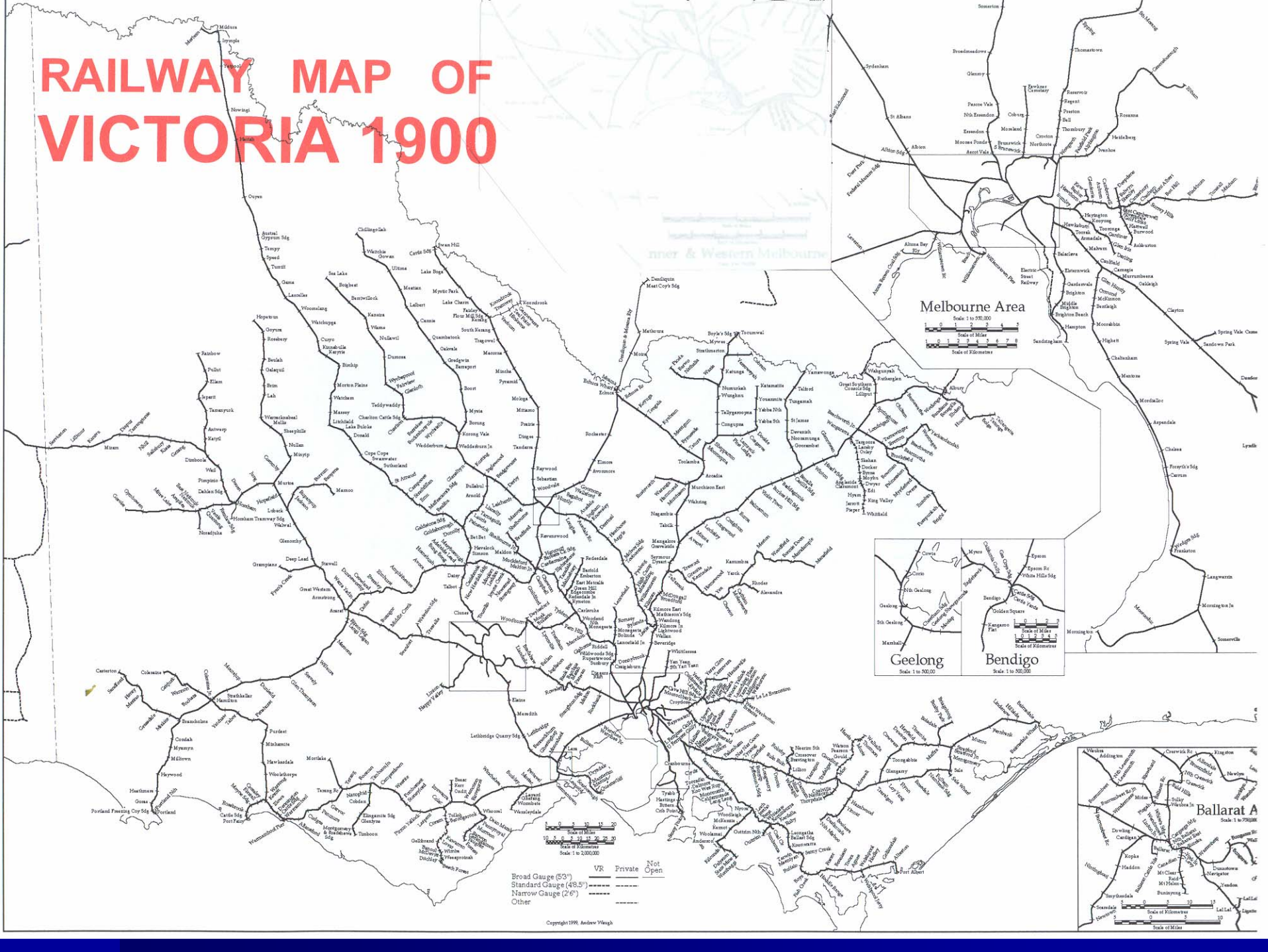

THE LANDING OF CAPTAIN COOK AT BOTANY BAY 1770
AUSTRALIA

1854 - stage-coach or railway

Note: crossing protection was not needed

RAILWAY MAP OF VICTORIA 1900



1904 Model T Ford

There are now in Victoria about:

2270 Railway crossings.

- **Active**
  - 480 have flashing lights
  - 360 have boom barriers
- **Passive**
  - 1430 have no active protection

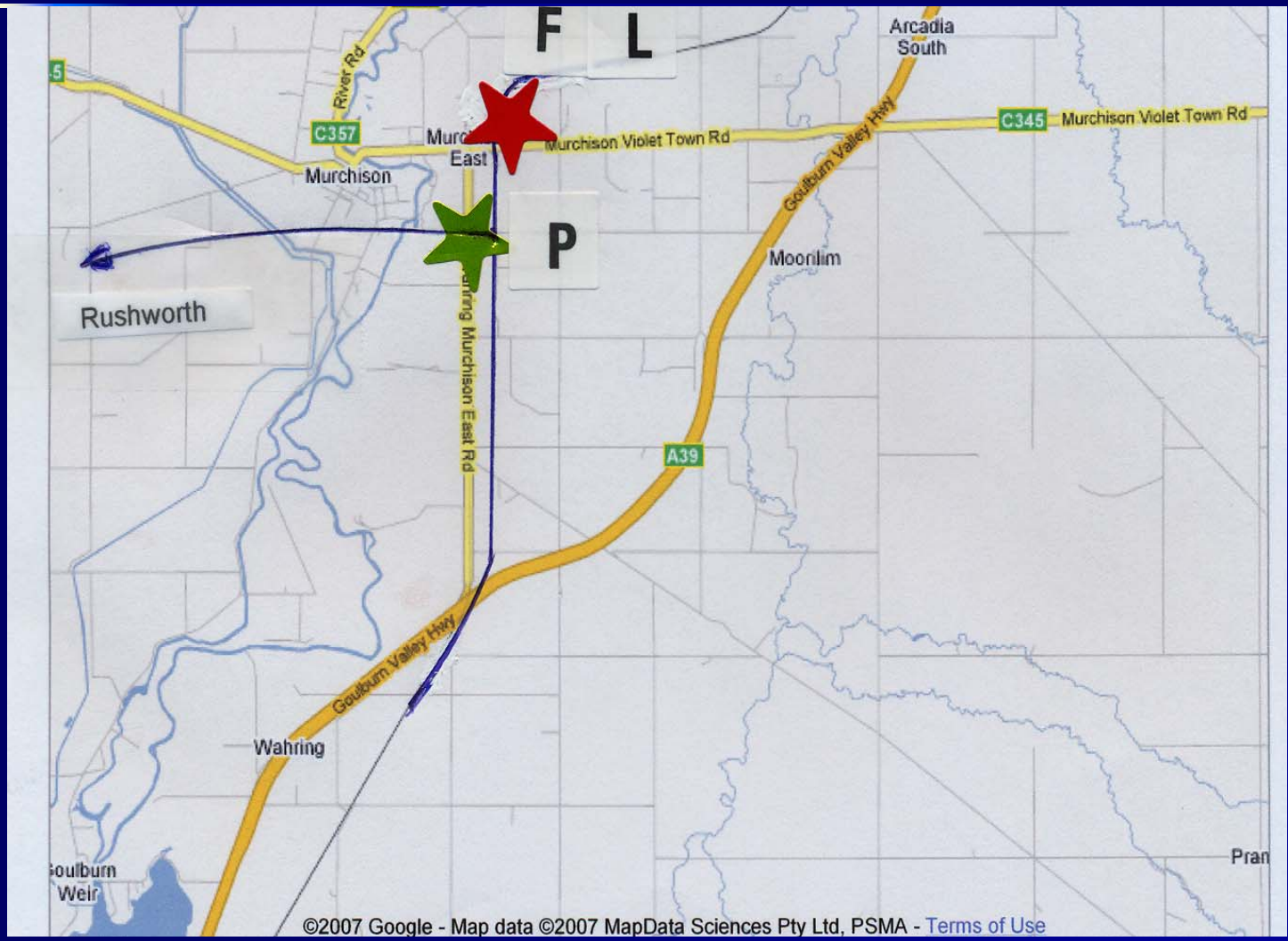
Can drivers discriminate between active and passive ?

"Do all railroad crossings have a device that warns you when a train is coming?" (Sanders, 1977)

After an active crossing, 23% said YES

After a passive crossing, 15% said YES !

Goulburn Valley Highway,1987



Best behaviour please !

Goulburn Valley Highway: motor vehicle driver head movements

		PASSIVE	PASSIVE	PASSIVE
FLASHING LIGHTS	TOTAL	No head movement	Looked One way	Looked Both ways
No head movement	88	**62**	14	**12**
Looked One way	84	43	**27**	14
Looked Both ways	92	39	25	**28**
TOTAL	264	144	66	54

QUESTION: Do most drivers meet design expectations at active and passive railway crossings?

ANSWER = NO

DOES THIS MATTER?

Conventional wisdom = **YES**

Science-based heresy = **NO**

The driver needs to know IS THERE A TRAIN COMING

Primary need

Secondary need

A Radical Rethink is overdue

The Terms of Reference

"existing, new and developing technologies… to improve safety at level crossings"

Wigglesworth offers the view that:

The appropriate technologies are those that give warning of an approaching train and NOT of an upcoming level crossing

Faster trains & longer trucks

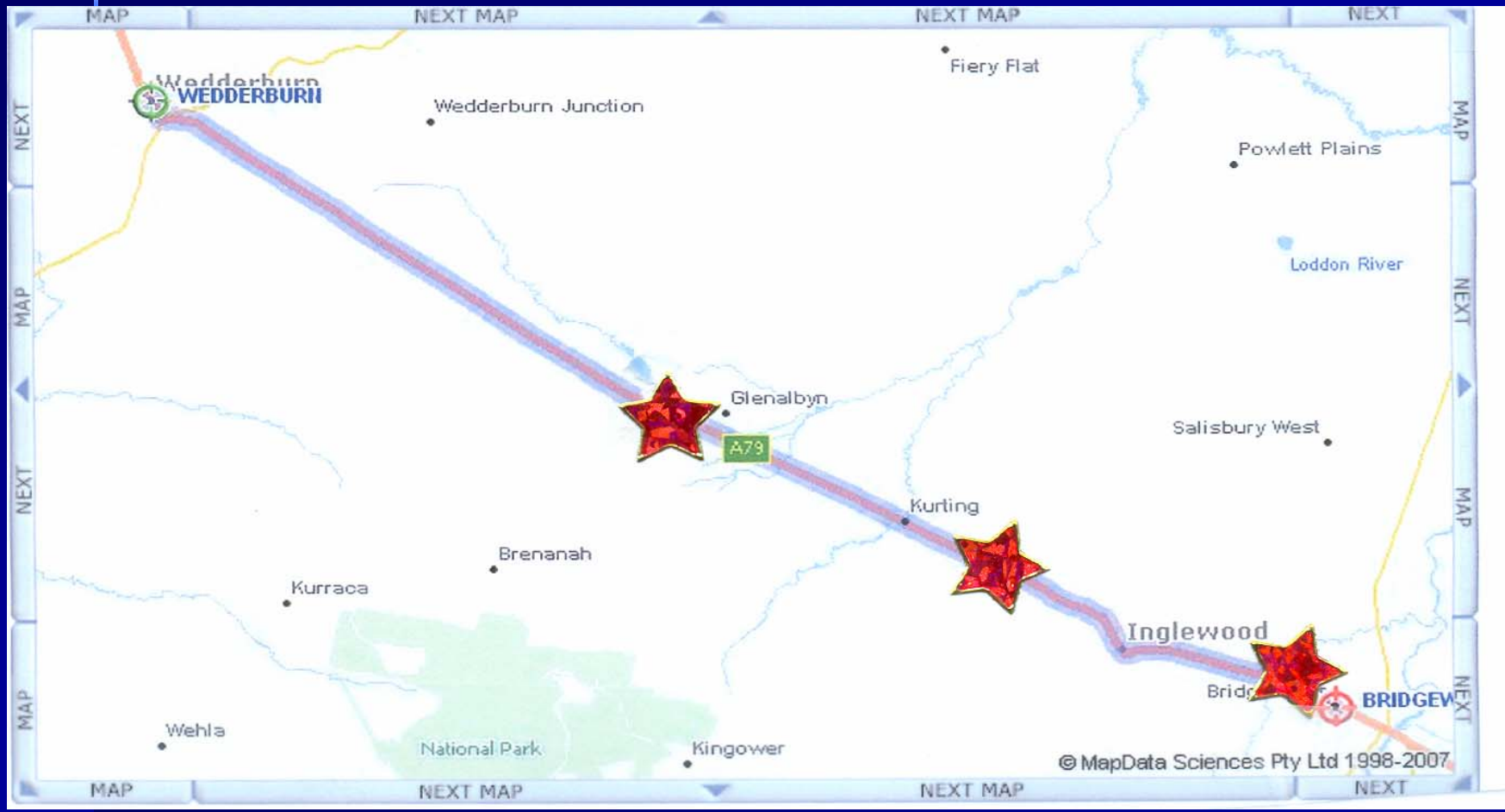
Involvement of trucks

Period	Crashes	Trucks
1973-77	85	3
99-06	23	8

Lismore rail crash, May 2006

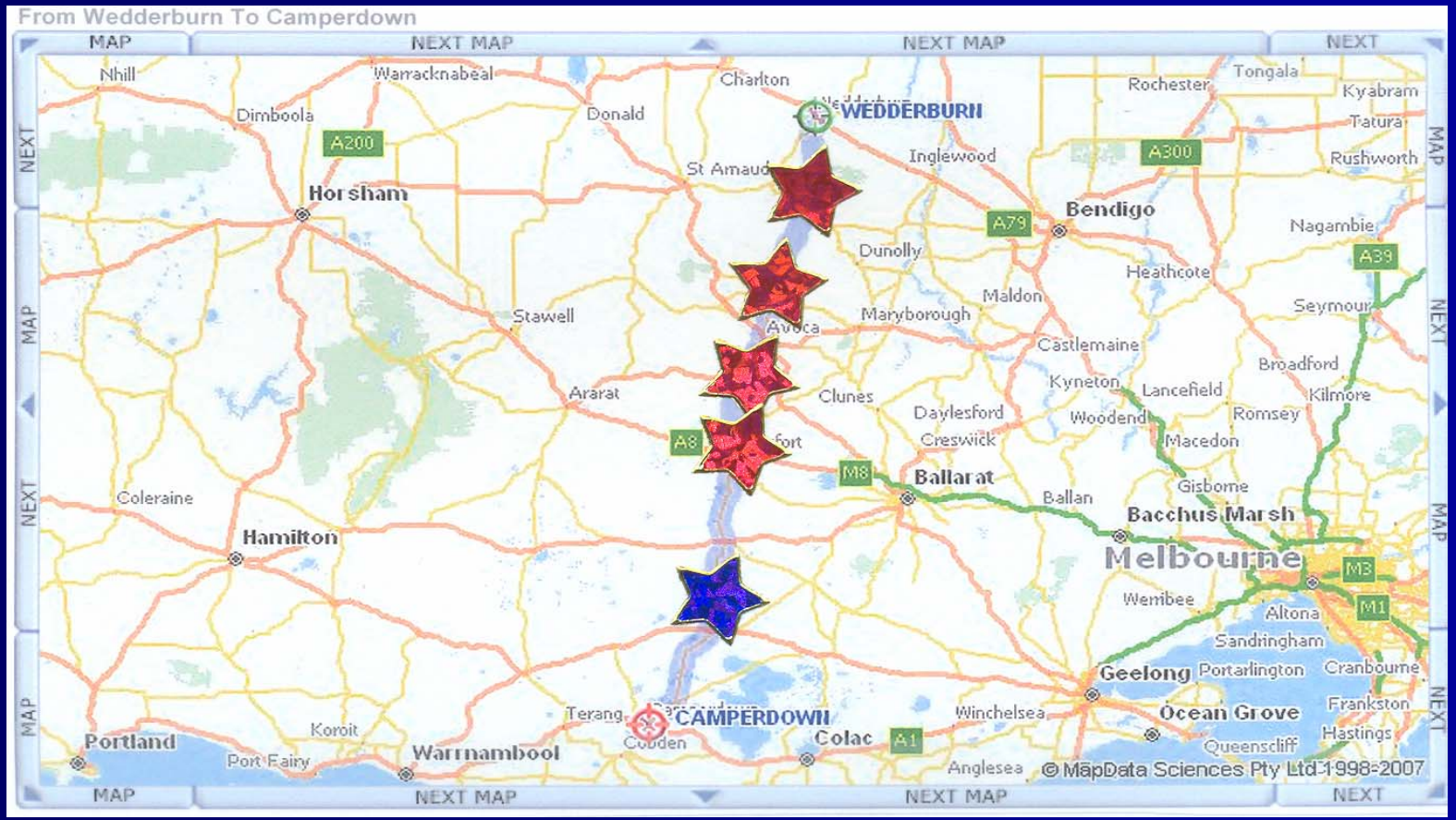
Lismore and ALCAM
(Australian level crossing assessment model)

First failure of ALCAM
Part 1: Wedderburn to Bridgewater



First failure of ALCAM

Part 2: Wedderburn to Camperdown



Second failure of ALCAM

Booms barriers in the bush !

EFFECTIVENESS OF 91 BOOM BARRIER INSTALLATIONS

	Before	After
Crossing years	1 068	613
Deaths	61	2
Deaths/100 crossing years	5.71	0.33


RAILWAY
CROSSING
STOP

Why not seal the track?

Haddon: 10 Countermeasure Strategies

- 1 Prevent the initial marshalling of the source of the energy

Can we close this crossing ?

ALCAM failed to identify the threat posed by this unnecessary crossing.

Third failure of ALCAM
Why not eliminate the crossing ?

Modern safety philosophy

- Crashes are considered to be failures of the system –
- NOT failures of the human

Child aspirin tablets: open bottle or blister pack ?

- "chewable and a sunshiny orange flavour"

Road traffic deaths Aust

1940	1970	2007
1560	*3952*	*1616*

- Seat belts
- Road treatments
- Random breath tests
- Aust design rules
- Bike helmet use

Actions Post Kerang

1	No more Stop signs	√
2	Rumble strips	?
3	New criminal offence	X
4	Advanced flashing lights	X

One excellent decision no more STOP signs

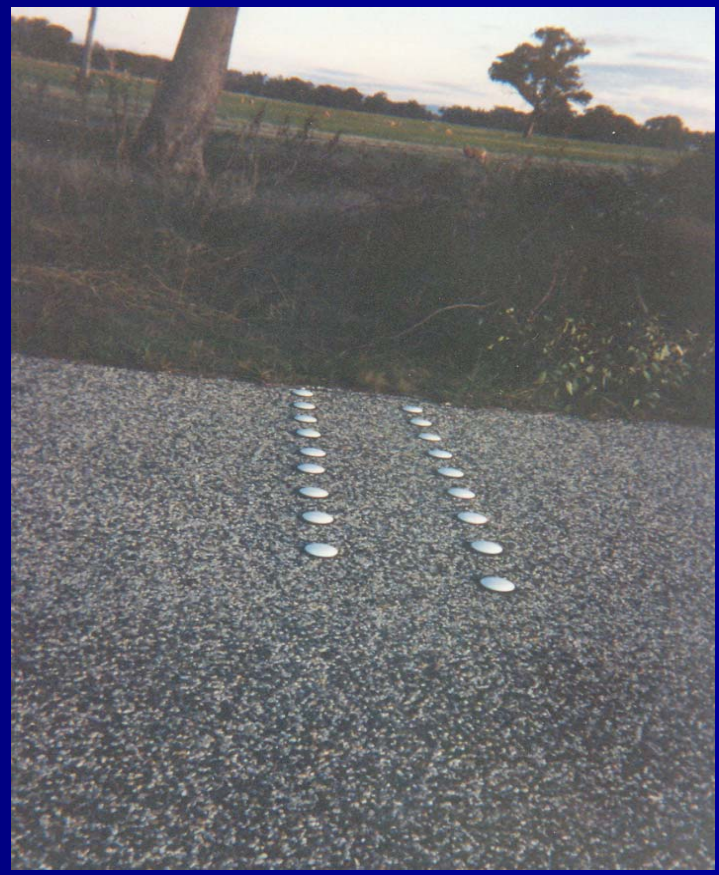
US: Changes from crossbucks to STOP signs (n = 1939)

(source Raub R (2007) ITE Journal 76: 4: 16-26. Table 5

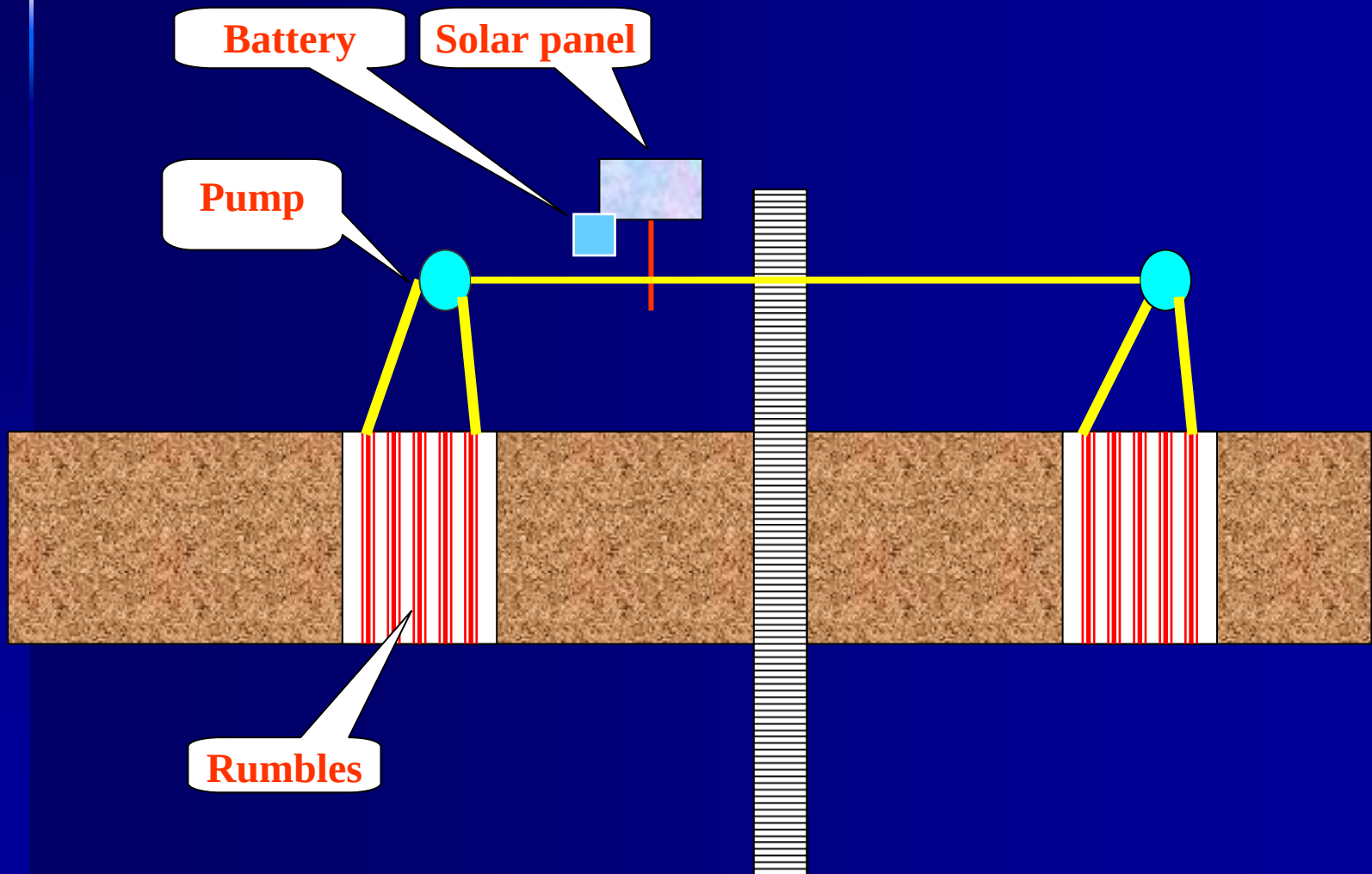
Device	Crashes	Rate per 100 crossing-years
Crossbucks	**192**	**2.10**
STOP	**261**	**2.64**

Static Rumble Strips

- Static rumble strips advise the driver of an upcoming level crossing but give no warning of an approaching train.
- They are unlikely to be successful



Active rumble strip system diagram (plan view)



Trying to beat the train will become an offence in Victoria

On what evidence ?

Visibility 490 metres
Train @ 125 km/h takes 14.1 secs
B-Double traverse needs 18.6 secs

Adequate sight distance?

- The time for B-Double traverse has to be less than train arrival time from the sight distance.

- Midland Hwy)
- Minto Road)
- Waterloo Rd)

inadequate sight distance

Evaluation of this strategy

1 Gives no warning of train approach **SO**

2 Innocent drivers will be punished ($3,000: 4 demerit points: automatic licence suspension for 3 months)

3 *There will be no reduction in mortality*

Advance yellow flashing lights which will have

Same number and size of lanterns

Same flash rate

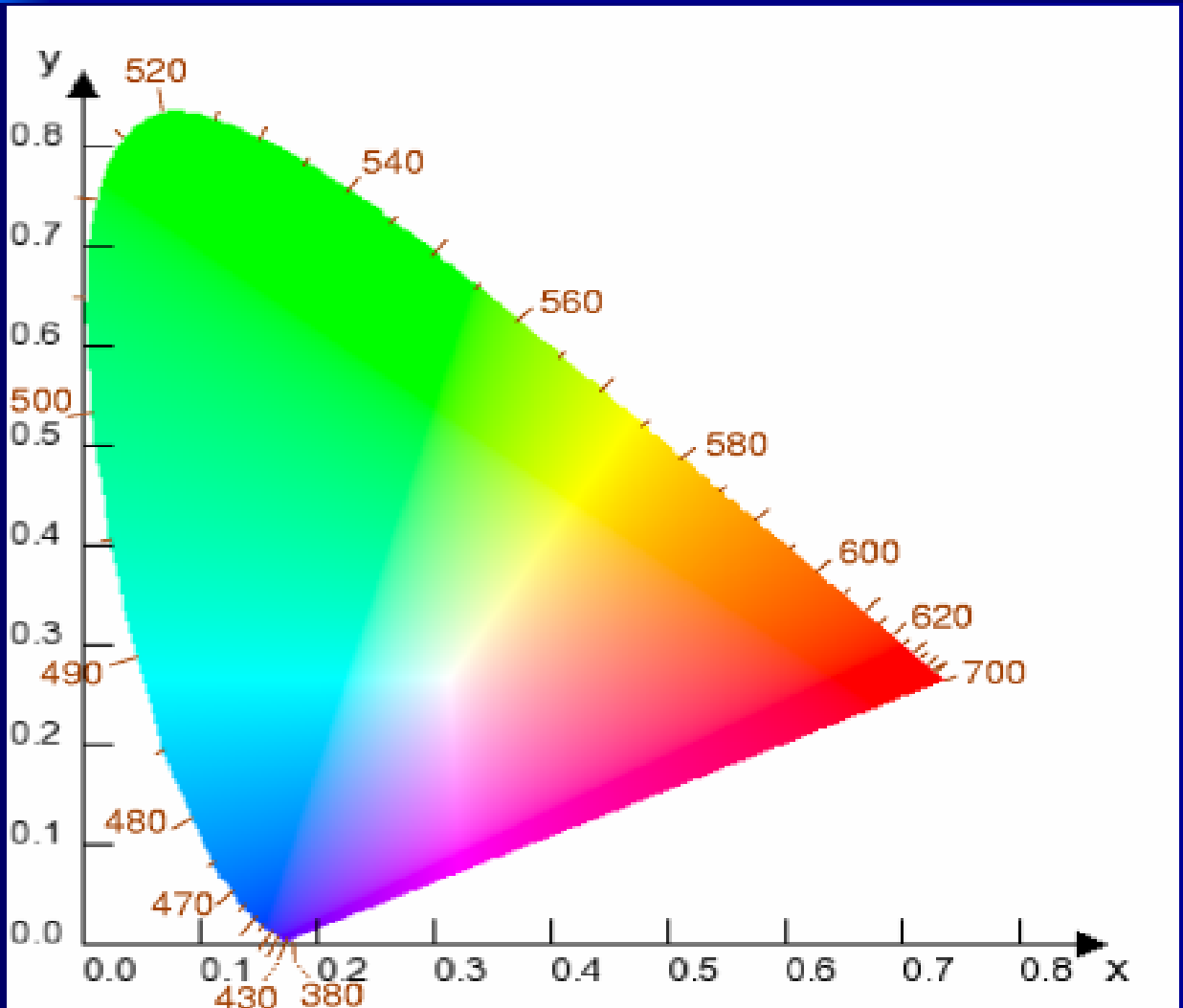
They will mean: STOP (if red)

BEWARE (if yellow)

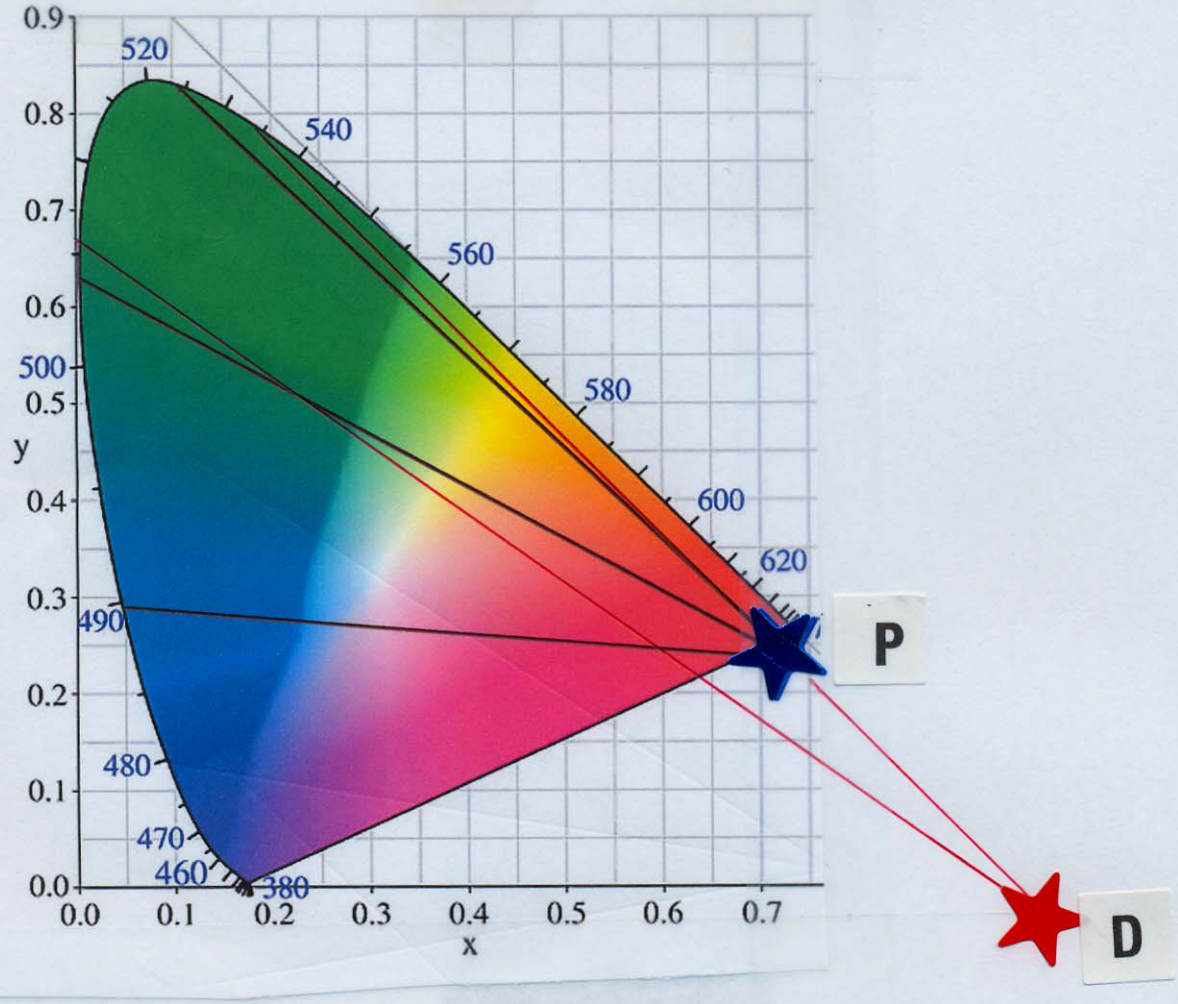
Is this a possible source of confusion ?

NO!! This is yellow! Can't you see ??

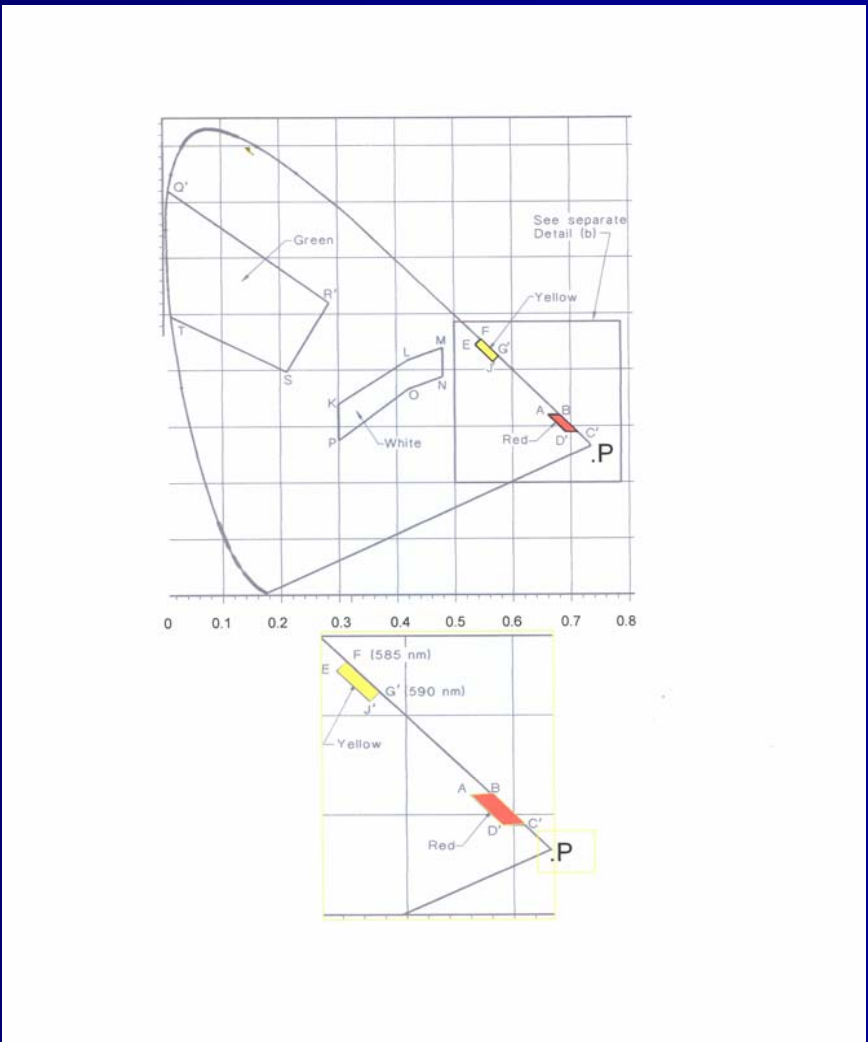
Cie Chromaticity Diagram



CONFUSION LINES AND COPUNCTAL POINTS FOR PROTANOPES (P) AND DEUTERANOPES (D)



CIE Red and Yellow Colours



Emeritus Prof Barry L Cole AO

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One (of 8) journal articles in 2006:

Search for coloured objects in natural surroundings by people with abnormal colour vision

How can we do better?

Premier	Bracks	Baillieu
Minister	Kosky	Mulder

who are advised by

Appropriate departmental public servants

whose advice is based

ON WHAT RESEARCH EVIDENCE ?

Wills PJ (1999) Review of Australia's Health

Australia - 0.3% of population produces 2.5% of new medical knowledge

Hence, *life expectancy has increased by 38%*

Curiosity-driven, investigator-initiated peer-reviewed research has been the foundation of that success

Research projects to advise of an approaching train

Visual Stimuli	Conventional traffic lights Map navigation systems
Auditory Stimuli	Voice-to-voice systems An acoustic laser beam
Tactile stimuli	Active rumble strips Deformable speed humps

A Tiny Start by Victoria

$15 m over the next five years to support curiosity-driven, investigator-initiated, peer-reviewed research to improve safety at level crossings in Victoria.

Admin tasks

1. List 100 crossings to be closed in 5 years: criteria
   >1 per km rural: > 4 per km urban

2. List (and change) crossings where train approach time is < B-Double clearance time

3. Repeal the "beat the train" legislation

4. Create and publish a databank of all Victorian railway crossings

Thank you for allowing me to make this presentation

Modern injury prevention

Effective countermeasures

1. Identify system failures
   remove, repair or replace

Ineffective countermeasures

1. Attempts to apportion blame

Corporate Manslaughter (UK) Act

- Failures that would make an organisation vulnerable include:

  Senior Management making decisions on incomplete/wrong information

Source: Safety & Health Practitioner April 2008