County and Local Transportation Infrastructure Needs

North Dakota Transportation Coalition
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Director: Upper Great Plains Transportation Institute
## Contents

- Overview of studies
  - Roads and bridges
  - 4-county study
  - Regional railroad study
- Overview of approach
- Summary of results
- Remaining tasks and timeline
**Background**

- Third study for legislature and governor
- Requested to present to interim committees:
  - Economic Impact
  - Energy Development and Transmission
  - Budget Section
- Periodic updates for NDDOT
# Key Factors in County Road Study

<table>
<thead>
<tr>
<th><strong>Oil and Gas</strong></th>
<th><strong>Agriculture</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of wells</td>
<td>Cultivated acres</td>
</tr>
<tr>
<td>Well locations</td>
<td>Crop mix</td>
</tr>
<tr>
<td>Production rate/curve</td>
<td>Yield</td>
</tr>
<tr>
<td>Inputs/outputs</td>
<td>Crop densities</td>
</tr>
<tr>
<td>Gathering pipeline</td>
<td>Elevator network</td>
</tr>
</tbody>
</table>
### Key Factors in Road Study (cont.)

<table>
<thead>
<tr>
<th>Traffic</th>
<th>Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck trips</td>
<td>Surface type</td>
</tr>
<tr>
<td>Truck axles/weights</td>
<td>Width &amp; design</td>
</tr>
<tr>
<td>ESALs</td>
<td>Age &amp; condition</td>
</tr>
<tr>
<td>Avg. Daily Traffic</td>
<td>Soil</td>
</tr>
</tbody>
</table>
Infrastructure Data Collection

- Goal: build a consistent county database across state
- Traffic counts and vehicle classifications
- Road geometry [width]
- Road structure [layers, depths, support]
- Current road condition
- Road jurisdiction/ownership
- Bridge attributes
Pavement Data Collection

Objective – collect pavement distress, ride, strength and geometric information on paved county roads to determine remaining life and projected construction costs

- **Condition Data Collection**
  - Collect data with NDDOT pathway van
  - 5,600 miles of paved county roads
  - Will not collect short segments
  - Van will provide consistent pavement distress and ride information
  - Collection in July, August, Sep. 2013
Pavement Data Collection

- Non-Destructive Testing - verify prior estimates on subgrade strength
  - Falling Weight Deflectometer (FWD) and Ground Penetrating Radar (GPR)
  - Western ND – all pavements not recently improved
  - Eastern ND – selected based on agricultural production facilities and other major traffic generators
  - FWD will be done first and GPR will be done on the sites thumped with FWD
Data Collection: County Survey

- Aggregate (gravel) costs
- Gravel production techniques
- Placement costs
- Transportation costs from pit to roads
- Dust suppressant usage/costs
- Stabilization usage/costs
- Intermediate practices
  - Stabilization armor coat
  - Double chip seal/armor coat
  - Others
Model Components

- 20 year forecasts for agricultural and oil production
- Ag forecasts specific to township and crop
  - Reflect county yields and yield forecasts
  - Changing crop mix
- Oil forecasts
  - Specific to spacing unit
  - Reflect filling in over time
  - All inputs and outputs
- Baseline traffic
Drilling Related Truck Movements

- Sand
- Water
- Proppant
- Cement
- Fuel
- Chemicals
- Scoria/Gravel
- Rig Equipment
- Pumpers
- Drilling Mud
- Pipe
- Workover Rigs
- Frac Tanks
- Crude Oil
- Saltwater
Agricultural Analysis

- **Known**
  - Crop production

- **Predict**
  - Truck trips and routes

- **Known**
  - Elevator & plant demands

- **Estimate**
  - Segment specific traffic

**Data:** crop production (NASS), elevator volumes (NDPSC), in-state processors (survey), road network (NDDOT-GIS Hub), local road data (2008 survey)
Crop Production and Location
Gravel Road Analysis

• Life-cycle cost analysis - practices
  – Graveling and blading
    • Normal levels (e.g. regraveling every 5 years, blade once per month)
    • Increased levels (e.g. regraveling every 3-4 years, blade twice per month)
    • High levels (e.g. regraveling every 2-3 years, blade once per week)
    • Usage of dust suppressant on impacted roads
Paved Road Analysis Process

- AASHTO 1993 Design Guide
- Predict year & type of improvement
- Improvement threshold based on pavement condition
- Year of improvement based on:
  - Existing structural capacity
  - Existing condition
  - Forecasted ESALs (Equiv. Single Axle Loads)
Paved Road Improvements/Maint.

• Improvement type
  – Overlay
  – Sliver widening
  – Reconstruction
  – Mine & blend

• Normal maintenance
  – Chip seals
  – Crack sealing and patching
  – Other
**County Bridge Analysis**

- Current NBI (County and Township)
  - Identified structurally deficient and functionally obsolete bridges
  - Estimate replacement unit cost from recent ND bridge projects
  - Survey counties for biennial maintenance cost
  - Forecast replacement of deficient and obsolete bridge
**County and Township Bridges**

- 37% are 50 years or older
- Over 20% are structurally deficient; others are functionally obsolete
- 490 bridges with capital improvement needs; almost all immediate
- $329 million of needs ($251 million for replacement)
### Status of County Bridges

<table>
<thead>
<tr>
<th>Status (2013)</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Deficient</td>
<td>1,729</td>
<td>70.11%</td>
</tr>
<tr>
<td>Structurally Deficient</td>
<td>552</td>
<td>22.39%</td>
</tr>
<tr>
<td>Functionally Obsolete</td>
<td>185</td>
<td>7.5%</td>
</tr>
<tr>
<td>Total Bridges</td>
<td>2,466</td>
<td>100%</td>
</tr>
</tbody>
</table>
### Projected Bridge Improvements

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deck Rehabilitation</td>
<td>4</td>
<td>99</td>
</tr>
<tr>
<td>Rehab. &amp; Widening</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Bridge Replacement</td>
<td>110</td>
<td>390</td>
</tr>
<tr>
<td>Culvert Replacement</td>
<td>280</td>
<td></td>
</tr>
</tbody>
</table>
County and Township Roads

- Paved road improvement needs:
  - Resurfacing
  - Widening
  - Reconstruction
  - Preservation/maintenance

- Unpaved road needs
  - Accelerated maintenance (graveling and blading)
## County Road Investment Needs by Surface Type ($2014 Million)

<table>
<thead>
<tr>
<th>Biennium</th>
<th>Gravel</th>
<th>Paved</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-2016</td>
<td>$606.40</td>
<td>$395.00</td>
<td>$1,001.40</td>
</tr>
<tr>
<td>2017-2018</td>
<td>$547.60</td>
<td>$345.60</td>
<td>$893.20</td>
</tr>
<tr>
<td>2019-2020</td>
<td>$547.60</td>
<td>$305.33</td>
<td>$852.93</td>
</tr>
<tr>
<td>2015-2034</td>
<td>$5,456.60</td>
<td>$2,744.15</td>
<td>$8,200.75</td>
</tr>
</tbody>
</table>
## County Road Investment Needs by Region ($2014 Million)

<table>
<thead>
<tr>
<th>Biennium</th>
<th>East</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-2016</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>2017-2018</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>2019-2020</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>2021-2022</td>
<td>44%</td>
<td>56%</td>
</tr>
<tr>
<td>2015-2034</td>
<td>49%</td>
<td>51%</td>
</tr>
</tbody>
</table>
Regional Railroad Infrastructure

- 1,200+ miles
- Inherited from Class I railroads
- Mostly light weight rails: age 100+ years
- Important to agriculture and energy
- Accumulated investment needs
Rail Weights (lb/yd)
ND Regional Railroads

- 67% <= 90
- 29% 100-115
- 4% 132 >
Rail Weights: U.S. Class I Railroads

- 61%: < 90
- 27%: 100-129
- 9%: 130-139
- 3%: 140+
Next Steps/Timeline

- Comments on county road study
- 4-county study
- Regional railroad study
- Expected reports to legislature