Edge Break Prediction Model for Low Volume Roads

Riaz Ul-Islam

Opus International Consultants

2007 Low Volume Road Workshop

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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**

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- **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**

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

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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**

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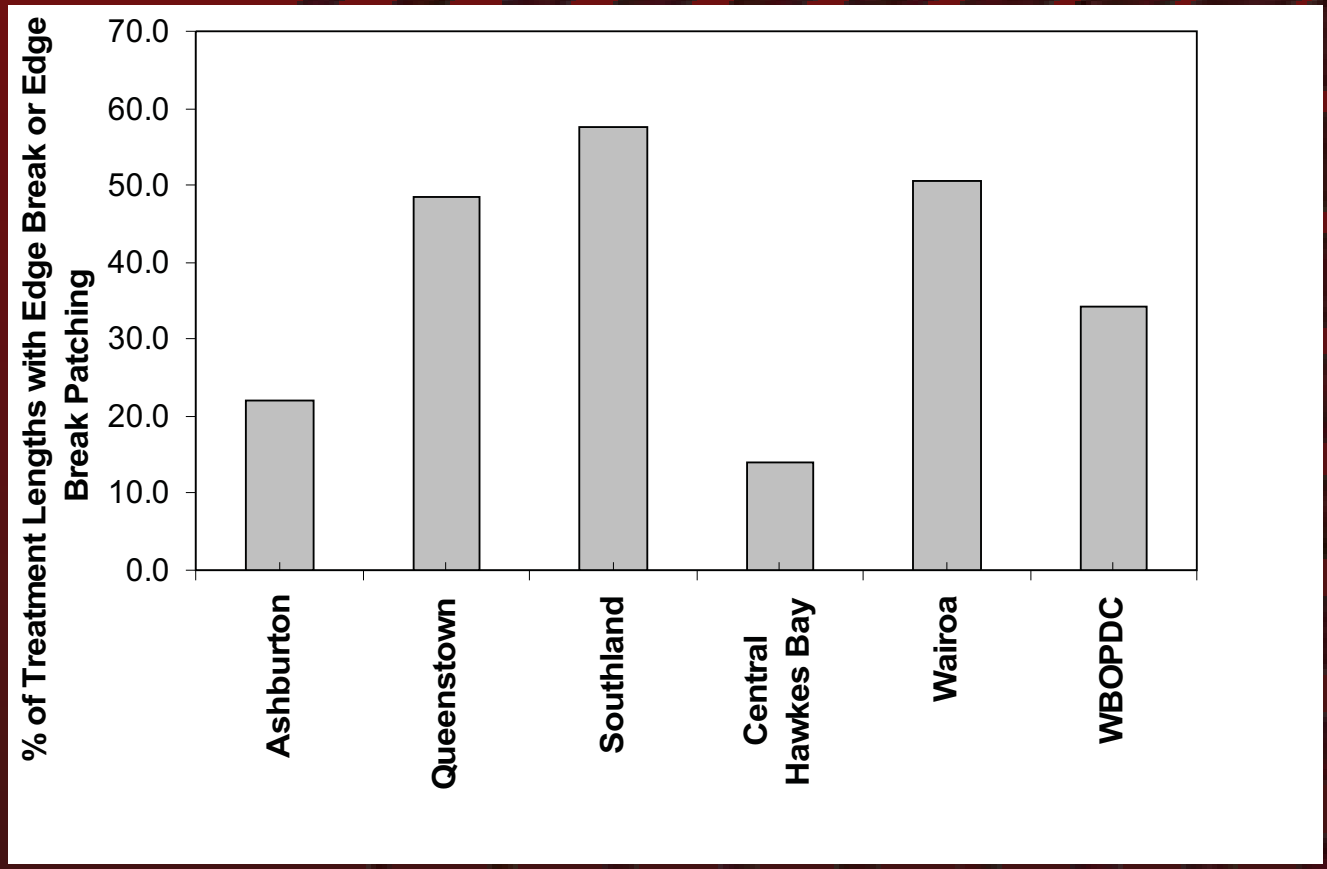
Edge Break Model - Low Volume Roads (Based on Rating Data)



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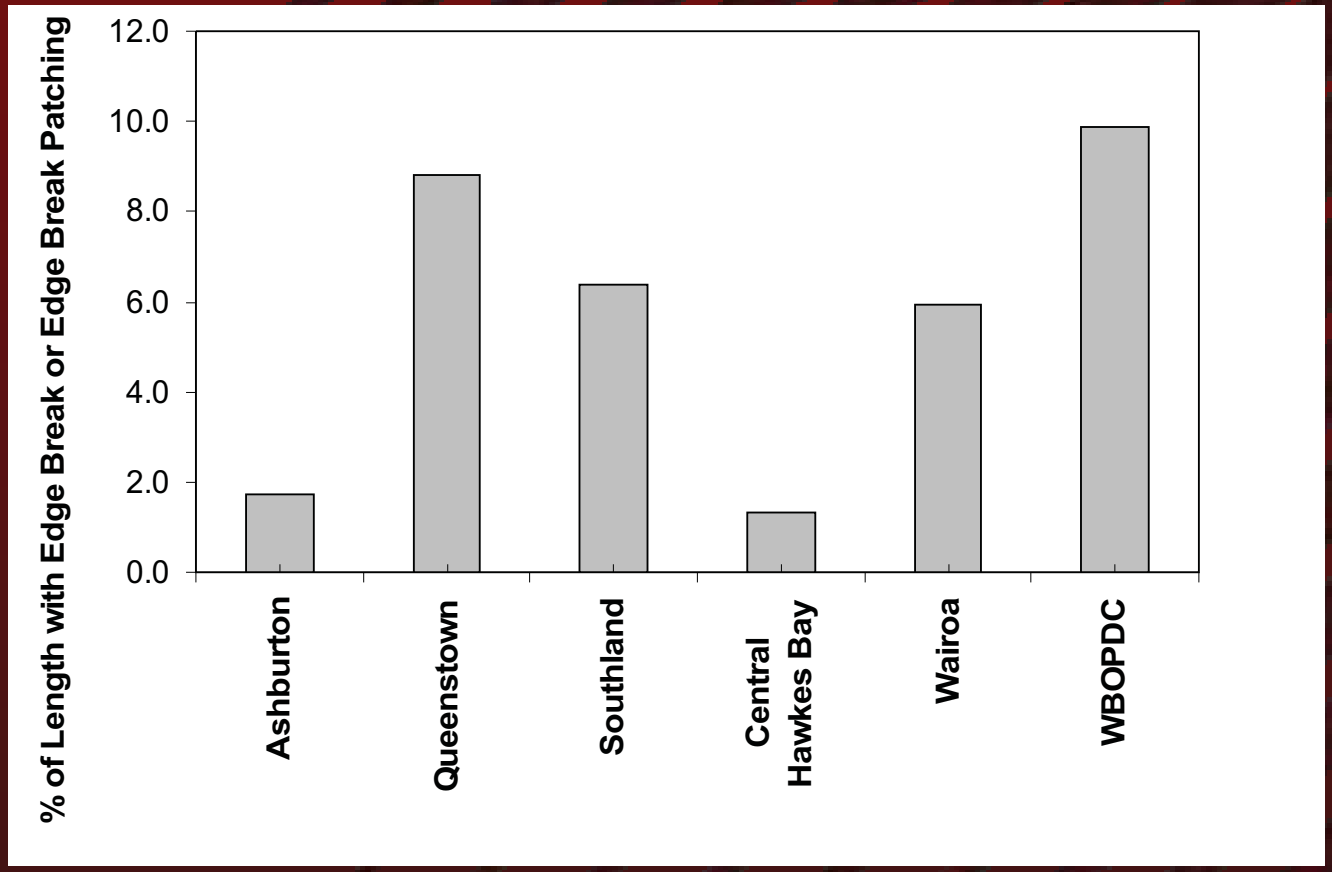

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Edge Break Models – Low Volume Roads

- **Relevant Independent Variables**
  - **Lane Width**
  - **AADT**
  - **Number of Heavies**
  - **Surfacing Age**
  - **Structural Number**
  - **Construction Quality**
  - **Terrain**
  - **Presence or Absence of Shoulder (Sealed/ Unsealed Shoulder)**

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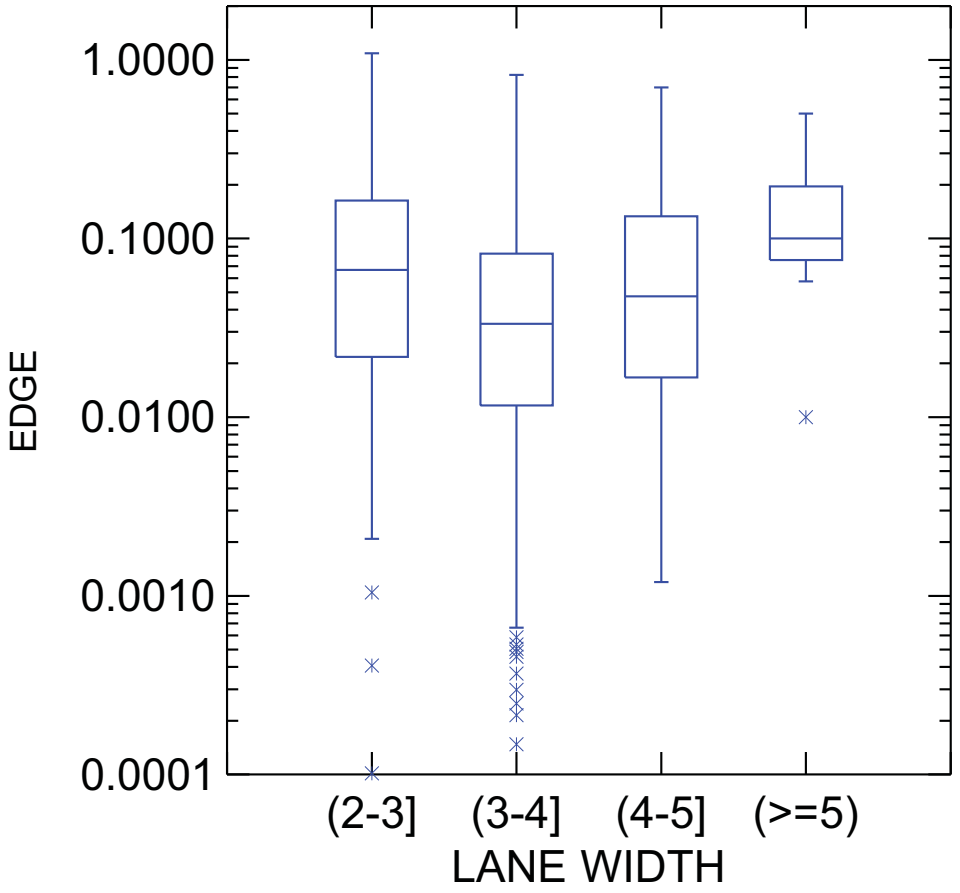

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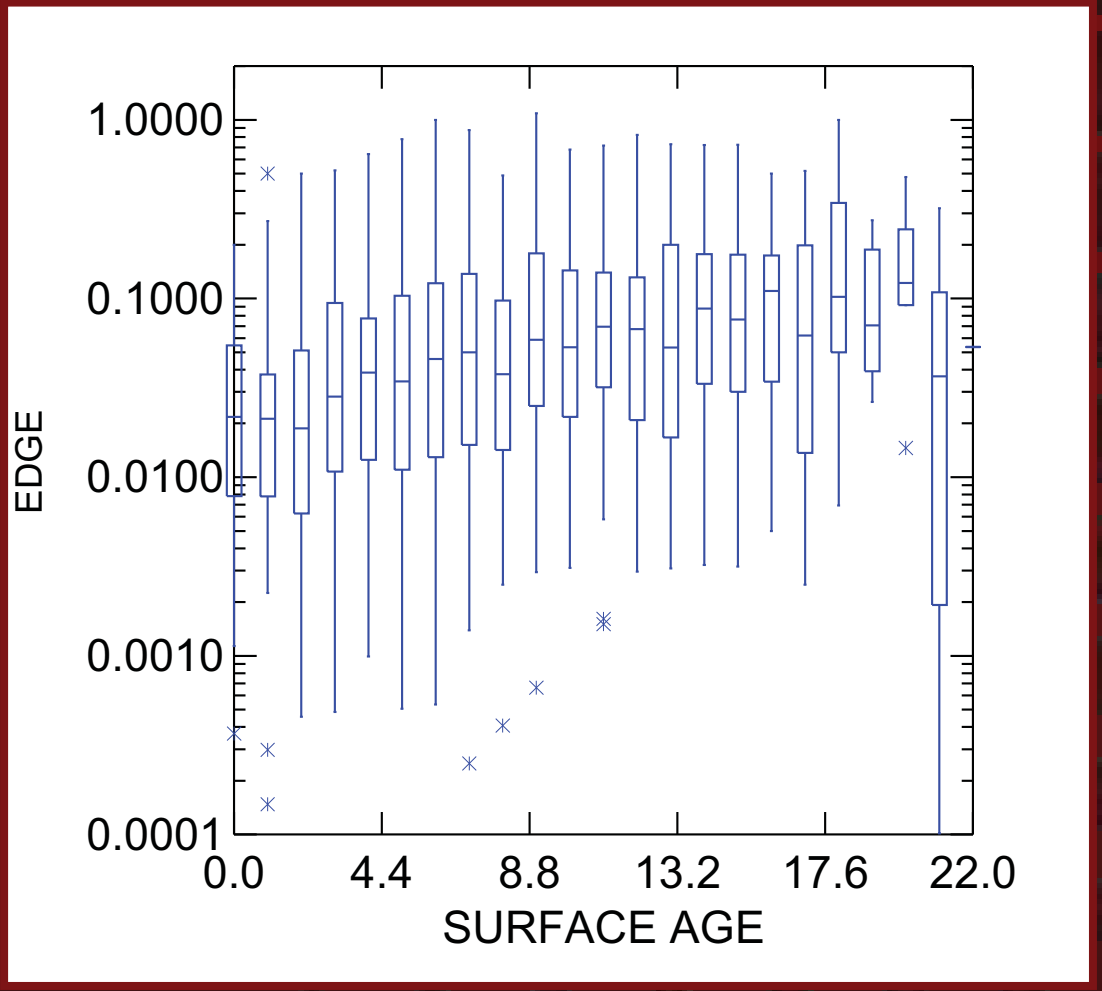

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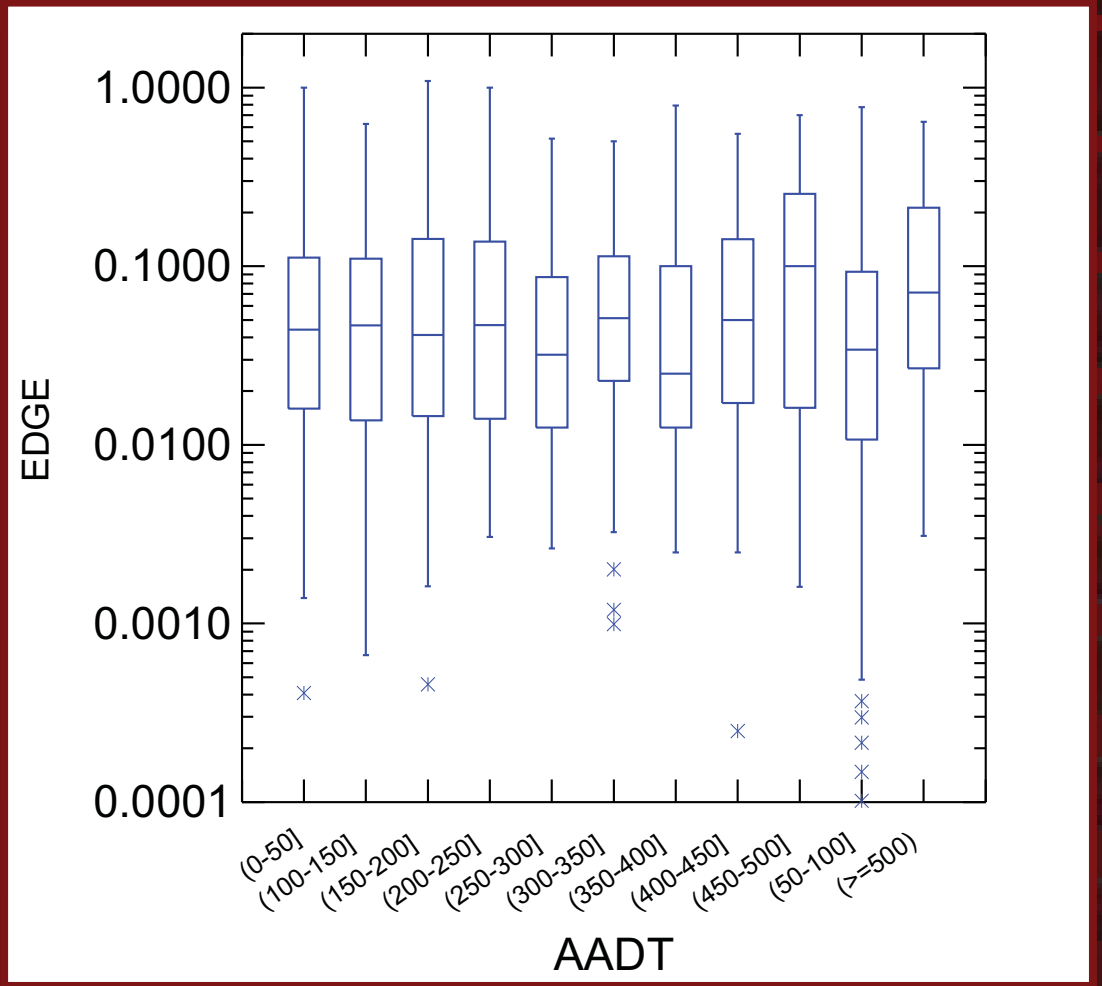

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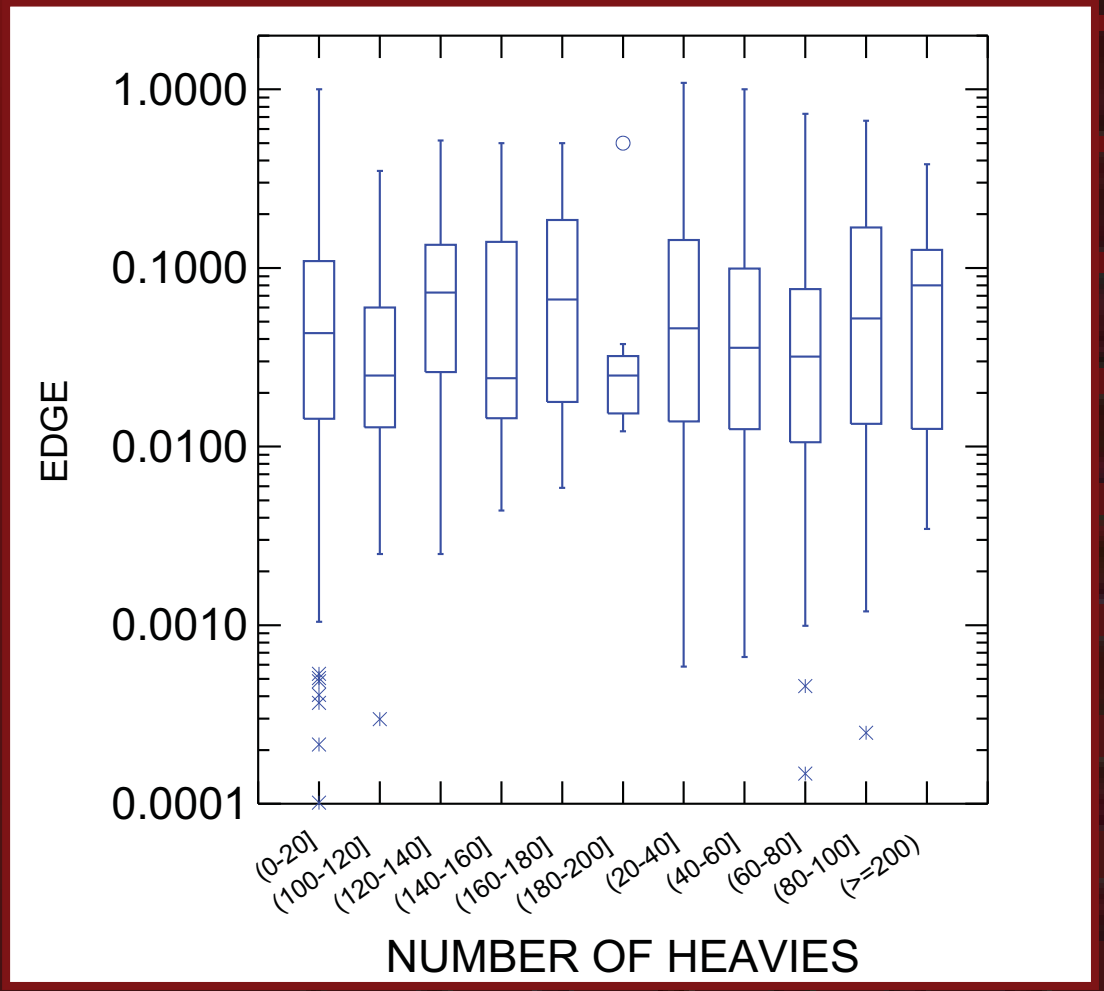

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Edge Break Model - Low Volume Roads

- 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 100vpd and 95% of all sites have less than 500vpd

Edge Break Models – Low Volume Roads

- **Probability Model to Predict Edge Break Initiation (Logit Model)**
- **Regression Model to Predict the Quantity of Edge Break**

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Edge Break Models – Low Volume Roads

$$\Pr obability\ of\ edge\ break = \frac{1}{1 + \exp(0.962 + 0.14W - 0.859\frac{\log_{10}(AADT)}{W} - 2.511\frac{\log_{10}(Age)}{W})}$$

- **W = lane width in meters (carriage way width/ number of lanes)**
- **Age = Surfacing age (in years)**
- **AADT = Estimated AADT**

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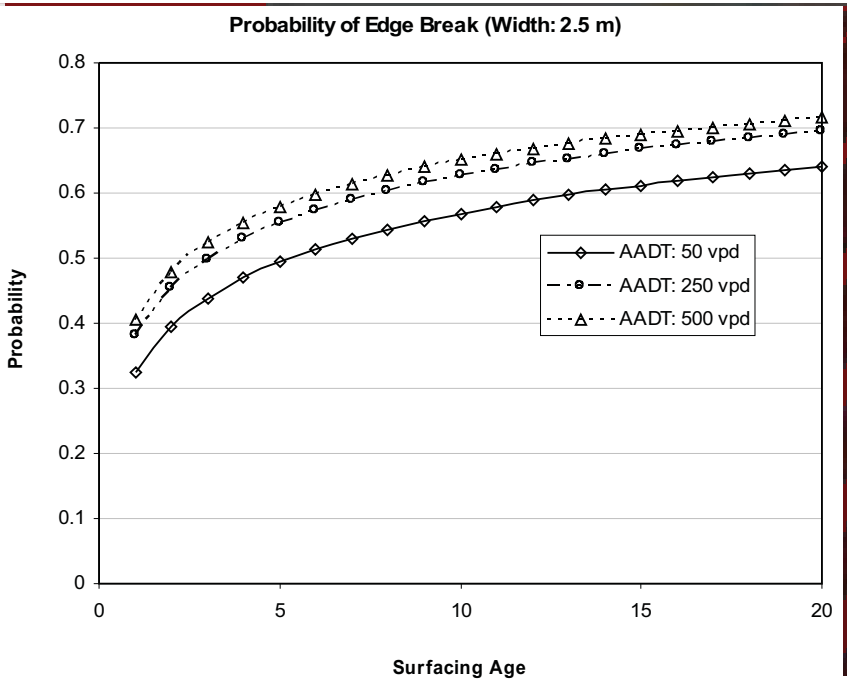
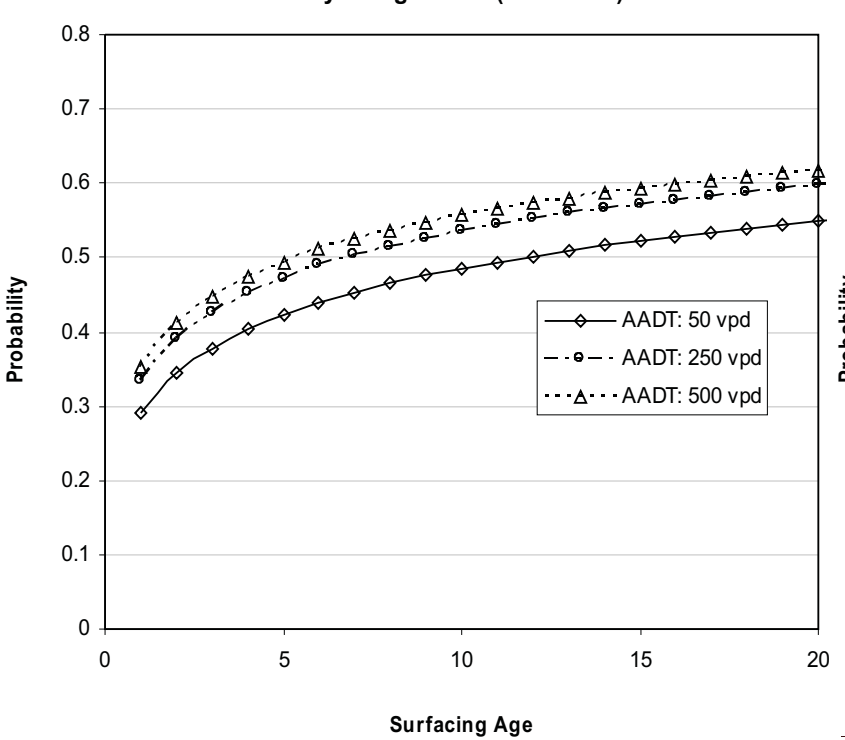
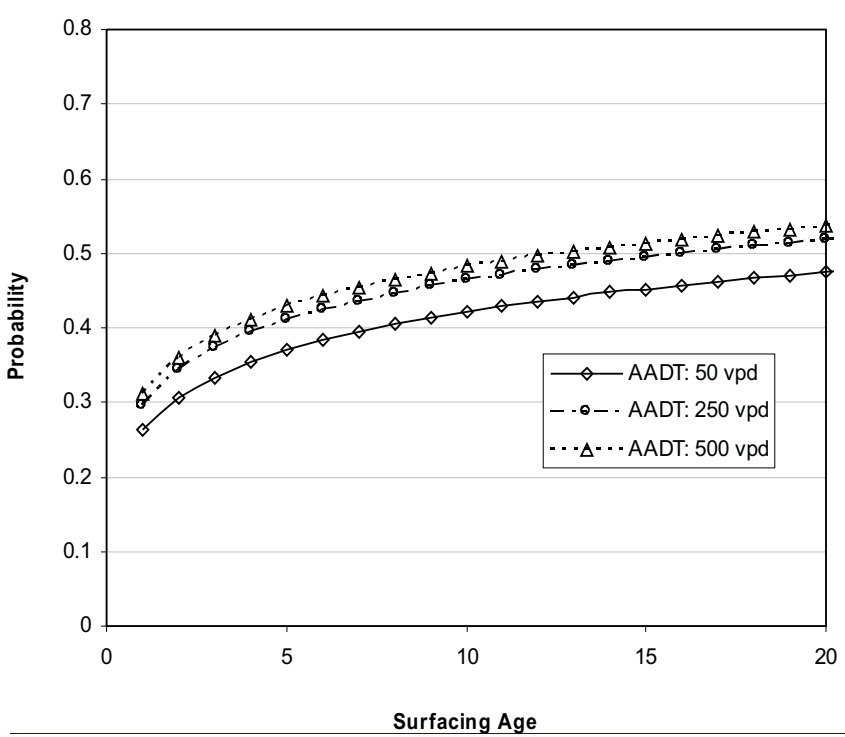
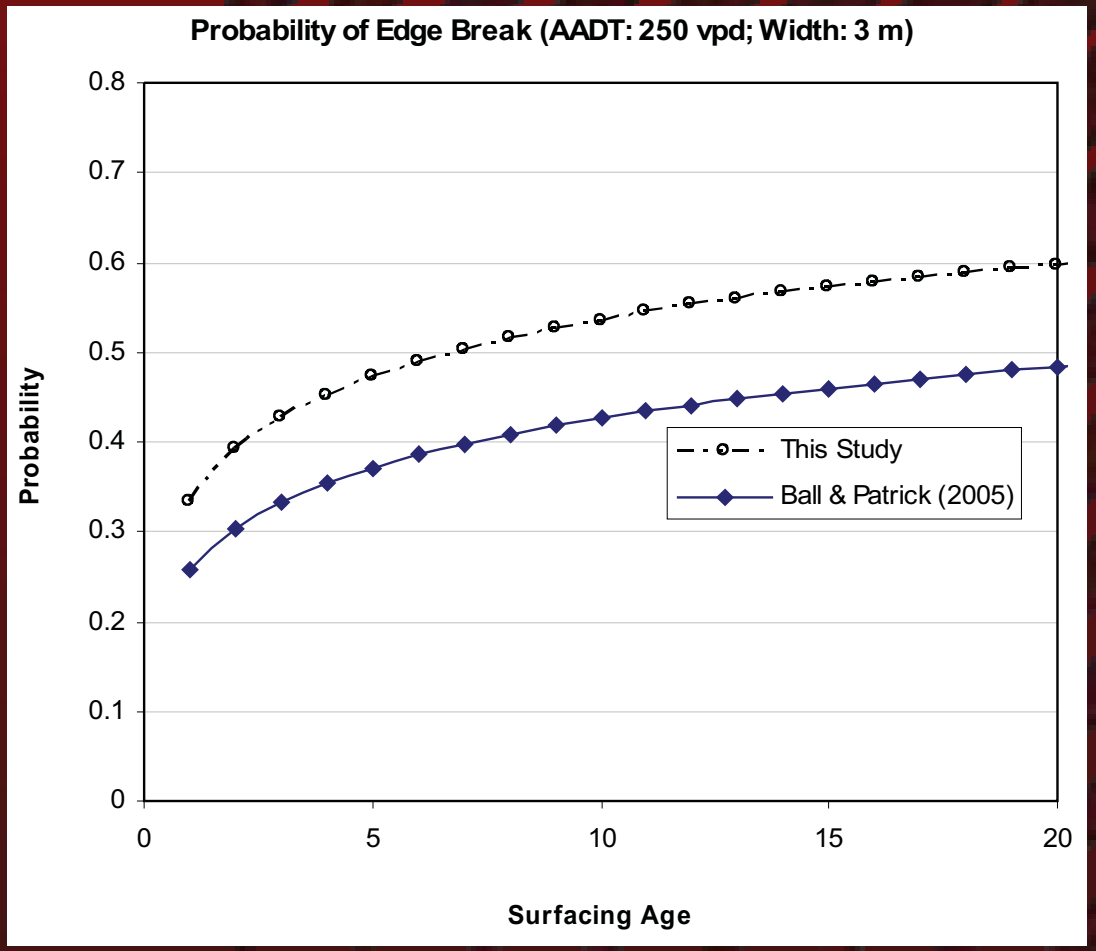


- AADT 250 vpd
- Probability = 0.5
  - in 3 years (width= 2.5m)
  - in 7 years (width= 3m)
  - In 16 years (width=3.5m)





Comparison with Earlier Study



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Edge Break Models – Low Volume Roads

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

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

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Data and Model

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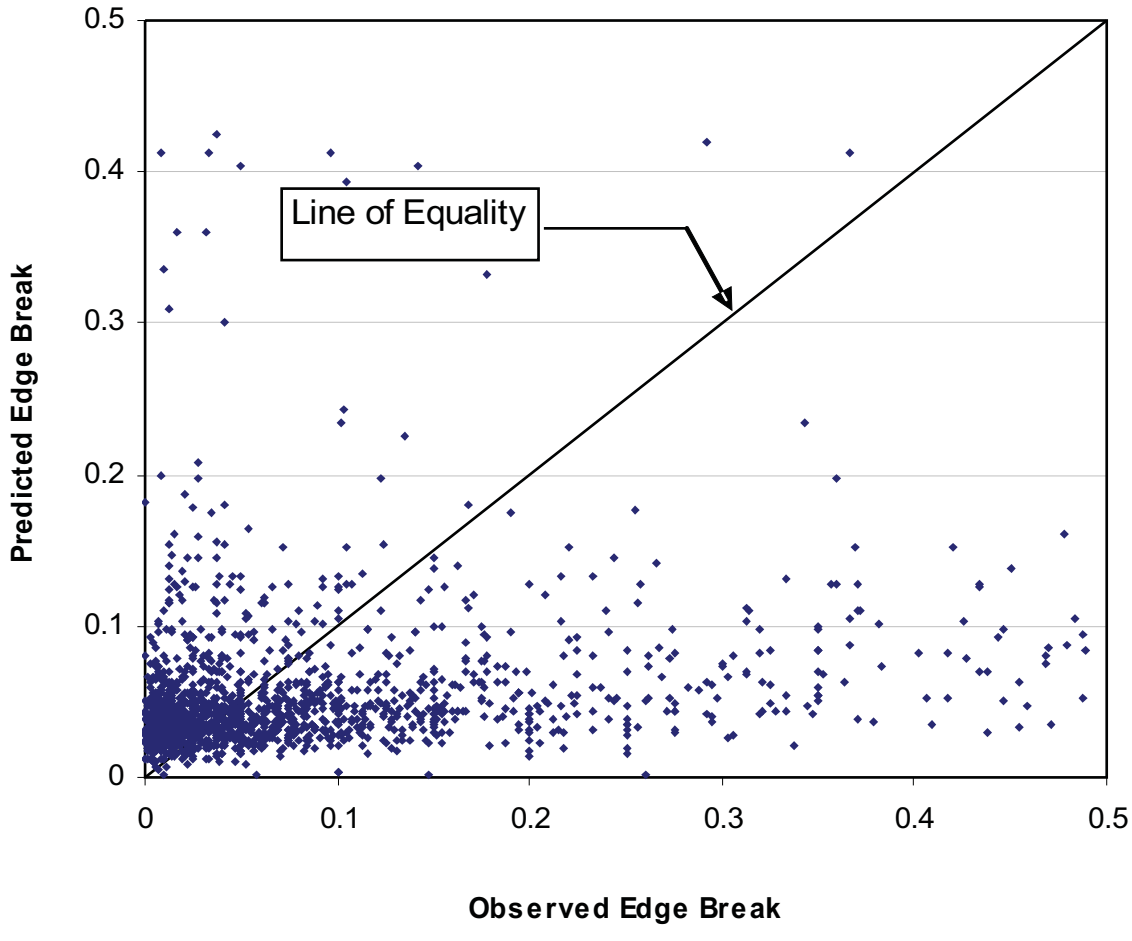

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Summary

- 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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Acknowledgements

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- **dTIMS Development Consortium**

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