UGPTI 2019-2021 - Road Needs Assessment:

NDDOT State Needs Study

and

Local Roads & Bridge Needs Study

WDEA Roundtable

December 18, 2019

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Introductory Remarks

- This study is again an improvement over the past studies.
  - Utilization of Legislative Support of Asset Management
    - GRIT – Geographic Roadway Information Tool
    - Better pavement history Data
  - Improved Unpaved Road Survey Instrument
    - Built with a user group
    - Provided Webinar based Training – Recorded
  - Updated Travel Demand Modeling Software

Upper Great Plains Transportation Institute

- Infrastructure Needs Studies History
  - 2007: NDDOT
  - 2009: NDDOT Level of Service Study
  - **2010:** ND Association of Oil and Gas Producing Counties/ND Commerce Department – Agriculture Producer Groups
  - 2011-13: North Dakota Legislature
  - 2013-15: North Dakota Legislature
  - 2013-15: NDDOT Cities
  - 2015-16: North Dakota Legislature
  - 2019-20: NDDOT Statewide Needs
  - 2019-20: North Dakota Legislature

Trends Impacting Roadways in ND

- Oil production
- Changing crop mix
- Highway funding levels and sources
- Population changes
- Construction Inflation and aggregate resource depletion
- Changing road maintenance practices

North Dakota's Local Road Network:

97,600 miles

6,600 miles are paved

59,000 miles are gravel surfaced

32,000 miles are unsurfaced

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2019 Study Horizon

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

2019 Study Priorities

- Emphasis on uniformity of gravel costing submissions (revised survey instrument)
- Additional improvements to county pavement condition data
- Continued improvement to traffic data and forecasting
- Updated costing and modeling concepts
- Capture more accurate data history from counties – asset inventory too
- Continued emphasis on maintaining system – not providing for major upgrades

Data Collected for 2019-20 Study

- 1,000+ vehicle counts and classifications by NDDOT & UGPTI (students and consultants)
- 6000 miles of pavement video image and ride data via 3 smartphone applications
- Gravel costing surveys for 53 counties
- NBIS data on about 2,300 local bridges

Created for the 2019-20 Study

- A statewide TransCAD truck flow model
  - Updated Oil & Gas Data from ND Mineral Resources
    - Inbound fresh water
    - Outbound crude oil
    - Outbound produced water
  - Updated Agricultural Forecasts
    - Yield and crop mix
- An AASHTO-93 Pavement Deterioration Model to predict pavement needs and remaining life

2019-20: Gravel Cost and Practices Surveys

- Survey of both counties and townships
  - 2019-20 study
    - County survey advisory group
    - Surveys went out mid-October
    - Webinar held to provide instructions and field questions
    - 53 Counties and about 1600 organized TWPs
  - Responses reflective of actual improvement and maintenance activities is critical
- Cost vary by county
  - Cost of materials and haul
  - Overlay frequencies
  - Dust and stabilization practices

Responses Received as of 12/17

Gravel Cost and Practices Surveys

- Aggregate (gravel) cost at pit
- Placement cost
- Transportation cost from pit to roads
- Dust suppressant usage/cost
- Stabilization usage/cost
- Intermediate practices
  - Double chip seal/armor coat

– Note: Gravel Maintenance Costs
  - Vary a great deal

2019 COUNTY ROAD NEEDS STUDY SURVEY

Please return this survey in the enclosed envelope by **November 20, 2019.** Please direct any questions to Alan Dybing at 701.231.5988 or countytwp@ugpti.org.

County: _____

Contact: _____ _____ _____
Name Phone Email

Preparer: _____ Date Prepared: _____

Aggregate Description

To provide information on the type and quality of aggregate used in your county, please check all boxes that apply. For example, if your county uses crushed, specification base gravel – select gravel, crushed material and specifications.

- Gravel ☐
- Scoria ☐
- Pit Run ☐
- Screened ☐
- Crushed Material ☐
- Specifications ☐
- Tested ☐
- Other _____ ☐

Placement Practices

When aggregate overlays are placed in your county, please select the typical practice that is used to apply an aggregate overlay.

- Truck Drop and Blade ☐
- Windrow/Equalize ☐
- Water/Rolling/Compaction ☐
- Other _____ ☐

Operational Tasks

In this section, please provide a percentage of tasks that are done using county resources versus the percentage of work done by a contractor. For example, if your county owns the pit and does all of the crushing using county labor, 100% would be entered into the first column, and 0% in the second column.

	Performed by:	
Task	**County**	**Contractor**
Crushing		
Hauling		
Placement		
Blading		
Dust Control		
Base Stabilization		

Gravel Road Costs

Please report costs for gravel for county roads in the table below. The table asks for unit costs for graveling, maintaining, and operating gravel roads. If you are quoting contractor prices, please circle "yes" in the right hand column.

Gravel/Scoria Cost			
Average Gravel/Scoria Cost (crushing & royalties at the pit)		❑ Per cu. yard ❑ Per Ton	Is this Contractor Price? (yes/no)
Trucking Cost from Gravel Origin		❑ Per loaded mile ❑ Per cu. yard ❑ Per Ton	Is this Contractor Price? (yes/no)
Average trucking distance for aggregate		❑ Miles one-way ❑ Miles roundtrip	
Truck Payload		❑ Cu. Yards ❑ Tons	
Placement Costs		Per Mile	Is this Contractor Price? (yes/no)
Blading Cost		Annual cost per mile	Is this Contractor Price? (yes/no)
Dust Suppressant Costs		Per mile	Is this Contractor Price? (yes/no)
Base Stabilization Cost		Per mile	Is this Contractor Price? (yes/no)

EXAMPLE ENTER ACTUAL BELOW	Traffic Levels		
	Low	Medium	High
Daily Traffic (Total AADT)	>50	50-150	150-350
Average Regraveling Thickness	3 in	4 in	5 in
Blading Frequency (# per year)	8	12	16
Regraveling Frequency (years between regraveling)	7	5	3
Dust Suppressant (yes/no)	no	no	Yes
Base Stabilization (yes/no)	no	no	Yes

County Entry	Traffic Levels		
	Low	Medium	High
Daily Traffic (Total AADT)			
Average Regraveling Thickness			
Blading Frequency (# per month)			
Regraveling Frequency (years between regraveling)			
Dust Suppressant (yes/no)			
Base Stabilization (yes/no)			

If you answered yes for Dust Suppressant – which type do you use?

_____

If you answered yes for Base Stabilization – which type do you use?

_____

Gravel Road Condition

This section asks for information regarding gravel road conditions and is broken into two separate categories: Federal Aid, and Non-Federal Aid. Please provide a rough estimate of the percentage of unpaved roads by condition for these two categories.

Condition	% Federal Aid Roads (CMC)	% Non-Federal Aid Roads (non-CMC)
Very Good		
Good		
Fair		
Poor		
Total	**100%**	**100%**

Gravel Materials Specifications

Please attach a sample specification and sample gradation, or state materials specification number. If materials used on CMC routes differ from non-CMC routes, please provide sample specifications and gradation by system type, if available.

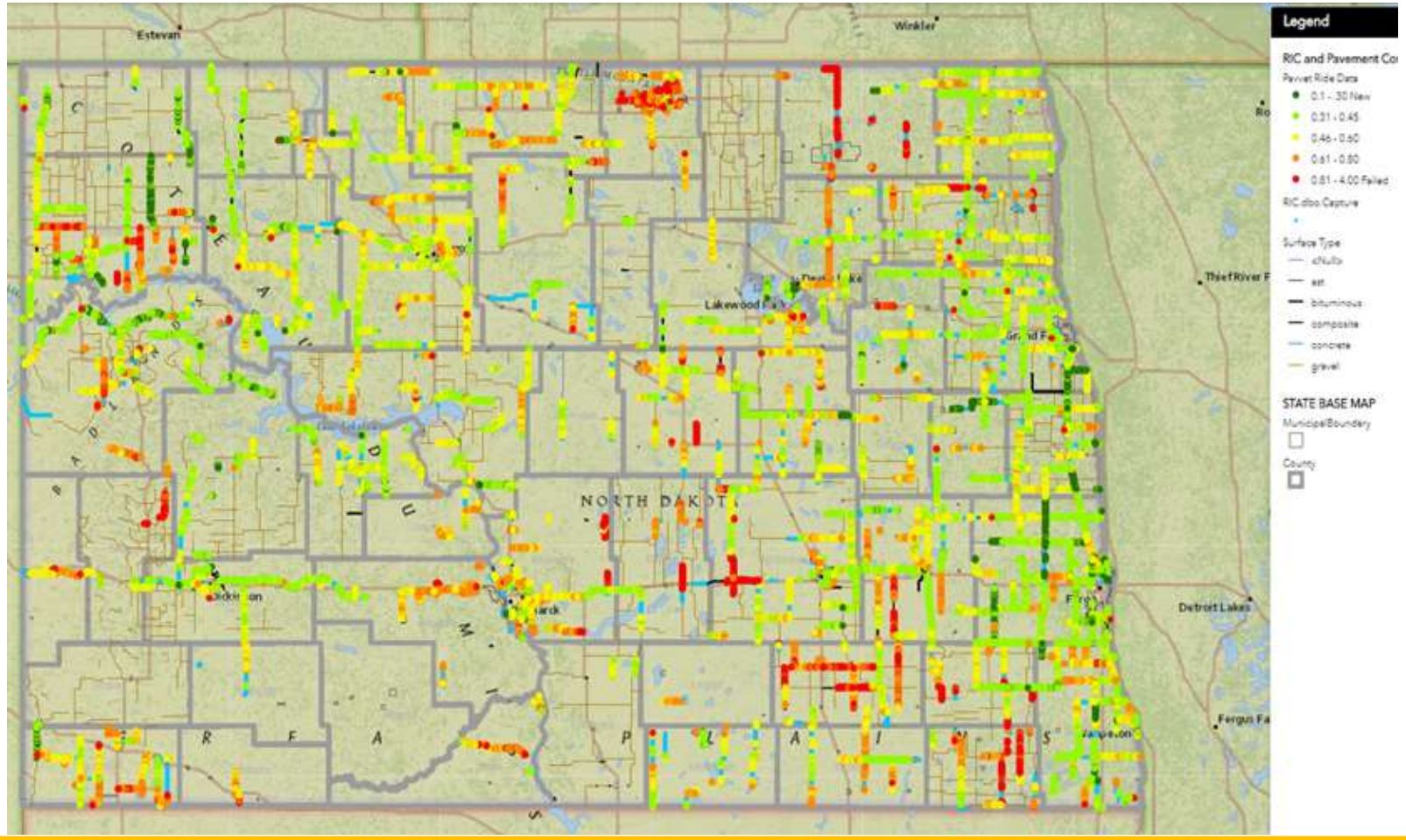
Comments or Suggestions (please attach additional sheets if needed):

2019-20 Pavement Data Collection

- Condition data collection
  - Collected data with NDSU Students using smartphones
  - Approx. 6,000 miles of paved county roads
  - Ride data collected with Pavvet, RoadBump, and Roadroid
  - Video images collected with RIC

- Scoring and reporting of data
  - NDSU students will do some manual scoring for validation
  - NDDOT and MnRoad Sections will be used for calibration
  - Data will be referenced to roadways to provide on-line mapping
  - All data will be integrated into AASHTO 93 model

Pavement Condition Status - 2019

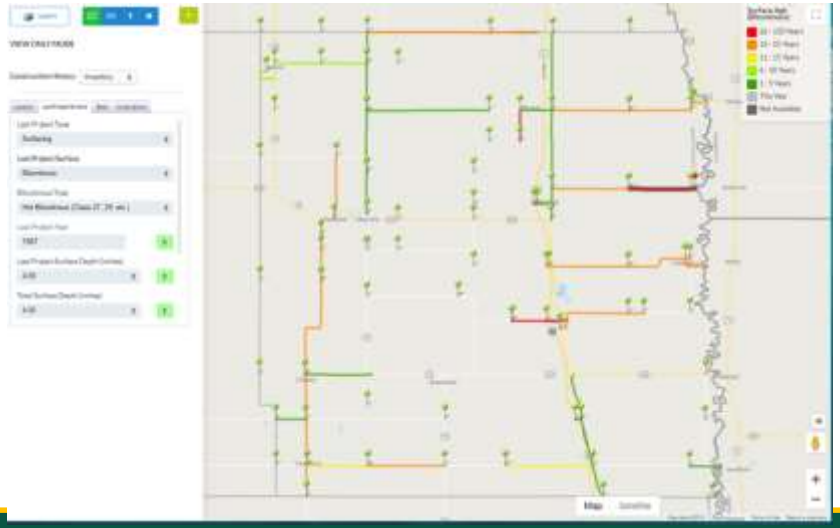


2019 Traffic Data Collection

- Data collection
  - 1/3 collected by NDSU students and 1/3 by contractor
  - NDDOT normal count schedule for remaining 1/3.
  - 450 counts added to the NDDOT current and past counts.
  - Most counts included truck classification
- Traffic data processing
  - Use ATR's from around state to factor the data
  - Use classification data to factor the volume counts
  - Input all traffic data into travel demand model
- Traffic data reporting
  - Specific count location data will be made available with an interactive map on the Web.

2019-20 Other Data

- Geographic Roadway Inventory Tool
  - Purpose: Provide Counties easy on-line tool to enter data
  - Pavement type and pavement age
  - Strength data – pavement and base thickness and type
    - Collected in 2014
  - Shoulder width information etc...
  - Previous FWD will be used to supplement for sub-grade strength



County Jurisdictional Data

- Surveyed 53 counties through NDLTAP in 2013, continued to update CMC routes as changes were made
- Updated NDDOT GIS Data
- Will verify in Tribal areas
- Please Review in GRIT
- Provided layer in GRIT for County updates
  - Most Counties have not updated this layer yet
  - Paved County roads have been updated
- Essential for unpaved/gravel cost projection splits between county and townships

Data Collection – Bridges

- Will use current 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/drained – GIS Hub
  - Bridges on roads with grass on road – Google Earth
  - Recently closed bridges – county memos to LG
  - Bridges recently replaced with culverts

Data Analysis Steps & Review

Oil Analysis

- Each of the major truck traffic categories were analyzed due to potential differences in travel behavior and trip length distribution.
- A total of 9 sub models were estimated for the overall oil sub model.
- Individual estimates were aggregated to the segment level for overall traffic estimates.
- Rig productivity, input volumes and outbound mode was updated following meeting with Oil & Gas Division and Pipeline Authority

Agricultural Analysis

- A total of 9 commodities were modeled. In addition, fertilizer and transshipment movements were modeled individually for a total of 11 ag sub models.
- Individual models were aggregated to the segment level to develop estimates of agricultural traffic estimates statewide.

Unpaved Road Analysis

- Grouped unpaved road miles by traffic volume categories.
- Established "normal" practices for each county based upon traffic observations and reported maintenance practices.
- For traffic volumes above normal levels responses for oil impacted roads were used to establish upper categories of maintenance.

Analysis Steps & Review – Paved Roads

- AASHTO 1993 Design Guide
- Predict year & type of improvement
- Improvement threshold: PSR < 2.5
- Year of improvement based on:
  - Existing structural capacity
  - Forecasted ESALs

Created for the 2019-20 Study

- A bridge deterioration and improvement model.
  - A study of bridges located on minimum maintenance roads – approximately 400 bridges excluded from the analysis – this work was done in 2014

Analysis Steps & Reviews - Bridges

- Unit cost model
  - Based on most recent NDDOT bid reports
  - Includes approach roadway, engineering, & incidentals
- Replacement cost projections:
  - Bridges: $250/sf. deck area
  - Culverts: $400,000-$600,000 /project

Analysis Steps & Reviews - Bridges

- Rehabilitation:
  - Deck widening 50% replacement cost
  - Deck replacement 45% replacement cost
- Preventive maintenance:
  - $0.25/sf./year

Outreach/Comment Process

ugpti.org/downloads/road_needs/

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Assessment of ND County and Local Road Needs

Related Links

- Introduction
- Study Updates

This effort responds to the North Dakota Legislature's request for a study of the transportation infrastructure needs of all county, township, and tribal roads and bridges in the state. Infrastructure needs are estimated using the most current crop and oil production forecasts, traffic estimates, and roadway condition data. Agricultural and oil-related traffic is modeled in detail at the sub-county level. Oil-related traffic is predicted for individual spacing units, whereas agricultural production is estimated at the township level.

- County Gravel Survey Webinar *(YouTube)*
- County Gravel Survey Form *(PDF, 231K)*
- County Gravel Survey Letter *(PDF, 48K)*

2015-2017 Project Files

- Final Report: Study of County and Local Roadway Needs: 2015-2017
- View Supplemental Information

2013-2015 Project Files

- Final Report: Study of County and Local Roadway Needs: 2013-2015
- View Supplemental Information

2011-2013 Project Files

- Final Report: Study of County and Local Roadway Needs: 2011-2013
- View Supplemental Information

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Provide Online Comment Button

- Will be provided on UGPTI Website
  - Tracking of Comments/Responses

Tracking of Comments/Responses

- As per 2014 Method.

Commenting Entity	UGPTI Emailed Road Authority Maps and Offered to Help(dch)	Tribal Contacts	UGPTI Visited Road Authority in Person (dch or bw)	UGPTI Contacted or Met With Road Authority's Consultant(dch)	Sent Response to UGPTI	UGTPI Emailed Response	UGPTI Phone Response
Adams County	X						
Barnes County	X		X	X	X	Mielke	X
Benson County	X		X		X		
Billings County	X		X		X	Mielke	
Bottineau County	X			X			
Bowman County	X			X			X
Burke County	X				X		
Burleigh County	X		X		X		Alan
Cass County	X		X				X
Cavalier County	X				X		
Dickey County	X		X	X	X	Mielke	
Divide County	X						
Dunn County	X		X				
Eddy County	X				X		
Emmons County	X		X	X			
Foster County	X						
Golden Valley County	X		X				
Grand Forks County	X		X		X		Alan
Grant County	X			X			
Griggs County	X						

NDSU-UGPTI Study Team

- Denver Tolliver – UGPTI Director
- Alan Dybing – Associate Research Fellow
  - Traffic Modeling/HERS-ST Modeling, Gravel Road Survey
- Tim Horner – Program Director
  - Pavement/Bridge Costing, Project Coordination
- Brad Wentz – Program Director
  - Pavement Condition, Traffic Data, County Scenarios, GRIT
- Satpal Wadhwa – Traffic Network, Ag Modeling
- Dale Heglund
  - LTAP Program Director – County TWP Coordination and Communication

Questions?

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