, <40 or > 40. Secondarily, bridges were evaluated on a sliding scale based on a posting of 0, =1, =2 or >2. Thirdly, bridges were evaluated based on a detour of >4 and then > 8. Based on these factors bridges were banded into quartiles of structural condition based on these criteria.

Table 4-6 demonstrates the technical weighting system used for preliminary evaluation of the 50 most deficient bridges in Beadle County.

Table 4-6: Technical Evaluation Matrix

1st Quartile	Sufficiency < 20 Posting = 0 Detour > 8	Sufficiency < 20 Posting = 0 Detour > 4	Sufficiency < 20 Posting = 1 Detour > 8	Sufficiency < 20 Posting = 1 Detour > 4	Sufficiency < 20 Posting = 2 Detour > 8	Sufficiency < 20 Posting = 2 Detour > 4	Sufficiency < 20 Posting > 2 Detour > 8	Sufficiency < 20 Posting > 2 Detour > 4
Bridges Meeting Criteria		1						
2nd Quartile	Sufficiency < 30 Posting = 0 Detour > 8	Sufficiency < 30 Posting = 0 Detour > 4	Sufficiency < 30 Posting = 1 Detour > 8	Sufficiency < 30 Posting = 1 Detour > 4	Sufficiency < 30 Posting = 2 Detour > 8	Sufficiency < 30 Posting = 2 Detour > 4	Sufficiency < 30 Posting > 2 Detour > 8	Sufficiency < 30 Posting > 2 Detour > 4
Bridges Meeting Criteria			2		1		1	
3rd Quartile	Sufficiency < 40 Posting = 0 Detour > 8	Sufficiency < 40 Posting = 0 Detour > 4	Sufficiency < 40 Posting = 1 Detour > 8	Sufficiency < 40 Posting = 1 Detour > 4	Sufficiency < 40 Posting = 2 Detour > 8	Sufficiency < 40 Posting = 2 Detour > 4	Sufficiency < 40 Posting > 2 Detour > 8	Sufficiency < 40 Posting > 2 Detour > 4
Bridges Meeting Criteria	1	6	1	3		1	1	1
4th Quartile	Sufficiency > 40 Posting = 0 Detour > 8	Sufficiency > 40 Posting = 0 Detour > 4	Sufficiency > 40 Posting = 1 Detour > 8	Sufficiency > 40 Posting = 1 Detour > 4	Sufficiency > 40 Posting = 2 Detour > 8	Sufficiency > 40 Posting = 2 Detour > 4	Sufficiency > 40 Posting > 2 Detour > 8	Sufficiency > 40 Posting > 2 Detour > 4
Bridges Meeting Criteria	1	5	4	1	2	1	3	14

Technical-Qualitative Evaluation

The second level of analysis was more of a composite technical-qualitative scoring matrix to outline a prioritized list of bridges for replacement within Beadle County. The technical-qualitative evaluation started from the technical evaluation discussed above, and applied a more refined metric as follows:

- SDDOT BIG Score – Based on the preliminary rating of each of the bridges in Beadle County, the relative score of each bridge was evaluated. As shown on Table 4-7, most of the highest scoring bridges pursuant to the BIG criteria also ranked high in terms of the overall technical evaluation.

- Condition Average – Superstructure, substructure and deck rating were combined into an average score to provide a weighted score of the most critical structural elements of each bridge.
- Fracture Critical – Structures identified with a fracture critical in the NBI database were noted. Given the typical bridge design in Beadle County, it was determined that fracture critical structures were more likely to experience potential failure. In some cases, this would serve to increase their potential ranking.
- Rehabilitation Only – Structures that didn't have a superstructure, substructure or deck rating less than 4 are not eligible for replacement through the BIG Program. Therefore structures with score higher than 4 in these three areas were flagged. In some cases this would serve to reduce their potential ranking.
- County System (Collectors) – A less significant factor than those previously discussed was if the bridge was located on either a county minor or major collector. Exactly 20 percent (10) of the 50 most deficient bridges in Beadle County are on the County system.
- County Priority – Ten initial bridge structures had been evaluated by the Beadle County prior to the development of the MTP. Based on this evaluation, the County forwarded these structures into the MTP development process as preliminary priorities. This initial priority listing was a consideration of the evaluation process.

Table 4-7 provides an overall summary of the technical-qualitative ranking of the 50 most deficient bridges in Beadle County. Of note, bridges listed within Table 4-7 are color coded to highlight various prioritization attributes.

- Green highlighted bridges indicate the initial 10 County replacement priorities.
- Blue highlighted bridges indicate County system bridges.
- Orange highlighted bridges indicate initial County priority and on the County System.
- Red highlighted bridges indicate no maintenance roadways (potential for closure; not eligible for BIG funds).
- Yellow highlighted cells note the top 10 BIG Scores for evaluated bridges.

Table 4-7: Initial Technical- Qualitative Ranking of Beadle County Bridges

Technical-Qualitative Rank	Bridge Number	County Priority	Rural Collector	Not Replacement Eligible (BIG Program)	Fracture Critical	B.I.G. Score	Condition Avg.	Estimated Replacement Cost
1	03340238	x				42.7	4.7	$305,000
2	03411220	x				39.0	5.0	$284,000
3	03340208	x				34.1	5.3	$300,000
4	03351280	x				30.1	4.0	$284,000
5	03029010				x	45.1	5.3	$402,600
6	03010122				x	44.9	4.3	$347,000
7	03399240	x	x			37.7	5.3	$284,000
8	03358030				x	47.0	4.7	$347,000
9	03170261			x		41.1	5.3	$305,000
10	03378030					39.0	5.0	$284,000
11	03047280					38.9	4.7	$300,000
12	03190266					39.0	5.0	$305,000
13	03091110				x	41.0	4.3	$315,000
14	03020124	x				32.9	5.0	$300,000
15	03100282	x			x	34.0	5.3	$343,000
16	03317270				x	38.9	5.0	$347,000
17	03414210					41.2	4.7	$0
18	03038030					35.1	5.3	$284,000
19	03021220					12.1	4.7	$310,000
20	03292030					38.9	5.3	$284,000
21	03010203			x		36.8	5.7	$305,000
22	03350281			x		37.9	5.7	$284,000
23	03066240		x	x		34.8	6.0	$284,000
24	03070104					35.1	5.0	$402,600
25	03295160					33.7	5.0	$284,000
26	03014270	x		x		37.5	6.0	$284,000
27	03371130			x		27.9	5.3	$284,000
28	03372020	x				26.5	4.7	$310,000
29	03350231				x	20.7	5.0	$347,000
30	03243170					12.8	Culvert	$284,000
31	03395290		x			9.5	4.7	$435,600
32	03060253		x			8.6	5.0	$561,000
33	03110132			x		24.5	6.0	$567,600
34	03071110					10.8	4.0	$507,000
35	03339110					9.8	4.7	$284,000
36	03050278					15.3	4.7	$284,000
37	03401100					10.9	4.7	$284,000
38	03160251		x			8.3	5.0	$732,600
39	03110215					15.9	5.0	$305,000
40	03019010					10.9	4.7	$373,000
41	03170097			x		17.1	5.0	$347,000
42	03404060	x	x	x		17.6	6.3	$315,000
43	03008240		x	x		34.8	5.7	$305,000
44	03155070			x		32.9	5.7	$284,000
45	03359270			x		31.7	5.7	$305,000
46	03265240		x	x		27.8	6.3	$2,105,400
47	03358040			x		25.4	5.7	$315,000
48	03330274		x	x		14.4	5.3	$481,800
49	03370232		x	x		12.5	5.3	$330,000
50	03123160			x		8.6	5.0	$501,600

Chapter 5: Pavement Evaluation & Investment Strategy

Base Condition Analysis

A major component of the Beadle County MTP was the development of the Pavement Management Plan. Beadle County is responsible for nearly 570 miles of roadway. Of this total inventory, about 220 miles is paved surface requiring some level of ongoing maintenance and preservation efforts. Paved roadway surfaces in Beadle County represent about 40 percent of the total centerline miles in the county.

The PMP was developed using field collected windshield data of existing pavement conditions as of the Fall of 2015. The data collection was done pursuant to the pavement surface evaluation and rating (PASER) system. The PASER system provides guidance for programming major pavement and overlay activities.

The use of the PASER system allows for both the classification of pavement conditions, at a planning level, and also will allow for the introduction of interventions to improve and maintain pavement quality in Beadle County. Other factors were also considered in developing the Pavement Management Plan such as the traffic volume, intervention type, regionally significant corridors, the area served, timing and others.

The MTP was also aided by a review and analysis of the current approved CIP of Beadle County for years 2016-2020. The Beadle County CIP directs investment to almost all major county paved roadways over the life of the next five years. All pavements are reconditioned through a chip and crack seal treatment over the years 2016-2020. Historic pavement management efforts of Beadle County were considered, however there was not a substantial amount of data available regarding these efforts. Information collected from Beadle County indicated that past practice has been to do a chip seal project on a roadway once every five years.

The basis for the development of the PMP for Beadle County is built upon the assumption that chip/crack seal work has been the primary means of managing the paved surfaces in the County. This is based upon the historic and projected CIP analysis from 2011-2020. This excludes the multiyear project currently underway on County Road 15 (Broadland Road).

Based upon both public and technical input, as well as through the development of a fiscally reasonable FIP, the PMP developed for Beadle County assumed the integration of major significant maintenance and maintenance or structural overlays for corridors of significance. This would call for the addition of new investments into the county roadway system, or at a minimum the reallocation of existing resources from chip/crack sealing to more costly overlay work. Beadle County's current pavement management program assumes that nearly 100 percent of paved roadways are treated with a maintenance project once every five years. Given the need to invest dollars in more substantial major pavement management efforts, this approach is recommended to change to a less frequent seal program.

Pavement Investment Analysis

The 2016-2020 CIP provided a baseline set of PMP treatment types and costs for development of future pavement investment strategies. Traditionally, Beadle County has only implemented pavement maintenance efforts through the ongoing deployment of crack and/or chip seal projects on the majority of county paved roadways.

The existing 2016-2020 Beadle County CIP was evaluated to determine a base case investment assumption for Beadle County's current pavement management program. Based on an evaluation of the current Beadle County CIP, it is possible to develop refined future year targets for PMP efforts. Table 5-1 shows the base condition average of assumed Beadle County investments in pavement and roadway maintenance. All future investment scenarios used to support the PMP will build upon the base condition funding analysis shown in Table 5-1.

Table 5-1: Five Year Average Pavement & Roadway Maintenance

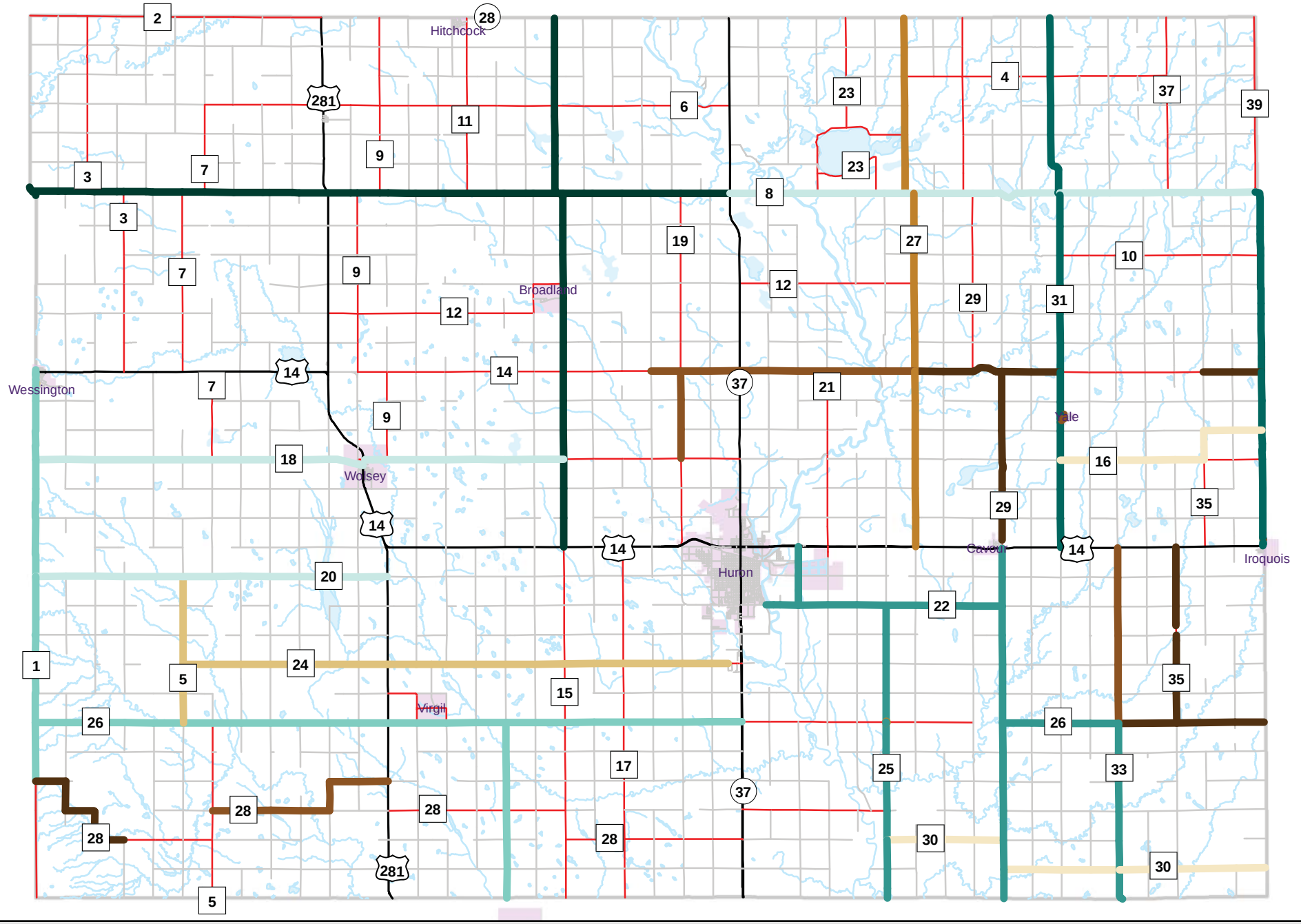
	Total	Avg. Cost	Avg. mi.	$/mi.*
Chip Seal	$4,303,203	$860,641	46	$18,710
Crack Seal	$389,205	$77,841	39	$2,006
Stripe	$138,482	$27,696	46	$602
Gravel + Shoulders	$2,125,039	$425,008	36	$11,938
Miscellaneous Expenses	$1,601,200	$320,240	-	-
Total	**$8,557,129**	**$1,711,426**	-	-

In the base condition, Beadle County is investing about $1,700,000 annually in its county roadway system. This amounts to an average of 43.6 miles of paved roadway maintenance and 36 miles of gravel maintenance per year. Table 5-2 shows the current system cycle for Beadle County roadway maintenance. The system cycle refers to the amount of time it takes the county to address each mile of roadway under current investment levels. Under current practice Beadle County is treating each paved roadway on a five year cycle and each gravel roadway on a 10 year cycle.

Table 5-2: System Cycle for Roadway Maintenance

Surface Type	Mileage	Miles/year	System Cycle (years)
Paved	223	43	5
Gravel	349	36	10

Adjustments to this system will be recommended in order to develop a more comprehensive and strategic pavement management plan for Beadle County. Figure 5-1 demonstrates the existing approved five year pavement Capital Improvement Plan (CIP) for Beadle County. Figure 5-1 shows the extent of currently programmed paved and gravel roadway improvements. As part of developing the MTP, it is assumed this program starting in 2017 is flexible for modifications based on the preferred pavement management strategy.



Beadle County Master Transportation Plan
Figure 5-1: Roadway Management Cycle

INVESTMENT DISTRIBUTION

Table 5-3 shows the investment splits by treatment type in the Beadle County roadway system. For purposes of developing investment strategies, costs related to chip and crack sealing have been consolidated. Striping costs are also included in the chip/crack seal category based on past and projected practices of the Beadle County Highway Department.

Just under 60 percent of the total roadway investments by Beadle County are dedicated to sealing efforts. A quarter (25 percent) of the investment in roadways goes specifically to gravel road maintenance. The balance of the roadway maintenance budget (18 percent) is set aside into a contingency or miscellaneous category used to address unexpected system wide maintenance needs, as well patching and pothole work as needs arise.

Table 5-3: Investment Splits by Maintenance Type

Treatment	Average Investment	Percent of Total
Chip/Crack Seal	$966,178	56.5%
Gravel Roads	$425,008	24.8%
Miscellaneous (contingency)	$320,240	18.7%
Total	**$1,711,426**	100.0%

As noted earlier, 60 percent of the Beadle County roadway system is gravel. The balance of the system, just under 40 percent is paved. Table 5-3 demonstrates the total mileage of the roadway system by surface type.

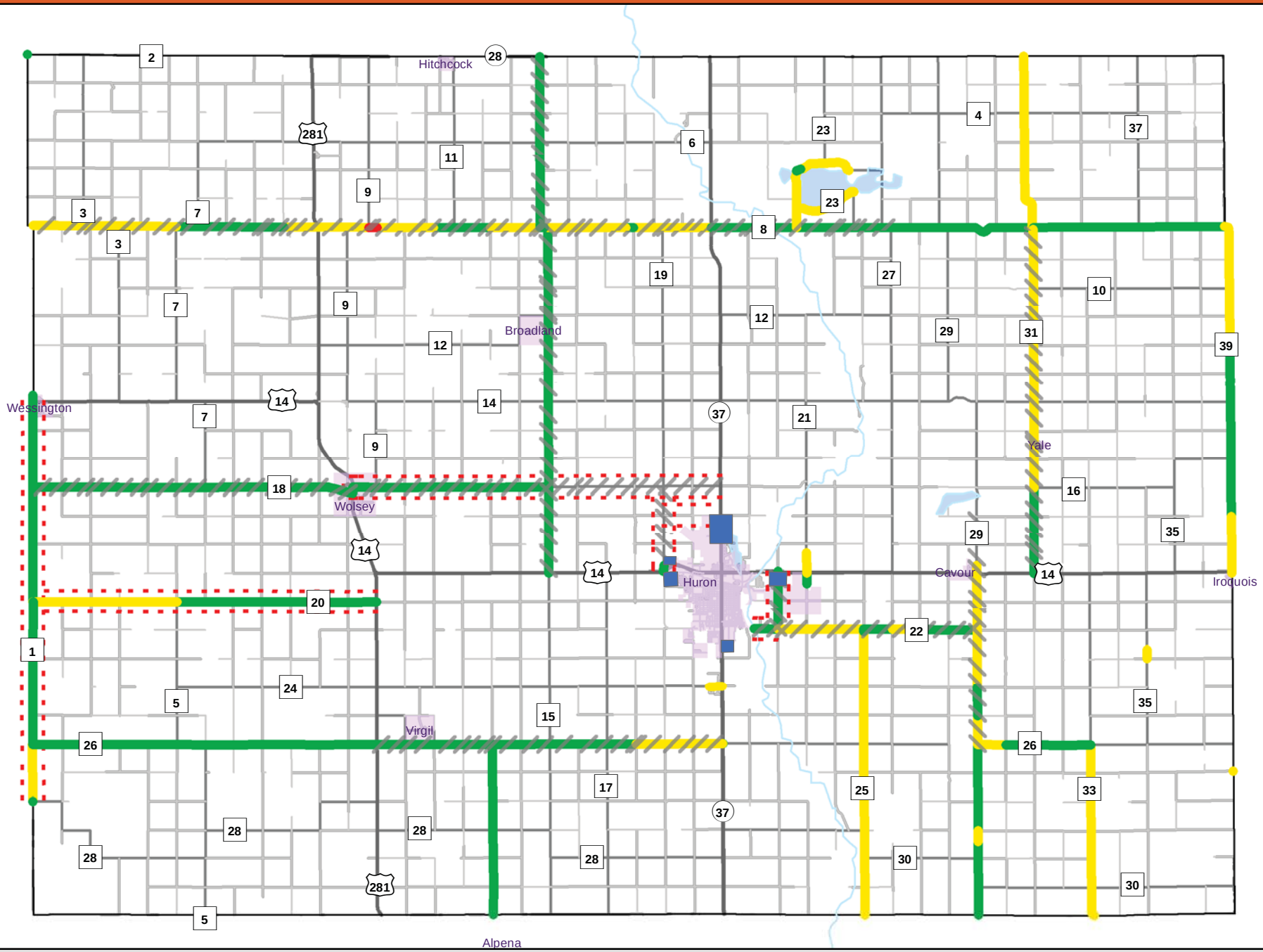
Based on current standards, Table 5-4 demonstrates the cost per mile investment in paved and gravel roadways in Beadle County. The percentage split reflects the share of investment made less the amount currently dedicated non-specific (contingency) expenses. Therefore, of specifically programmed investments, the split between paved and gravel roadway investments in Beadle County is typically an 80-20 split.

Table 5-4: Investment by Roadway Type

Surface Type	Mileage	Investment/Mile	percent of Investment
Paved	223	$4,332.64	70.9%
Gravel	349	$1,217.79	19.9%
Miscellaneous (contingency)	572	$559.86	9.2%

CURRENT INVESTMENT NEED

Based on current PASER data, Figure 5-2 demonstrates relative pavement system investment need. Additionally, based on input received and collected as part of the early public involvement process, Figure 5-2 identifies areas of economic development and truck-related concerns.

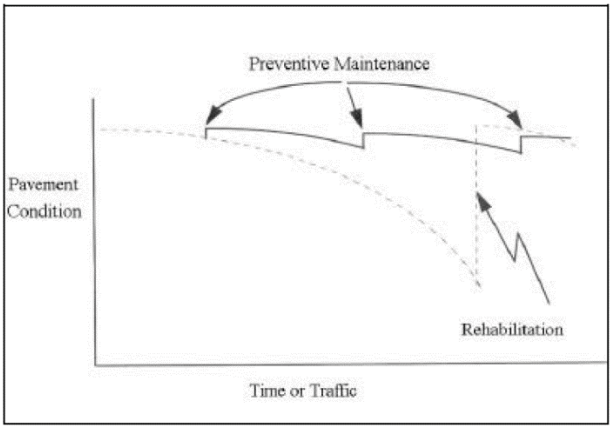


Beadle County Master Transportation Plan
Figure 5-2: Current PASER/Investment Need

Developing a Pavement Management Strategy

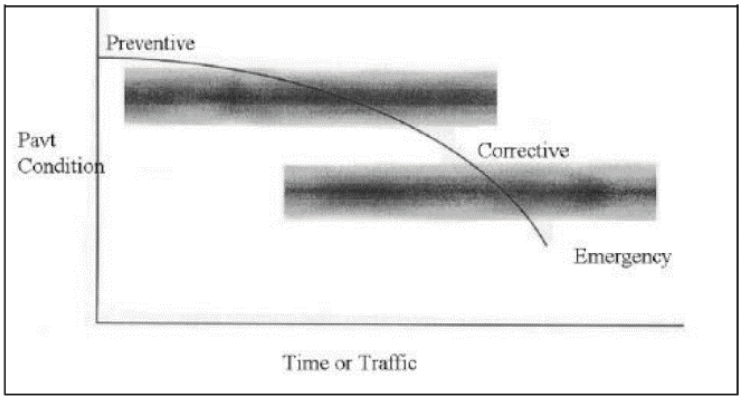
Research suggests it is more cost efficient to keep a good road in operating condition than to replace an aging road. By putting money upfront into seal coating, crack sealing, etc., the roadway's life can be extended far more efficiently than waiting until structural improvements are required (overlays, milling, reconstruction, etc.). Preventative maintenance, as indicated in Figure 5-3 is much cheaper than corrective maintenance.

Figure 5-3: Preventive Maintenance



Corrective and emergency repairs occur when the roads are more deteriorated or have lower PASER ratings and require costly structural improvements or reconstruction. As shown in Figure 5-4, the longer a road is allowed to deteriorate the more steep the investment is in fixing and upgrading the road.

Figure 5-4: Investment vs Deterioration



DESCRIPTION OF POTENTIAL INTERVENTIONS

The basis for the development of the PMP for Beadle County is tied directly to the PASER data developed early in the planning process. Based on the PASER data, it is possible to recommend a system of necessary improvement strategies, or pavement interventions. What follows is a summary of the potential interventions roadways based on current PASER rating.

PASER Rating of 3 – 4:

Major structural overlay (>2") or Asphalt Surface Treatments (AST) – Due to significant signs of aging, a structural overlay is required. Milling and removing the deteriorated area will extend the life of the overlay. Patching and repair will need to be done prior to an overlay project.

PASER Rating of 5:

Nonstructural Overlay (<2') or Asphalt Surface Treatments (AST) – Pavements are aging, however are in sound structural condition. Can benefit from a non-structural overlay (<2") or an AST.

PASER Rating of 6 - 7

Seal Coat and Crack Sealing - Light signs of aging. Roadway shows very few signs of aging and can be maintained with routine crack filling. The roadway life can be extended with a sealcoat and routine crack sealing.

PASER Rating of 8 - 9:

No immediate maintenance – Roadways are currently in very good shape. Program as part of routine crack filling and basic maintenance should be performed to continue to extend the life of the roadway.

Cost Considerations for Intervention Types

The Beadle County MTP builds upon the historic and existing pavement management program used by the Highway Department. However, to more cost consciously manage pavements in Beadle County, a revised program is recommended. In order to adequately balance future investment need within the PMP program and among bridge system needs, an assessment of intervention types is needed.

Additionally, consideration is needed if the current paved roadway system in Beadle County should in fact be maintained, or if a modified treatment type is needed. Approximate costs per mile for major maintenance tasks associated with Beadle County are shown in Table 5-5. Cost per mile assumptions for these treatment types are shown in Table 5-5, and would generally reflect planning level assumptions on cost. Included are also the ADT thresholds typical for various pavement treatment types.

Table 5-5: Per Mile Pavement Treatment Costs

Pavement Treatment	Cost/Mile	ADT
Chip/Crack	$22,000	n/a
Return to Gravel (Active)	$60,000	ADT < 150
Blotter	$120,000	ADT >150
Maintenance Overlay	$180,000	ADT>650
Structural Overlay	$250,000	ADT >650
Micro surfacing	$60,000	n/a

Surface selection criteria shown in Table 5-5 is based on a study completed by the SDDOT in 2004. Future intervention options need to consider that many Beadle County highways carry less than 150 vehicles per day. Even fewer carry more than 650.

Patching and sealing projects should continue as needed to maintain roads that are in fair to good conditions (PASER rating 6 or 7). The current cycle of sealing the entire county once every five years needs to be reconsidered to free up more revenue for other pavement needs, or needs facing Beadle County bridges.

A more aggressive preventative maintenance project will do the most to address the problems of deteriorating roads and has the ability to turn a PASER rated 5 road into a 9, for example. Overlay and AST (blotter) projects address all surface related issues with the road and will do the most to improve the overall county highway system. However, these investment needs should be considered on higher priority corridors.

As part of developing the Beadle County PMP a planning level assessment was developed regarding different pavement treatments. As noted, Beadle County has typically treated the existing network of paved roads on a five-year cycle with chip/crack sealing. Gravel roads are typically given more significant maintenance on a 10-year cycle.

Life cycle cost for various pavement management treatments were evaluated based on current cost per mile assumptions. Those cost are shown in Table 5-6. The 20 year column is highlighted to reflect the current planning horizon of the Beadle County MTP.

Table 5-6: Life Cycle Costs for Various Surface Treatment Costs ($/mi.)

Treatment Type	Year 1-5	Year 7	Year 10	Year 15	Year 20	Year 30	Year 40
Chip/Crack (5 Yr. Cycle)	$22,000	$44,000	$66,000	$88,000	$110,000	$154,000	$198,000
Chip/Crack (7 Yr. Cycle)	$22,000	$44,000	$44,000	$66,000	$66,000	$110,000	$132,000
Gravel Conversion (Active)	$60,000	$60,000	$72,000	$72,000	$84,000	$96,000	$108,000
Gravel Conversion (Passive)	$0	$11,000	$23,000	$23,000	$35,000	$47,000	$59,000
Blotter (7 Yr. Chip/Crack + Micro @ Yr. 20)	$120,000	$142,000	$142,000	$164,000	$224,000	$246,000	$268,000
Maintenance Overlay (7 Yr. Chip/Crack + Micro Surface @ Yr. 20)	$180,000	$202,000	$202,000	$224,000	$284,000	$306,000	$328,000

Note: Costs in current dollars

Setting Pavement Management System Targets & Standards

Based upon public and technical input as well as through the development of a fiscally reasonable FIP, the PMP developed for Beadle County assumes the gradual integration of maintenance or structural overlays or Blotter treatment for certain corridors. However, pavement overlays are far more costly than the chip/crack seal approach historically used by Beadle County.

To account for the increased resources required for overlays or blotter treatment, resources currently allocated to chip/crack seal work will need to be reduced. Beadle County's current PMP assumes that nearly 100 percent of paved roadways are treated with a maintenance project once every five years. Given the need to invest dollars in more substantial major pavement management efforts, this approach is recommended to change to a less frequent seal program from 5 years to 7 years.

In order to account for a larger investment in overlay or blotter work, the County should consider the development of a network of RSC. These are corridors either currently or projected to carry traffic of "regional" significance. The RSC network are corridors which are the most logical to consider for more significant pavement management investment through overlays or blotter. Further, the RSC may in fact be used as part of other investment targeting for bridge investment.

REGIONALLY SIGNIFICANT CORRIDORS

The Beadle County MTP established this network of RSC. The RSC represents corridors of significance to internal movements of traffic within Beadle County. Interregional and interstate traffic movements through Beadle County are handled on corridors such as US 14, US 281 and SD 37. Therefore these corridors are not included as part of the RSC. While these corridors are regionally significant, they are not the responsibility of Beadle County.

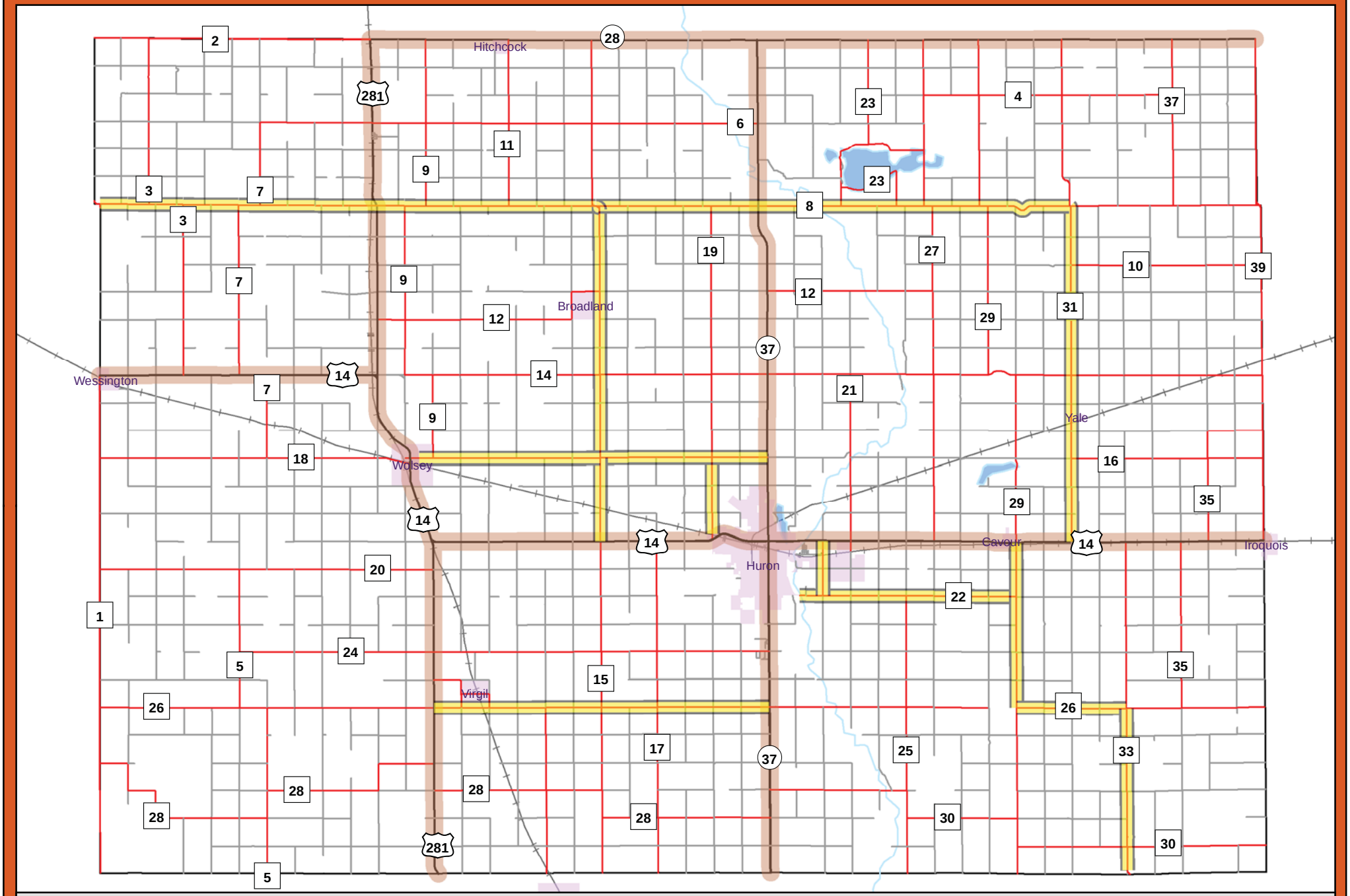
Planning level information gathered through the development of the MTP was used to develop the RSC network. Important variables were as follows:

- Economic Development Corridors – These are corridors currently or projected to see increased traffic based on economic development opportunities within Beadle County.
- Economic Development Nodes - Areas which have been identified as having significance from an economic development perspective.
- Truck Traffic – These are corridors where truck traffic is typically above the county average, or where existing or projected agricultural or industrial development suggested sustained or increasing trends for truck traffic.

Figure 5-5 shows the suggested RSC network for Beadle County. Also highlighted are major SDDOT corridors. Together the RSC and existing SDDOT corridors demonstrate the major backbone of the transportation network in Beadle County. Table 5-7 shows the specific corridor segments and mileage of the proposed RSC Network.

Table 5-7: Beadle County Regionally Significant Corridors

County Road	Segment	Mileage
8	West County Line to County Road 31	36
15	US 14 to County Road 8	12
18	Wolsey to SD 37	13
19	US 14 to County Road 18	3
22	James River to County 29; Custer Ave. North to US 14	10
26	US 281 to SD 37; County Road 29 to County Road 33	16
29	US 14 to County Road 22	2
31	US 14 to County Road 8	12
33	County Road 26 to South County Line	6
	Total RSC Mileage	**110**
	Percentage of Total County System	**19.2%**
	Percentage of Total Major Collector System	**38.0%**
	Percentage RSC on Paved Roadway	**93.6%**
	Percentage RSC on Major Collector	**93.6%**



Beadle County Master Transportation Plan
Figure 5-5: Regionally Significant Corridors

ESTABLISHING PAVEMENT TREATMENT TYPE BY CORRIDOR

A number of pavement management techniques are available to Beadle County. An investment strategy for the county highway system has been preliminarily developed based on a review of existing roadway data sets. Another critical input was the RSC network discussed earlier. Relevant data sources used were as follows:

- Existing ADTs – Review existing ADTs to determine corridors currently carrying more significant travel volumes.
- Crash Data – Review corridor level crash data to factor potential shoulder, profile or striping needs which may be leading safety concerns.
- PASER Rating/Investment Priority – Review current PASER rating and resulting investment priority for each paved roadway in the county.

Overlay

Typical standards have pointed to using overlays on corridors with an ADT over 650. Given the relatively low volumes on the majority of roadways in Beadle County, very few corridors justify the expense required to do a maintenance or structural overlay. More significant corridors with existing and future regional significance should be considered for overlays.

The RSC network would be the largest universe of corridors feasibly eligible for overlays. However, to further refine that network, Figure 5-6 condenses the RSC network to roadways which should be considered high priority candidates for an overlay. The number one priority corridor in the county for a future overlay would be the portions of County Road 22 which serve as the SD 37 Local Bypass.

Blotter

Blotter is appropriate for less significant corridors, but those which may require more substantial maintenance to improve overall condition of currently paved or roads identified for conversion to paved surface. Blotter would be a substitute to an overlay where the current road base would be milled up and returned to improve the current roadbed. A recent local example would be the work currently underway on County Road 15/Broadland Road. Typical standards established point towards to using Blotter on corridors with ADTs between 150 and 650. The largest universe of potential corridors for Blotter eligible corridors would be the RSC network. The only exception would be the portion of the County Road 22 corridor currently designated as the SD 37 Local Bypass. Traffic and truck volumes are too high on this corridor to justify a Blotter treatment.

Table 5-8: Overlay or Blotter Candidate Corridors

County Road	Segment	Mileage
8	County Road 7 to County Road 31	32
19	US 14 North One Mile	1
22	James River to County 29; Custer Ave. N to US 14	10
26	US 281 to SD 37	12
29	US 14 to County Road 26	6
	Total Mileage	**61**
	Percentage of Total County System	**10.6%**
	Percentage of Total Paved System	**27.6%**
	Percentage of RSC	**55.5%**

Chip/Crack Seal

Currently Beadle County does chip/crack seal program on a roughly five year cycle for all paved roadways. The recommendation is to reduce the system treatment cycle from five years to seven years for chip/crack sealing. This change in approach would thus free up additional revenue for other system needs. If a more frequent maintenance is deemed appropriate on a five year cycle, it is suggested the RSC network be used to delineate corridors with a more frequent chip/crack seal treatment.

Table 5-9: Candidate Chip Seal (on RSC) – 5 Year Chip Seal Cycle

County Road	Segment	Mileage
8	West County Line to County Road 7	5
15	US 14 to County Road 8	12
26	County Road 29 to County Road 33	4
31	County Road 8 to US 14	12
33	County Road 26 to South County Line	6
	Total Mileage	**39**
	Percentage of Total County System	**6.8%**
	Percentage of Paved System	**17.6%**
	Percentage of RSC	**35.5%**

Table 5-10: Candidate Chip Seal (Off RSC) – 7-Year Chip Seal Cycle

County Road	Segment	Mileage
1	US 14 to County Road 20	7
8	County Road 33 to East County Line	6
13	County Road 26 to South County Line	6
15	County Road 8 to North County Line	6
18	West County Line to County Road 15	18
20	West County line to US 14	12
23	Lake Loop	6
39	County Road 8 to US 14	10
	Total Mileage	**71**
	Percentage of Total County System	**12.4%**
	Percentage of Paved System	**32.1%**

Gravel to Pavement

Existing corridors that are currently gravel may warrant consideration to convert to a paved surface. Based on a review of existing and projected development patterns in Beadle County a total of 8.75 miles of current gravel road are proposed as candidates for conversion to pavement. Currently one quarter mile of the proposed section of County 19 (Parke Avenue SW) is currently paved. Table 5-11 shows the proposed candidate corridors for gravel to asphalt conversion.

Table 5-11: Candidate Corridors for Gravel to Asphalt Conversion

County Road	Segment	Mileage
18	County Road 15 to SD 37	6
19	1/4 Mile North of US 14 to County Road 18	2.75
	Total Mileage	**8.75**
	Percentage of Total County System	**1.5%**
	Percentage of Total Major Collector System	**0.0%**
	Percentage on Major Collector	**0.0%**

Pavement to Gravel Conversion

In an era of decreasing revenues and increasing costs, an emerging trend is the conversion of pavement to gravel. Recent analysis points to conversion to gravel being most effective on roadways with ADTs less than 150, with lower truck volumes. Based on existing data conditions, some segments of corridor in Beadle County may be candidates for conversion to gravel, either passive or active and are identified below. However, the current approach is to not recommend a conversion for these corridors unless financial conditions warrant. For now, these would be considered candidate chip seal projects with a 7-year cycle.

Table 5-12: Candidate Chip Seal (Off RSC) 7 Year Chip Seal

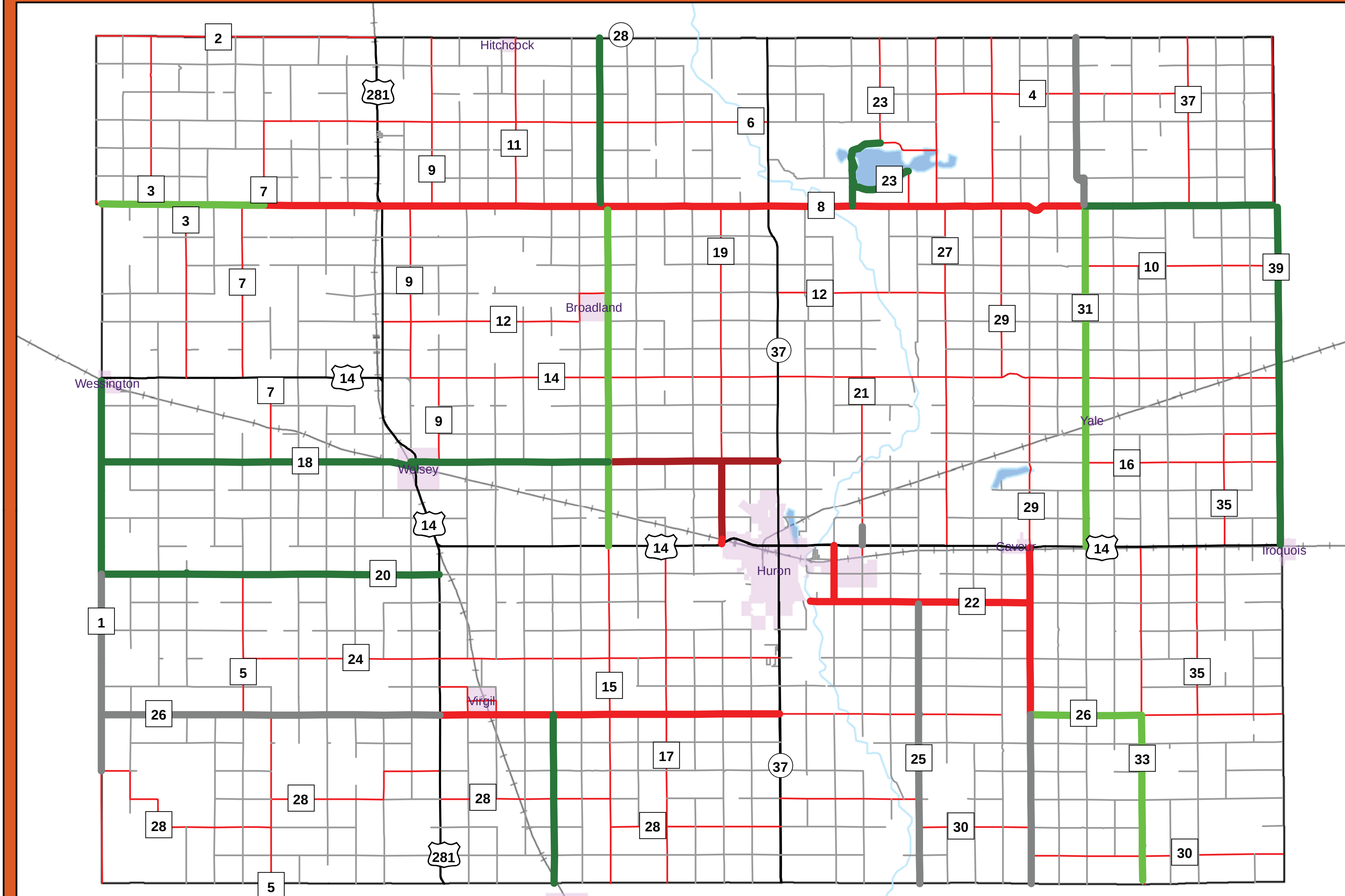
County Road	Segment	Mileage
1	County Road 20 to One Mile South of County Road 26	7
21	US 14 North 3/4 Mile	0.75
25	Country Road 22 to South County line	10
26	County Road 1 to US 14	12
29	County Road 26 to South County Line	6
31	County Road 8 to North County Line/SD 28	6
	Total Mileage	**41.75**
	Percentage of Total County System	**7.3%**
	Percentage of Total Major Collector System	**15.5%**
	Percentage on Major Collector	**98.3%**

Summary of Recommended Treatment & Investment Needs

Table 5-13 below summarizes the recommended surface treatment type for those segments of corridor previously discussed. It synthesizes tables 5-8 through 5-12. This summary covers the total system of county paved roads plus those additional miles of roadway currently gravel for which future pavement treatment is recommended. The balance of the Beadle County system not covered below is currently gravel roadway. The current gravel roadway network of County roadways are recommended to remain as gravel for the life of the current 20 year MTP.

Table 5-13: Treatment Summary

Treatment	Mileage	percent County System	percent of RSC
Overlay or Blotter	61	11%	55%
Gravel to Asphalt	8.75	2%	8%
5 Year Chip Seal	39	7%	35%
7 Year Chip Seal	71	12%	n/a
7 Year Chip Seal (gravel conversion)	41.75	7%	n/a
Total Mileage	**221.5**		
Percentage of Total County System	**38.7%**		



Beadle County Master Transportation Plan
Figure 5-6: Investment Priorities

Chapter 6: Intersection, Safety & Traffic Analysis

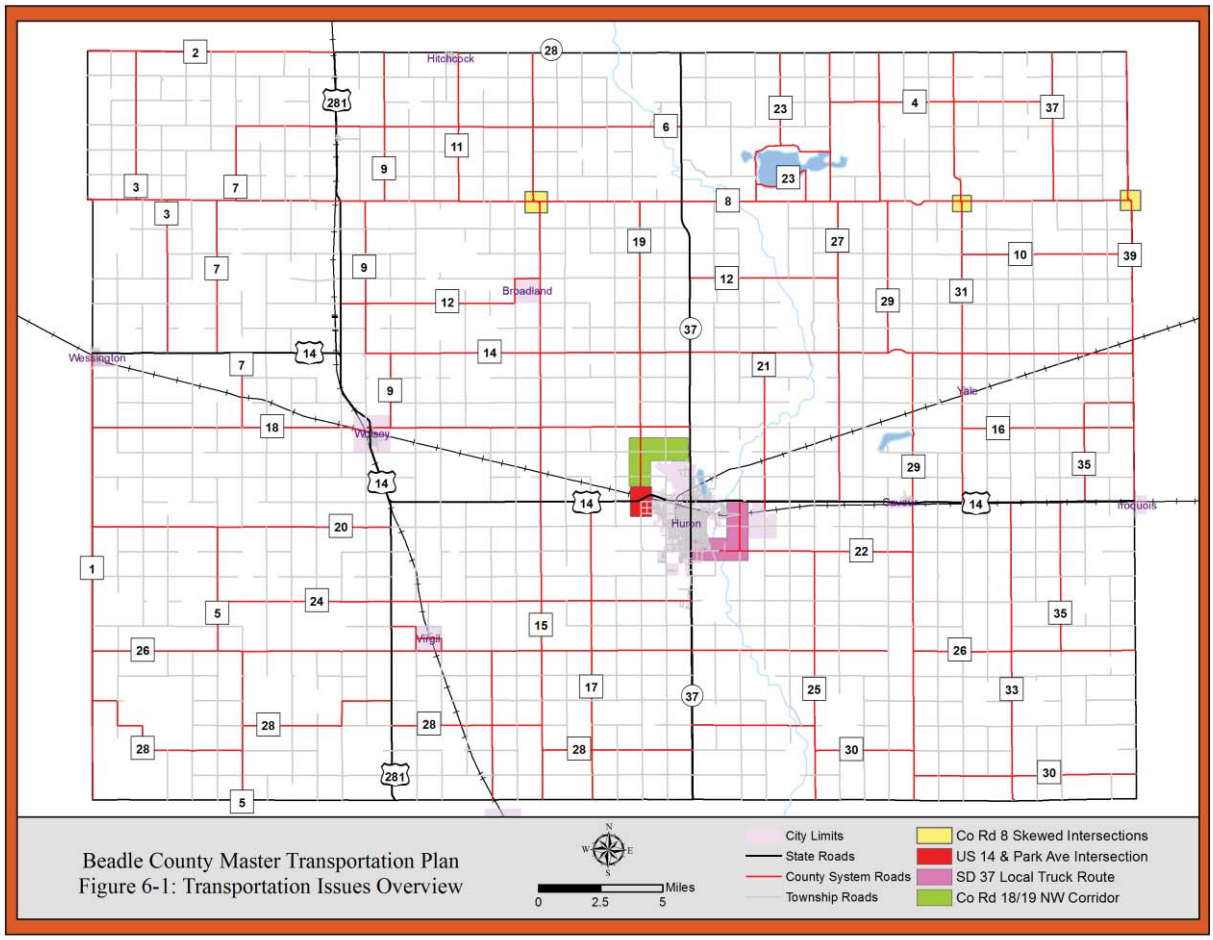
Background & Introduction

The following five roadway segments or intersections were identified as primary candidates for more detailed analysis as part of the Beadle County MTP:

- County Road 8 & 39 (418th Avenue)
- County Road 8 & 31
- County 8 & 15
- US 14 & Park Avenue
- 21st SE & Custer Avenue (recently signed as Local SD 37 Truck Bypass).
- County Road 19 (All 3 miles north of US 14; and two miles on County 18 between SD 37 and intersection with County Road 19)

These locations that were identified as primary safety concerns during SAT meetings and the public input process can be seen in the Figure 6-1.

Figure 6-1: Transportation Issues Overview



County Road 8 Offset Intersections

Three intersections along County Road 8 with offset geometries were identified for analysis as part of this Beadle County MTP. These intersections are at north-south section line corrections, with S-curves in place on north south roadways to create a continuous road instead of two offset intersections.

Figure 6-2: County Road 8 Offset Intersections

These intersections include:

- County Road 8 and County Road 15
- County Road 8 and County Road 31
- County Road 8 and County Road 39

These s-curves create acute angles along the north-south roads, which are counterintuitive to drivers and present sight distance issues for north-south movements. There are multiple alternative intersection configurations which could be applicable to creating more intuitive intersection geometries.

With only two crashes between the three intersections over the past five years, the three offset intersections on County Road 8 are likely not a pressing safety concern. Low-cost basic signage and marking improvements would likely improve the recognition of the stop-controlled intersection during both daytime and nighttime conditions.

LOW-COST IMPROVEMENT ALTERNATIVE

Currently, when the adjacent fields are full of crops, intersection visibility and recognition is greatly reduced. Low-cost improvements at the three offset study intersections should be considered due to the lack of crash history and the low traffic volumes. Intersection improvements in Figures 6-3, -4, -5 and -6 could improve safety.

Figure 6-3: Upgraded signage and pavement markings: $6,500 per intersection*

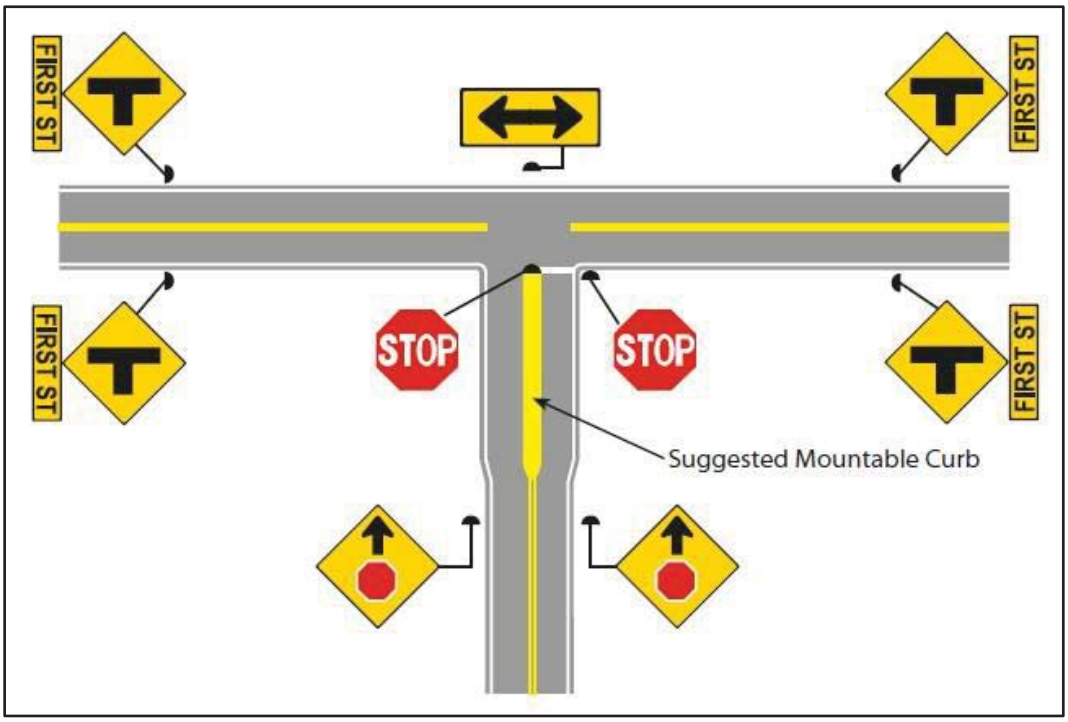
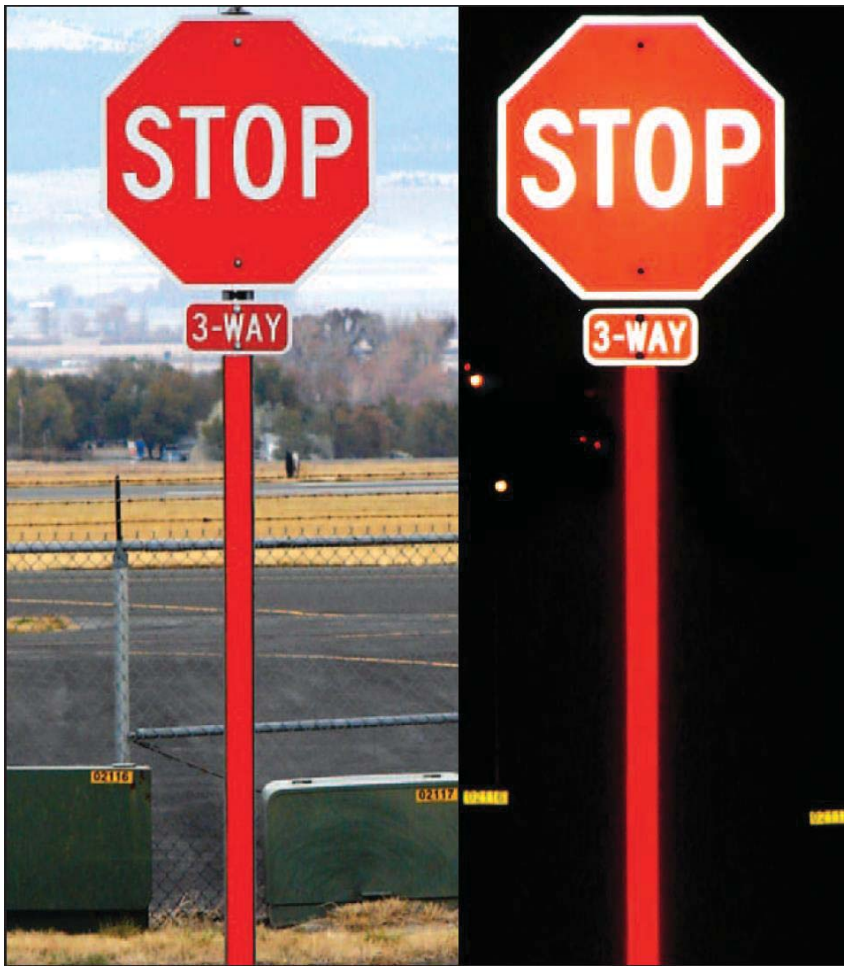


Figure 6-4: Flashing solar powered LED beacons on STOP sign: $10,000 per intersection*

Figure 6-5: Transverse rumble strips in lanes approaching stop signs: $6,500 per intersection*

Figure 6-6: Retroreflective strips on sign posts: Less than $1,000 per intersection*



* Average cost of improvement per FHWA estimate

INTERSECTION RECONSTRUCTION ALTERNATIVES

Potential reconstruction alternatives for consideration at the offset intersections include:

- Reconstruction of s-curve Configurations
- Eliminating s-curve and converting to two offset T-intersections.

Given the low traffic volumes at each offset intersection and a lack of documented safety issues, it may be most appropriate to consider any major intersection geometry revisions as part of future pavement rehabilitation or reconstruction projects. A summary of the costs associated with the proposed reconstruction alternatives can be seen below in Table 6-1.

Table 6-1 - Reconstruction Alternatives Estimated Costs Summary

INT	Alt	Length (miles)	Construction Cost*	ROW Impact (acres)	ROW Cost**	Total Cost
Co Rd 8 & Co Rd 15	S-Curve	0.59	$ 352,272.73	12.1	$60,500.00	**$ 413,000**
	Offset T	0.23	$ 136,363.64	0	$ -	**$ 136,000**
Co Rd 8 & Co Rd 31	Offset T	0.13	$ 77,272.73	1.3	$ 6,500.00	**$ 84,000**
Co Rd 8 & Co Rd 39	S-Curve	0.27	$ 159,090.91	2.5	$12,500.00	**$ 172,000**
	Offset T	0.21	$ 125,000.00	0	$ -	**$ 125,000**

* Assumes reconstruction cost of $600,000 per mile

** Assumes ROW cost of $5,000 per acre

County Road 15 & County Road 8

Offset T-Intersection Alternative

Changing the intersection to two offset T-intersections would eliminate the s-curve of the current intersection providing improved intersection sight distance. Positioning the two T-intersections at the existing County Road 15 north-south approaches would provide 1,450 feet between the new offset County Road 15 approaches. This alternative would provide adequate spacing between approaches and would not require purchase of additional right-of-way. A preliminary layout for the conversion of the existing s-curves to two offset T-intersections is shown in Figure 6-7.

Cost Estimate: $136,000

Figure 6-7: Co Rd 8 & Co Rd 15 Offset T-Intersection Alternative

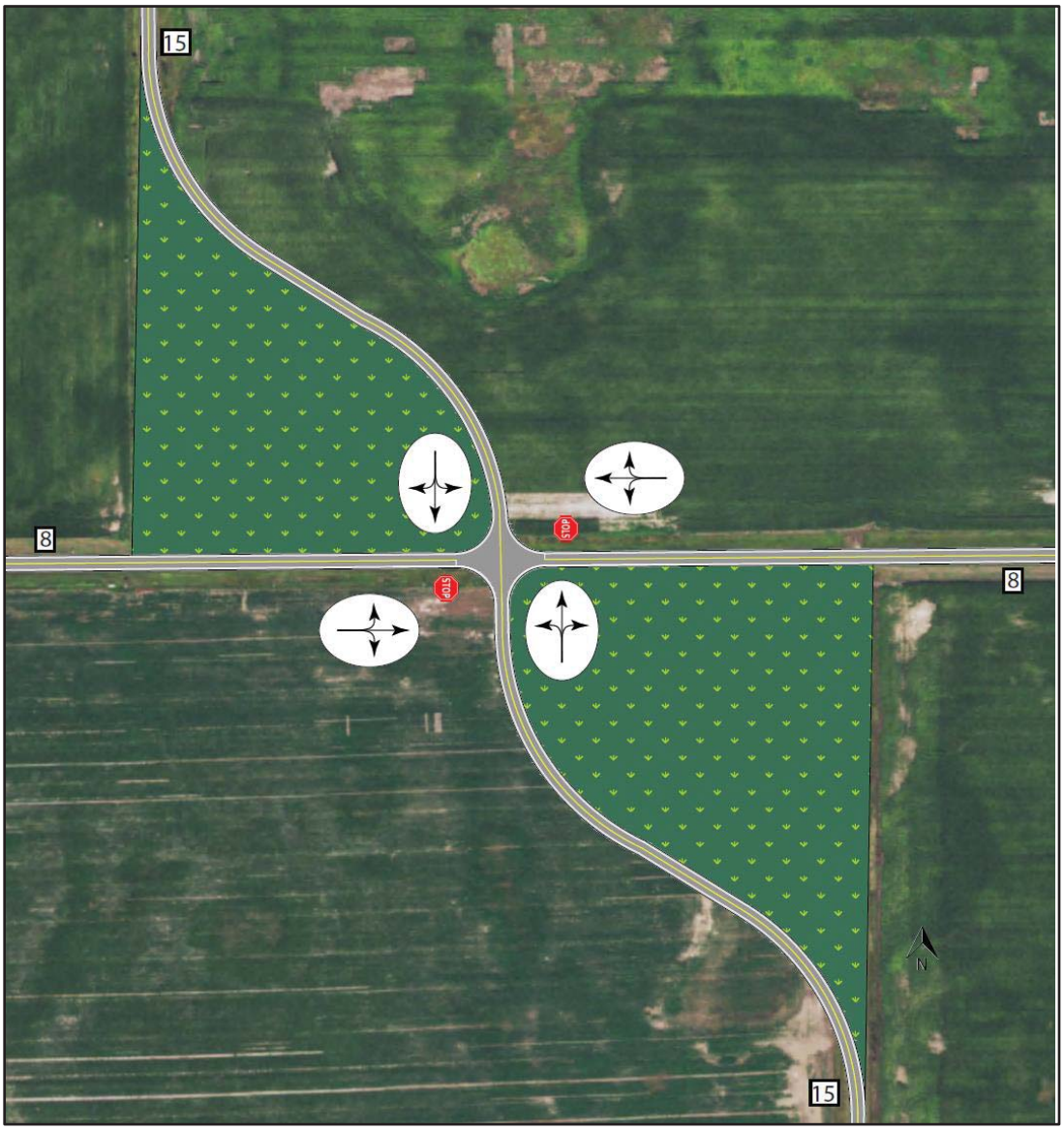
Reconstruction of S-Curve Alternative

Changing the geometries of this intersection would change the angle that County Road 15 intersects with County Road 8, from an acute angles to meet perpendicular (90°) as shown in Figure 6-8**.** This alternative would also need new signage to reflect the geometry change. The safety of this alternative lies in that it eliminates the acute angle that currently exists which could minimize the potential for future crashes occurring due to the acute angle. This geometric realignment would require purchase of additional right-of-way and would involve realignment of the northbound and southbound county roads, and relocation of the approaches. A preliminary layout of the realigned s-curves is shown in Figure 6-8 below.

ROW Impact: 12.1 acres

Cost Estimate: $413,000

Figure 6-8: Co Rd 8 & Co Rd 15 S-curve Alternative



County Road 31 & County Road 8

Offset T-Intersection Alternative

This alternative is not appropriate at this location due to limited space between north and south approaches of County Road 31 (approximately 200 feet).

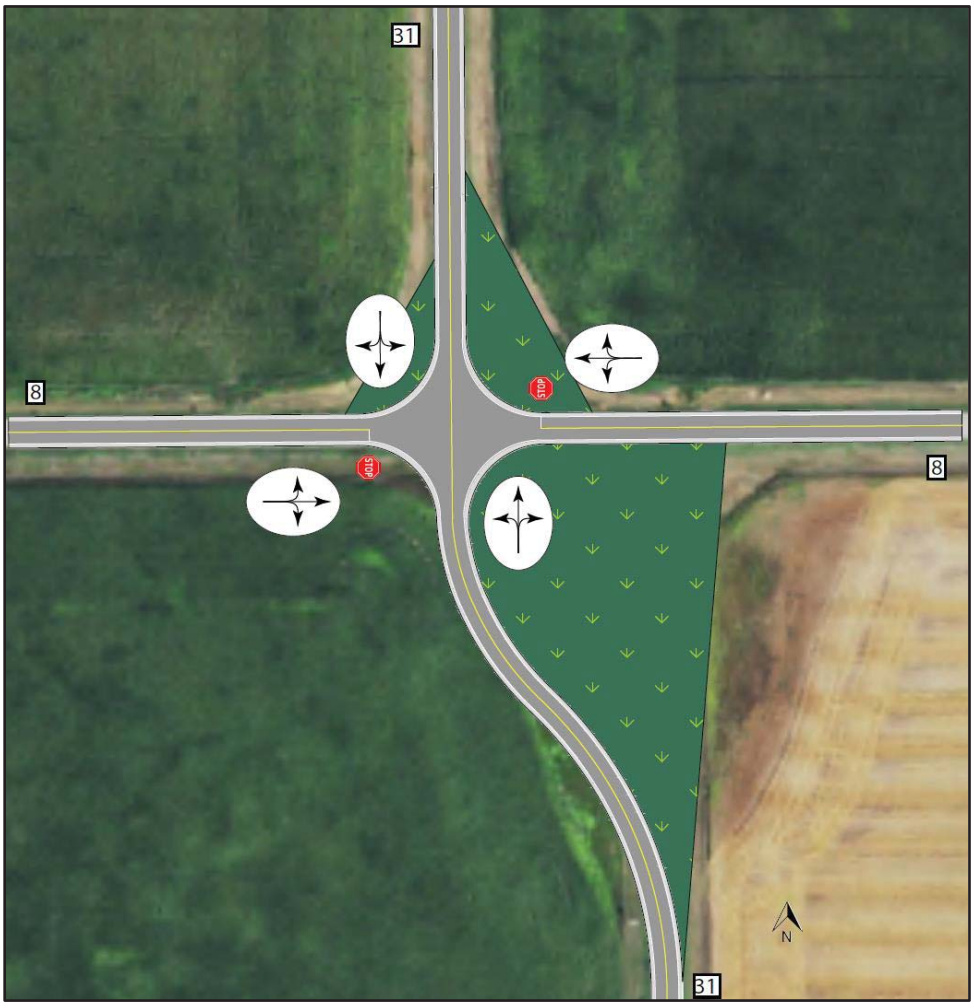
Reconstruction of S-Curve Alternative

Realignment of the north leg of County Road 31 would eliminate the s-curve and create a perpendicular (90°) intersection with County Road 8. This would improve sight distance issues which currently exist. This realignment would likely require purchase of right-of-way. The cost for this type major road realignment construction project is usually high. A preliminary layout of the realigned s-curves is shown in Figure 6-9 below.

ROW Impact: 1.3 acres

Cost Estimate: $84,000

Figure 6-9: Co Rd 8 & Co Rd 31 S-curve Alternative



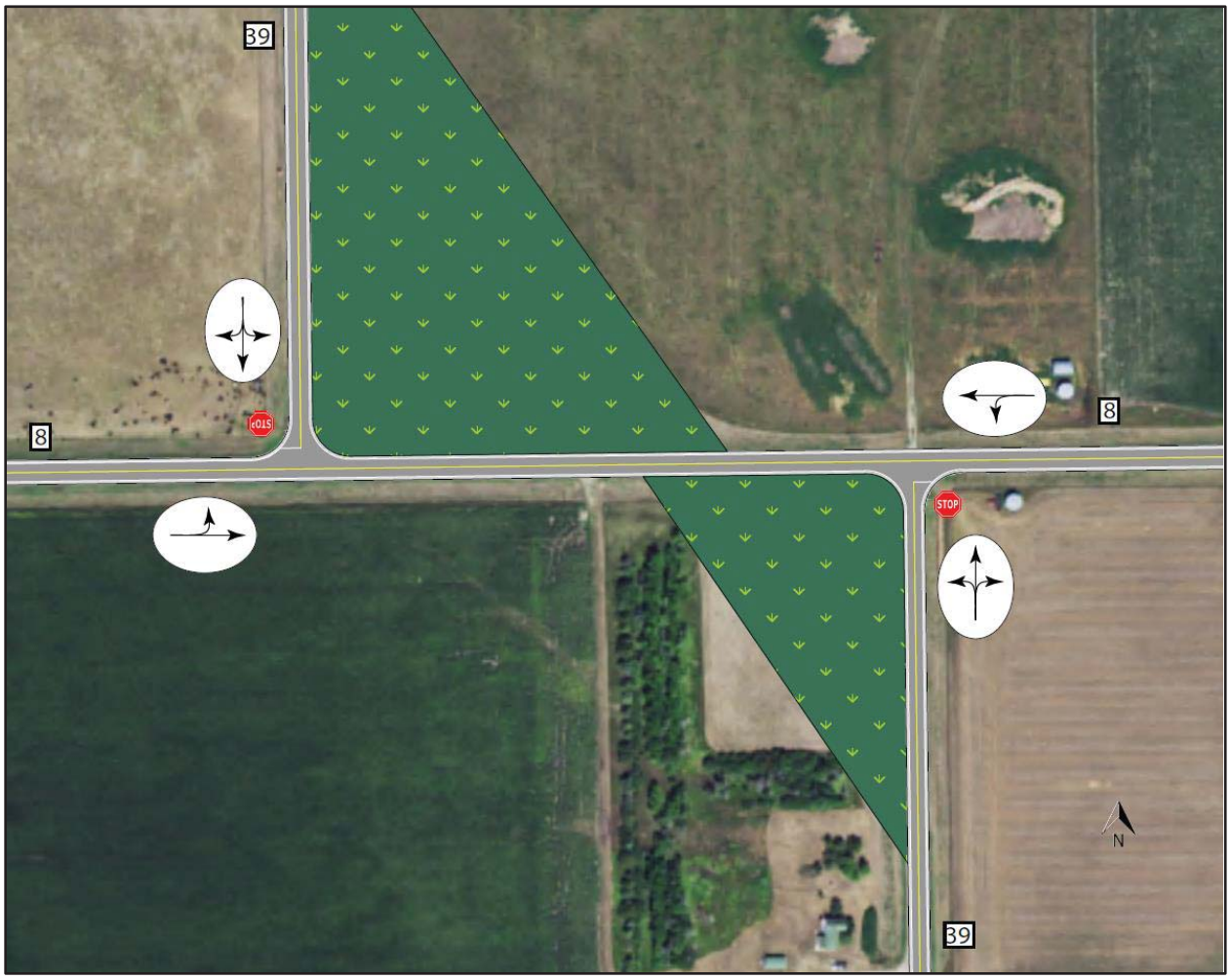
County Road 39 & County Road 8

Offset T-Intersection Alternative

Changing the intersection to two offset T-intersections would eliminate the s-curve of the current intersection providing improved intersection sight distance. However, this alternative may not be applicable at this location due to limited spacing between the offset approaches of County Road 39 (approximately 820 feet). A preliminary layout of the offset T-intersections is shown in Figure 6-10 below.

Cost Estimate: $125,000

Figure 6-10: Co Rd 8 & Co Rd 39 Offset T-Intersection Alternative



Reconstruction of S-Curve Alternative

Realignment of the north leg of County Road 31 would eliminate the s-curve and create a perpendicular (90°) intersection with County Road 8. This would improve sight distance issues which currently exist. This geometric redesign would likely require the purchase of additional right-of-way and would involve a major realignment of the southbound approach. This type road realignment construction project is usually high. A preliminary layout of the s-curves can be seen below in Figure 6-11.

ROW Impact: 2.5 acres

Cost Estimate: $172,000

Figure 6-11: Co Rd 8 & Co Rd 39 Offset S-Curve Alternative

US 14 & Park Avenue

The intersection of US 14 and West Park Avenue was identified as a potential safety concern during the public involvement process. Based on economic development patterns both north and southeast of the intersection, there is potential for increased traffic at this intersection in the future. Recent intersection crash trends suggest visibility issues. 11 of the 13 total crashes at this intersection over the past five years have occurred at dawn.

A preliminary signal warrant analysis indicates that signalization is currently unwarranted at this intersection. The following low-cost intersection improvements alternatives should be considered at the intersection of US 14 and Park Avenue prior to consideration of signalization or geometric changes:

- Upgrade intersection signage and pavement markings
- Install flashing LED beacons on intersection advanced warning signs and STOP signs
- Install Rural Intersection Conflict Warning System (RICWS)

UPGRADE INTERSECTION SIGNAGE AND PAVEMENT MARKING

Basic signage and pavement marking upgrades can improve the recognition of stop-controlled intersections during both day and night conditions. This approach should be considered at rural intersections experiencing at least four crashes in the past five years. Typical installation cost of this type of basic signage and marking approach ranges from $5,000 to $8,000 per intersection. Implementation of this approach at US 14 and Park Avenue would include the following FHWA recommended upgrades:

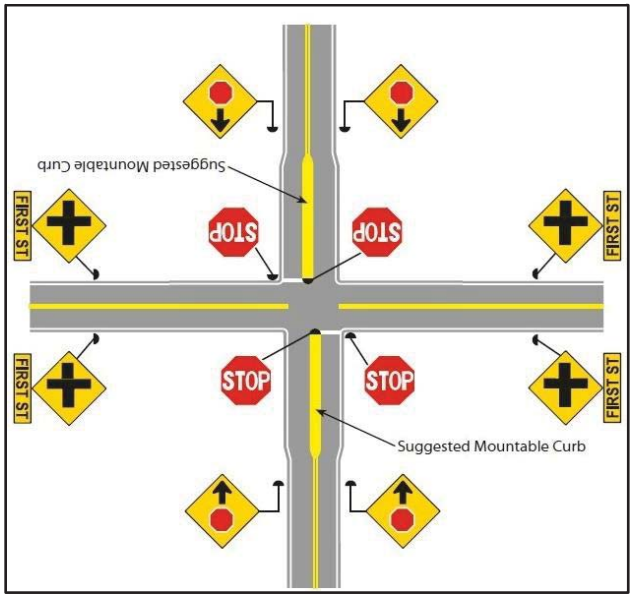
*L*ow-Cost Countermeasures for the Through Approach

- Doubled up (left and right), oversize intersection advanced warning signs, with street name sign plaques.

Low-Cost Countermeasures for the Stop Approach

- Doubled up (left and right), oversize advance "Stop Ahead" intersection warning signs.
- Doubled up (left and right), oversize STOP signs.
- Installation of a minimum six foot wide raised splitter island on the stop approach (if no pavement widening is required).
- Properly placed stop bar.
- Removal of any foliage or parking that limits sight distance.
- Double arrow warning sign at stem of T-intersections.

Figure 6-12: Example of basic intersection safety



FLASHING LED BEACONS ON INTERSECTION ADVANCED WARNING SIGNS AND STOP SIGNS

Flashing LED beacons further improves recognition of stop-controlled intersections over the basic signage and pavement marking improvements. This approach applies to rural intersections experiencing eight to 10 crashes in the past five years and implementation generally ranges from $5,000 to $15,000 per intersection depending on the chosen strategy.

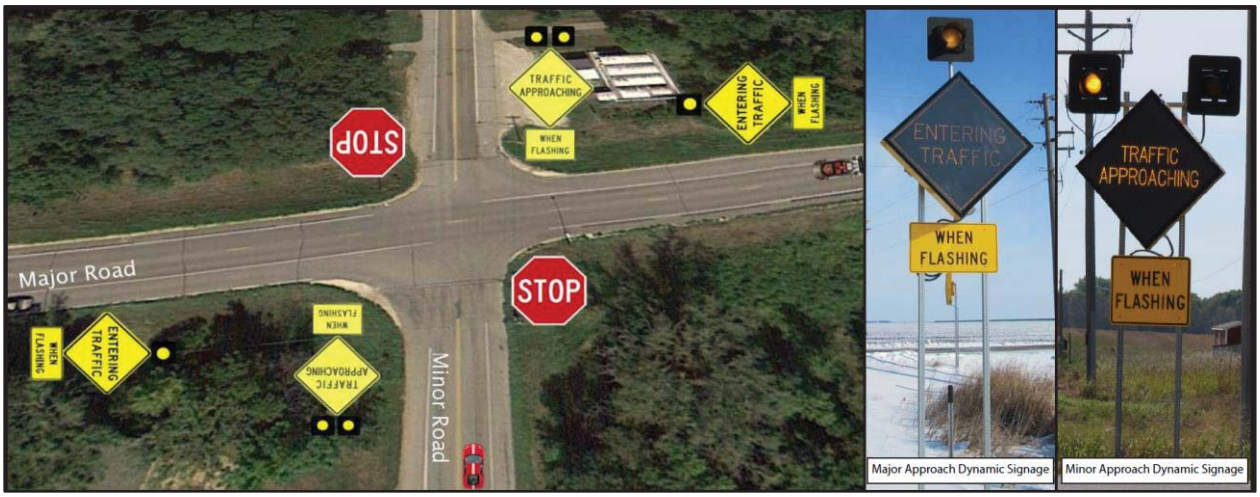
Figure 6-13: Example of rural flashing beacon installation

RURAL INTERSECTION CONFLICT WARNING SYSTEM

The Rural Intersection Conflict Warning System (RICWS) uses a combination of signage, vehicle detection, and dynamic warning beacons to alert drivers of possible intersection conflicts. This system can include dynamic warning signs on the minor approaches only, the major approaches only or both minor and major approaches. This system is generally installed at intersections experiencing 10 to 20 crashes in the last five years resulting from sight distance issues due to intersection geometry or cross-traffic speeds. Implementation costs of a RICWS for dynamic signage are approximately $45,000 per intersection (for the minor approach only) and $100,000 per intersection (for both major and minor approaches).

Figure 6-14: RICWS with Dynamic Signage for Minor Approaches Only

Figure 6-15: RICWS with Dynamic Signage for Major and Minor Approaches

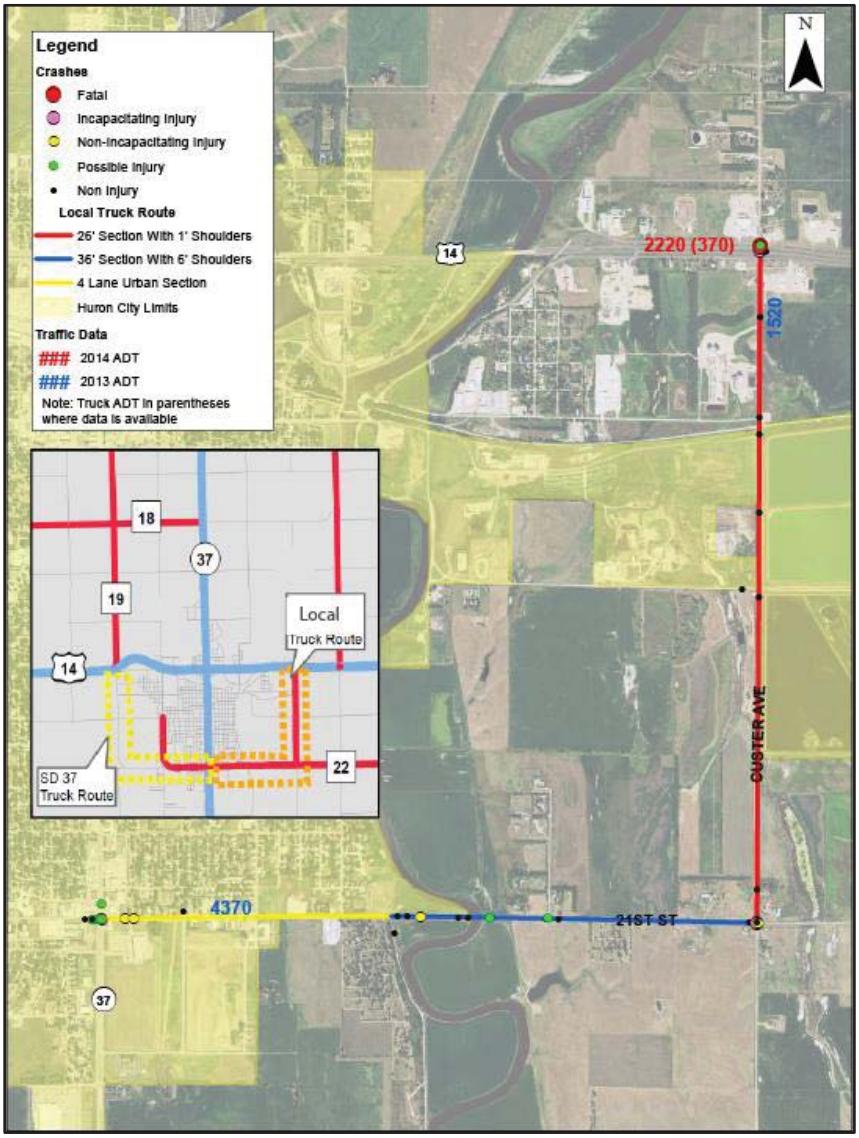


21st SE & Custer Avenue

Due to the expected economic development in southern Huron, both 21st Street and Custer Avenue are likely to experience higher levels of personal and heavy vehicle traffic. Portions of both corridors were until recently designated as SD 37 local truck route. However, this designation was removed at the request of Beadle County. The Custer Avenue/21st Street Corridors are shown in Figure 6-16. Whether signed as a truck route or not, these corridors lend themselves to existing and future potential for bypass traffic.

Current crash trends indicate an issue with vehicle collisions with wildlife. 41 percent of crashes within this corridor over the last 5 years have involved wildlife. Nearly all of the wildlife-vehicle crashes occurred during the night or early morning hours. Possible mitigation strategies could include increased lighting, updated signage, and upgraded roadside fencing.

Figure 6-16: Custer Avenue/21st Street Corridors



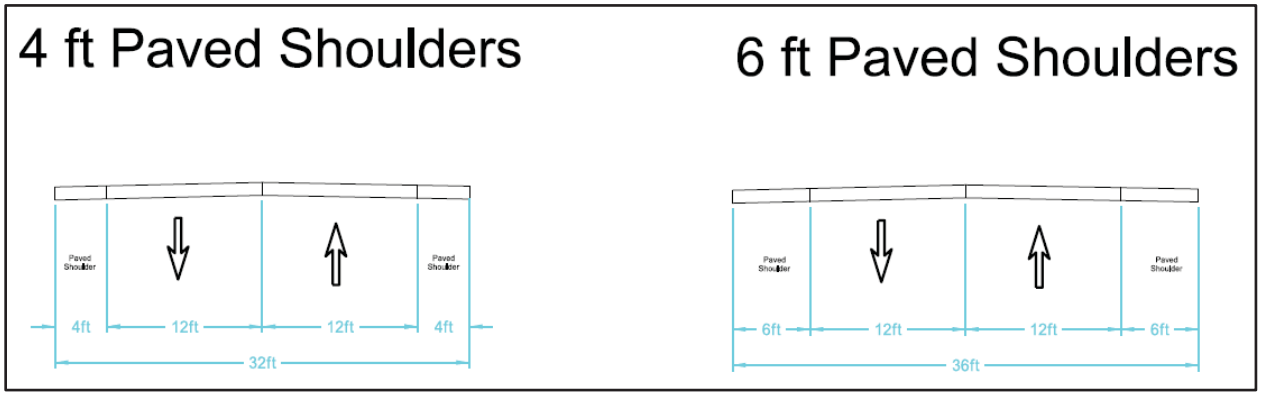
Currently, the Custer Avenue/21st Street corridors are two-lane, rural, 36-foot wide section with six-foot shoulders as the route proceeds to the east outside of the developed area of Huron. As the route continues onto Custer Avenue to the north, the route then becomes narrower with a 26-foot cross section with 1-foot shoulders, which is undesirable for larger vehicles. Figures 6-17 and 6-18 below show the two different typical sections present along the Custer Avenue/21st Street. Based on studies done by the FHWA, there is a correlation between enhanced safety through wider shoulder widths which have been shown to reduce crashes and roadway departures. Wider shoulders allow for better maneuverability and easier turning movements for large vehicles such as tractor-trailers.

Figure 6-17: 21st Street typical existing section: two-lane rural section with 6-foot shoulders

Figure 6-18: Custer Avenue typical existing section: Narrower two-lane rural section with 1-foot shoulders

Typical roadway sections developed to accommodate both increased heavy vehicle traffic volumes due to planned economic development and pedestrian and bicycle traffic along this corridor is shown in Figure 6-19 below.

Figure 6-19: Proposed Typical Sections



- Truck Route proposed shoulder widening alternatives:
  - Four-foot paved shoulder
    - $161,000 per mile
  - Six-foot paved shoulder
    - This alternative would provide improved safety to on-road pedestrians along the corridor.
    - $241,000 per mile

Table 6-2 - Paved Shoulder Cost Estimate

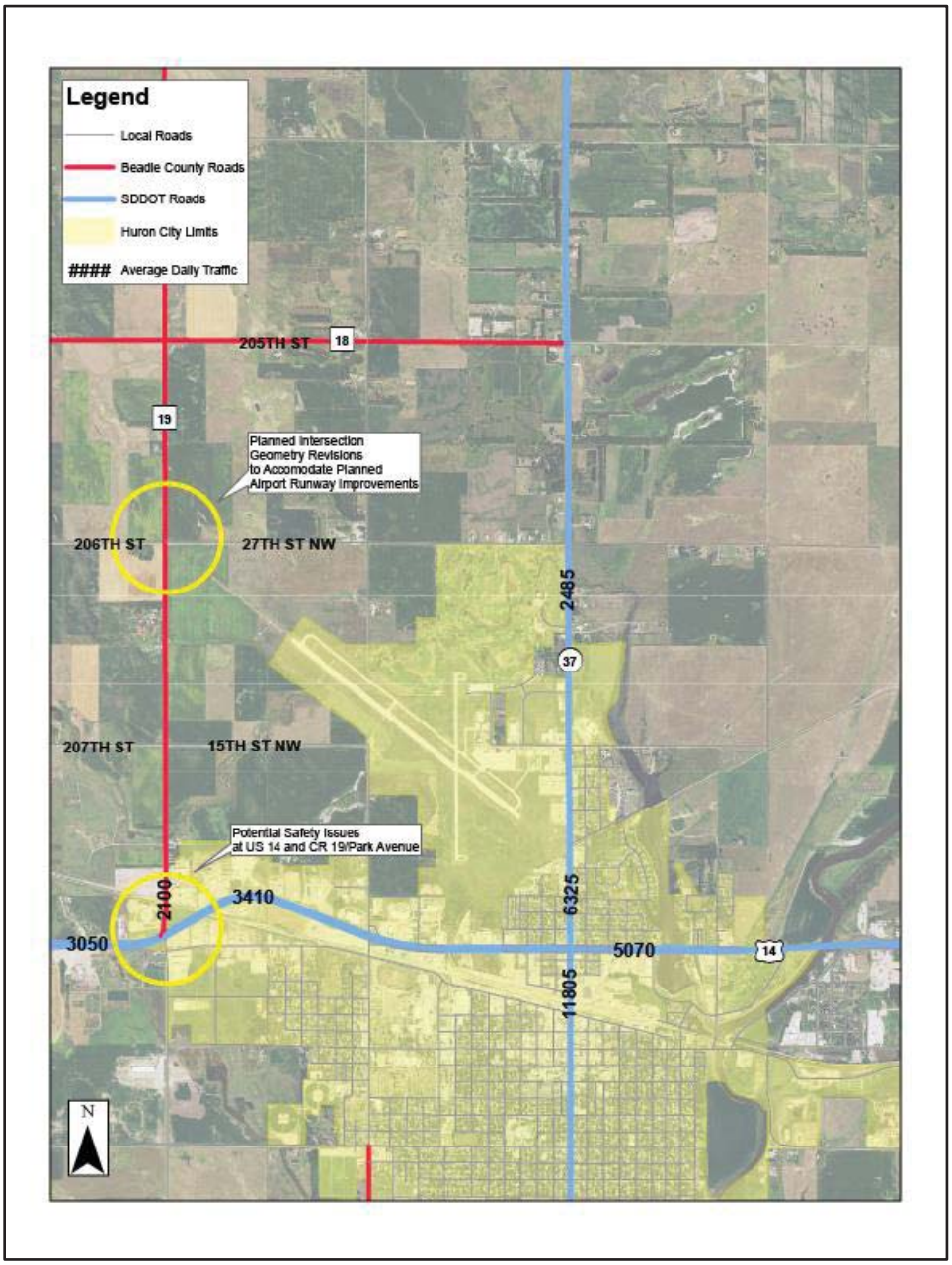
Cost Estimate		
	Four-foot Shoulder	Six-foot Shoulder
8-inch Crushed Stone Base	$62,296.46	$93,444.69
7-inch Asphalt	$439,739.73	$659,609.60
Total	$502,036.20	$753,054.29
Cost per Mile	$161,000.00	$241,000.00
Cost Difference per Mile		$80,000.00
Total Cost Difference		$251,000.00

As part of a future pavement management work on 21st Street/Custer Avenue consideration should be given for development of a minimum four-foot paved should. Beadle County should seek a cost sharing agreement with the City of Huron for future improvements in this corridor.

County Road 19/County Road 18

As shown in Figure 6-20, County Road 19 and County Road 18 have been identified as corridors of significance to Beadle County. These corridors warrant future consideration to convert the current surfacing from gravel to pavement. Beadle County and the City of Huron need to pay special attention to access management.

Figure 6-20: Co Rd 18 & Co Rd 19



Chapter 7: Programming & Recommendations

Revenue and Investment Options & Recommendations

Based on the guidance from the SAT, a series of revenue and investment scenarios were considered for use in the MTP. The intent of the scenario development was to ensure adequate funding was available to support needed new investment both in an expanded pavement management program and a bridge investment strategy for Beadle County.

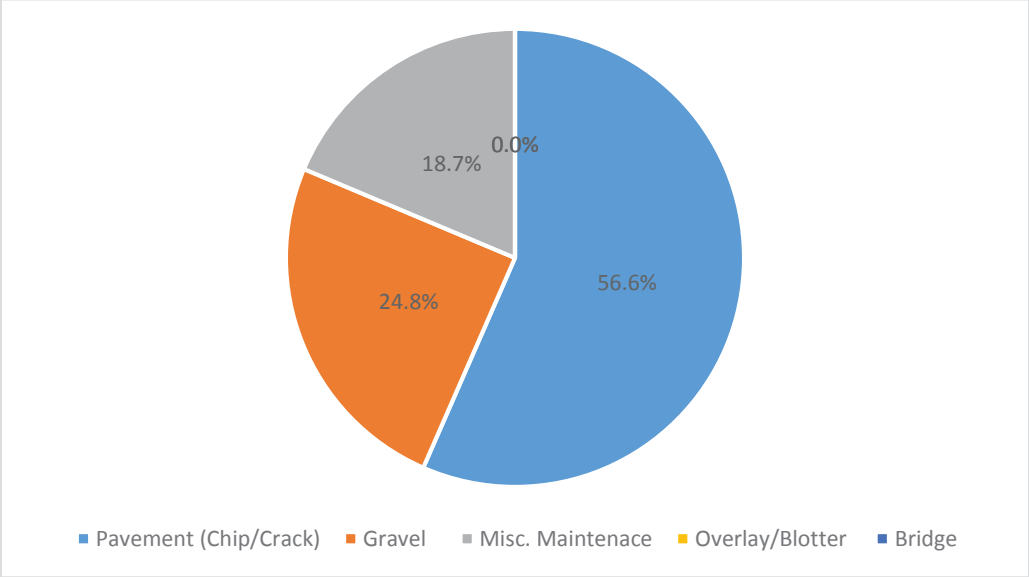
Based on a reallocation of existing Highway Department revenue, five scenarios were developed to allocate resources to meet system wide transportation needs. Two scenarios are essentially cost neutral, as they reallocate existing committed revenue in Beadle County. Three scenarios assume new revenue and some reallocation of existing revenue. In the end a "hybrid" funding scenario is recommended to support the 20 year Beadle County MTP.

Base year, or existing condition, investments in the Beadle County Highway system were presented earlier. Those were the basis for the development of the future potential funding scenarios. Table 7-1 shows the base year assumptions in funding by category.

Table 7-1: Base Year Investment by Beadle County Transportation Category

Category	Average Investment	Percent of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$970,000	56.6%	100.0%
Gravel	$425,000	24.8%	
Miscellaneous Maintenance	$320,000	18.7%	
Overlay/AST	$0	0.0%	
Bridge	$0	0.0%	0.0%
Total	**$1,715,000**	100.0%	100.0%

Figure 7-1: Base Year Investment by Beadle County Transportation Category



PAVEMENT INVESTMENT CONSIDERATIONS

The investment approach for pavement management in Beadle County will be to reduce chip/crack sealing to a seven year cycle from a five year cycle for less significant roadways. This will free up approximately $300,000 for other pavement and bridge needs. Each of the five funding scenarios and the recommended "hybrid" scenario assumes this reduction in chip/crack sealing. Investment in pavements (including gravel) are slightly above 90 percent of the total system investment through each scenario, with the balance dedicated to bridges.

COST NEUTRAL FUNDING SCENARIOS

Reduce Current Highway Department "Miscellaneous" Funds

Beadle County has traditionally set aside an average of $320,000 for miscellaneous maintenance. These funds address unexpected system needs and provide dollars for pot holes and system wide patching. Additionally, Beadle County invests enough resources to provide needed gravel work on all existing County gravel roads on approximately a 10 year cycle.

The MTP developed two scenarios which reallocated a percentage of gravel road and miscellaneous maintenance funds to support bridge maintenance or more intensive pavement management work.

Table 7-2 shows Cost Neutral Scenario A:

- Reduce Miscellaneous Maintenance by 25 percent;
- Reduce Gravel road investment by 25 percent;
- Reduce Chip Seal Cycle on most non-Regionally Significant Corridor (RSC) roads to a 7 year cycle.

While Scenario A does provide for the needed revenue to support other assumptions regarding the bridge needs in Beadle County, it fails to adequately provide substantial program needs for more significant pavement management efforts.

Table 7-2: Cost Neutral Scenario A

Category	Projected Investment	Percent of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$682,000	39.8%	91.3%
Gravel	$318,750	18.6%	
Miscellaneous Maintenance	$240,000	14.0%	
Overlay/Blotter	$324,250	18.9%	
Bridge	$150,000	8.7%	8.7%
Total	**$1,715,000**	100.0%	100.0%

Figure 7-2: Cost Neutral Scenario A

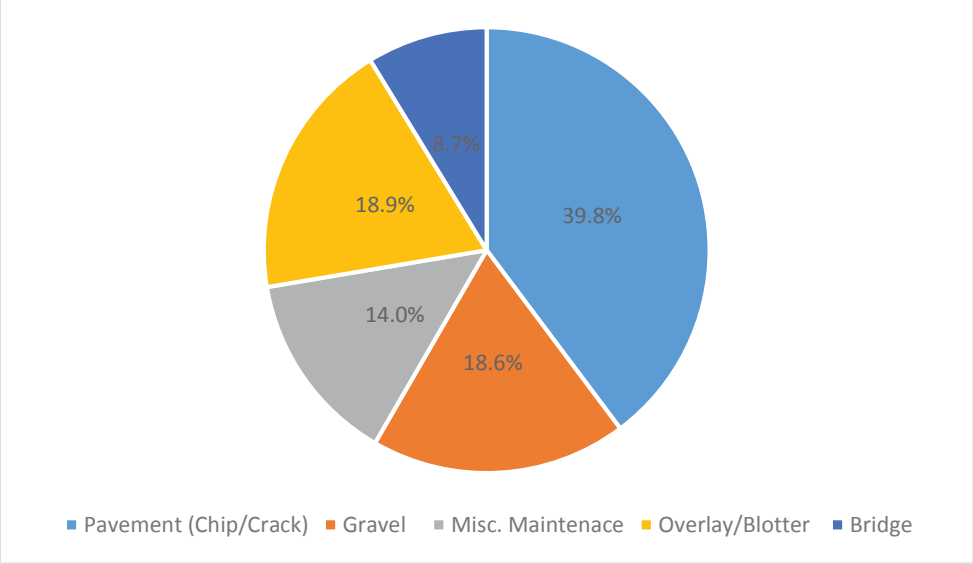


Table 7-3 shows Cost Neutral Scenario B:

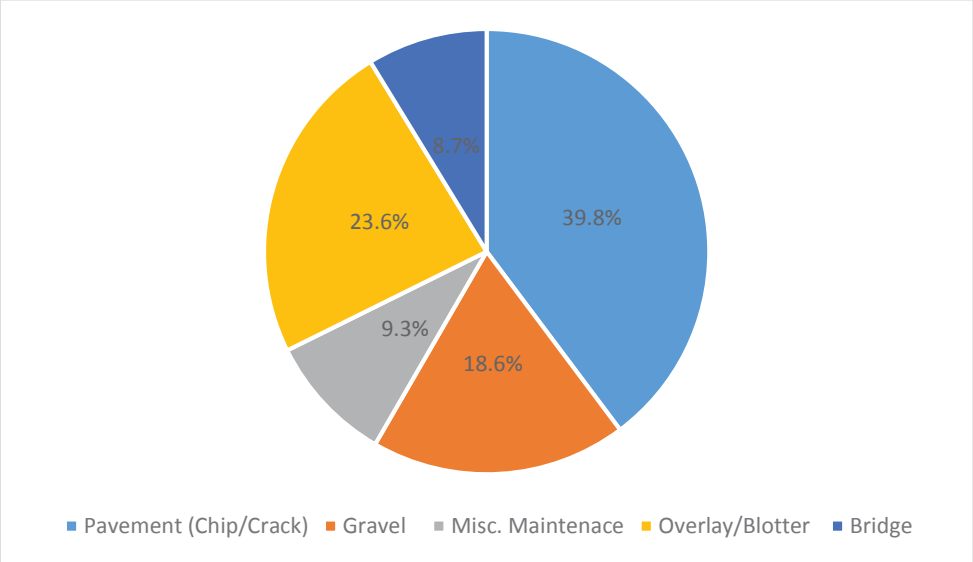
- Reduce Miscellaneous Maintenance by 50 percent;
- Reduce Gravel road investment by 25 percent;
- Reduce Chip Seal Cycle on most not RSC roads to a 7 year cycle.

Scenario B provides the needed revenue to support other assumptions regarding the bridge needs in Beadle County but fails to adequately provide substantial program needs for more significant pavement management efforts. Further, the risks inherent in the new investments in bridges and pavement may not likely outweigh the benefits of new resources allocated to pavement management efforts.

Table 7-3: Cost Neutral Scenario B – Reduce Miscellaneous County Highway Funds by 50%

Category	Projected Investment	Percent of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$682,000	39.8%	91.3%
Gravel	$318,750	18.6%	
Miscellaneous Maintenance	$160,000	9.3%	
Overlay/Blotter	$404,250	23.6%	
Bridge	$150,000	8.7%	8.7%
Total	**$1,715,000**	100.0%	100.0%

Figure 7-3: Cost Neutral Scenario B – Reduce Miscellaneous County Highway Funds by 50%



NEW SYSTEM REVENUE OPTIONS

Independent from the cost neutral funding options discussed above, three funding options were developed to look at increasing the amount of revenue dedicated to the Beadle County Highway System. The intent of looking at revenue plus scenarios was to make sure the full range of funding opportunities for needed transportation improvements in Beadle County were understood. Each scenario tried to capitalize on new revenue in a unique revenue center within the Beadle County transportation budget.

The following assumptions were applied equally to all new revenue options scenarios:

- Maintain existing investments in the Miscellaneous Maintenance and Gravel Roads;
- Reduction in chip seal frequency on most non-RSC corridors from 5 to 7 years;
- Dedicated the minimum $150,000 in new bridge program;
- Dedicated the balance of new system revenues to Overlay/Blotter investments.

GENERAL FUND INCREASE

Two scenarios were developed that assumed a 10 percent and 20 percent increase in general fund support of transportation needs in Beadle County. Based on existing financial analysis, this will equate to roughly $160,000 to $320,000 annual in new system revenue. This is based upon the preliminary financial analysis of $1,600,000 historic contribution to the highway department from the Beadle County General Fund.

New Revenue Scenario A and B are shown below as Tables 7-4 and 7-5.

Table 7-4: New Revenue Scenario A – Assume 10 percent increase in General Fund

Category	Projected Investment	Percent of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$682,000	36.3%	92.0%
Gravel	$425,000	22.6%	
Miscellaneous Maintenance	$320,000	17.0%	
Overlay/Blotter	$300,000	16.0%	
Bridge	$150,000	8.0%	8.0%
Total	**$1,877,000**	100.0%	100.0%

Figure 7-4: New Revenue Scenario A - Assume 10 percent increase in General Fund

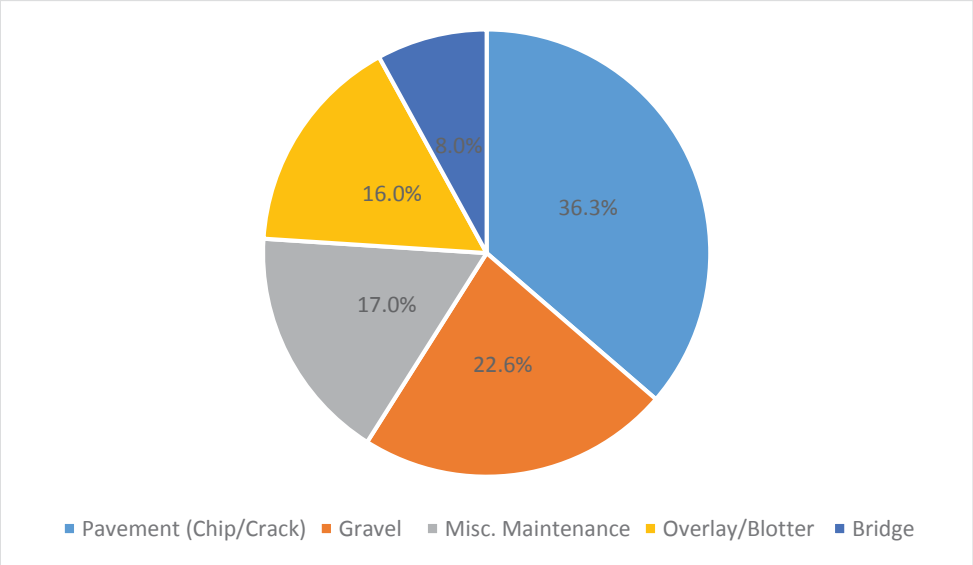
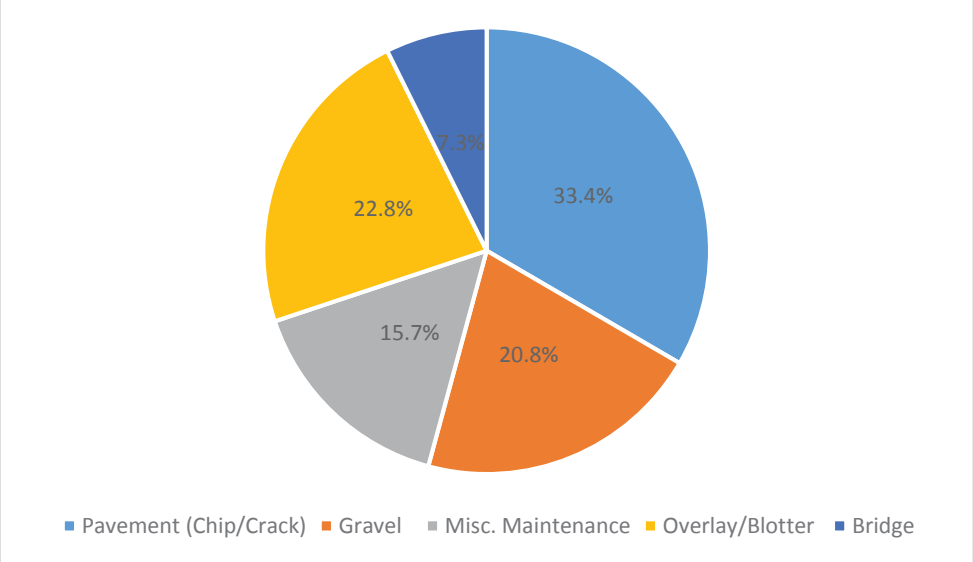


Table 7-5: New Revenue Scenario B- Assume 20 percent increase in General Fund

Category	Projected Investment	Percent of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$682,000	33.4%	92.7%
Gravel	$425,000	20.8%	
Miscellaneous Maintenance	$320,000	15.7%	
Overlay/Blotter	$465,000	22.8%	
Bridge	$150,000	7.3%	7.3%
Total	**$2,042,000**	100.0%	100.0%

Figure 7-5: New Revenue Scenario B- Assume 20 percent increase in General Fund



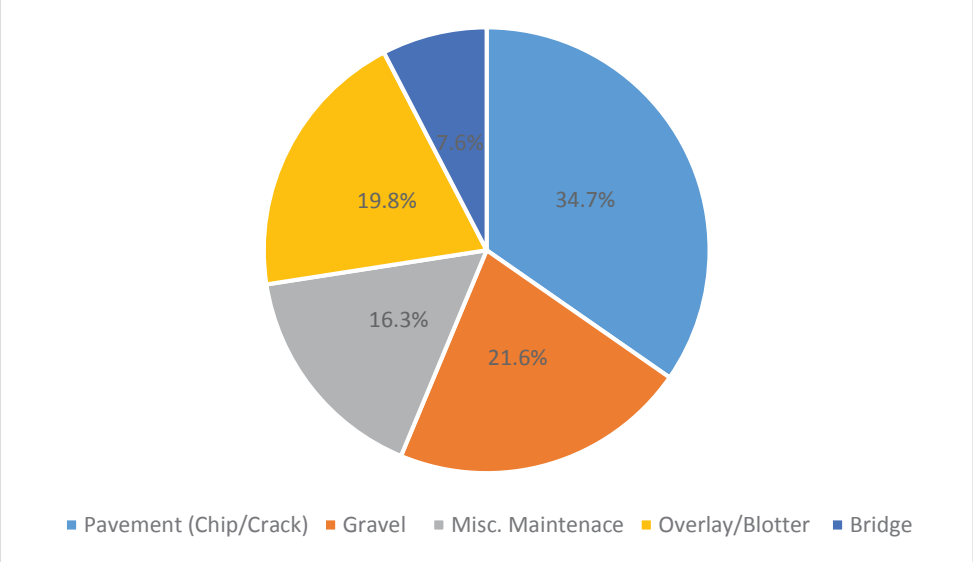
WHEEL TAX

A new revenue scenario was developed based on a revised County wheel tax ordinance to raise the wheel tax paid by vehicles registered in Beadle County. Preliminary analysis indicated that under the previously defeated ordinance an additional $322,000 in annual revenue would have been generated. New Revenue Scenario C assumes a $250,000 increase in revenue generated from a potential future change in the current wheel tax Ordinance.

Table 7-6: New Revenue Scenario C – Assumes $250,000 increase in Wheel Tax Revenue

Category	Projected Investment	Percent of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$682,000	34.7%	92.4%
Gravel	$425,000	21.6%	
Miscellaneous Maintenance	$320,000	16.3%	
Overlay/Blotter	$390,000	19.8%	
Bridge	$150,000	7.6%	7.6%
Total	**$1,967,000**	100.0%	100.0%

Figure 7-6: New Revenue Scenario C – Assumes $250,000 increase in Wheel Tax Revenue



RECOMMENDED HYBRID INVESTMENT SCENARIO

After consultation and evaluation of the two cost neutral and three revenue plus scenarios developed for the Beadle County MTP, it was determined that a hybrid approach would be needed. The recommended hybrid funding scenario to support the MTP included elements of all five scenarios.

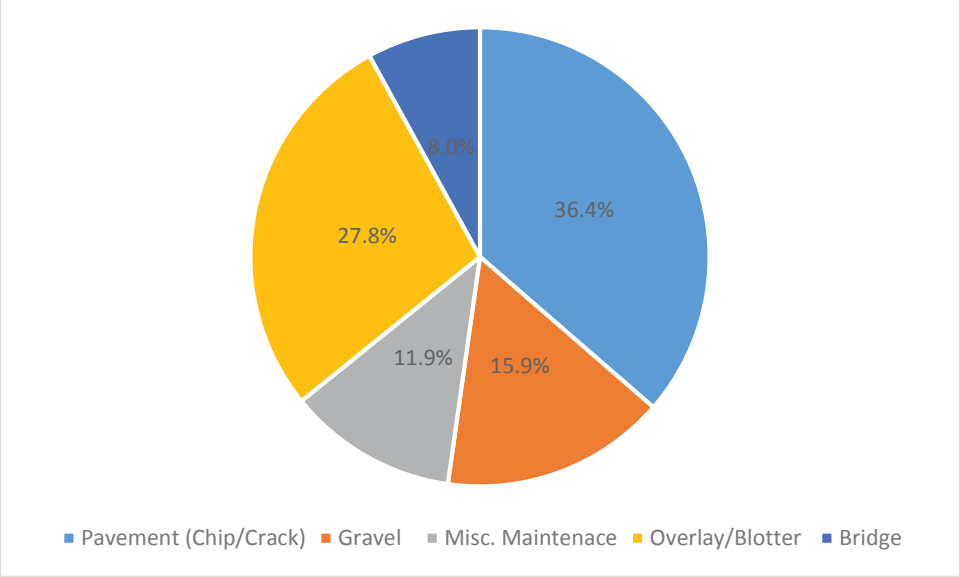
The primary assumptions used to support the hybrid funding scenario were as follows:

- Reduce Miscellaneous Maintenance Investments by 20 percent;
- Reduce Gravel Road Investments by 20 percent;
- Reduce frequency of Chip/Crack Seal Work on non-RSC corridors to 7 years;
- Assumes 10 percent increase in revenue from SB1 (i.e. State Aid);
- Identify 10 percent in new System Revenue (i.e. General Fund).

Table 7-7: Recommended Hybrid Funding Scenario

Cost Center	Projected Investment	% of Total	Pavement-Bridge Split
Pavement (Chip/Crack)	$695,000	34.1%	92.6%
Gravel	$340,000	16.7%	
Misc. Maintenance	$256,000	12.6%	
Overlay/Blotter	$595,000	29.2%	
Bridge	$150,000	7.4%	7.4%
Total	**$2,036,000**	100.0%	100.0%

Figure 7-7: Recommended Hybrid Funding Scenario



Summary of Hybrid Investment Scenario

The implementation of the Hybrid funding scenario does introduce risks to Beadle County in the following areas:

- Reduce availability of funding for unforeseen needs and investments through the reduction in miscellaneous maintenance funds.
- More deterioration of some lesser volume gravel roads.
- More deterioration of some lower volume paved roads.

These risks were evaluated by the SAT and determined that they were outweighed by the following benefits of the Hybrid funding scenario:

- Dedicated funding stream to support a county wide bridge investment strategy, benefiting both county and township needs.
- Adequate annual revenue to support the development of a meaningful program of more significant pavement management and overlay work on roadways determined to regionally significant corridors, which in fact carry the majority of county traffic.

- A balanced highway investment approach commensurate with usage of the existing paved and gravel Beadle County roadway network.
- Conservative assumptions for a limited amount of new revenue into the County transportation system, reflected current conditions which demand new increased investments but that also reflect the understanding the fees collected by the county under SB 1 will likely provide net new revenue to Beadle County over at least the first five to ten years of the MTP.

Table 7-8 below provides a summary of the revenue projections to support the MTP developed based upon the Hybrid Funding Scenario supported by the Beadle County MTP. The Hybrid Funding Scenario addresses the wide range of both pavement management and bridge improvement needs in Beadle County.

Table 7-8: Summary of Revenue Projections for Beadle County MTP Development - Hybrid

Year	Wheel Tax	State Aid	General Fund	STP Funds	BIG	Total	Dedicated to MTP Analysis	Revenue by Time Band
2016	$215,000	$2,090,000	$1,760,000	$250,000		$4,315,000	$1,941,750	
2017	$218,225	$2,121,350	$1,786,400	$253,750		$4,379,725	$1,970,876	
2018	$221,498	$2,153,170	$1,813,196	$257,556		$4,445,421	$2,000,439	
2019	$224,821	$2,185,468	$1,840,394	$261,420	$720,000	$4,512,102	$2,030,446	
2020	$228,193	$2,218,250	$1,868,000	$265,341		$4,579,784	$2,060,903	
2021	$231,616	$2,251,524	$1,896,020	$269,321		$4,648,480	$2,091,816	**$10,874,481**
2022	$235,090	$2,285,296	$1,924,460	$273,361		$4,718,208	$2,123,193	
2023	$238,617	$2,319,576	$1,953,327	$277,461		$4,788,981	$2,155,041	
2024	$242,196	$2,354,370	$1,982,627	$281,623	$720,000	$4,860,816	$2,187,367	
2025	$245,829	$2,389,685	$2,012,366	$285,847		$4,933,728	$2,220,177	
2026	$249,516	$2,425,530	$2,042,552	$290,135		$5,007,734	$2,253,480	**$11,659,259**
2027	$253,259	$2,461,913	$2,073,190	$294,487		$5,082,850	$2,287,282	
2028	$257,058	$2,498,842	$2,104,288	$298,905		$5,159,092	$2,321,592	
2029	$260,914	$2,536,325	$2,135,852	$303,388		$5,236,479	$2,356,415	
2030	$264,827	$2,574,369	$2,167,890	$307,939		$5,315,026	$2,391,762	
2031	$268,800	$2,612,985	$2,200,408	$312,558		$5,394,751	$2,427,638	
2032	$272,832	$2,652,180	$2,233,415	$317,246	$1,440,000	$5,475,673	$2,464,053	
2033	$276,924	$2,691,962	$2,266,916	$322,005		$5,557,808	$2,501,013	
2034	$281,078	$2,732,342	$2,300,920	$326,835		$5,641,175	$2,538,529	
2035	$285,294	$2,773,327	$2,335,433	$331,738		$5,725,792	$2,576,607	
2036	$289,574	$2,814,927	$2,370,465	$336,714		$5,811,679	$2,615,256	
2037	$293,917	$2,857,151	$2,406,022	$341,764		$5,898,855	$2,654,485	**$28,094,631**
Total	**$5,340,080**	**$51,910,542**	**$43,714,141**	**$6,209,395**	**$2,880,000**	**$107,174,157**	**$48,228,371**	**$50,628,371**

Similar to the Base scenario discussed earlier, the Hybrid Investment Scenarios falls far short of meeting any kind of fiscal constraint test. While not required to be fiscally constrained, the intent of the Beadle County MTP is to be realistic and achievable. However, the Hybrid Investment Scenario does most accurately distribute revenue needs based upon the current 20 year forecast assumptions developed for the MTP.

To provide a sense of the gap between available revenue and needed revenue, Table 7-9 provides a summary of the revenue gap between need and available revenue over the life of the 20 year Beadle County MTP.

Table 7-9: Revenue Gap to Support Beadle County MTP – Hybrid Scenario

Time Band	Revenue	Expenses	Difference
2017-2021	$10,874,481	$11,116,883	-$242,402
2022-2026	$11,659,259	$13,222,074	-$1,562,814
2027-2037	$28,094,631	$38,613,792	-$10,519,161
Total	**$50,628,371**	**$62,952,748**	**-$12,324,377**

In order to support a fiscally constrained plan over the life of the 20 year Beadle County MTP, the following additional new revenue would be needed by five year time band:

- 2017 – 2021: Additional $50,000 annually;
- 2022-2026: Additional $300,000 annually;
- 2027-2037: Additional $875,000 annually.

As discussed before, the Beadle County MTP is not required to be fiscally constrained. Therefore the revenues to support the investments identified by the Beadle County MTP provide substantiation for the continued need to provide increased investment into the road and bridge infrastructure of Beadle County. The analysis completed through the Beadle County MTP shows the delta between the existing revenue and needed revenue to maintain the current Beadle County transportation infrastructure in a State of Good Repair (SOGR). Maintaining infrastructure in a SOGR is a primary principle behind both MAP-21 and its replacement, the FAST Act.

Table 7-10 shows the comparative difference between the Base Investment condition and the Hybrid Investment condition for Beadle County by time band over the life of the Beadle County MTP. The difference amounts to roughly $10.9 million in additional investment over the life of the Beadle County MTP over the current status quo.

Table 7-10: Investment Comparison: Base Investment versus Hybrid Investment

Time Band	Base	Hybrid	Difference
2017-2021	$9,791,843	$11,116,883	+$1,325,040
2022-2026	$10,714,579	$13,222,074	+$2,507,495
2027-2037	$31,532,286	$38,613,792	+$7,081,506
Total	**$52,038,708**	**$62,952,748**	**$10,914,040**

State of Good Repair – A New Bridge Investment Strategy

Based on a review and assessment of existing bridges in Beadle County the most critical needs facing the County are located on township roads. A needs based investment strategy was coupled with a planning level technical evaluation process to assist in directing future Beadle County revenues towards the most deficient bridges within Beadle County. Additionally, to ensure maintenance and preservation on the balance of the Beadle County bridge inventory currently not deficient, a State of Good Repair (SOGR) program is recommended to assist in preserving system integrity.

The investment prioritization process started first with addressing low and medium investment priority needs through SOGR preventative and ongoing maintenance efforts. For lower volume and less utilized bridges, specifically on the township system a systematic program of bridge closures is recommended for consideration. Beyond the development of the SOGR and the removal of lower volumes township bridges from the system inventory, the investment strategy ends with a prioritized list of high priority bridges for replacement/rehabilitation.

The bridge investment strategy for the Beadle County MTP identifies that nearly 60 percent of the bridges in Beadle County have a sufficiency rating greater than 60. To prepare a balanced approach to bridge investment needs over the life of the MTP, a program of regular and ongoing preventative maintenance typical for bridges which are not structurally deficient is recommended.

The intent is to establish and maintain a SOGR for bridges not currently deficient. The majority of the program needs for the SOGR Program would likely fall on bridges currently on the county system. The SOGR program would be targeted at Low Priority Investment (Sufficiency >80) and Medium Priority Investment bridges (Sufficiency 60 to 79) as defined earlier in the BIP. However, all bridges within the County would be considered eligible for ongoing preventative maintenance through a program of SOGR.

The SOGR program would be two tiered:

1. Preventative Maintenance – More significant maintenance work, some of which may be eligible for funding through the SDDOT BIG Program. These would typically be targeted at medium priority bridges with a sufficiency rating between 60 and 79.
2. Routine Maintenance – Smaller scale maintenance efforts and activities, many of which could be done by County staff. These would typically target bridges with a sufficiency rating greater than 80, but may also apply to efforts which preserve the capacity of bridges with a sufficiency rating between 60 and 79.

The SOGR would set aside funds annually to provide for the detailed inspection and evaluation of a quarter of the current Beadle County bridge inventory. The outcome of the annual rotation of inventory and inspection would lead to the development of programmatic "work orders" for routine or preventative maintenance. Following the detailed inspection, a thorough work plan of improvements would be developed and implemented by Beadle County. The inspection cycle should be done in arrears to the programming of the improvement's, meaning that bridges scheduled for preventative or routine maintenance and small scale

repair should be inspected at least one year prior to having the work scheduled and completed. This would allow each year's maintenance program to be prepared in accordance with the following years budget constraints.

The determination to use internal or external labor for this work would be at the discretion of the County. The County may decide to reserve its labor force for the routine maintenance efforts, and allocate sufficient resources for contracting of more significant preventive maintenance work.

Specific improvements identified for bridges in Beadle County would vary by the condition of each bridge in the finding of the annual assessment. However, the following would be a generalized overview of the types and kind of work which could be expected as part of the annual state of good repair program.

PREVENTATIVE MAINTENANCE PROGRAM

As bridges begin to age, certain bridge components require repair. Beadle County's SOGR is designed to repair and replace worn or broken bridge components. This work is intended to extend the life of the bridge inventory and correct any immediate safety deficiencies. The secondary goal of the repairs is to also remove hazards and provide for preservation of infrastructure in a cost-efficient manner.

Typical preventative maintenance efforts would cost between $10,000 and $25,000. Common repairs include:

- New scour countermeasures; or repair of previously deployed scour measures.
- Repairing, restoring or strengthening major structural elements.
- Repairing, replacing or supplementing timber structural elements, timber railings, timber deck runners (excluding a full deck replacement).
- Retrofit repairs to fatigue prone details of steel girders.
- Replace deteriorated bridge railings. Environmental damage is considered preventive maintenance, but damage from car strikes or upgrades to crash test standards are not.
- Repair existing scour countermeasures.
- Painting. Painting a bridge is a significant endeavor. The amount of surface area coated is small, but the work to create a containment system and scaffolding for access to the underside of the bridge would require significant effort. A containment system supported by the bridge would be put in place as the sandblasting was performed and paint was applied.

ROUTINE MAINTENANCE ACTIVITIES

A number of smaller maintenance needs can be addressed annually by Beadle County. Many of these needs are not typically called out as part of the biannual inspections. These minor repairs should be detailed by the inspecting engineers and tracked on the future reports which would support the State of Good Repair effort.

Typical routine maintenance efforts would cost in the range $3,000 to $5,000. Routine Maintenance work order repairs range in size and complexity and can include work such as:

- Vegetation removal

- Overburden Removal
- Deck drain maintenance
- Wood deck nail replacement
- Vehicle damage repairs
- Hazard marker replacement
- Deck repairs
- Minor concrete repairs

PRELIMINARY TARGET BRIDGES FOR STATE OF GOOD REPAIR – PREVENTATIVE MAINTENANCE PROGRAM

Tables 4-8, 4-9, and 4-10 show the preliminary list of County and Township system bridges considered candidates for preventative maintenance and or near-term routine maintenance.

Figure 4-1 shows the location of the medium investment priority bridges in Beadle County noted for inclusion in the SOGR program.

Table 7-11: County "On-System" State of Good Repair Candidates

Bridge Number	Condition Average	Sufficiency Rating
03160251	5.0	50.0
3404060	6.3	59
03008240	4.3	61.7
03330274	5.3	62.1
03180102	5.0	64.5
03258060	6.3	67.1
03334240	6.0	69.1
03155240	6.7	70.4
03330262	5.0	71
03370268	5.7	71
03036060	6.0	71.1
03194120	5.7	72.1
03041190	5.0	74.7
03290263	7.0	77.1
03330228	5.7	78.2

Table 7-12: County "Off System" - State of Good Repair Candidates

Bridge Number	Condition Average	Sufficiency Rating
03170097	5	52.9
03370232	5.3	62.4
03265240	6.3	62.8
03222220	5.0	63.1
03359020	5.7	64.7
03234030	5.7	64.8
03020008	5.0	67.1
03354080	6.0	72.7
03010239	6.0	73.1
03058270	6.0	74.1
03300108	6.0	75.1
03287040	7.0	79.1
03381020	6.0	79.1

Table 7-13: "Township System"- State of Good Repair Candidates

Bridge Number	Condition Average	Sufficiency Rating
03019010	4.7	51.0
03155070	5.7	61.6
03123160	5.0	63.5
03359270	5.7	63.6
03358040	5.7	64.5
03070083	5.3	68.0
03130213	5.0	69.1
03382220	5.0	69.1
03080262	5.7	70.0
03151290	6.0	74.0

STATE OF GOOD REPAIR IMPLEMENTATION

It is recommended that SOGR preventative maintenance projects be integrated into planned roadways improvements to maximize the mobilization of county resources. Once the pavement program has been fully refined, it will highlight coordination "points" for integrating bridge maintenance and inspection efforts into programmed county roadway projects.

Addressing High Priority Investment Need

Nearly 40 percent of Beadle County bridges are considered high priority investment needs given their sufficiency rating is less than 60. Prior to allocating resources to addressing high priority bridges needs in Beadle County, it was the direction of the SAT to first explore the potential to reduce the number of bridge structures through a process of closure.

RECOMMENDED CANDIDATES FOR CLOSURE

As part of the closure analysis, an evaluation of existing deficient bridges was considered. Only bridges on the township system were considered for potential closure. Given the critical nature of current County system network, bridges on the county system were excluded for consideration for closure. Bridges deemed appropriate for closure should be removed from the high priority investment needs list. Once closure candidates have been removed from the list of high priority needs, earlier technical and qualitative evaluation metrics can be used to refine a final list of prioritized bridges needing replacement or major rehabilitation.

The average calculated detour length (miles) of bridges with a sufficiency rating less than 60 on the township system is 5.69 miles. Nearly half (44 percent) of survey respondents supported closing lower volume bridges if it meant more funding for more regionally significant bridges. A quarter of respondents were mixed regarding their support for closing certain bridges in Beadle County. Overall, nearly three-quarters of those surveyed felt inclined to at least consider options to reduce the inventory of county bridges through a system of closures.

Determination on the candidate list for recommended bridge closures was developed based on the following factors:

- Detour length and traffic volumes
- Existing residences, farmsteads and ranches; including a Google Earth assessment of the adjacent area
- Township road maintenance data provided by the Beadle County Auditor's office.
- Review current NBI structural data.

Table 7-14 highlights the sixteen bridges either currently closed or those which should be considered strong candidates for closure. As time passes, additional closures may be recommended based on changing conditions, however current inventory of either closed or candidates for closure in shown on Table 7-14. Beadle County will want to annually evaluate the condition of these bridges to determine unique structural conditions which may serve as a trigger for closure. However, no specific baseline triggers for closure are suggested given only planning level analysis was conducted as part of the MTP.

Table 7-14: Recommended Closure List

Bridge Number	Sufficiency Rating	MTP Rating	Current Status	Recommendation
3150238	19.5	n/a	Removed 2016	X
3170261	20.3	9	Open	Close
3159250	20.3	n/a	Closed	Remain Closed
3310256	21.3	n/a	Closed (programmed for Replacement)	Reconsider Replacement
3315260	23.3	n/a	Closed	Remain Closed
3327230	24.4	n/a	Removed 2016	X
3340275	25.6	n/a	Removed 2016	X
3132210	26.4	n/a	Closed	Remain Closed
3411220	27.4	2	Open	Close
3338100	31.8	n/a	Closed	Remain Closed
3190266	34.9	12	Open	Close
3021220	37.4	19	Open	Close
3010203	44	21	Open	Close
3110215	50.5	39	Open	Close
3130213	69.1	n/a	Open	Remain Open
3374100	83.1	n/a	Open (Culvert)	Remain Open

UPDATED TECHNICAL/QUALITATIVE RANKING OF HIGH PRIORITY INVESTMENT NEEDS

The initial list of the 50 most deficient bridges in Beadle County presented previously was reviewed in light of the evaluation of candidate bridges appropriate for preventative maintenance efforts and the expanded list of potential bridges recommended for closure.

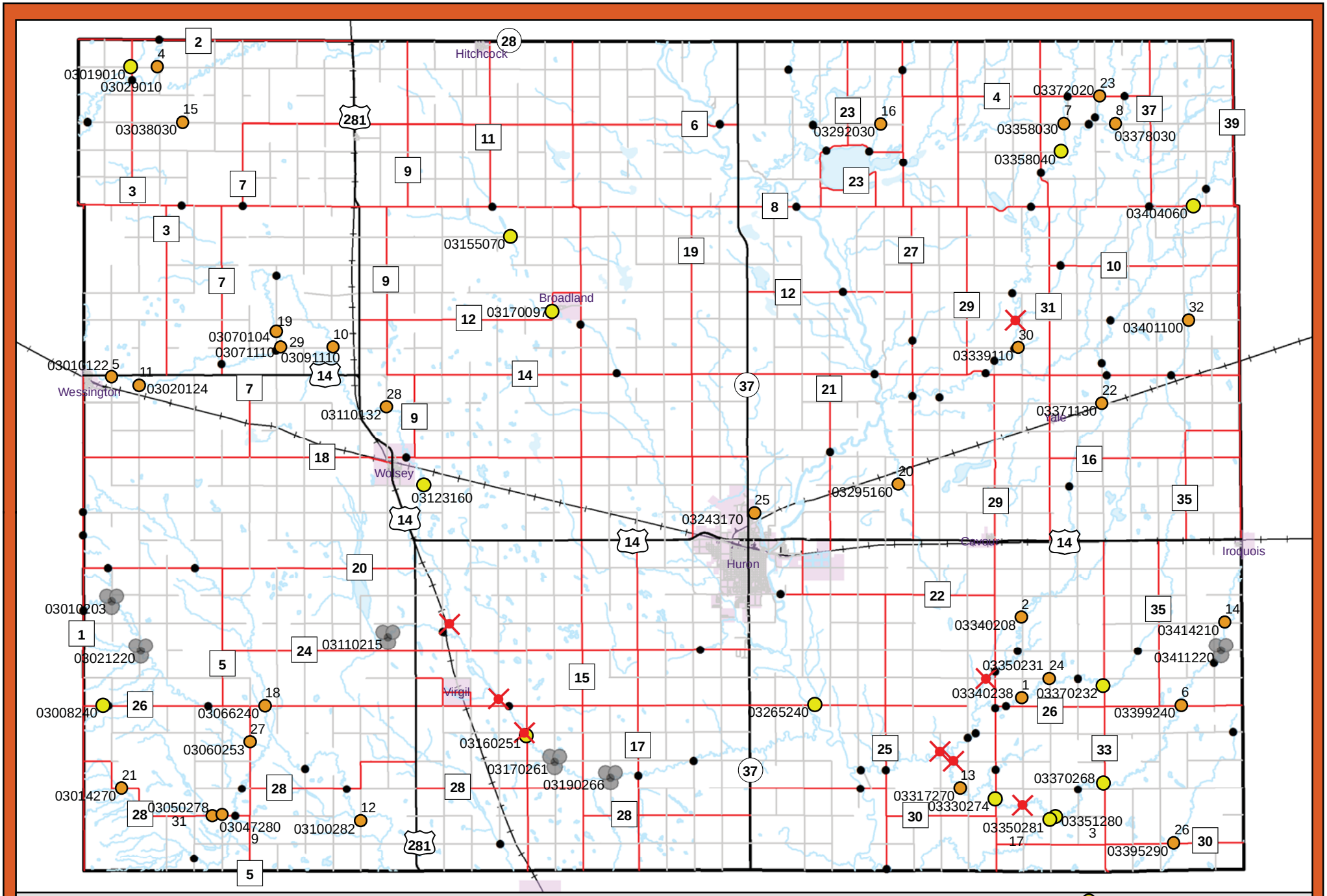
Bridges recommended for preventative maintenance through a program of SOGR or bridges recommended for closure have been removed from the list of the most deficient bridges in Beadle County. What remains is a list of 32 bridges with highest priority for replacement or major rehabilitation.

- Yellow highlighted **cells** note the top 10 BIG Scores for evaluated bridges.

Table 7-15 shows the remaining 32 bridges which would be considered the highest priorities for full replacement or major rehabilitation.

Table 7-15: Remaining High Priority Rehabilitation or Replacement Bridges

MTP Ranking (Revised)	Bridge Number	Initial County Priority	County Collector	Not Replacement Eligible (BIG Program)	Fracture Critical	B.I.G. Score	Condition Avg.	Estimated Replacement Cost
1	03340238	x				42.7	4.7	$305,000
2	03340208	x				34.1	5.3	$300,000
3	03351280	x				30.1	4.0	$284,000
4	03029010			x	x	45.1	5.3	$402,600
5	03010122				x	44.9	4.3	$347,000
6	03399240	x	x			37.7	5.3	$284,000
7	03358030				x	47.0	4.7	$347,000
8	03378030			x		39.0	5.0	$284,000
9	03047280					38.9	4.7	$300,000
10	03091110				x	41.0	4.3	$315,000
11	03020124	x				32.9	5.0	$300,000
12	03100282	x			x	34.0	5.3	$343,000
13	03317270				x	38.9	5.0	$347,000
14	03414210					41.2	4.7	$336,000
15	03038030					35.1	5.3	$284,000
16	03292030					38.9	5.3	$284,000
17	03350281			x		37.9	5.7	$284,000
18	03066240		x	x		34.8	6.0	$284,000
19	03070104					35.1	5.0	$402,600
20	03295160					33.7	5.0	$284,000
21	03014270	x		x		37.5	6.0	$284,000
22	03371130			x		27.9	5.3	$284,000
23	03372020	x				26.5	4.7	$310,000
24	03350231				x	20.7	5.0	$347,000
25	03243170					12.8	Culvert	$284,000
26	03395290		x			9.5	4.7	$435,600
27	03060253		x			8.6	5.0	$561,000
28	03110132			x		24.5	6.0	$567,600
29	03071110					10.8	4.0	$507,000
30	03339110					9.8	4.7	$284,000
31	03050278					15.3	4.7	$284,000
32	03401100					10.9	4.7	$284,000



Beadle County Master Transportation Plan
Figure 7-8: Summary of Recommended Bridge Priorities

Miles
0 2.5 5

Other County Bridges
County System Roads
Other Roads
City Limits
State of Good Repair List
Rehab/Replace
Recommended Closure
xx Bridge Rank
03xxxxxx Bridge ID Number
Currently Closed or Removed Bridges

Bridge Investment Program

BRIDGE INVESTMENT CONSIDERATIONS

Currently no funds are dedicated to bridge improvements in Beadle County. The *Financial Plan* accounts for $900,000 in BIG funded bridges every five years, or $1,800,000 over the first 10 years of the plan (2017-2026). This is 80 percent SDDOT funds; 20 percent Beadle County.

In order to match the anticipated revenue from the SDDOT BIG program, Beadle County will need to account for a minimum of $180,000 every five years, or approximately $35,000 annually. Table 7-16 shows the current total inventory split between County and Township bridges, and shows the relative investment need for each system.

Table 7-16: Beadle County Bridge System Split & Investment Needs Summary

System	Percent of Total Inventory	High Need	Medium	Low
County	50%	10%	17%	22%
Township	50%	28%	7%	16%
	100%	**38%**	**24%**	**38%**

Given that the majority of traffic in the county is carried on township roads, it is recommended that future funding splits in new revenue generated and dedicated to bridges in Beadle County be split more heavily towards county system bridges. Table 7-17 shows that 60 percent of future revenue would go to county bridges and 40 percent to township bridges.

Table 7-17: Beadle County Bridge System Split & Investment Needs Summary

System	Target Investment Percentage
County System	60%
Township System	40%

Since nearly 60 percent of bridges in Beadle County are listed as either high or medium investment priorities, it is suggested that 60 percent of future new revenue generated for the Beadle County bridge system be directed at a program of rehabilitation or replacement. This would account for investments in full replacement or significant rehabilitation of bridges with a sufficiency rating less than 60; and major preservation for bridges with a sufficiency rating between 60 and 79.

Table 7-18: Bridge Investment Type System Split

Investment Type	Target Percentage
Rehabilitation/Replacement	60%
Preservation/State of Good Repair	40%

After a review of bridge system needs developed as part of the MTP, it was determined that based on projected SDDOT BIG revenue, Beadle County should set a goal of $150,000 dedicated to bridge system needs. This would provide for at least $100,000 a year in new revenue for bridge investments beyond the minimum required SDDOT BIG program match.

New Beadle County bridge revenue would be used to match projected SDDOT BIG funds, and also provide additional local revenue to cost constrain additional bridge system investments beyond those funded through the BIG program.

Based on earlier assumptions for splits between rehabilitation/repair, preservation and SOGR investments, Table 7-19 shows the relative splits in future revenue between the system and actual investment type over a five-year projection with a future revenue of $1,470,000.

Table 7-19: Bridge Investment Type System Split – Five Year Assumption

System Splits by Investment Type – Five Year Totals	
County	**Investment Level**
Rehabilitation/Replacement	$529,200
Preservation/State of Good Repair	$352,800
Total	**$882,000**
Township	**Investment Level**
Rehabilitation/Replacement	$352,800
Preservation/State of Good Repair	$235,200
Total	**$588,000**

Pavement Management

PAVEMENT INVESTMENT CONSIDERATIONS

The investment approach for pavement management in Beadle County will be to reduce chip/crack sealing to a seven year cycle from a five year cycle. This reduces the amount of

treated mileage from 46 miles a year to 31 miles annually. This will free up approximately $300,000 for other pavement and bridge needs. Each of the five funding scenarios assumes this reduction in chip/crack sealing. All five funding scenarios assume a reduction in the chip/crack seal program to a seven year cycle. Investment in pavements (including gravel) are slightly above 90 percent of the total system investment through each scenario, with the balance dedicated to bridges.

PAVEMENT MANAGEMENT PLAN - PROGRAMMING RECOMMENDATIONS

Beadle County has been working to maintain over 200 miles of county roads with a tentative maintenance plan. Recently this plan has focused on paving County Highway 15 and chip seal projects around the county. There are, of course, other maintenance activities such as patching, gravel infill and blading completed.

The Financial Plan developed for the MTP supports approximately $1,300,000 in pavement related investments over the life of the plan. These numbers were generally the target for the pavement plan.

This amount of road surface maintenance seems to be sustainable and should be planned for going forward. Patching and sealing projects should continue as needed to maintain roads that are in fair to good conditions (PASER rating 5 – 8).

The focus for recommendations is on pavement overlays and chip seals. These preventative maintenance projects do the most to address the problems of deteriorating roads and an overlay has the ability to turn a PASER rated 5 road into a 9, for example. Paving projects address all surface related issues with the road and do the most to improve the overall county highway system. Below in table 7-6 is the priority paving list. It is a 10-year (2017-2026) plan for all pavement overlay and chip seal projects throughout the county.

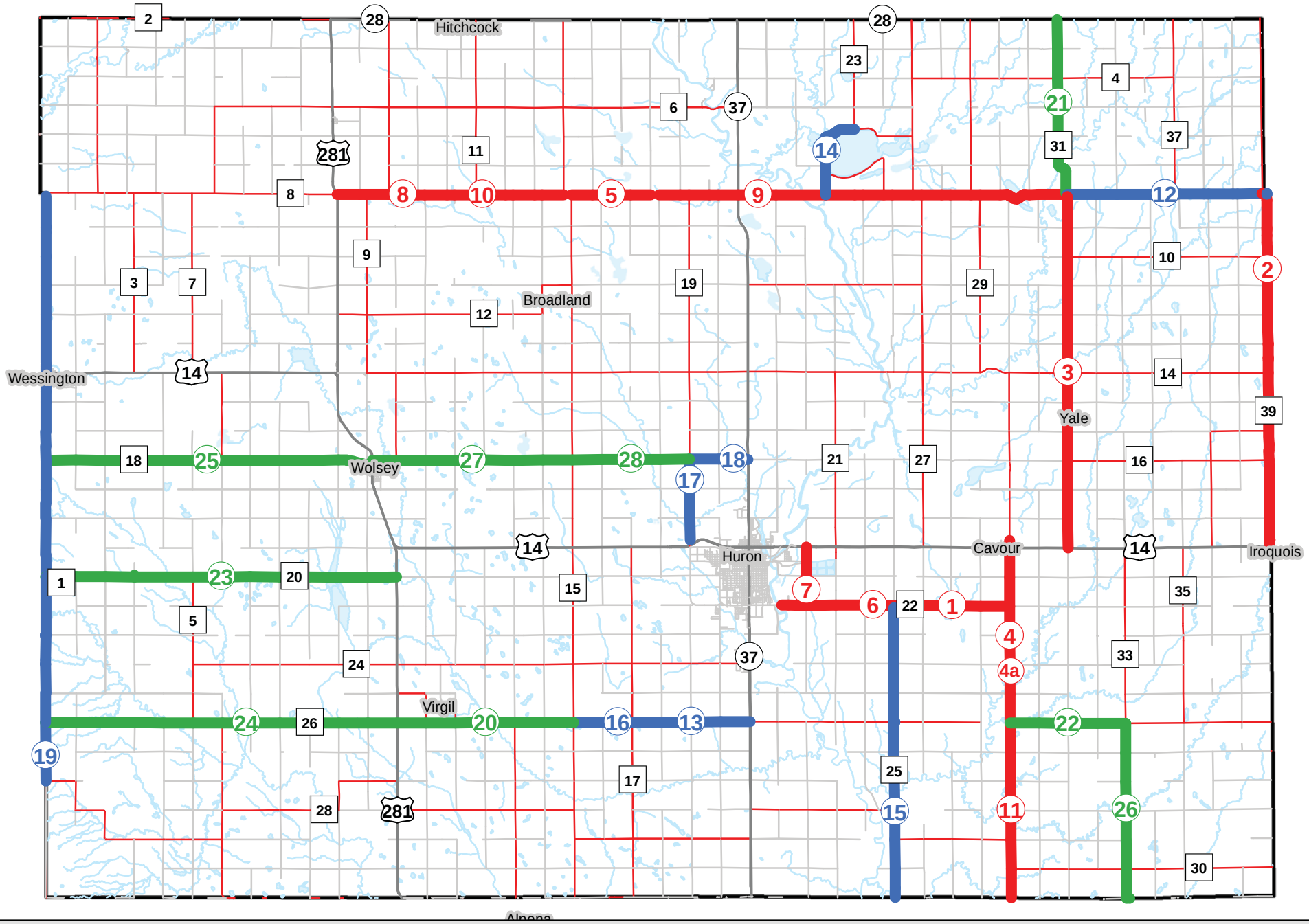
The pavement projects list was developed and prioritized based on a number of factors including: the current PASER rating, whether the corridor was regionally significant, the overall traffic volume, needed connectivity, adjacent pavement projects, improvement types, costs and others. Ultimately almost every mile of paved county road is included in the ten-year plan and there are projects included in every quadrant of Beadle County.

Working with Beadle County and using the best available data, table 7-5 outlines the PMP focus efforts on maintaining the best county highway system possible. The priority paving plan focuses on the next ten years, 2017 through 2026. The PASER rating values were collected in the Fall of 2015. The values of the road conditions will change over time and focusing on a ten year paving plan allows us to address known needs. Beyond the year 2026 it may be necessary to re-score the road conditions and reevaluate the paving priorities.

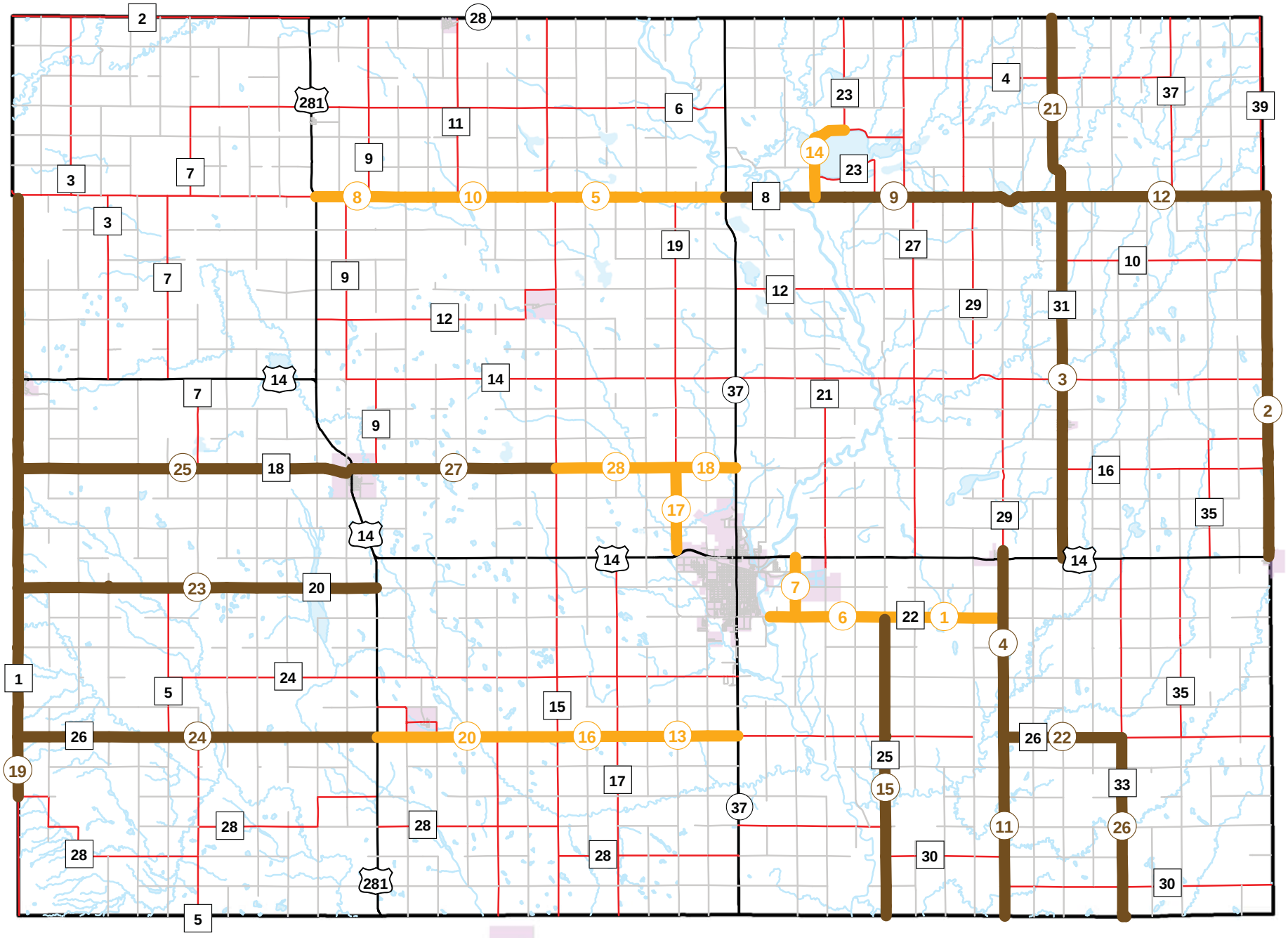
The priority paving plan in table 7-20 lists projects for each year of the plans with total lengths ranging from 8 miles to 46 miles. This list is also presented as maps in Figures 7-9 and 7-10.

Table 7-20: Priority Paving List (10 Year Plan)

Priority Paving List (10 Year Plan)								
Number	Year	County Highway	Limits		Average PASER Rating	Type	Length (Miles)	Estimated Cost (2016 Dollars)
			Begin	End				
1	2017	22	Co Rd 25	Co Rd 29	6.8	Overlay	4.0	$720,000
2		39	Co Rd 8	US 14	6.5	Chip Seal	12.0	$264,000
3		31	Co Rd 8	US 14	6.3	Rut Fill	12.0	$192,000
4		29	Cavour	Co Rd 26	6.1	Rut Fill	6.4	$102,400
						Year Total	**34.4**	**$1,278,400**
4a	2018	29	Cavour	Co Rd 26	6.1	Chip Seal	6.4	$140,800
5		8	Co Rd 15	SD 37	6.0	Overlay*	5.3	$954,000
6		22	US 14	Co Rd 22	7.0	Chip Seal	2.0	$44,000
7		22	James River	Co Rd 25	6.3	Chip Seal	4.0	$88,000
						Year Total	**17.7**	**$1,226,800**
8	2019	8	US 281	389th Ave	6.5	Overlay	3.0	$540,000
9		8	SD 37	Co Rd 31	7.0	Chip Seal	11.3	$248,600
						Year Total	**14.3**	**$788,600**
10	2020	8	389th Ave	Co Rd 15	6.4	Overlay	5.0	$900,000
11		29	Co Rd 26	County Line	6.0	Chip Seal	6.0	$132,000
						Year Total	**11.0**	**$1,032,000**
12	2021	8	Co Rd 31	County Line	7.0	Chip Seal	6.7	$147,400
13		26	Co Rd 17	SD 37	6.0	Overlay	3.1	$558,000
14		23	Co Rd 8	404th Ave	5.1	Overlay	3.1	$558,000
						Year Total	**12.9**	**$1,263,400**
15	2022	25	Co Rd 22	County Line	6.0	Chip Seal	10.0	$220,000
16		26	Co Rd 15	SD 37	7.0	Overlay	3.0	$540,000
17		19	Co Rd 18	Mustang Way	NA	Structural Overlay	2.8	$700,000
						Year Total	**15.8**	**$1,460,000**
18	2023	18	Co Rd 19	SD 37	NA	Structural Overlay	2.0	$500,000
19		1	Co Rd 8	Co Rd 28	6.9	Chip Seal	20.0	$440,000
						Year Total	**22.0**	**$940,000**
20	2024	26	US 281	Co Rd 15	7.0	Overlay	6.0	$1,080,000
21		31	Co Rd 1	US 281	5.0	Chip Seal	6.0	$132,000
						Year Total	**12.0**	**$1,212,000**
22	2025	26	Co Rd 29	Co Rd 33	6.8	Chip Seal	4.0	$88,000
23		20	Co Rd 1	US 281	6.6	Chip Seal	12.0	$264,000
24		26	Co Rd 1	US 281	7.0	Chip Seal	12.0	$264,000
25		18	Co Rd 1	US 14	7.0	Chip Seal	11.0	$242,000
26		33	Co Rd 26	County Line	6.0	Chip Seal	7.0	$154,000
						Year Total	**46.0**	**$1,012,000**
27	2026	18	US 14	Co Rd 15	NA	Chip Seal	7.0	$154,000
28		18	Co Rd 15	Co Rd 19	NA	Structural Overlay	4.0	$1,000,000
						Year Total	11.0	$1,154,000
*except the bridge						**10 Year Total**	**197.1**	**$11,367,200**



Beadle County Master Transportation Plan
Figure 7-9: 10-Year Pavement Plan



Beadle County Master Transportation Plan
Figure 7-10: 10-Year Pavement Plan by Type