Building a Database to Predict the Future

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Why????

- Becker County MN Engineer
- 2008 - County Board Requests
- Brad’s rambling story....

...Critical step for effective Transportation Asset Management
TAM Summary

Transportation Asset Management

- Inventory
- Performance Assessment
- Long Range Improvement Plans and Budget
- Set Targets And Optimization
- Short Term Improvement Plans
- Performance Prediction

2018 North Central Local Roads Conference
• **Geographic Roadway Inventory Tool (GRIT)**
  - Developed by UGPTI for ND Needs Study
  - Recent upgrade to GRIT 2.0
  - Developed support agreement non-ND Counties
• **Geographic Roadway Inventory Tool (GRIT)**
  - Currently 4 Layers of Data

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<tr>
<th>Construction History</th>
<th>Construction Planning</th>
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<th>Load Restrictions</th>
<th>Maintenance</th>
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• Geographic Roadway Inventory Tool (GRIT)
  - Web Map viewers for all data items
  - GIS format for combining data
• Geographic Roadway Inventory Tool (GRIT)
  – GIS Web Services for all Data
• Geographic Roadway Inventory Tool (GRIT)
  - Pavement Condition Rating
- Geographic Roadway Inventory Tool (GRIT)
  - Bridge Condition Rating
Short Term Plans

- Geographic Roadway Inventory Tool (GRIT)
  - Construction Planning Layer (5 Yr Plan)
  - Created by using current measures (condition or age)
- Geographic Roadway Inventory Tool (GRIT)
  - In Viewers Overlay 5 yr plan on performance data
  - Performance data ONLY from last year
• Geographic Roadway Inventory Tool (GRIT)
  – MN LRRB Performance Prediction Project
  – Spring 2019 Completion

Goals

• Develop seamless data integration processes with MnDOT pavement condition and traffic data with GRIT inventory data.
• Develop a pavement condition forecasting module within GRIT based on the AASHTO 93 model.
• Provide on-line GIS web maps and services to prioritize roadway construction schedules and multi-year plans.
- Geographic Roadway Inventory Tool (GRIT)
  - Adding a Performance Section to the Construction History Layer
• Geographic Roadway Inventory Tool (GRIT)
  - 1st Task - combining performance data with Inventory
  - This is pavement condition data data averaged on project history
• Geographic Roadway Inventory Tool (GRIT)
  - With all inventory, planning, and Performance data geospatially combined model calculates what condition and age will be over the next 25 years.

\[
\log(W_{18}) = Z_R \times S_o + 9.36 \log(SN + 1) - 0.20 + \frac{\log(\Delta PSI)}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 \log(M_R) - 8.07
\]

where:

- \( W_{18} \) = predicted number of 18-kip equivalent single axle load applications
- \( Z_R \) = standard normal deviate
- \( S_o \) = combined standard error of the traffic prediction and performance prediction
- \( \Delta PSI \) = difference between the initial design serviceability index, \( p_o \), and the design terminal serviceability index, \( p_t \)
- \( M_R \) = resilient modulus (psi)
- \( a_i \) = \( i^{th} \) layer coefficient
- \( D_i \) = \( i^{th} \) layer thickness (in.)
• Geographic Roadway Inventory Tool (GRIT)
  - Developing future year plans
  - BUT this time the condition and age will be for that future year
• The Final Steps of TAM
  - Setting Targets and Optimization Models
  - Output 20 year Needs and Improvements
  - Engineers and Managers generally prefer to use the data and develop their own long range plans
Building a Database to Predict the Future

This is the Database we need to build!
More Information/Resources

• See the UGPTI Website at
  – https://www.ugpti.org/
    • Resources/Asset Inventory

• Email Contacts
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  – Andrew.Wrucke@ndsu.edu
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