

## Motivation

This project was initiated due to the high occurrence of right-angle collisions at rural divided intersections with larger than normal median widths.

It is believed that extended medians give the impression of right-of-way to drivers on the minor approaches. The objective of this study is to confirm this relationship and determine the width at which new standards are required.



Sample wide-median intersection, Highway 43 at Range Road 82. Wembley, Alberta. [2006 ESRD Aerial Imagery]

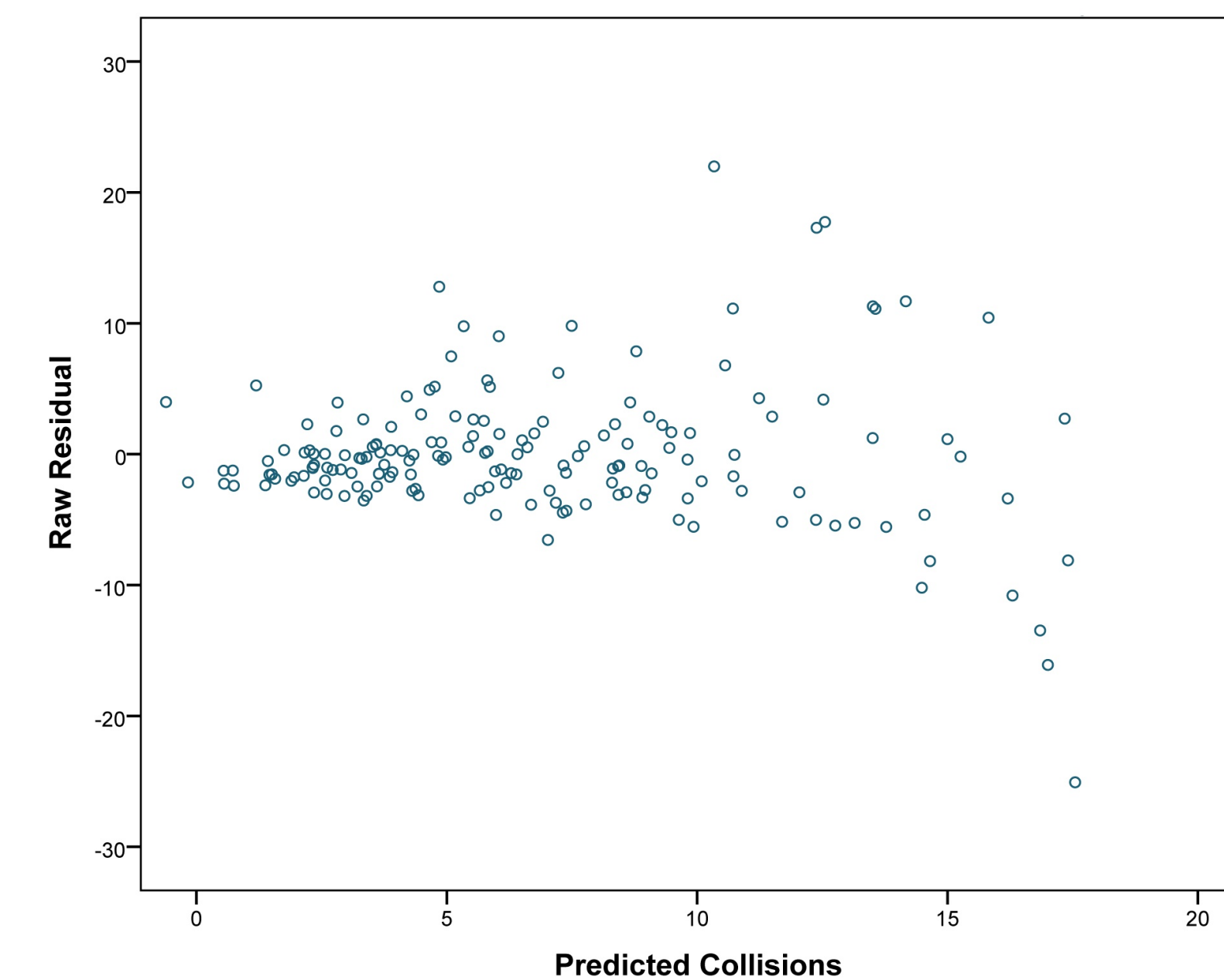
## Methodology

- 171 rural unsignalized divided intersections for which turning movement counts were available were selected for analysis.
- Digital video logs were reviewed to ensure that no contributory factors were involved.
- Median widths were calculated in GeoMedia as the length of an intersecting segment through outside lane markings on major highways.
- Generalized linear model was developed to illustrate the relationship between median width and collisions.
- One-way ANOVA test of average collisions per million entering vehicles across binned median width groupings was carried out.

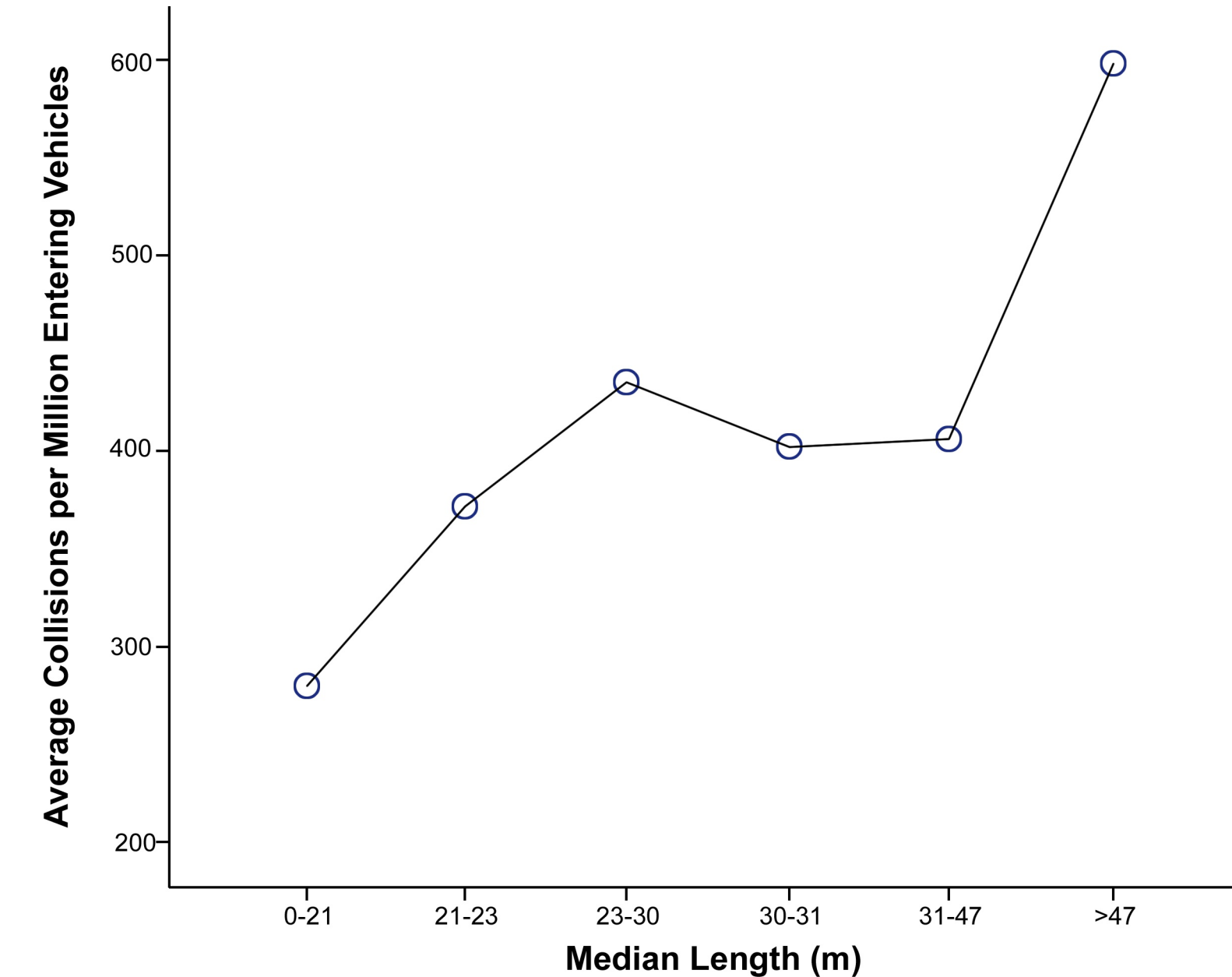
## Collision Model

Deriving a generalized linear model for expected collisions at unsignalized rural divided intersections yielded:

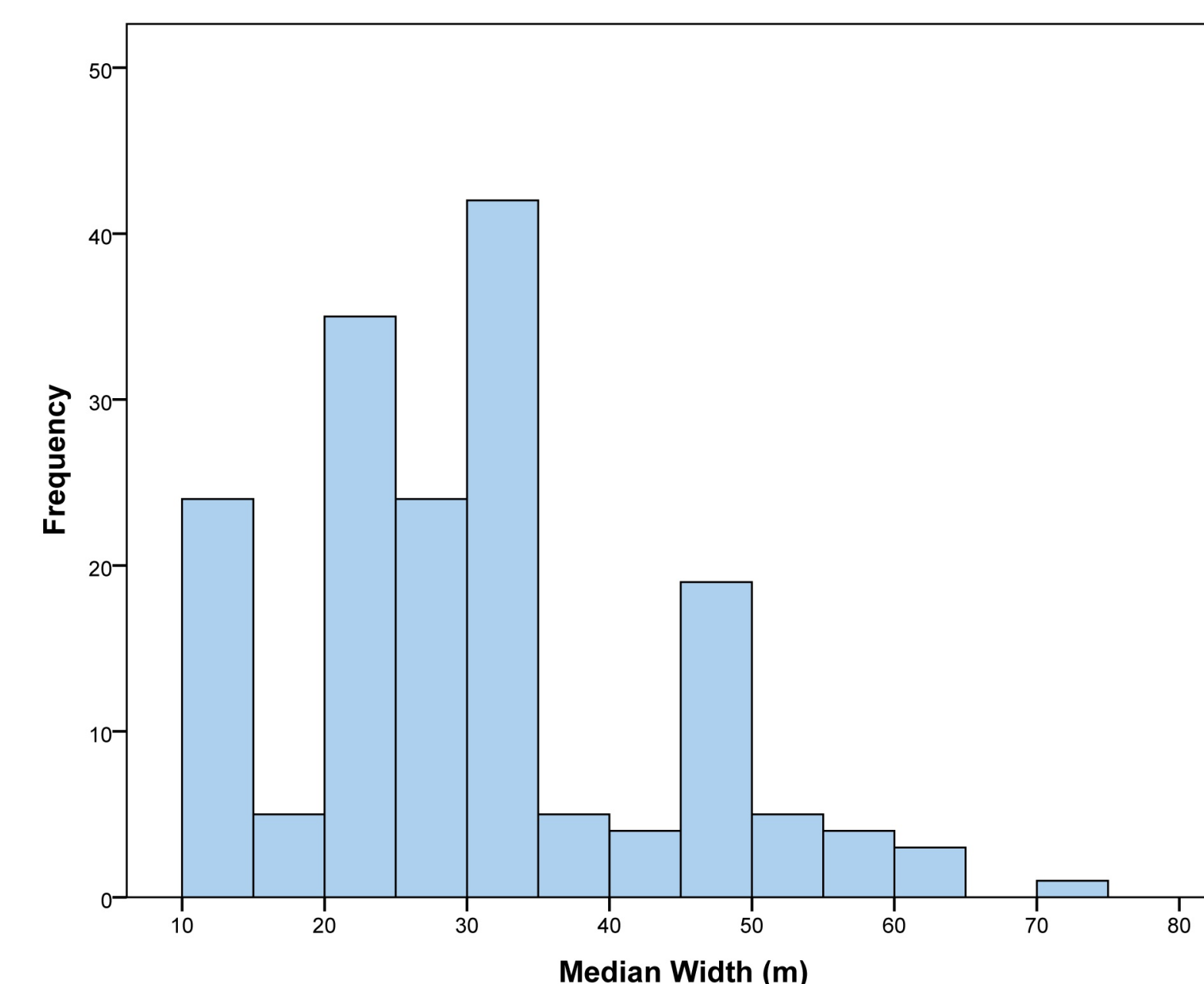
$$C = -6.1 + 1.4E^{-4}(AADT_{maj}) + 3.8E^{-3}(AADT_{min}) + 8.8E^{-1}(Length_M^2)$$



Plotting the raw residuals against the expected collisions from the model shows little drift but increasing variance towards the boundary values. Removal of outliers had only a nominal impact on the performance of the model.



After dividing sites into six equal groups by median width, a one-way ANOVA test was carried out which determined that there is a significant difference in the mean collisions per million entering vehicles ( $p=0.027$ ) with a sharp increase in the  $>47m$  group.



The sample sites are primarily between 20-40m. The Alberta Geometric Design Guide (1999) currently encourages medians of 55m or wider to accommodate trucks and to allow for future multilaning.

## Results

- There is a strong relationship between median width and collision rates.
- Median width is much less significant than the square of the median width.
- Square of median length contributory with  $p=0.023$ .
- Average collisions per MEV increases sharply after approximately 45m.

## Discussion / Recommendations

- Median widths are positively related with segmental safety but negatively related with intersection safety.
- The MORECOAR [1] report suggests compatibility, consistency, and affordability in collision mitigation strategies.
- NCHRP 650 [2] suggests double yellow pavement markings in wide medians as well as yield bars. This is also recommended by Ontario's MTO [3] and the Federal Highway Administration [4].
- Given the definitive point at which positive guidance is lost, a new design standard consistent with MTO, FHWA, and TRB suggestions is recommended for intersections with medians  $>45m$ .

## References

- [1] Opus International. 2010. *Methods of Reducing Collisions on Alberta Roads*. Calgary, AB.
- [2] Maze, T., Hochstein, J., Souleyrette, R., Preston, H., Storm, R. *NCHRP 650: Median Intersection Design for Rural High-Speed Divided Highways*. Washington, DC.
- [3] Ontario Ministry of Transportation. 2000. *Ontario Traffic Manual Vol 5: Regulatory Signs*. St. Catharines, ON.
- [4] Federal Highway Administration. 2009. *Manual on Uniform Traffic Control Devices for Streets and Highways*. Washington, DC.

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