Edge Break Prediction Model for Low Volume Roads

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2007 Low Volume Road Workshop
RIMS NZ dTIMS & Low Volume Roads

- NZ dTIMS predictions for low volume roads
  - Fairly robust for resurfacing quantities
  - Not so accurate for rehabilitation needs particularly AWPT

- AWPT is mainly justified based on maintenance cost
RIMS NZ dTIMS & Low Volume Roads

- Maintenance cost drivers are
  - Heavy dig-outs
  - Potholes
  - Shoving
  - Edge Break
  - Flushing, etc.

- Prediction models for many of these distress types are not available in HDM
RIMS NZ dTIMS & Low Volume Roads

- LTPP study for improving current HDM models and/ or developing new models
- Interim arrangement – develop prediction models using available data
- Edge Break Prediction Model
Edge Break Model - Low Volume Roads

- Local authorities (3100 KM of Local Authority Roads)
  - Central Hawkes Bay District Council
  - Wairoa District Council
  - Western Bay of Plenty District Council
  - Ashburton District Council
  - Southland District Council
  - Queenstown Lakes District Council

- Data comprised a total of 3762 treatment lengths out of which 1652 (44%) showed edge break or edge break patches
Edge Break Model - Low Volume Roads (Based on Rating Data)

% of Treatment Lengths with Edge Break or Edge Break Patching

- Ashburton
- Queenstown
- Southland
- Central Hawkes Bay
- Wairoa
- WBOPDC
Edge Break Model - Low Volume Roads (Based on Rating Data)

% of Length with Edge Break or Edge Break Patching

- Ashburton
- Queenstown
- Southland
- Central Hawkes Bay
- Wairoa
- WBOPDC
Edge Break Models – Low Volume Roads

- Relevant Independent Variables
  - Lane Width
  - AADT
  - Number of Heavies
  - Surfacing Age
  - Structural Number
  - Construction Quality
  - Terrain
  - Presence or Absence of Shoulder (Sealed/ Unsealed Shoulder)
Edge Break Model - Low Volume Roads

- Half of the sites with edge break developed edge break within the first six years after surfacing.
- Around 30% of sites with edge break, developed edge break within first two years after surfacing.
- Around 64% of sites with lane width less than 2m showed edge break, whereas around 32% of sites with lane width between (3.75-4m) showed edge break.
- More than 50% of all sites cater an AADT of less than 100 vpd and 95% of all sites have less than 500 vpd.
Edge Break Models – Low Volume Roads

- Probability Model to Predict Edge Break Initiation (Logit Model)
- Regression Model to Predict the Quantity of Edge Break
Edge Break Models – Low Volume Roads

\[
\text{Probability of edge break} = \frac{1}{1 + \exp(0.962 + 0.14W - 0.859 \log_{10}(AADT) - 2.511 \log_{10}(\text{Age})/W)}
\]

- **W** = lane width in meters (carriage way width/number of lanes)
- **Age** = Surfacing age (in years)
- **AADT** = Estimated AADT
- AADT 250 vpd
- Probability = 0.5
  - in 3 years (width= 2.5m)
  - in 7 years (width= 3m)
  - In 16 years (width=3.5m)
Comparison with Earlier Study

Probability of Edge Break (AADT: 250 vpd; Width: 3 m)

Surfacing Age

Probability

- ·-·- This Study
- ⬤ Ball & Patrick (2005)
**Edge Break Models – Low Volume Roads**

\[ Y = 10^{( -0.537W + 0.018 \text{AGE} + 0.001 \text{AADT})} \]

- **R-Square** = 0.862
- **W** = lane width in meters (carriage way width/number of lanes)
- **Age** = Surfacing age in years
- **AADT** = Estimated AADT
Data and Model

![Scatter plot with line of equality](image-url)

- **Predicted Edge Break** vs. **Observed Edge Break**

- The line of equality is indicated within the scatter plot.
Summary

- Edge break initiation model seems reasonable given high randomness in data
- The model is adopted in RIMS NZ dTIMS CT
- Better model may be needed in the long term
  (Based on LTPP data)
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