Project PRIME: Innovative road markings to promote better rider behaviour and casualty reduction

Prof Alex Stedmon[1], David McKenzie[2], Martin Langham[1], Kevin McKechnie[3], Richard Perry[2], Stuart Wilson[2], Morag Mackay[2], Vince Tait[2], Stuart Geddes[3]

[1]Open Road Simulation Ltd, [2]Transport Scotland, [3]BEAR Scotland, UK



Road Safety Scheme of the Year Award
Judges Special Merit Award

Road Safety Award (HC)
Research Initiative of the Year (C)

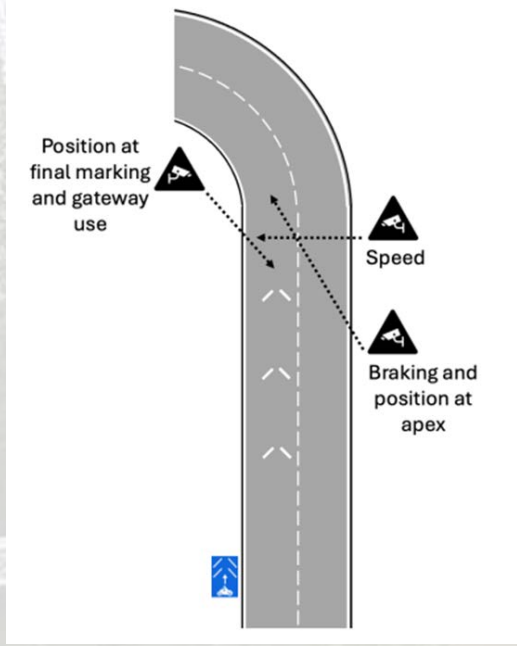
PMIRSA 2023

David McKenzie, Project Manager, Transport Scotland

PRIME = **P**erceptual **R**ider **I**nformation for **M**aximising **E**xpertise or **E**njoyment

Phase 1 – 2020 - 2022

- opportunistic sample of motorcycles
  - 32,213 motorcycles across all sites (100%)
  - 9,919 lead motorcycles (30.8%)
- 22 trial sites
  - speed reductions (10)
  - lateral position at the final PRIME (15)
  - lateral position at the apex (13)
  - reduced braking (9)
  - use of the PRIME road markings (18)
- no negative effects
- no effects at comparison sites







Phase 2 – 2023 to 2025 – Three themes

- 2023 – Untreated roads
- 2024 – Right hand bends
  - Carry over effects
- 2025 – Greater speed reductions – alternative design
  - Long term effects

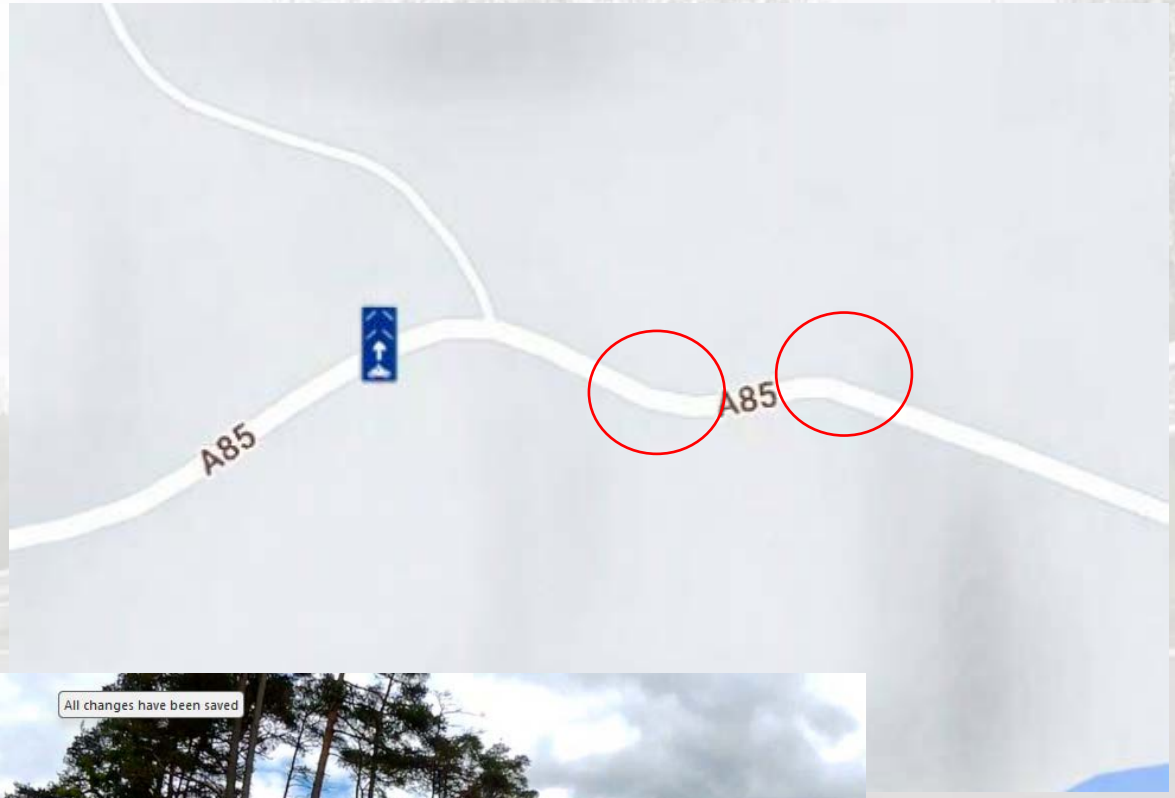
Phase 2 results – 2023 to 2025

- opportunistic sample of motorcycles
  - 15,557 motorcycles across all sites (100%)
  - 5,680 lead motorcycles (35.6%)
- 18 trial sites
  - speed reductions (13)
  - lateral position at the final PRIME (14)
  - lateral position at the apex (14)
  - reduced braking (9)
  - use of the PRIME road markings (17)
- no negative effects
- no effects at comparison sites
- Carry over effects
- long term effects (2, 3 and 5 years)

Site	Rider Behaviour				
	Speed	**Position at PRIME**	**Position at Apex**	**Braking**	**Use of Gateway**
2023					
Landrick	Sig		Sig		Sig
Strathyre	Sig	Sig			Sig
Glenogle	Sig	Sig	Sig	Sig	Sig
Mid Lix	Sig	Sig	Sig		Sig
Dalkenneth	Trend	Trend	Sig	Trend	Sig
West Lodge	Sig	Sig	Sig	Sig	Sig
Lawers Lodge*	*No effect*	*No effect*	*No effect*	*No effect*	*No effect*
2024					
Dalmally	Sig	Sig	Sig		Sig
Strone Hill	Sig	Sig	Sig		Sig
Clifton	Sig	Sig	Sig		Sig
Ardveich House	Sig	Sig	Sig		Sig
Dunira East	Sig	Sig	Trend		Sig
Carry over left	Sig	Trend			Trend
Carry over right	Sig	Sig	Sig		Sig
Dalchonzie	Trend		Trend		Trend
Tullybannocher*	*No effect*	*No effect*	*No effect*	*No effect*	*No effect*
2025					
Butterbridge	Sig	Sig		Sig	Sig
Butterbride – *East*	Trend	Sig	Sig		Sig
Loch Lubhair - East	Sig	Sig	Sig	Sig	Sig
Rob Roy's Dip - *East 1*		Sig	Sig	Sig**	Sig
Rob Roy's Dip - *East 2*	Sig	Sig	Sig		Sig
Dalkenneth	Trend	Trend	Sig	Trend	Sig
Tullybannocher*	Trend***				

2024 – Carry over effects

- Carry over effects
- 3 bends (R – L - R)
- PRIMEs at bend 1
- No PRIMEs at 2 and 3 – data collection only



- Reductions in speed at all 3
- +ve changes in position

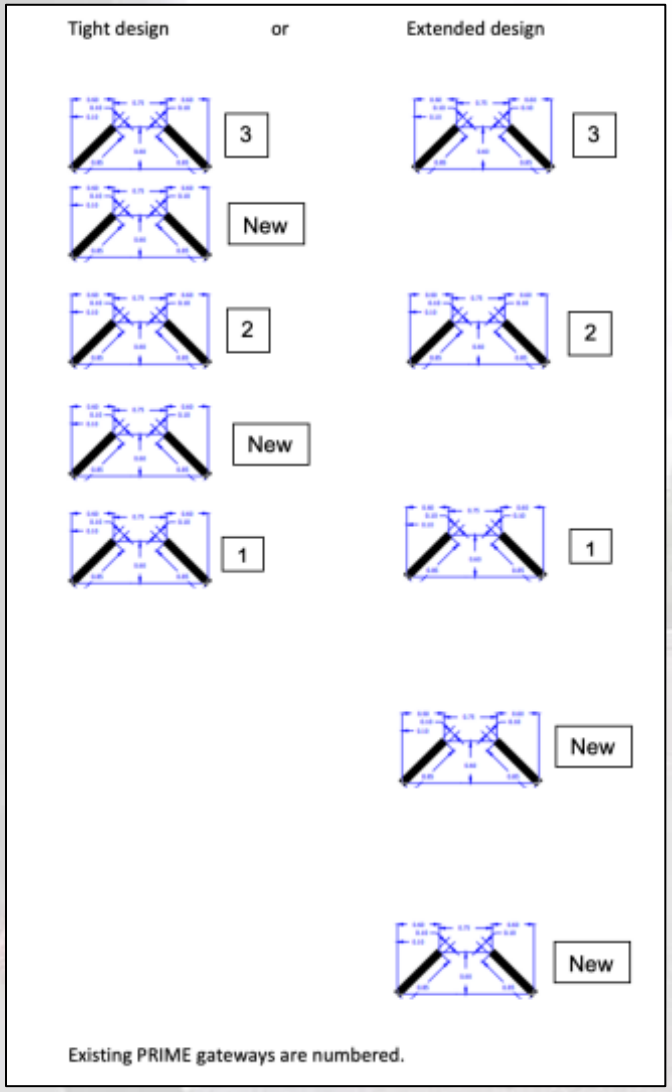


2025 – Long term effects

- 5 sites compared with previous findings
- 3 from 2020
- 1 from 2022 & 2023
- Significant +ve changes in position and use of PRIMEs

		Long-term behaviour change				
	Time period	Speed	Position		Braking	Use of gateways
Site name			PRIME	Apex		
Butterbridge East (new site)	n/a	-	-	-	-	-
Butterbridge	3 years	-	✓	-	-	✓
Loch Lubhair East	5 years	-	✓	✓	✓	✓
Rob Roy's Dip East 1	5 years	-	✓	-	-	✓
Rob Roy's Dip East 2	5 years	-	✓	✓	-	✓
Dalkenneth	2 years	-	-	✓	-	✓
Tullybannocher (comparison)	n/a	-	-	-	-	-

Phase 2: 2025 – speed reductions?



5 PRIMEs designs

Site name	5 PRIMEs effects observed: Speed	Position: PRIME	Position: Apex	Braking	Use of gateways
Butterbridge East (new site)	-	-	-	-	-
Butterbridge	-	-	-	-	-
Loch Lubhair East	✓	-	-	-	-
Rob Roy's Dip East 1	-	-	-	-	-
Rob Roy's Dip East 2	✓	-	-	-	-
Dalkenneth	-	-	-	-	-
Tullybannocher (comparison)	-	-	-	-	-



Summary results

- Six years of research
- 35 trials sites installed (11 Right / 24 Left)
- 47,770 motorcycles
  - 15,599 lead riders analysed (32.5%)
  - 28,538 group riders (59.7%)
  - 4,915 carrying pillion (10.3%)
- Behaviour change
  - speed reductions (23)
  - lateral position at the final PRIME (29)
  - lateral position at the apex (27)
  - reduced braking (24)
  - use of the PRIME road markings (35)
- Sustained effects up to 5 years



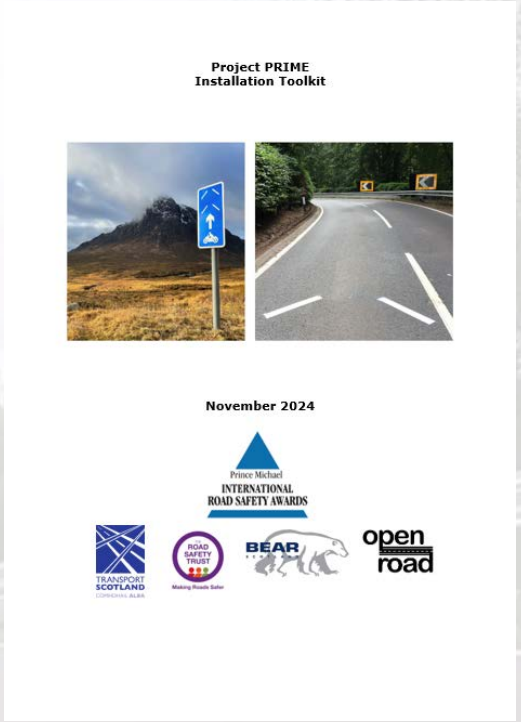
Motorcycle using PRIME road marking



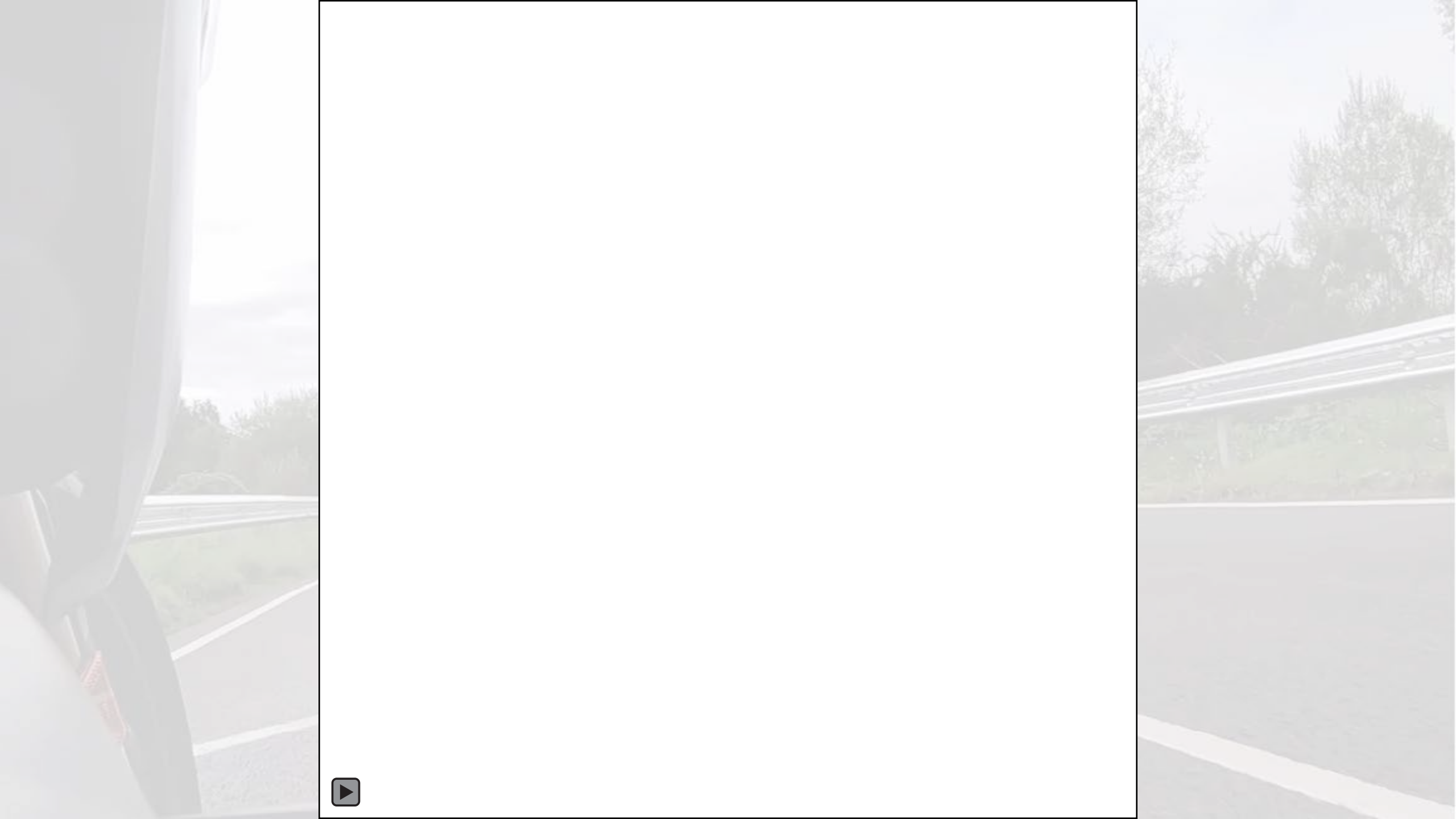
Example of Pre/Post PRIME positioning

Knowledge sharing

- International interest
  - implementing PRIMEs for casualty reduction
  - local councils and road safety partnerships
- Publication of installation toolkit
  - Sign and marking design and specification
  - Evidence of effectiveness
  - Site selection and approvals
- Uptake by road authorities
- Impact outside of Scotland
- Academic journals







Thank you

- We are keen to talk to anyone who might be interested in installing PRIMEs for motorcycle casualty reduction

- Project team contact details

- david.mckenzie@transport.gov.scot
- KMcKechnie@bearscotland.co.uk
- Sgeddes@bearscotland.co.uk
- vince.tait@transport.gov.scot



PRIMEs – if you install them, motorcyclists will use them

All images: A Stedmon courteousy of Transport Scotland

In memory of Alex…

