Crashrisk model incorporating the out-of-context-curve effect

1.1 Definitions

1.1.1 The Advisory Speed calculation

This is the formula I used for calculating the *Advisory Speed*.

$$AS = -\left(\frac{107.95}{H}\right) + \sqrt{\left(\frac{107.95}{H}\right)^2 + \left[\frac{127{,}000}{H}\right]\left[0.3 + \frac{X}{100}\right]}$$

where AS = RGDAS Advisory Speed (km/h)

X = % Crossfall (sign relative to curvature)

H = Absolute Curvature (radians/km) = (1000m / R)

X and *R* were taken from the road geometry data collected by the SCRIM machine. If $R < 0$ then the sign of *X* was switched. Then the range of *X* was limited to 0 to 30.

The resulting value of *AS* was capped at 110 km/hr. In urban locations the cap for when calculating *AS2* (but not *AS1*) defined in the next section, 1.1.2, was set at 70 km/hr.

1.1.2 The Out-of-Context-Curve effect

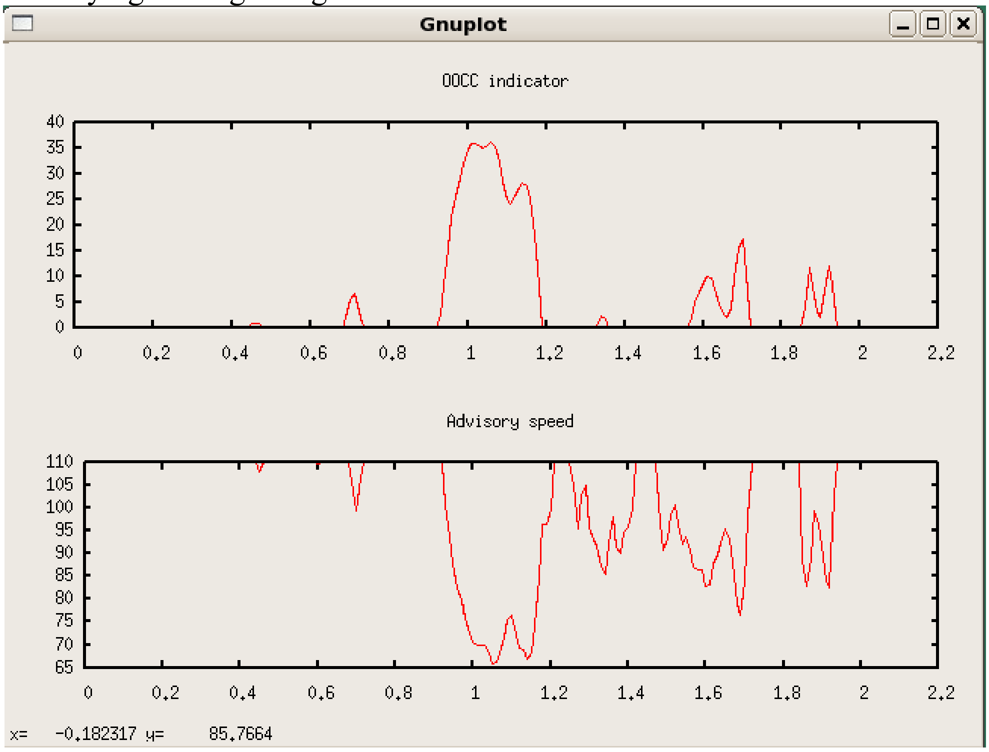
The out-of-context-curve indicator for a particular 10 metre road section was defined as follows: Take the average advisory speed, *AS1*, for the current and preceding two 10 metre sections and the average advisory speed, *AS2*, for the 50 10 metre sections preceding the 3 used to calculate *AS1*. Then the *OOCC* indicator is zero if $AS2 \leq AS1$ and

$$AS2 - AS1$$

if $AS2 > AS1$.

For the *decreasing* side of the road I do the same thing in the opposite direction. The risks for the two sides of the road are summed so we don’t need to know the directions of the vehicles.

This formula has the disadvantage that if doesn't do a very good job of identifying the beginning of the curve.



The top graph shows the OOCC indicator and the bottom graph shows the advisory speed. We would like the OOCC indicator graph to die away rather more quickly after the beginning of the curve. However, in terms of predicting crash rates the present formulation works better than anything else I have tried. (Ignore the x and y coordinates given at the bottom of the graph).

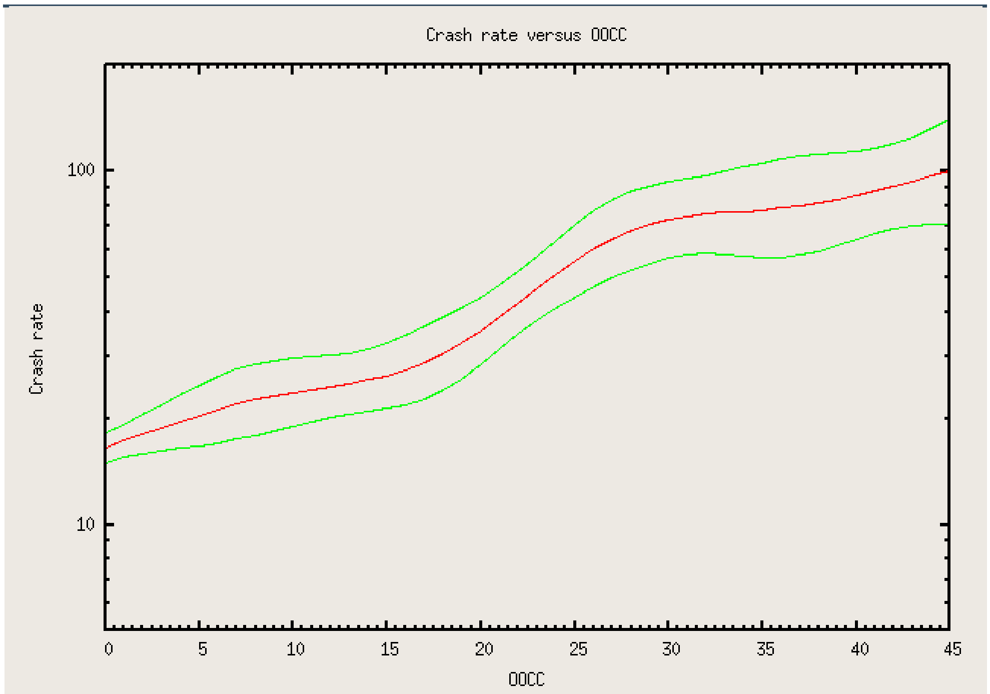
1.2 The *crashrisk* model

This a rerun of my crashrisk model of 2004 with an adjusted skid-site 3 definition and including the out-of-context-curve effect. See the copy of the previous report at http://www.robertnz.net/pdf/crashrisk8.pdf. This is the same as the report submitted in 2004 except that a short postscript has been added.

In this part I am using the measured values of the SCRIM coefficient.

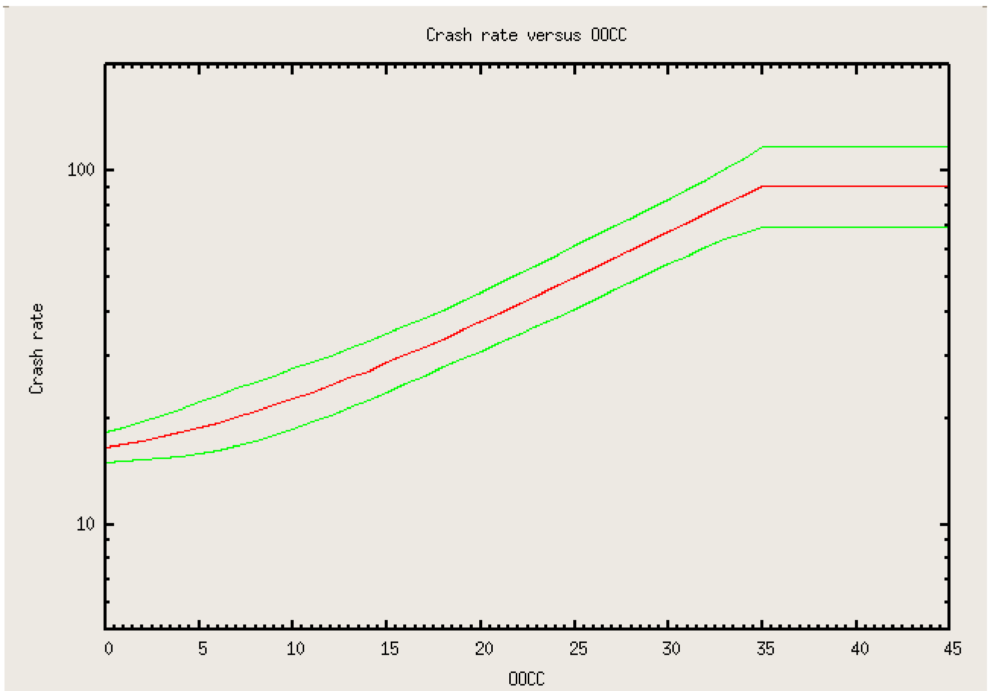
See, particularly, sections 5.3 and 5.4 in that report. The tables of coefficients and the analysis of variance tables are given in the accompanying spreadsheet.

Analysis of the "all crashes data" using a spline curve for the OOCC effect showed that the effect was fairly constant when the OOCC indicator was above 35.

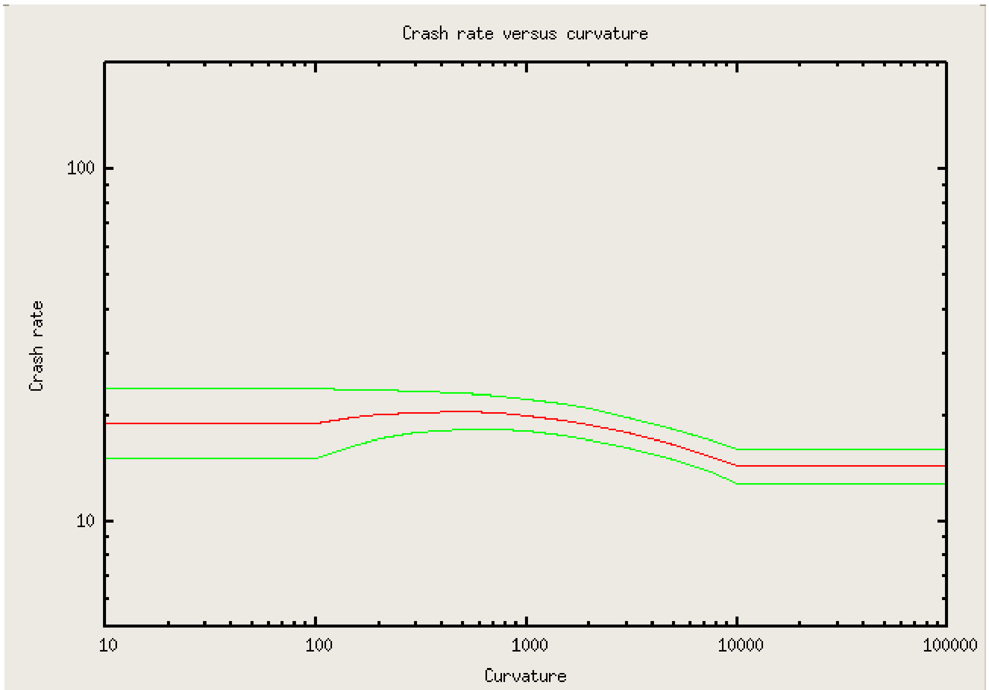


So I have combined values above 35 and fitted a cubic curve between 0 and 35. In the case of the analysis of the wet-selected crashes I fitted a quadratic rather than a cubic since I couldn't get convergence with the cubic. When you are using this data to predict crash risk you must replace values of OOCC above 35 by 35.

The next graph shows the OOCC effect for all crashes using the cubic curve.

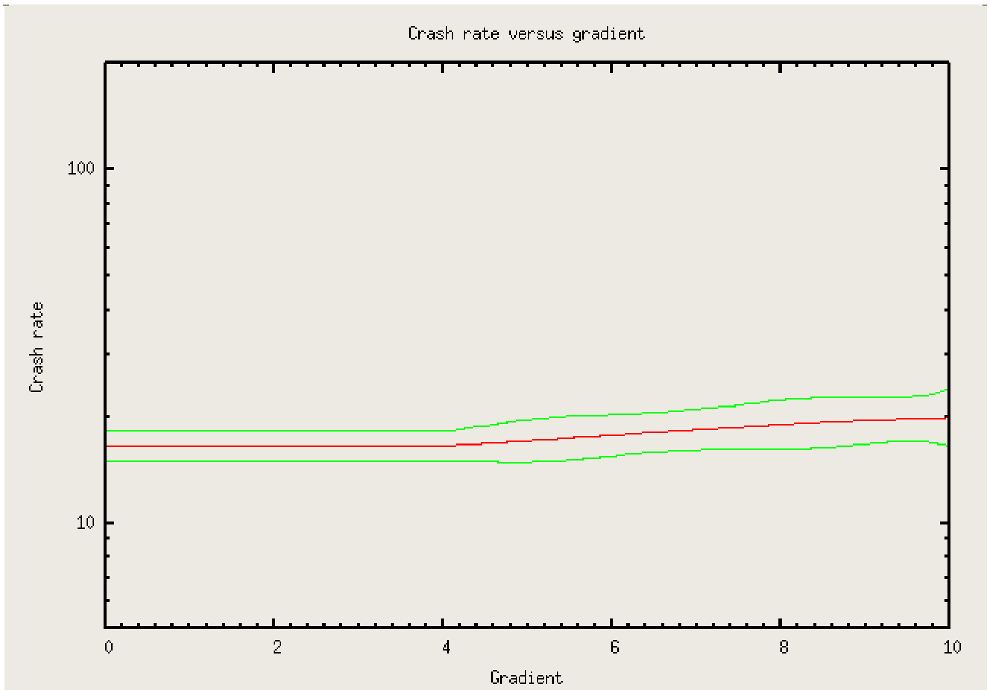


This has swallowed up much of the curvature effect found in the earlier analysis.



Compare this with the graph of section 5.3.3 in the previous report.

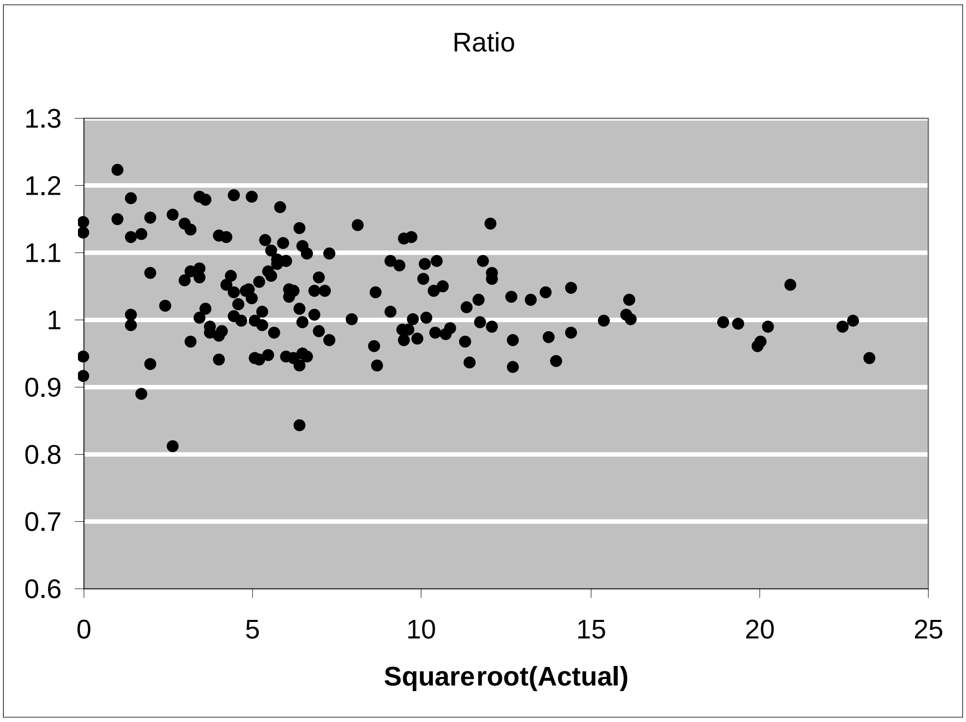
The following graph shows the gradient effect. Adjusting the skid-site 3 category to include only intersections and not taking account of gradient has lead to a much more credible result than that obtained in the previous analysis.



1.3 Replacing SCRIM by the investigatory level.

This section investigates replacing the measured value of SCRIM by the investigatory level for each skid-site value – see section 9.1 in my previous report. It isn't sensible to try to refit the model using these SCRIM values. However one can recalculate the fitted values substituting the investigatory levels for the SCRIM values. When one does this, one finds that the total number of crashed predicted for the network is incorrect and one needs to adjust the coefficient of the constant in the model. For example for the "all crashes" model -13.916 needs to be replaced by -14.043. The adjustments for the other analyses are given in the accompanying spreadsheet.

In order to see how closely the results using the investigatory level match those using the measured values of scrim I subdivided the network as in section 6.1 of the previous report. This divides the network into 142 segments. The following graph shows the ratio of the predicted numbers of crashes using the investigatory levels to the predicted values using the measured value of scrim and a functions of the square root of the actual number of crashes.



This shows that the agreement is moderately good for those segments with high number of crashes (either they are longer roads or have more traffic) but not so good for the segments with low number of crashes.