North Dakota Infrastructure Needs Studies by Jurisdiction: State, County, Township, Urban and Transit

North Dakota Symposium on Transportation Funding
Tim Homer - Program Director
Bismarck Radisson
March 14, 2018
Upper Great Plains Transportation Institute
North Dakota State University

Content of Today’s Presentation

• Quick History of Needs Studies
  – Sponsor of Individual Study
  – Study Team Members
  – Methods Used
  – Data Collection Details
  – Results

• Roll-up of All Studies

• Corresponding tables are found in the blue handout
North Dakota State System Needs Study

• Study Sponsor
  – NDDOT

• Year Conducted
  – 2016
  – Additionally a study of impacts of 129,000 pound trucks performed in 2016

• Team Members
  – NDDOT – Grant Levi, Steve Salwei, Scott Zainhofsky, Jack Smith
  – UGPTI – Alan Dybing, Tim Horner, Brad Wentz, Andrew Wrucke

North Dakota State System Needs Study

• Methods
  – Study was performed with FHWA Highway Economic Requirements System State Version (HERS-ST) Software
  – Separate pavement analysis was performed using AASHTO-93 Pavement Analysis
  – Both processes selected pavement projects needed within a 20 year period with timing based upon maximum benefit/cost ratio
  – Bridges were analyzed separately
North Dakota Truck Harmonization Study
of 129,000 pound trucks - 2016

• Study Sponsor
  - 2015 Legislature
  - Study Team:
    • NDDOT, UGPTI, NDHP
    • ND Dept. of Commerce plus 8 association groups
  - 129,000 lb. trucks were modeled to project bridge inventory ratings to compare to current ratings

North Dakota Truck Harmonization Study
of 129,000 pound trucks

• Methods
  - 7 trucks equal to or nearly equal to 129,000 pounds were used to study pavement and bridge impacts
North Dakota Truck Harmonization Study of 129,000 pound trucks

**Methods**
- Equivalent Single Axle Loads were calculated for current trucks versus 129 k trucks.
- 129 k trucks were modeled to project bridge inventory ratings to compare to current ratings.

**Results**
- Pavement impacts were negligible since 129,000 lb. trucks have more tandem and triple axles which are more pavement friendly and result in fewer trips.

North Dakota Truck Harmonization Study of 129,000 pound trucks

**Results**
- Bridges are more sensitive to heavier trucks no matter of the axle configurations.
- Impact to state system ridges was additional $716 million occurring sometime in the future.
## North Dakota State Infrastructure Needs Study*

<table>
<thead>
<tr>
<th>Year</th>
<th>Road Needs ($million)</th>
<th>Improved Miles</th>
<th>Bridge Needs ($million)</th>
<th>Total ($million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-17</td>
<td>$1,182</td>
<td>696</td>
<td>$287</td>
<td>$1,469</td>
</tr>
<tr>
<td>2018-19</td>
<td>$1,182</td>
<td>696</td>
<td>$41</td>
<td>$1,233</td>
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<tr>
<td>2020-21</td>
<td>$777</td>
<td>665</td>
<td>$41</td>
<td>$818</td>
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<tr>
<td>2022-23</td>
<td>$777</td>
<td>665</td>
<td>$41</td>
<td>$818</td>
</tr>
<tr>
<td>2024-25</td>
<td>$746</td>
<td>614</td>
<td>$42</td>
<td>$788</td>
</tr>
<tr>
<td>2026-35</td>
<td>$4,978</td>
<td>3,189</td>
<td>$181</td>
<td>$5,159</td>
</tr>
</tbody>
</table>

**Truck Harmonization**

<table>
<thead>
<tr>
<th>Year</th>
<th>Road Needs ($million)</th>
<th>Improved Miles</th>
<th>Bridge Needs ($million)</th>
<th>Total ($million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-35</td>
<td>$9,642</td>
<td></td>
<td>$1,395</td>
<td>$11,037</td>
</tr>
</tbody>
</table>

*Study considered only the improvement and routine maintenance costs for highways

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## North Dakota County-Township Study

- **Study Sponsor**
  - 2015 Legislature
- **Year Conducted**
  - 2015 to 2016
- **Team Members**
  - NDDOT Planning Staff (Pavement Data)
  - UGPTI – Alan Dybing, Tim Horner, Brad Wentz, Dale Heglund, Andrew Wrucke, Michal Jaroszynski
  - Dynatest and Infrasence
Quick History of County-Township 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: First study with GRIT, Oil Production Scenarios

North Dakota County-Township Study

- Methods
  - Pavement condition collected by NDDOT
  - Pavement and soil strength collected by UGPTI through Dynatest & Infrasense
North Dakota County-Township Study

- **Methods**
  - Gravel Surveys of Counties and Townships
  - Creation of traffic model for entire state to predict truck loads on county and state roads
  - Pavement prediction model created to forecast when projects would be needed

### North Dakota County-Township Study

<table>
<thead>
<tr>
<th>Year</th>
<th>Gravel ($million)</th>
<th>Paved ($million)</th>
<th>Bridges ($million)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-17</td>
<td>$645</td>
<td>$296</td>
<td>$87</td>
<td>$1,028</td>
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<tr>
<td>2018-19</td>
<td>$607</td>
<td>$299</td>
<td>$87</td>
<td>$993</td>
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<td>2020-21</td>
<td>$660</td>
<td>$278</td>
<td>$87</td>
<td>$1,025</td>
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<td>2022-23</td>
<td>$661</td>
<td>$237</td>
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<td>2024-25</td>
<td>$603</td>
<td>$233</td>
<td>$90</td>
<td>$926</td>
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<tr>
<td>2026-35</td>
<td>$2,916</td>
<td>$921</td>
<td>$11</td>
<td>$3,848</td>
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<tr>
<td>2016-35</td>
<td>$6,091</td>
<td>$2,265</td>
<td>$449</td>
<td>$8,805</td>
</tr>
</tbody>
</table>
North Dakota Urban Study

• Study Sponsor
  – North Dakota DOT & ND League of Cities
• Year Conducted – 2016
• Team Members
  – NDDOT – Steve Salwei
  – NDLC – Blake Crosby
  – UGPTI – Brad Wentz, Alan Dybing, Tim Horner, Andrew Wrucke, Michal Jaroszynski
  – Dynatest

North Dakota Urban Study

• Methods
  – Major Collectors in 14 largest cities
    • Not on State System
    • Approximately 550 miles
    • Urban Bridges not on state system
  – UGPTI collected pavement data
### North Dakota Urban Study

<table>
<thead>
<tr>
<th>Year</th>
<th>Roads ($million)</th>
<th>Bridges ($million)</th>
<th>Total ($million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-17</td>
<td>$141</td>
<td>$8</td>
<td>$149</td>
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<tr>
<td>2018-19</td>
<td>$97</td>
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<td>2020-21</td>
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<td>2026-35</td>
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<td>$173</td>
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<tr>
<td>2016-35</td>
<td>$601</td>
<td>$42</td>
<td>$643</td>
</tr>
</tbody>
</table>

### Transit Needs Study

- Requested and Sponsored by ND DOT
- Conducted in 2014
- Steering committee included members of NDDOT, urban and rural transit agencies, MPOs, and AARP
Transit Needs Study

• UGPTI team: Jeremy Mattson and Jill Hough
• Study examined the following metrics:
  – Days and hours service is available
  – Trips per capita
  – Vehicle miles per capita
  – Vehicle hours per capita

Regional Service Data
Transit Needs Study

• Scenarios examined
  – Scenario 1: Each region must meet 1 of 3 benchmarks
  – **Scenario 2: Accounts for projected population growth and must meet requirement for Scenario 1**
  – Scenario 3: Each region must meet 2 of 3 benchmarks and requirements for scenario 2
  – Scenario 4: Minimum 10% increase, and must meet requirements of Scenario 3

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
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</thead>
<tbody>
<tr>
<td>Annual operating expense increase (million $)</td>
<td>$5.0</td>
<td>$7.0</td>
<td>$9.2</td>
<td>$9.6</td>
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<tr>
<td>Vehicle expense (one-time cost) (million $)</td>
<td>$8.6</td>
<td>$10.9</td>
<td>$13.3</td>
<td>$13.5</td>
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</table>

Increase in Estimated Long-Term Annual Vehicle Replacement Costs: $1.0 million ($200,000 non-Federal share)
## Transit Needs Study

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Cost ($million)</th>
<th>Vehicle Cost ($million)</th>
<th>Total ($million)</th>
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</thead>
<tbody>
<tr>
<td>2016-17</td>
<td>$55</td>
<td>$17</td>
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<td>2018-19</td>
<td>$57</td>
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<td>2024-25</td>
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<td>2026-35</td>
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<tr>
<td>2016-35</td>
<td>$606</td>
<td>$113</td>
<td>$718</td>
</tr>
</tbody>
</table>

## Statewide Infrastructure Needs – All Jurisdictions

<table>
<thead>
<tr>
<th>Year</th>
<th>State ($million)</th>
<th>County and Twp ($million)</th>
<th>Urban ($million)</th>
<th>Transit ($million)</th>
<th>Total ($million)</th>
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</thead>
<tbody>
<tr>
<td>2016-17</td>
<td>$1,469</td>
<td>$1,028</td>
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<td>2022-23</td>
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<td>2016-35</td>
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<td>$8,805</td>
<td>$643</td>
<td>$718</td>
<td>$21,202</td>
</tr>
</tbody>
</table>
Further Information

- Tim Horner – UGPTI
- Alan Dybing – UGPTI
- Jeremy Mattson – UGPTI
- Michal Jaroszynski - UGPTI