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Traffic moment at level crossings: when busy crossings can be safer

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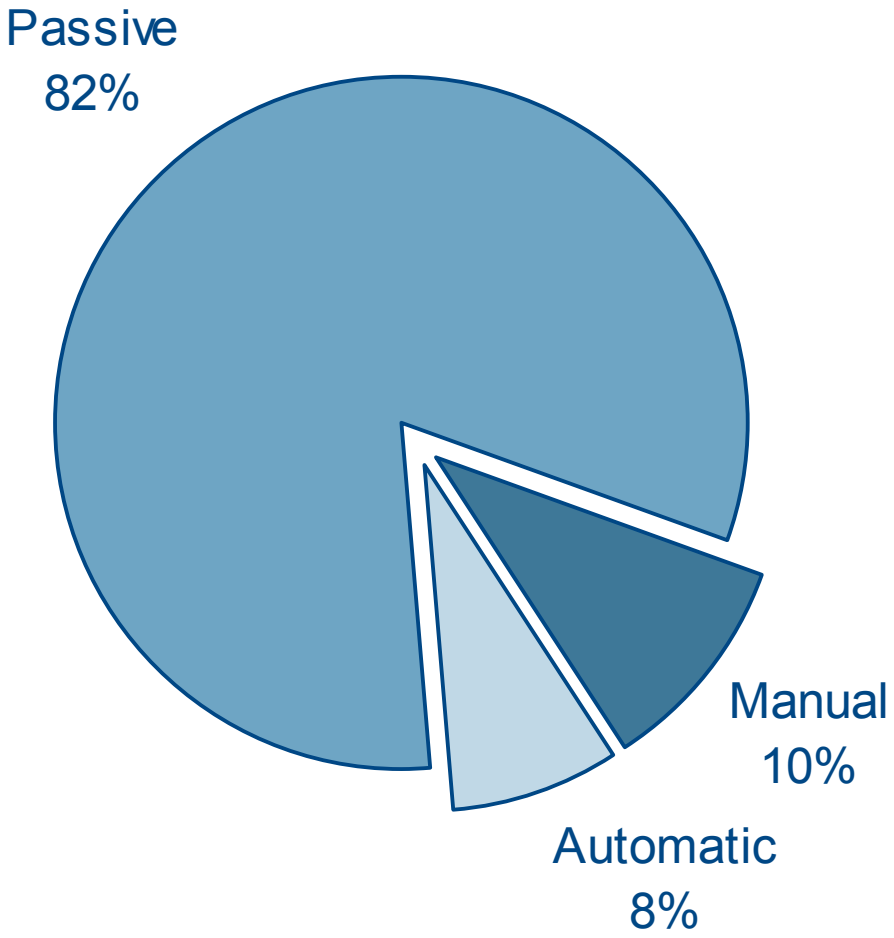
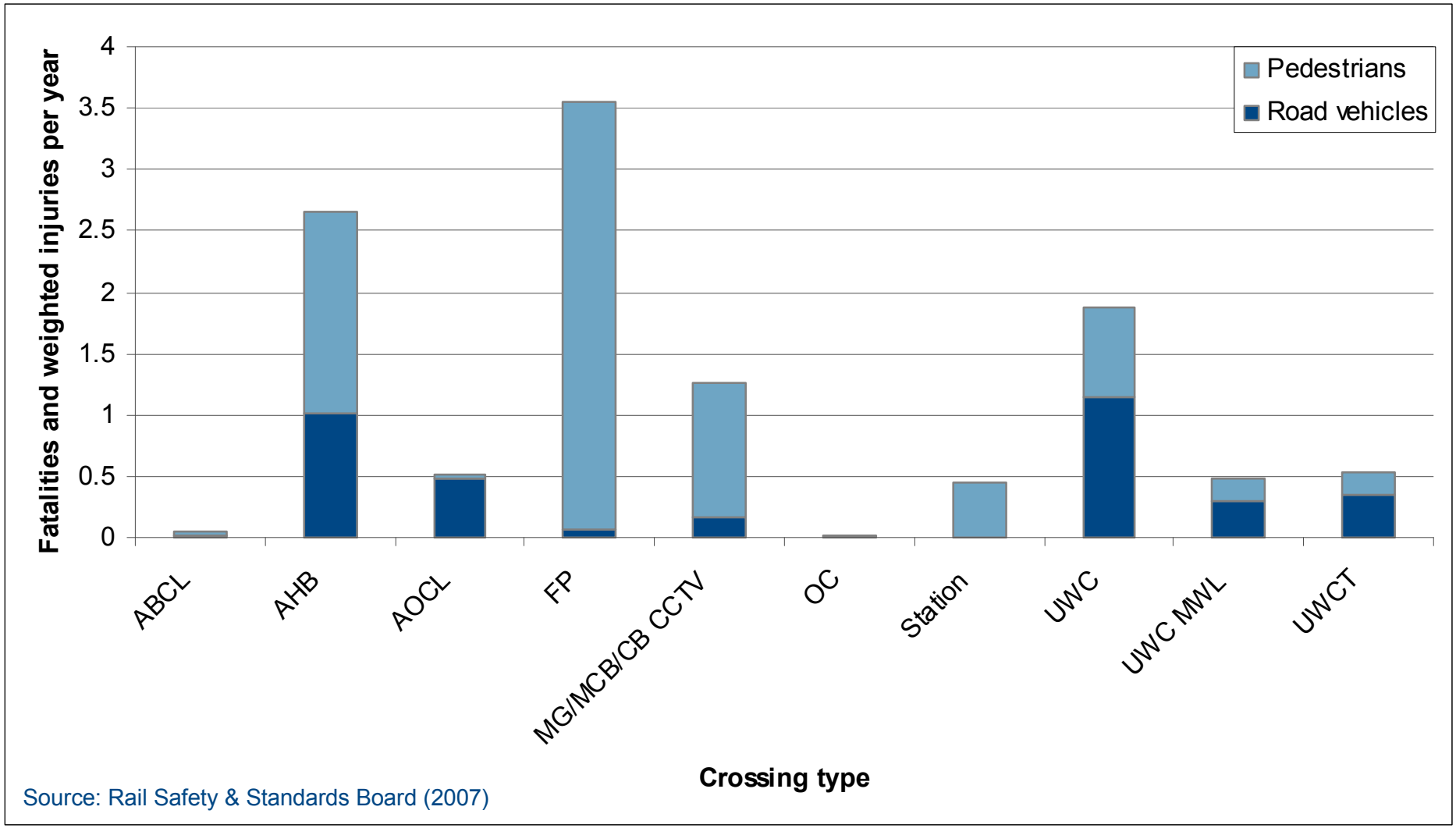
This presentation concentrates on traffic moment, an important factor influencing risk at level crossings

- In Great Britain (GB) risk is unevenly distributed amongst level crossings (LX); traffic moment is a particularly important factor influencing risk at some LX
- Historically, LX risk models in GB have considered a linear relationship between risk and traffic moment: more road and rail traffic equals more risk
- We have developed a non-linear model that refines this relationship
- This presentation contrasts the two methods and presents some outline results from their application

The majority of the 8,000 Level Crossings in GB are passive (>80%), with the remaining split relatively evenly

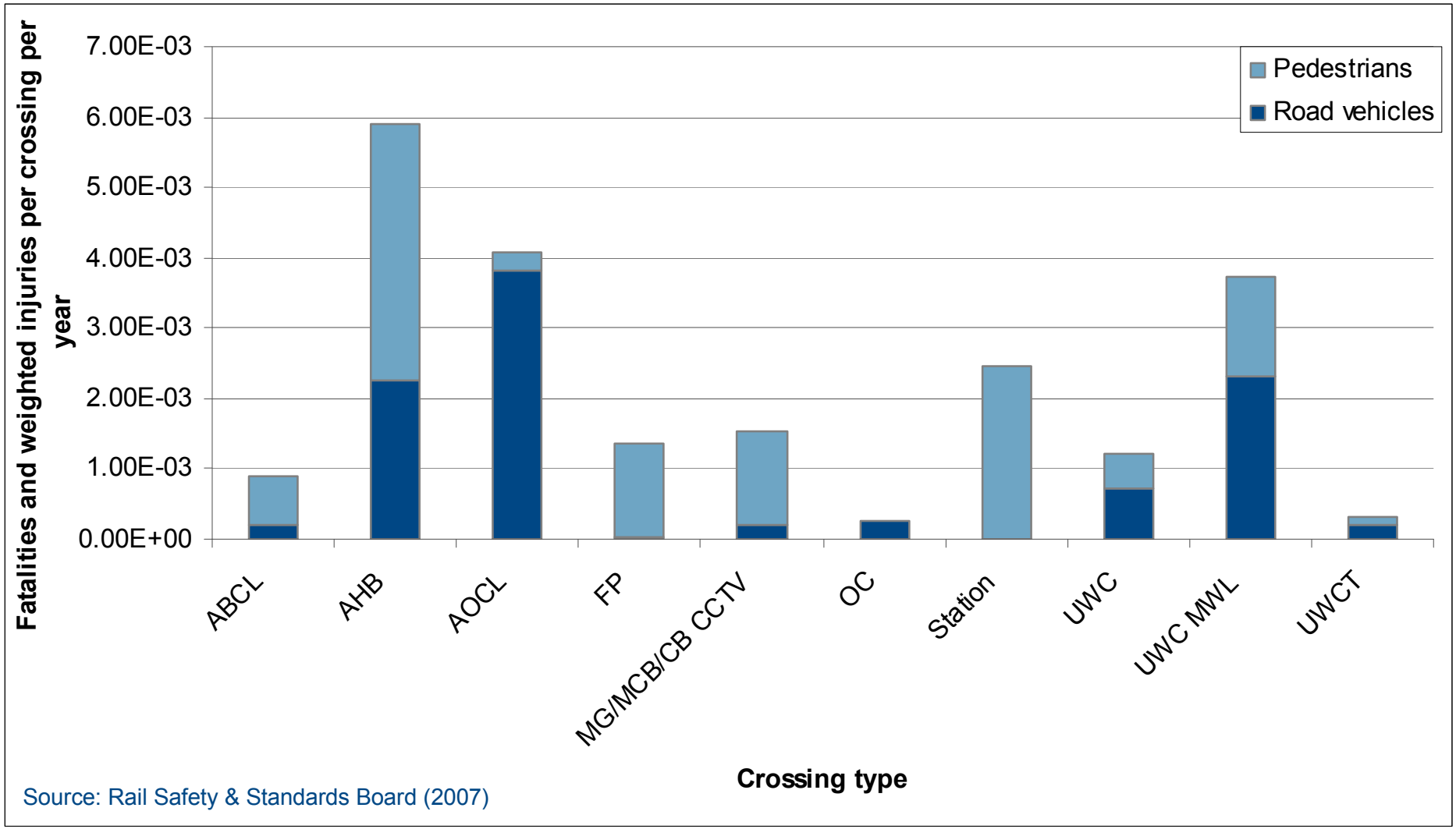


LX fatalities contribute some 7% of the total network risk (~12 fatalities and weighted injuries per year)



Source: Rail Safety & Standards Board (2007)

Normalising this by number of LX shows collective risk concentrated at a few relatively 'high risk' crossing types



Source: Rail Safety & Standards Board (2007)

Prediction of the likely collision frequency has been a key determinant of risk at busy crossings

- Assessment of risk at LX has tended to separate the collision frequency and consequences by user type: pedestrians and vehicle users
- The vehicle component has been of particular interest, given the more complex interactions with the LX and the potentially serious consequences of a collision
- At the busiest crossings in the UK upwards of 10,000 vehicles per day may use a LX, providing many opportunities for collision between a vehicle and an approaching train

A linear relationship between traffic moment and collision frequency has been assumed by many LX risk models

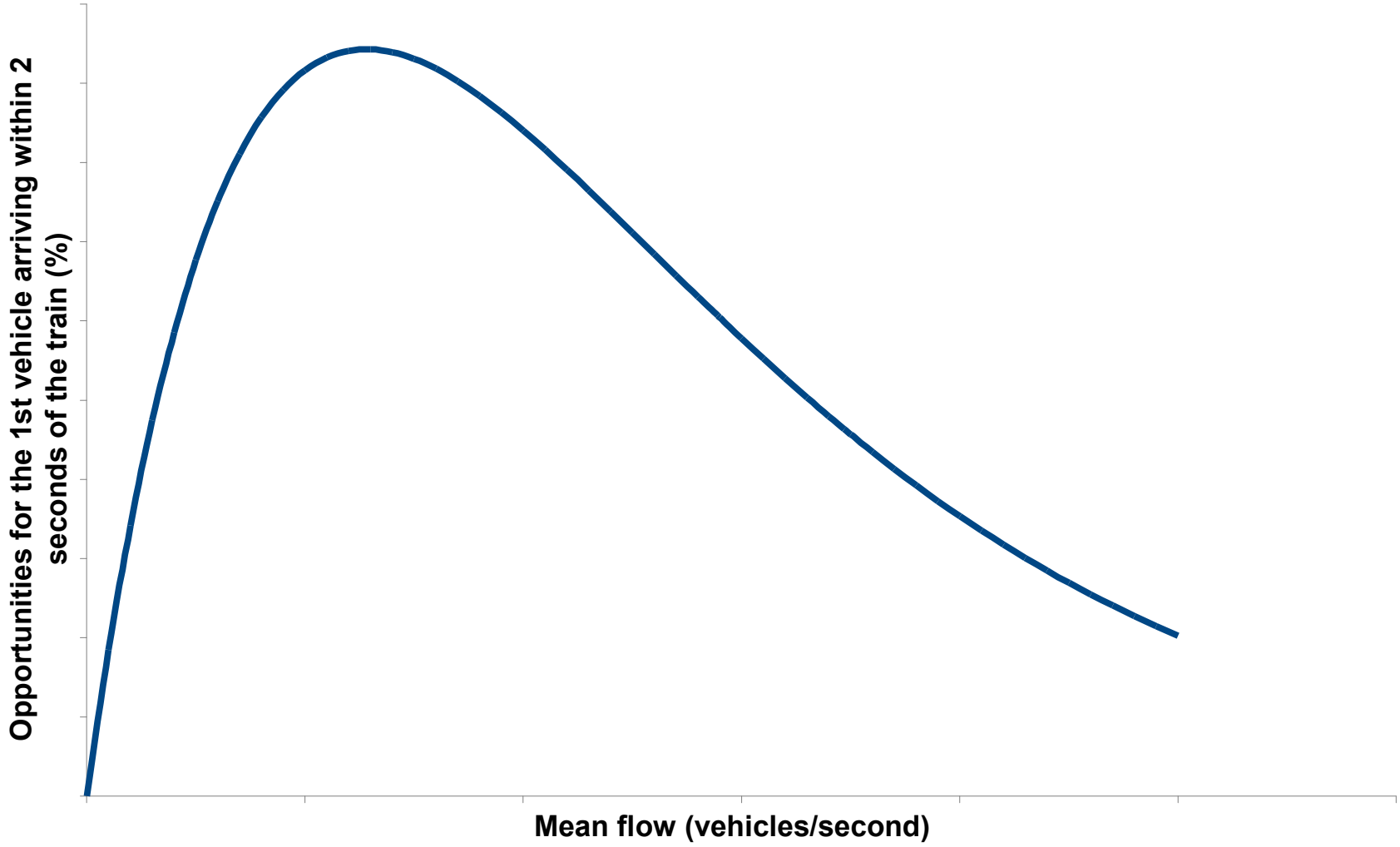
- This approach has been the basis of various models used in GB over the past decade
- Linear models assume that the number of opportunities for collision between a train and a vehicle increases linearly with traffic moment (the product of trains and vehicle numbers)
- Linear models predict the highest collision frequencies at ‘busiest’ crossings, i.e. those with the highest traffic moment

Research[1] on automatic crossings suggests that queuing vehicles may reduce the opportunities for collision

- The research argues that a chain of events is needed for a collision: a vehicle has to arrive shortly before a train and they must fail to stop
- Subsequent vehicles queue behind the first vehicle to arrive
- The first vehicle (assuming it stops safely) therefore acts as a safety barrier reducing the number of opportunities for collision

Stott, P F (1987) *Automatic Open Level Crossings: A Review of Safety*. Department of Transport

The research therefore suggests that opportunities for collisions occur non-linearly with respect to vehicle flow



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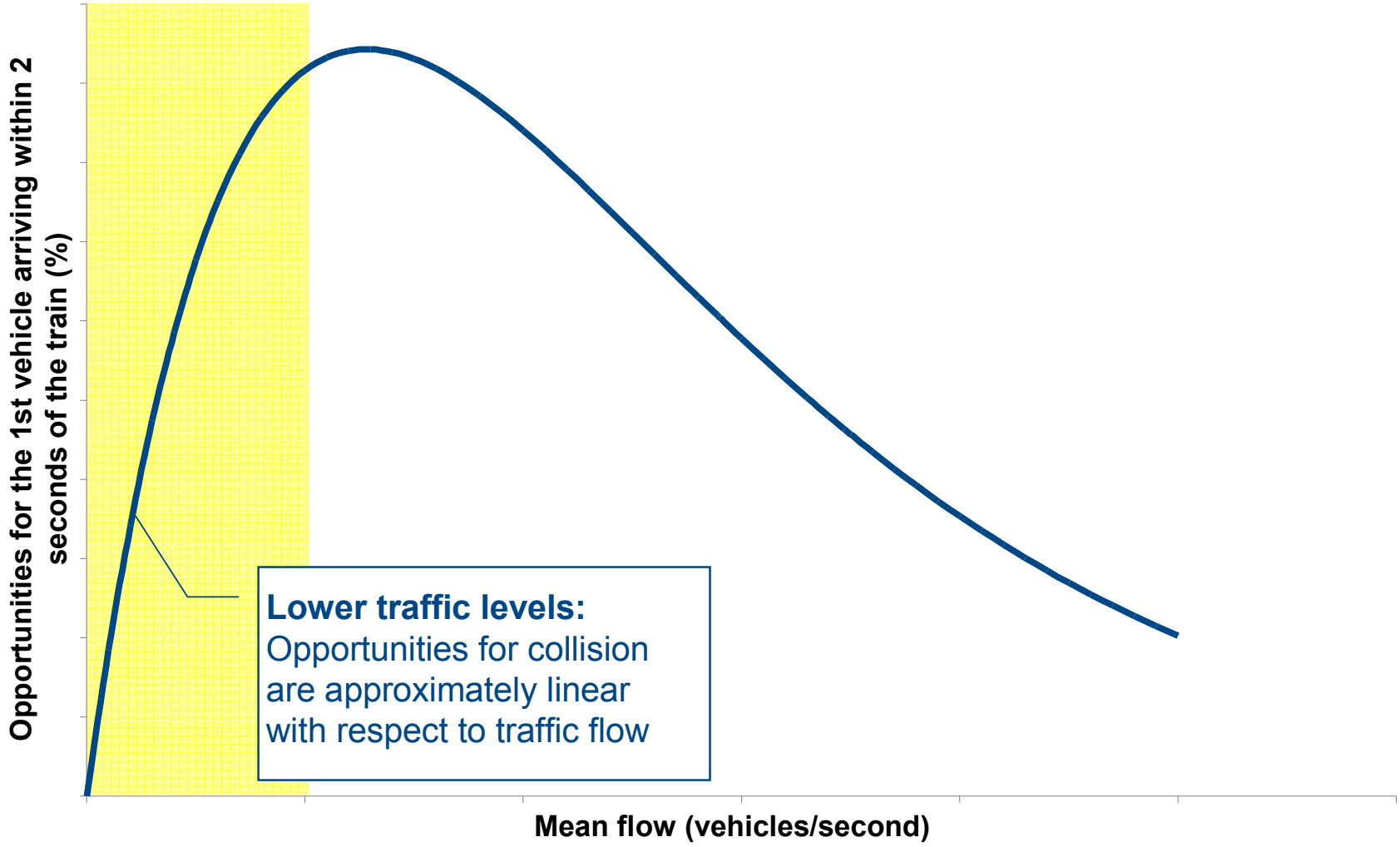

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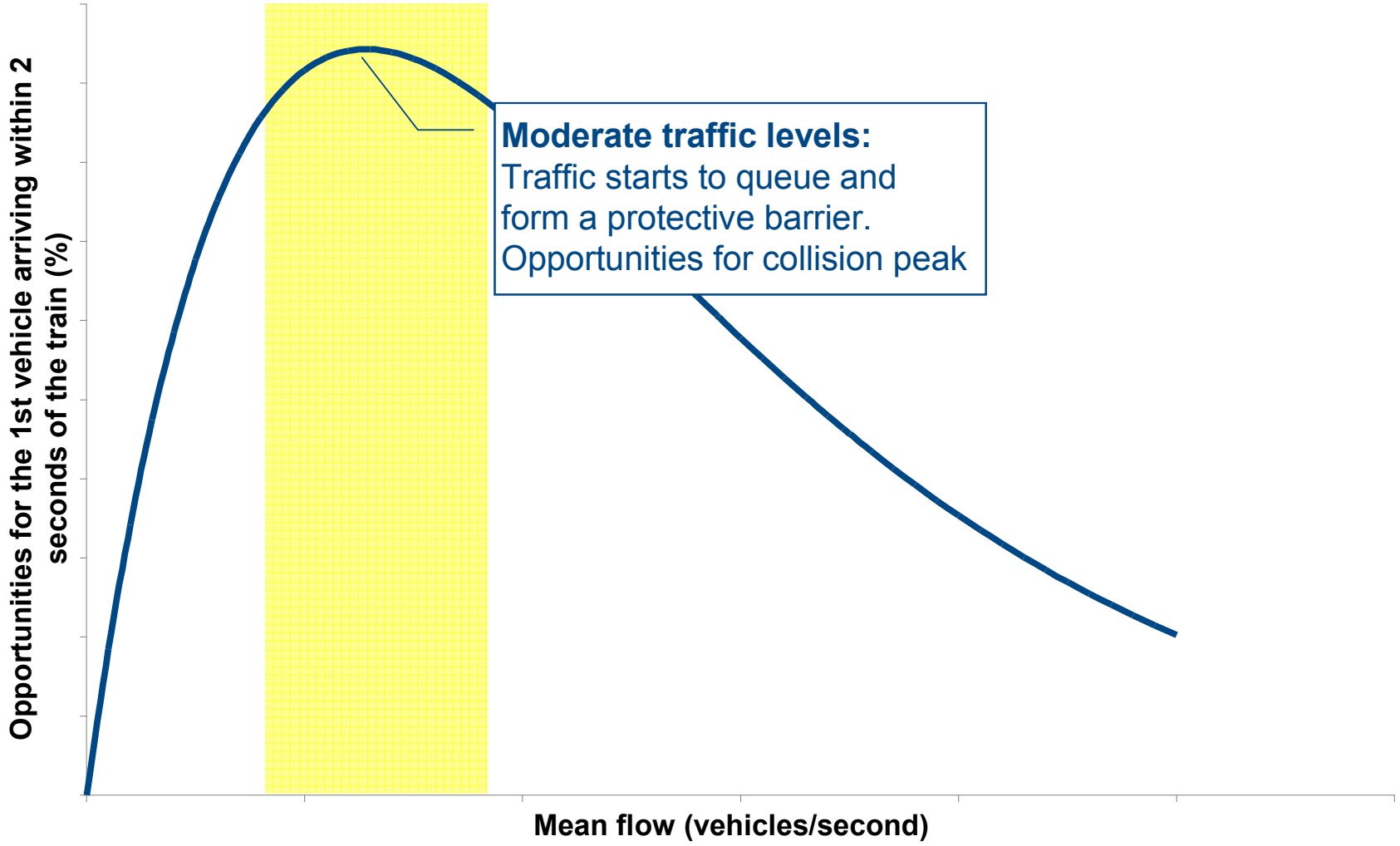

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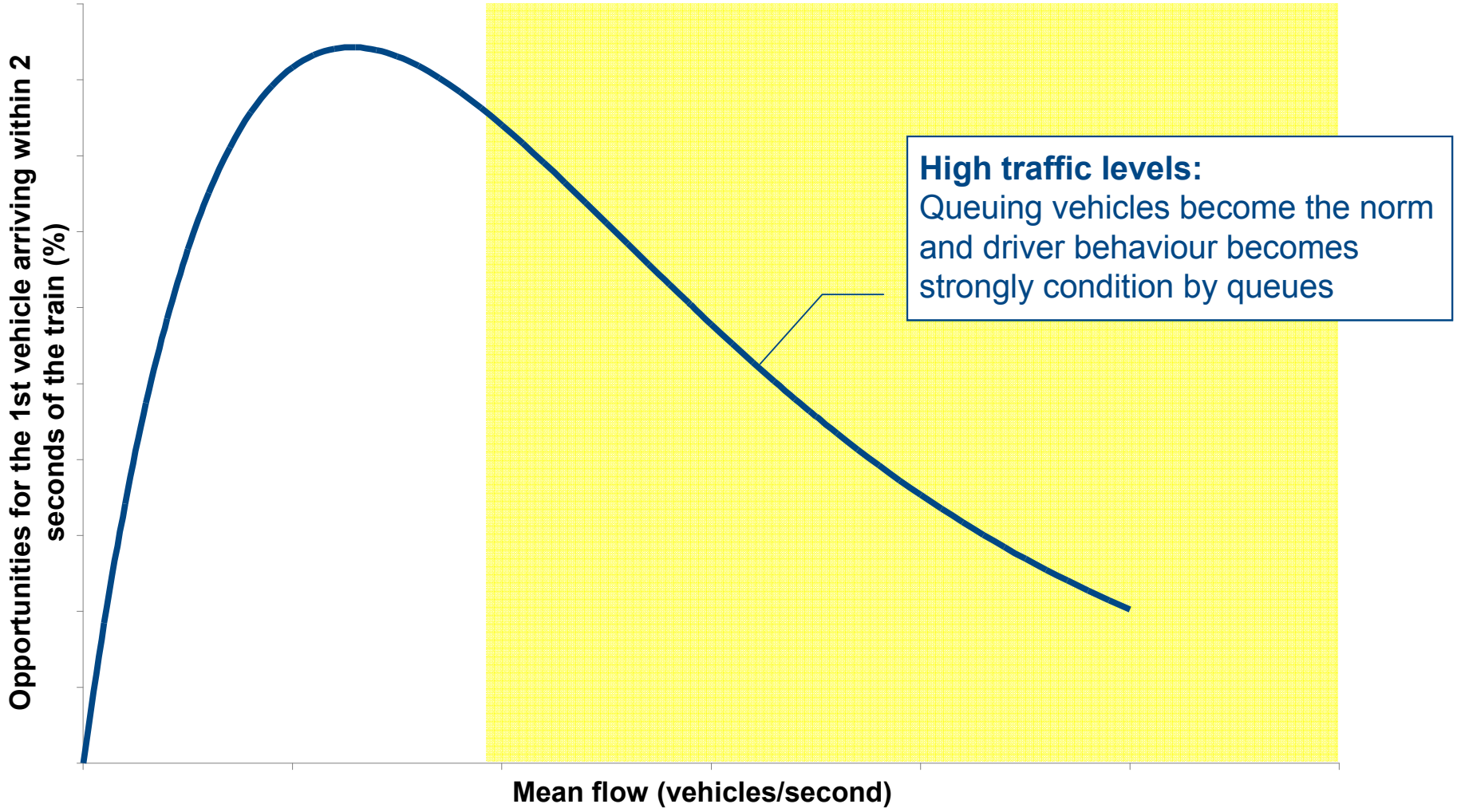
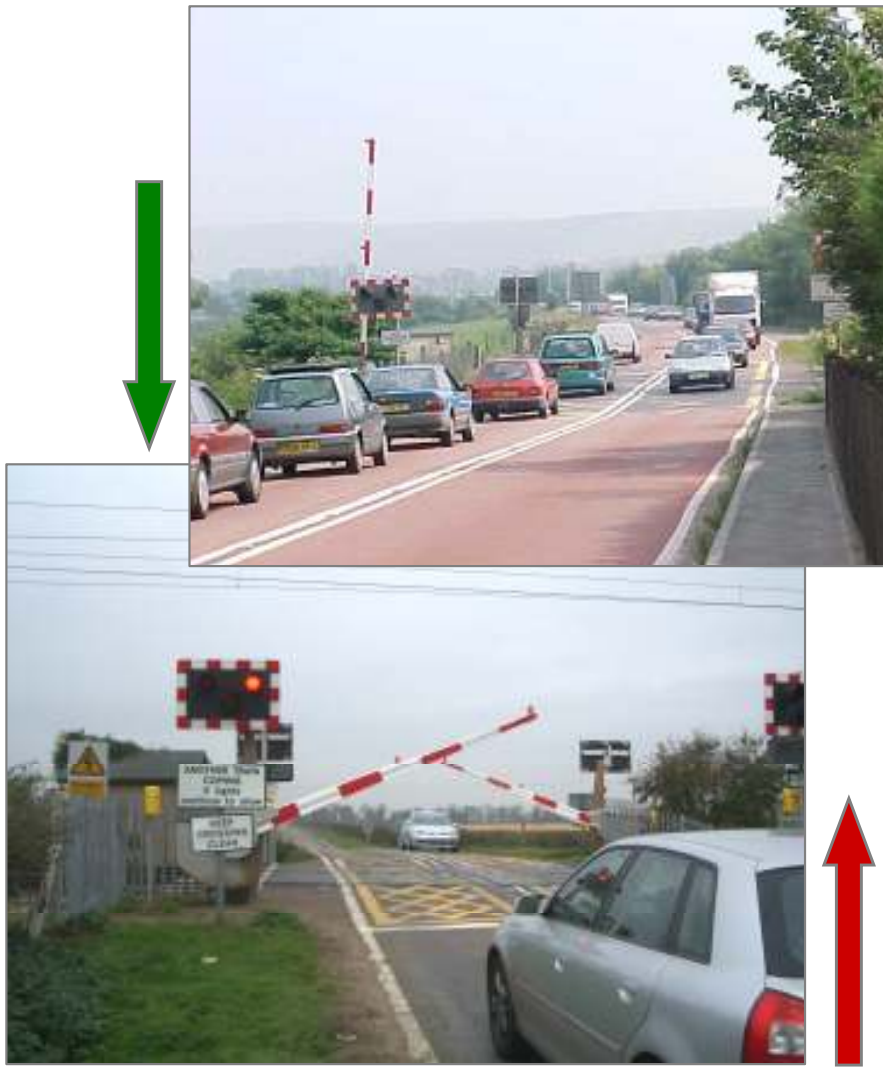


We applied this non-linear model to some 300 automatic crossings to see how it changed their risk ranking

Designation	Linear	Non-linear
LX A	1	21
LX B	2	2
LX C	3	5
LX D	4	101
LX E	5	54
LX F	6	1
LX G	7	7
LX H	8	85
LX I	9	90
LX J	10	37
LX K	11	6
LX L	12	282
LX M	13	186
LX N	14	4
LX O	15	3
LX P	16	61
LX Q	17	77
LX R	18	8
LX S	19	207
LX T	20	60



Use of this theory is changing which level crossings are considered in GB to be 'high risk'

- It is likely that the re-appraisal of LX risk predicted using the non-linear approach will focus on those automatic crossings with moderate traffic moment
- The shift in emphasis away from LX with very high levels of road traffic is supported by historical data that report a number of collisions at moderately-busy crossings in recent years; none have been reported in the same time period at those crossings with the highest road traffic
- This is likely to mean a change in focus for expenditure on LX safety designed to mitigate total risk associated with LX use

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