



# Infrastructure Needs: North Dakota's County, Township, & Tribal Roads & Bridges 2017-2036

November 2, 2017  
Western Dakota Energy Association

Upper Great Plains Transportation Institute  
North Dakota State University

# Road Infrastructure Studies

- 2010 study: UGPTI estimated road investment needs for the 2011 session
  - 21,500 new wells & increased ag. production
- 2012 study: updated investment needs
  - 46,000 new wells, ag. production, & initial bridge study
- 2014 study: more comprehensive data
  - Higher roadway costs, ag. production, & 60,000 new wells
- 2016 study: further data improvements
  - Oil development changes – scenario analysis

# Study Horizon

- 20 year time frame
- Traffic and investment needs estimated annually
- Results summarized by:
  - Biennium
  - Region
- Detailed results (by)
  - County
  - Jurisdiction

# Key Factors in Road Study (1)

<b>Oil and Gas</b>	<b>Agriculture</b>
Number of wells	Cultivated acres
Well locations	Crop mix
Production rate/curve	Yield
Inputs/outputs	Crop densities
Gathering pipeline	Elevator network

# Key Factors in Road Study (2)

<b>Traffic</b>	<b>Costs &amp; Practices</b>
Truck trips	Surface type
Truck axles/weights	Gravel Cost
ESALs	Overlays
Avg. Daily Traffic	Maintenace

# Data Sources (1)

<b>Oil production</b>	ND Oil & Gas Division
<b>Pipeline/transload network</b>	ND Pipeline Authority
<b>Base road network</b>	NDDOT GIS Hub
<b>Crop production</b>	USDA-NASS
<b>Elevator demand</b>	ND PSC

## Data Sources (2)

<b>Traffic</b>	Vehicle counts and classifications
	Surveys/elevator reports
<b>Gravel Costs</b>	Surveys

# Uncertainty in Oil Development

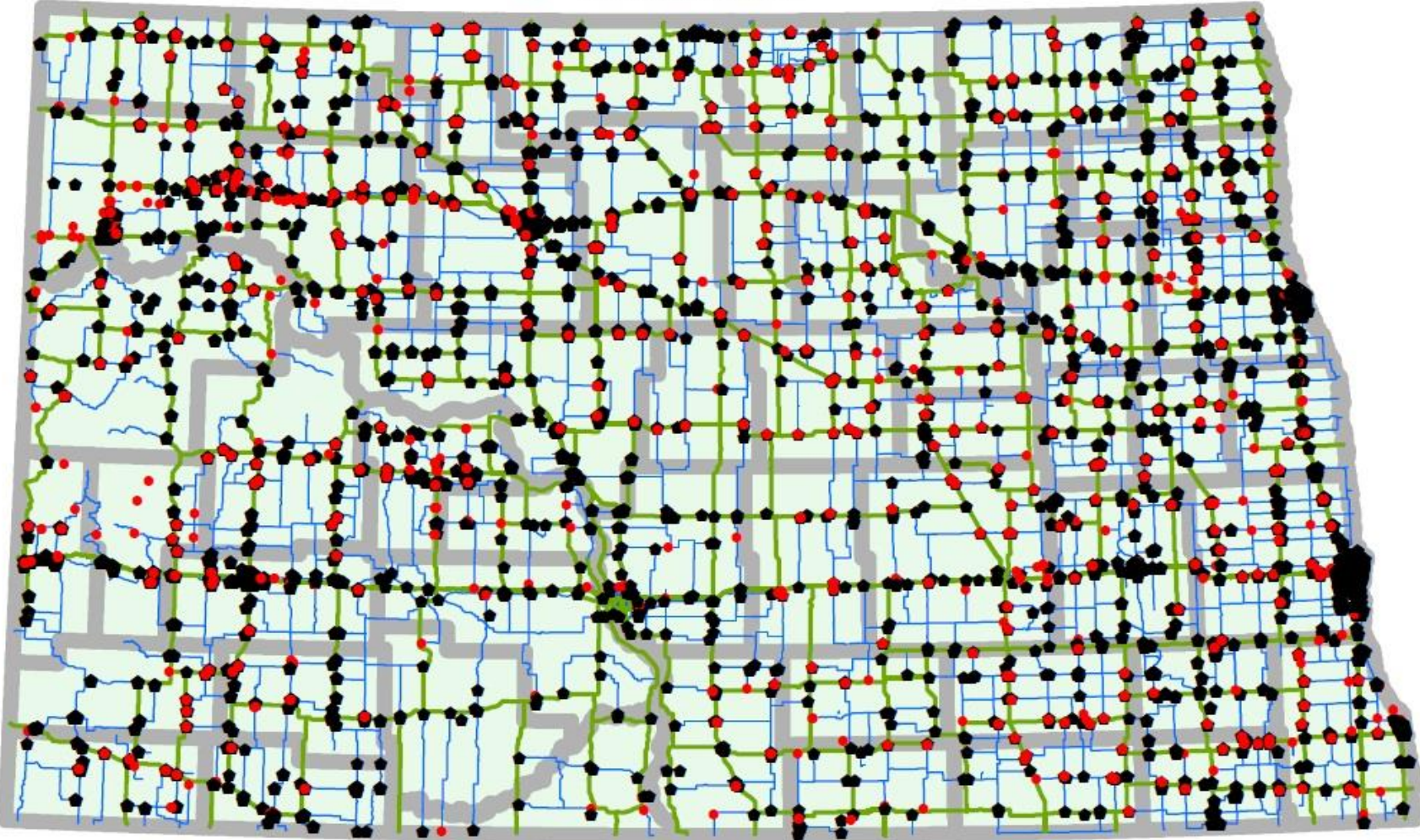
- 3 Scenarios
  - 30 Rigs
  - 60 Rigs
  - 90 Rigs



# County Traffic Counts

- ◆ Volume Only
- Truck Classification

2015



# Modeled Movements

- Agriculture
  - Wheat (including durum), corn, soybeans, barley, canola, sunflowers, sugar beets, potatoes, & beans
  - Fertilizer movements
  - Transshipments
- Oil Exploration/Production
  - Freshwater, sand, equipment, supplies, pipe, outbound saltwater, & outbound crude oil

# Unpaved Road Analysis

- Unpaved road miles grouped by traffic volume categories
- “Normal” practices established for each county based upon traffic observations and reported maintenance practices
- For traffic volumes above normal levels responses for oil impacted roads used to establish upper categories of maintenance

# Gravel Road Needs

Period	Statewide	Oil Patch	Rest of State
2017-18	\$ 644.65	\$ 293.04	\$ 351.61
2019-20	\$ 606.97	\$ 254.84	\$ 352.14
2021-22	\$ 659.80	\$ 306.77	\$ 353.03
2023-24	\$ 660.86	\$ 307.47	\$ 353.40
2025-26	\$ 602.62	\$ 248.61	\$ 354.01
2027-36	\$ 2,915.81	\$ 1,159.72	\$ 1,756.09
2017-36	\$ 6,090.72	\$ 2,570.44	\$ 3,520.27

# Bridge Analysis

- National Bridge Inventory (NBI): county and local
- Open bridges (other than culverts): 2,556
- Not considered: recently replaced or minimum maintenance roads
- Improvements considered: replacement or rehabilitation
- Maintenance

# Data Collection – Bridges

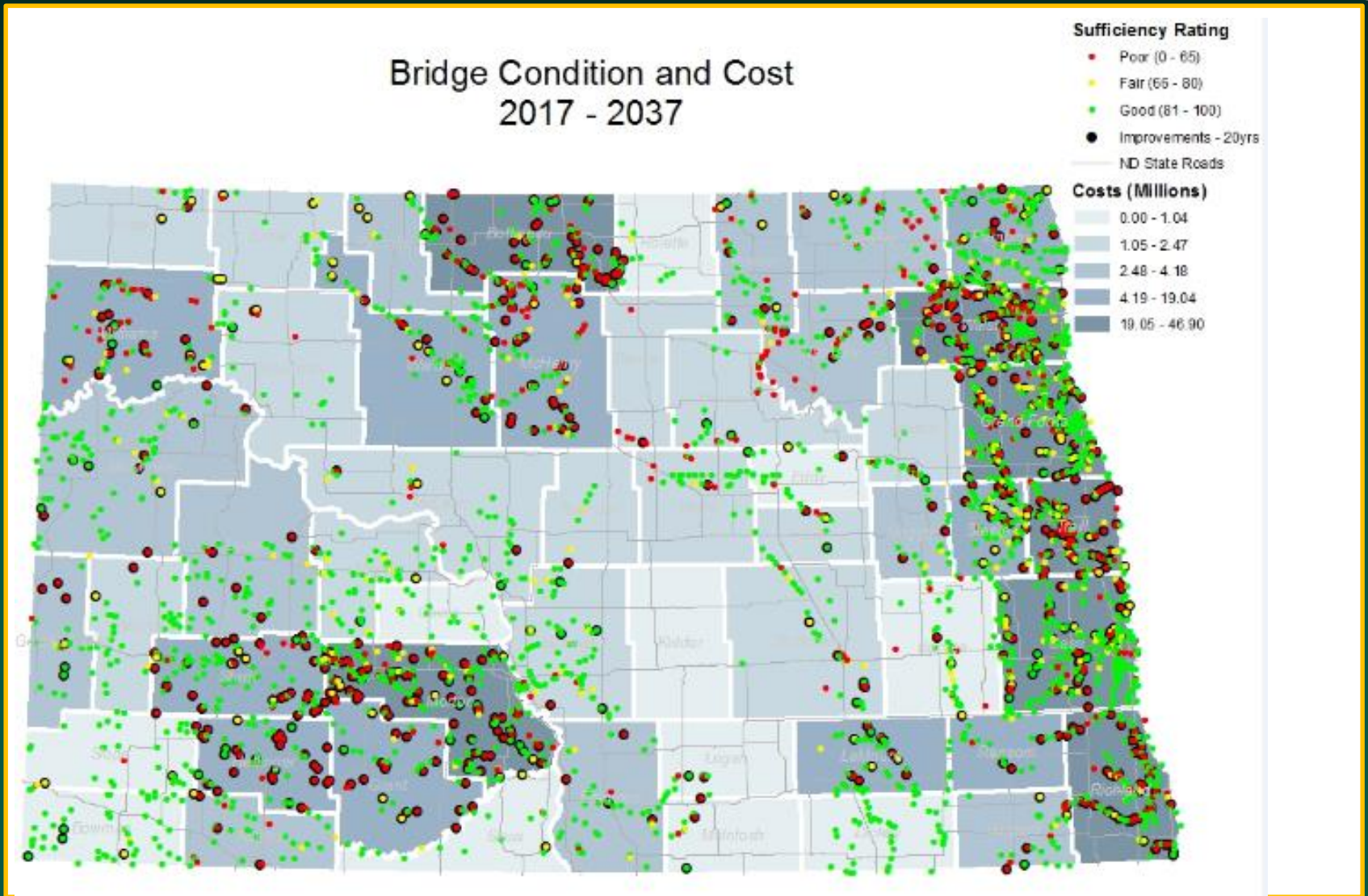
- Used 2015 NBI bridge inventory & GIS data
- 2,423 open county, township and local bridges
- Removed 406 bridges
  - Bridges on trails – GIS Hub
  - Bridges on unimproved roads – GIS Hub
  - Bridges on graded/drainage – GIS Hub
  - Bridges on roads with grass on road – Google Earth
  - Recently closed bridges – county memos to LG
  - Bridges recently replaced with culverts

# Bridge Funding Needs

Period	Statewide	Oil Patch	Rest of State
2017-18	\$87.0	\$20	\$67
2019-20	\$87.0	\$21	\$66
2021-22	\$87.1	\$20	\$67
2023-24	\$87.0	\$21	\$66
2025-26	\$90.0	\$23	\$67
2027-36	\$11.3	\$3	\$8
2017-36	\$449.4	\$108	\$341



# Grand Totals by County – All Improvements





# Paved Road Analysis

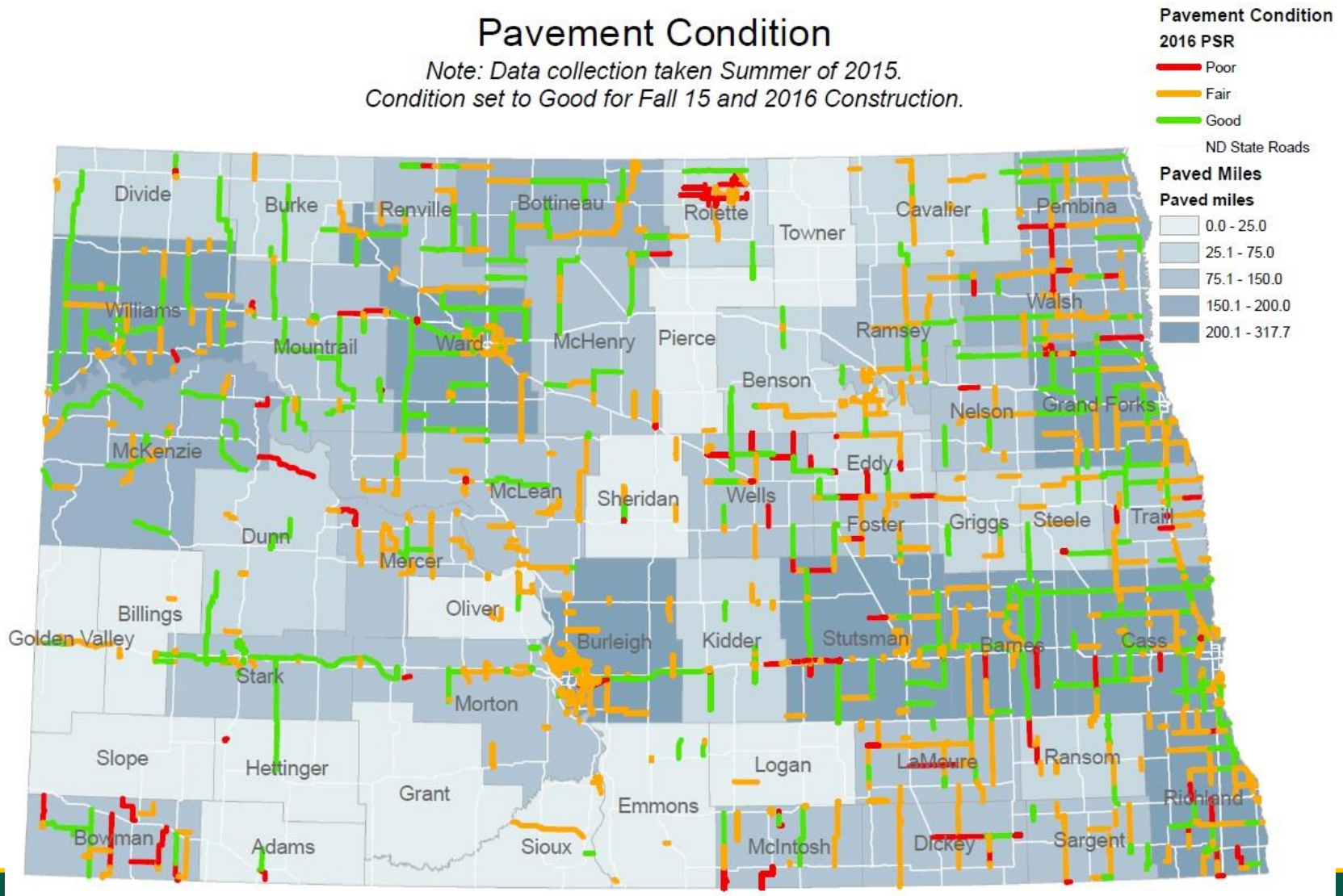
- Paved road condition data collected by NDDOT
- Traffic forecast estimates were used to simulate deterioration in pavement condition
- AASHTO-93 model used to model improvements

# Table of Paved Roads Results – 60 Rig

Period	Statewide	Oil Patch	Rest of State
2017-18	\$296.1	\$85.6	\$210.5
2019-20	\$299.3	\$96.8	\$202.5
2021-22	\$278.1	\$121.7	\$156.4
2023-24	\$236.8	\$100.5	\$136.3
2025-26	\$233.4	\$75.9	\$157.5
2027-36	\$920.8	\$390.8	\$530.1
2017-36	\$2,264.5	\$871.1	\$1,393.4

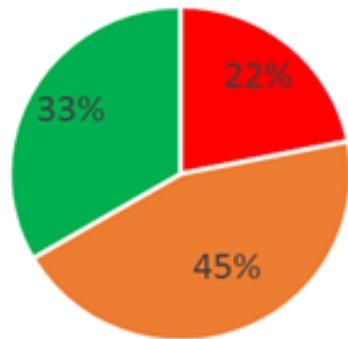
# Pavement Condition

Note: Data collection taken Summer of 2015.  
Condition set to Good for Fall 15 and 2016 Construction.



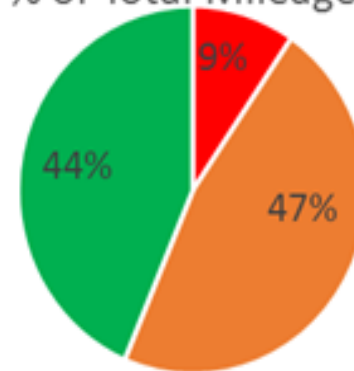
# Average Pavement Condition

2013 Pavement Condition  
% of Total Mileage



■ Poor ■ Fair ■ Good

2016 Pavement  
Condition  
% of Total Mileage



■ Poor ■ Fair ■ Good

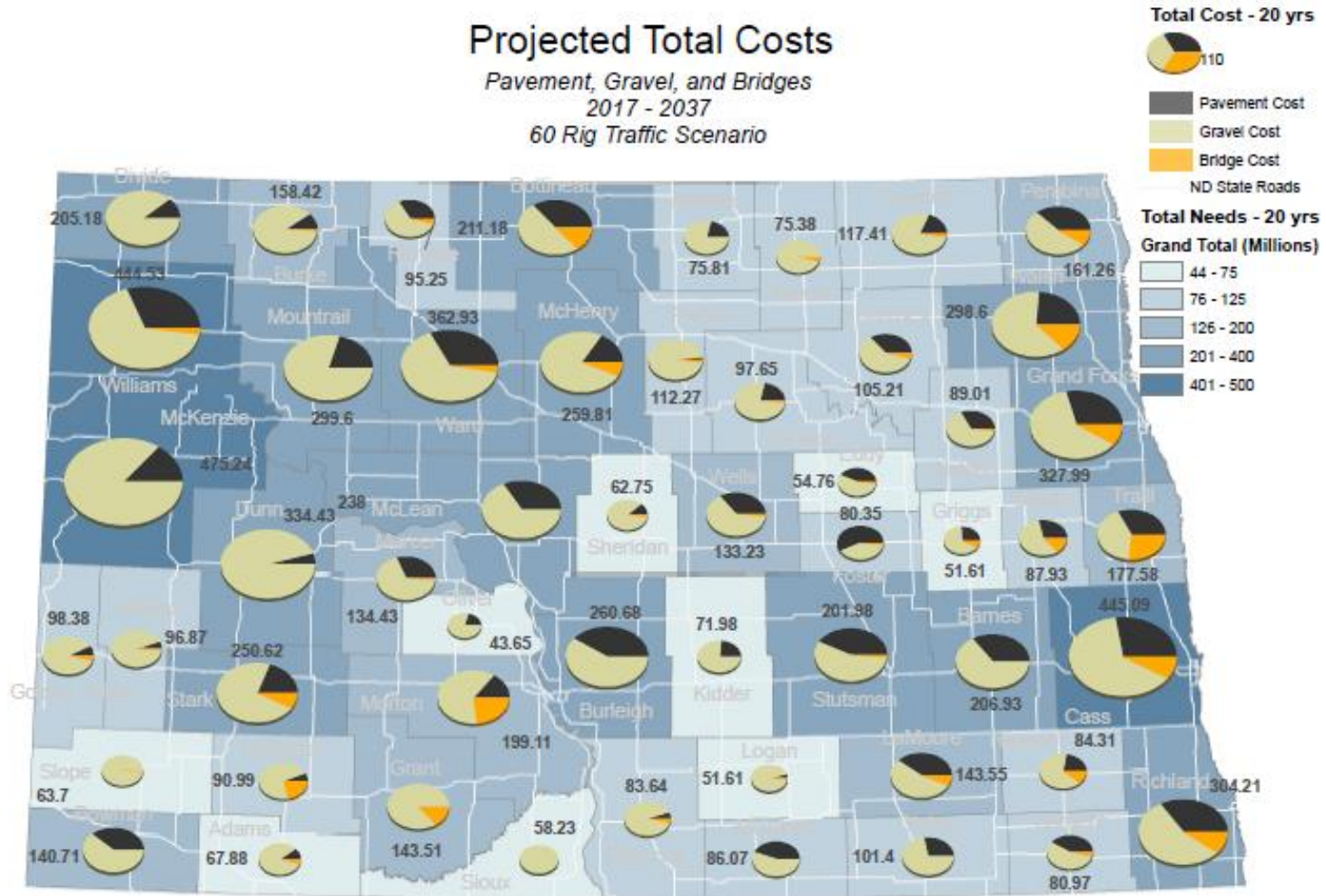
# Total Funding Needs

Period	Statewide	Oil Patch	Rest of State
2017-18	\$1,028.7	\$399.6	\$629.1
2019-20	\$994.2	\$372.6	\$621.6
2021-22	\$1,025.9	\$449.5	\$576.4
2023-24	\$985.7	\$429.0	\$556.7
2025-26	\$924.0	\$345.5	\$578.5
2027-36	\$3,848.7	\$1,553.5	\$2,295.2
2017-36	\$8,804.2	\$3,549.5	\$5,254.7

# Grand Totals by County – All Improvements

## Projected Total Costs

Pavement, Gravel, and Bridges  
2017 - 2037  
60 Rig Traffic Scenario



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# Questions?

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