P2Ws in bus lanes study

Main Report

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II. Whilst the Mayor's Transport Strategy recognises that P2Ws "can generate more pollution and noise" than cars it also recognises their use as a "quick, relatively low cost private transport that are more space and fuel efficient than cars" (Chapter 4G.26) and in response to the P2W lobby committed to implementing a trial of P2W usage in bus lanes (Proposal 4G.1).

III. The primary objective for this study was to investigate and offer evidence to show whether the safety of P2W users could be enhanced by allowing them access to bus lanes (the measure). The assessment was to involve comparing the casualty history of all vulnerable road users (VRUs) to ensure the measure does not create a negative impact on themselves or other road users.

IV. In September and October 2002, TfL introduced three pilot schemes on the Transport for London Road Network (TLRN) whereby P2Ws were permitted to use bus lanes along the three routes (A41, A23 and A13) during the hours of operation.

V. The report has evolved since the original study was commissioned and complex arrays of factors and concerns have emerged during the course of the trial. For ease of reference the three iterations of the trial's development are:

- Original trial – (Duration 18 months) instigated as part of the Mayor's commitment in his transport strategy to reduce P2W casualties.
- Extended trial – (Duration 36 months) undertaken as a result of the findings of the original trial report.
- Final trial – (Duration 36 months) review of the extended trial to address the issues raised by the stakeholders.

VI. This report addresses issues raised by stakeholders at a seminar held by TfL in September 2006, where preliminary findings from the extended trial were presented. These included the exclusion of one trial route as the collision history was adversely affected by roadworks during the trial, and an investigation to see whether the potential effect of migration to and away from the trial routes could be investigated.

VII. Analysis of the casualty history on the trial routes for a 36 month period before and after implementation of the measure has been compared with two different control methods, the original control route data and a statistically more robust "Tanner control" method introduced after 18 months.

VIII. The casualty history on each trial route was compared to both controls using four different scenarios (two during all hours and two during bus lane operating hours). This resulted in eight comparison analyses for each VRU group.

IX. The assessment of **P2W collision numbers** showed six of the eight analyses as being beneficial to the safety of P2W riders and two of the eight showed a disbenefit to this group. All four assessments during operational hours showed a safety benefit.

X. The **pedal cycle casualty numbers** showed three of the eight analyses as being beneficial to the safety of pedal cyclists and five of the eight showed a disbenefit to this group. Two of the four assessments during operational hours showed a safety benefit.

XI. The **pedestrian casualty numbers** showed two of the eight analyses as being beneficial to the safety of pedestrians, five returned a disbenefit and one showed no change.

XII. However, none of the differences are statistically significant.

XIII. It was intended to undertake an assessment of casualty rates (number of collisions per P2W or cycle journey made). However the only flow data retrospectively available for this purpose is the Department for Transport's Average Annual Daily Flow (AADF) counts, produced at over 15,000 locations across the UK using a variety of different methods. This data is included in this report for the trial and control corridors.

XIV. The AADF data is in general based on surveys on a single day each year - with, in some cases, estimation methods used if no survey has taken place. They are subject to significant variability, particularly for some vehicle classes (such as cycles and P2Ws). For these reasons, this data cannot robustly support an analysis of potential migration between corridors, and so casualty rates.

XV. However, TfL will continue to investigate whether alternative sources of traffic flow data are available that could provide a more robust basis for estimating the casualty rates.

XVI. Figures from the Original Trial Report demonstrate that the bus speeds on all trial routes increased.

XVII. Attitudinal research carried out on behalf of TfL was included in this study. Studies targeted motorcyclists, cyclists, bus drivers, car drivers, pedestrians and the general public.

XVIII. The surveys revealed that motorcyclists and car drivers (who are not bus users) were the only two user groups where a majority approved of the measure.

XIX. Amongst other VRUs the main reason for disapproval of the measure was their perception of the compromise to safety.

XX. The comparisons of collisions involving VRUs using the Tanner control showed neither a benefit nor disbenefit from the introduction of the measure. None of the results from any of the user group comparisons were statistically significant.

XXI. When the VRU collisions were assessed against the original control routes (excluding the A13) during bus lane operating hours, a slight net benefit was returned. However, included in this reduction were localised increases in pedestrian casualties on the A41. Again, none of the results were statistically significant.

2.0 Introduction

Collisions involving Powered Two Wheeler (P2W) riders generate comparatively high numbers of casualties in London, relative to the size of this group among road users. Accordingly, P2W riders are identified as highly Vulnerable Road Users (VRUs), and share this category with cyclists and pedestrians.

An extensive range of measures is being developed and deployed specifically to improve the safety of cyclists and pedestrians. In contrast, apart from the general use of safety cameras, trials of P2Ws in bus lanes and a trial of P2W access to advanced stop lines at controlled junctions, no practical traffic management measures have been introduced in London specifically to enhance the safe use of the P2W mode.

The Mayor and TfL recognise that the P2W has a positive role to play in reducing congestion and associated pollution by offering a practical and efficient alternative to four wheeled motorised modes – especially cars and vans for courier and light freight. Other benefits to transport in London stem from low the financial costs associated with the mode. Many P2Ws, including small motorcycles, mopeds and scooters, are cheap to buy and run, and are increasingly recognised by TfL and nationally by the Department for Transport (DfT) as an important component in tackling social and economic exclusion.

Currently, the extent of net benefits that the use of P2Ws offers to the population of London and its visitors is limited by the high costs of relatively large numbers of collisions and casualties.

The number of trips and kilometres travelled by P2Ws have increased in London steadily from 1995 to 1999 and has remained around the 1999 level since. Correspondingly, the development of innovative traffic management measures to improve the safe use of this mode is becoming an increasingly important goal.

Proponents of P2W use consider that allowing this mode to use bus lanes would dramatically improve the safety of riders, and all other road users[1]. If these expectations prove well founded, roll out of the measure has the added benefit of involving relatively simple and small changes to streets with existing bus lanes. Apart from identifying where to introduce the improvement first, the main task and cost would be to renew bus lane signage. Should it be shown that allowing motorcycles access to bus lanes would improve the safety of all road users, the costs of implementing this measure would be minimal in comparison to other major schemes.

Whilst the Mayor's Transport Strategy recognises that P2Ws "can generate more pollution and noise" than cars it also recognises their use as a "quick, relatively low cost private transport that are more space and fuel efficient than cars" (Chapter 4G.26) and in response to the P2W lobby committed to implementing a trial of P2W usage in bus lanes (Proposal 4G.1).

The outcome from such a trial was deemed to be of value to the cause of improving the safe use of P2Ws, and road safety in general throughout the capital and the UK.

3.0 Trial Objective

The primary objective for this study was to investigate and offer evidence to show whether the safety of P2W users could be enhanced by allowing them access to bus lanes (the measure), The assessment was to involve comparing the casualty history of all vulnerable road users (VRUs) to ensure the measure does not create a negative impact on other road users.

Relatively high casualty numbers associated with use of mopeds, scooters and motorcycles provide an ongoing cause for concern in London. P2W Killed or Seriously Injured casualties (KSI) for the Capital have been the road user category that has shown least progress towards the 2010 casualty reduction targets. However, it is recognised that this has been against a background of growth in ownership and usage.

The Mayor's Transport Strategy[2] includes a specific response to concerns about P2W casualties. Proposal 4G.1, committed TfL to consider trials allowing P2Ws into bus lanes as a means of potentially reducing the exposure of P2W riders to general traffic in order to improve safety.

TfL took these factors into account in designing a study which considered the safety of all road users. The primary objectives for the trial were to:

- Investigate whether allowing P2W use of bus lanes would be an effective way to improve the safe use of the P2W mode in London.
- Discover whether significant disbenefits would arise, with particular concern for other vulnerable road users, especially cyclists and pedestrians.
- Publish the trial data and results of comparative calculations to quantify the tangible positive and negative impacts of the measure.
- Draw conclusions from the experiment data where possible, to provide a basis for future action by TfL, and to assist other transport authorities in considering the merits of the measure on test.

4.0 Report Structure

4.1 Background

The report has evolved since the original study was commissioned and complex arrays of factors and concerns have emerged during the course of the trial. For ease of reference the three iterations of the trial's development are:

- Original trial – (Duration 18 months) instigated as part of the Mayor's commitment in his transport strategy to reduce P2W casualties.
- Extended trial – (Duration 36 months) undertaken as a result of the findings of the original report.
- Final trial – (Duration 36 months) review of the extended trial to address the issues raised by the stakeholders.

These are detailed in the sections below.

4.2 Original trial report

In September and October 2002, TfL introduced three pilot schemes on the Transport for London Road Network (TLRN) whereby P2Ws were permitted to use bus lanes along the three routes during the hours of operation.

The original trial was reported on after 18 months and the report published on 19th November 2004[3].

The report concluded that *"further casualty data is needed in order to make a robust assessment of the trials."*

After consultation with stakeholders, the trial was extended for a further 18 months.

4.2.1 Original trial – casualty analysis scope and plan

The original procedure for the trial required the identification of 'trial' sections of highway in which P2Ws were allowed in bus lanes, and 'control' sections of highway without P2W access to bus lanes.

Detailed records of all reported collisions and casualties were gathered from trial and control corridors throughout the eighteen month duration of the experiment. Data were also gathered to establish an accurate record of reported collisions and casualties on the corridors before the experiment began.

4.2.1.1 Methodology - Key criteria for selection of trial and control sites

- Part of TLRN
- Known locations of motorcycle usage
- Standard with-flow bus lane
- Mix of frontage (residential, commercial)
- Mix of location, but outside congestion charge area
- High but not excessive casualty rates

4.2.1.2 Sites chosen for trial routes:

- A13 East India Dock Road, between Leamouth Road and Butcher Row East - from 9th Sept 2002;
- A23 Brixton Road, between Camberwell New Road and Streatham Common South; - from 20th Oct 2002; and
- A41 Finchley Road, between Queen's Grove North and Platt's Lane; - from 20th Oct 2002.

4.2.1.3 Sites chosen for control routes:

- A5 Rondu Road to Summit Close and Humber Road to Staples Corner
- A10 Pasteur Gardens to Ostliffe Road and Wilbury Way to Laburnum Avenue

However, there were a number of concerns about this method, namely:

- The section of the carriageway of the A13 used for this trial underwent considerable roadworks during the after period of the trial. The extent of works culminated in a 22% increase in KSIs compared to a 35% fall in the KSI rate across the TLRN network. It is for this reason that the final report does not consider this data to be valid and therefore the comparisons in this final report disregard the A13 data.
- The A10 may not be a suitable control as it is in North London and generally in outer London whilst the trial sites on the A41 and A23 are generally in inner London.
- The A5 may not be a suitable control for the A41 as it was a parallel route and therefore could be directly influenced by the trial.
- Most significantly, the control sites were considered too small for meaningful statistical comparisons to be made.

4.3 Extended trial report

To avoid the methodological problems listed above the method of control was changed from the route based comparison, to an area based control that satisfied the requirements of the Tanner Test, a formula devised by J C Tanner in work for the Transport Research Laboratory, last published in the early 1980s.

The 'Tanner Test' formula became a new element in the method by which control data could be generated, and a detailed description of how the Tanner Test was applied can be found in Appendix II. In summary it involved collision figures from the entire TLRN divided into three sets of figures with the results for the boroughs nearest to the trial corridors being used as the control. The disadvantages of this method include the fact that it uses a control ratio rather than absolute figures,[4] which means that collision rates are not able to be compared.

The publication of the extended report was proposed to be in the form of two types of test procedure which could be used to assess the impact of introducing the measure.

- A practical experiment – to quantify the tangible impact on collisions and casualties during a thirty-six month before and after trial period (using the Tanner Test).

- Attitudinal surveys – to gauge the opinions and feelings of road users about the measure.

4.3.1 Extended trial – Casualty analysis scope and plan

The extended trial used the same start date as the original report (October 2002).

The key criteria and the sites chosen for the trial routes remained consistent with the original scope (detailed in 4.2, above), but two changes were made to the trial structure

Firstly, the duration of the before and after casualty studies was extended from 18 months to 36 months.

The second change involved the method of assessing the trial corridors against the control data. To satisfy the Tanner Test, collision figures from the entire TLRN were divided into three sets of figures from the boroughs nearest to the trial corridors.

4.4 Final trial report

A number of concerns were raised by stakeholders when a verbal account of the draft report on the casualty analysis (using Tanner) and an Executive Summary of the user and attitudinal surveys were circulated at a seminar held by TfL in September 2006. It was agreed that the issues raised at the seminar would be addressed in the final report.

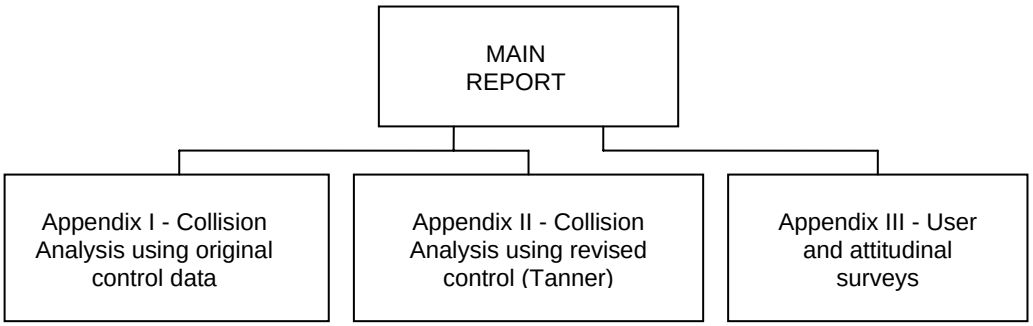
As a consequence of the issues raised by stakeholders at the seminar held in September 2006 (section 4.3), the following areas of contention were considered in the final report:

- the method of control altered in mid trial from control routes to the use of the Tanner Test, against a wider control frame to allow for a more rigorous statistical analysis. However, the stakeholders were not informed of the change.
- the new control method did not enable collision rate comparison (due to possible migration, which was a factor not considered during the original scoping of the trial) to be assessed.
- The Original Trial remit did not consider experiences from other authorities in the UK and abroad.
- The use of the A13 as a trial corridor was flawed due to the presence of roadworks for the duration of the after period. This skewed the collision numbers upwards.
- There was an element of subjectivity in the attitudinal and user surveys
- The impact of congestion charging (which started 4 months after this trial) was not considered.

Obviously, the most important issue to be considered when assessing the use of bus lanes by P2Ws is the safety of all road users. The views of the stakeholders are reflected in the new suite of documents which focus on the importance of safety. All existing data has been re-assessed and the casualty history for the trial routes has been assessed against the original control routes and also the revised control method.

The data considered meaningful from the original user survey and attitudinal surveys are also re-visited and presented here.

The report structure is as follows:



This document (the main report) pulls together the evidence contained within the supporting documents (which are appended to this report) and assesses potential benefits and disbenefits of the trial. The report widens the scope of the trial to enable the concerns raised by the stakeholders to be addressed. This has enabled factors previously not considered to be considered, such as the experiences of some of the other schemes that have been introduced in the UK and overseas, with an investigation of the issue surrounding migration of P2Ws between bus lanes.

4.4.1 Final trial – casualty analysis scope and plan

All data have been re-assessed for relevance and accuracy for the purposes of assessing the viability of this measure. As requested at the stakeholders meetings, two parallel casualty reports have been produced (see Appendix I – Casualty analysis using the original control method, and Appendix II – Casualty analysis using the Tanner control method).

5.0 Collision Analysis - Before and after data comparison

The summary comparisons made in this section use the casualty data collected during the trial period and documented in Appendices I and II. These two documents share the same trial route data but differ in the way the control data are derived.

Appendix I derives its data from the empirical evidence gathered from the original trial control sites casualty histories. These have been produced following the most recent review commissioned after the September 2006 Stakeholder seminar.

Appendix II has been compiled from the same before data for comparison with figures resulting from extrapolations of TLRN statistics (see section 4.3), and including use of the Tanner formula. Data for the A13 is presented in this document but the assessments contained in this section only use that for the A41 and A23.

This report focuses on the impact of the measure on casualties in the VRU groups that may be affected as this is seen as essential to the overall outcome of the report. To complement this analysis and help understand general trends, all casualties are also considered.

For each VRU group assessment is carried out of the combined trial routes against the combined control routes and the Tanner control areas.

As stated in section 4.4, concerns have been noted that the reliability and validity of data from the A13 trial site were adversely affected by the extensive disruption caused by a major redevelopment program of works. Consequently the review using both control data concentrates on the trial as a whole but discounts the A13 route. The comparisons between sums of data from the A5 + A10 control sites, and sums of data from the A23 & A41 trial sites offer the next most useful combination of comparable data, after analysis of the A41 and A5 results.

Each VRU group is also assessed using data from the single trial route, the A41 and compared to the single control route the A5 as the A41 trial site runs parallel to the A5 control site. In many respects this makes data from these sites the most directly comparable and a potentially useful gauge of the impacts of the measure.

The VRU groups reported on are:

- P2Ws
- Pedal Cycles
- Pedestrians

5.1 Vulnerable Road Users

The assessments contained within sections 5.1.1 to 5.1.3 below consider all collision types where the casualties (of all severities) have been the respective vulnerable road user.

Each assessment investigates four scenarios,

1. A41 trial route against control route (A5) and control area (using the Tanner Test control) for all times of day.

2. A41 trial route against control route (A5) and control area (using the Tanner Test control) for operating hours only.
3. A41 & A23 trial routes combined data against A5 & A10 control routes combined data and the Tanner Test control for all times of day.
4. A41 & A23 trial routes combined data against A5 & A10 control routes combined data and the Tanner Test control for operating hours only.

The assessments are summarised in the tables below.

5.1.1 Collision Analysis - Impact on Powered Two Wheeler Riders

Using the original control data, three of the four scenarios show a safety benefit. Using figures from the Tanner Test calculations, the graphs also reflect a safety benefit in three cases. There is a safety benefit in all cases when bus lane operating hours are active. However, none of these cases are statistically significant.

P2Ws	%age change in collisions, trial against controls (Reduction Increase)	
Scenario (section 4.1)	Original Control	Tanner Control
1	1	9
2	23	4
3	9	4
4	9	4

Table 1 – Percentage change in “Before” and “After” casualty numbers from the four scenario comparisons for P2Ws

5.1.2 Collision Analysis - Impact on Pedal Cyclists

The analysis of the four scenarios (see section 5.1) showed mixed results. The original control data comparison (see Table 2) shows safety benefits in scenarios 2 and 4 (operating hours) with disbenefits in 1 and 3 (all hours). The Tanner control comparison shows a disbenefit in three of the four scenarios. The changes are not statistically significant.

Pedal cycles	%age change in collisions, trial against controls (Reduction Increase)	
Scenario (section 4.1)	Original Control	Tanner Control
1	24	22
2	17	5
3	5	12
4	12	3

Table 2 – Percentage change in “Before” and “After” casualty numbers from the four scenario comparisons for pedal cycles

5.1.3 Collision Analysis - Impact on Pedestrians

Analysis of the trial routes against the original control data showed an increase in collisions involving pedestrians in three out of four scenarios and in two out of four scenarios in the Tanner Test comparison, (see Table 3). Of the two that showed a benefit, both were during operating hours. These results are again not statistically significant.

Pedestrians	%age change in collisions, trial against controls (Reduction Increase)	
Scenario (section 4.1)	Original Control	Tanner Control
1	31	39
2	38	85
3	4	0
4	16	6

Table 3 – Percentage change in “Before” and “After” casualty numbers from the four scenario comparisons for pedestrians

5.2 Conclusions - Impact on Vulnerable Road Users

The **VRU casualty number** assessments were carried out using four scenarios. Each scenario compared the trial against both types of control, resulting in eight analyses for each VRU group.

The assessment of **P2W collision numbers** showed six of the eight analyses as being beneficial to the safety of P2W riders and two out of eight showed a disbenefit. All four assessments during operational hours showed a safety benefit.

The **pedal cycle casualty numbers** showed three of the eight analyses as being beneficial to the safety of pedal cyclists and five out of eight showed a disbenefit. Two of the four assessments during operational hours showed a safety benefit.

The **pedestrian casualty numbers** showed two of the eight analyses as being beneficial to the safety of pedestrians, five returned a disbenefit and one showed no change.

None of the figures produced are statistically significant.

6.0 User and Attitudinal surveys

To understand fully how riders of P2Ws and pedal cycles would react to the measure, vehicle counts before and after the implementation of the measure were assessed. The attitude of all road users towards the measure was also investigated using customer research. Full details are found in Appendix III, and this section summarises the results.

6.1 Attitudinal surveys

Customer research carried out on behalf of TfL into the attitudes of a range of road users were made available for this study. Studies targeted motorcyclists, cyclists, bus drivers, pedestrians and the general public.

The surveys showed that only motorcyclists and car drivers (who are not also bus users) as the two user groups where a majority approved of the measure. Amongst the VRU groups, the main reason for disapproval of the measure was their perception of the compromise to safety.

Among a sample of Londoners, more people believe allowing motorbikes to use bus lanes would be a bad idea than a good one, but opinion is strongly divided, with 45% in favour and 48% against.

6.2 Speeds and bus journey times

One concern for the introduction of the measure relates to the potential for the delay to buses, which obviously contradicts the commitment in the Mayor's Transport Strategy for the expeditious movement of public transport.

The assessment of the impact of the measure on the speed of buses has to rely on the only "before and after" comparisons that were available. These were presented in the Original trial report [3] and are detailed below.

These "before" and "after" data (Table 4 - shown below) only provides 18 months figures but is sufficient enough to make a valid comparison.

Table 4 – Before and After speed data from Original Trial report

	Bus lanes						Other traffic lanes					
	Buses (mph)			PTWs (mph)			PTWs (mph)			General traffic (mph)		
	Before	After	Change	before*	after	change	before	After	Change	before	after	change
A13	21	26	+20%	34	31	-9%	31	33	+7%	30	29	-3%
A23	20	24	+17%	25	30	+17%	25	23	-8%	23	26	+12%
A41	23	27	+15%	28	31	+9%	28	27	-3%	25	29	+14%
A5	22 mph average			31 mph average*			32 mph average			31 mph average		
A10	27 mph average			32 mph average*			29 mph average			30 mph average		

Spot survey average speeds (in free-flowing traffic)
* = illegal

The table demonstrates that the bus speeds increased in all cases but when assessing this data the following must be considered,

- The “before” P2W speeds in the trial bus lanes and the “before” and “after” speeds from the control routes are based on illegal usage of the lanes by P2Ws and cannot be considered representative.

The Original Trial Report also reported that bus journey times fell by 1 to 2 minutes on the A13 and A41, but increased by 1 minute on the A23. The document states that the following must be considered,

- The A13 bus routes were affected by roadworks
- The A23 journey times were affected by changes to the bus route.

The Extended Trial Report carried out a more detailed assessment of the bus journey times on the three trial and two control routes and is included in Appendix III.

The data sets were collected using the “Marquis” roadside beacon infrastructure that records the time of each bus that passes.

The report states that there was

- “*remarkable consistency in average speed provided by bus lanes*”
- “*Most routes have seen an improvement in reliability*” culminating in a “*range in journey time of just two minutes on a 30 minute journey*”,

though it wasn’t stated that this was as a result of the trial.

However the reliability of this data is subject to the following:

- The start date for the collection of the data is April 2004, 18 months after the implementation of the trial routes.
- There is no before and after comparison of journey times from these data sets.
- The journey times recorded do not consider the effect of the length of time spent at each stop due to the number of passengers alighting or disembarking.

6.3 Vehicle Usage and Migration

The casualty analysis presented in section 5.0 above is on the basis of absolute numbers of collisions and casualties. However, if there is a significant divergence in usage patterns by the different vehicle categories between the trial routes and the controls, the pattern in collision rates per trip would be different. This could arise if, for example, significant migration of P2Ws or cyclists to or away from the trial routes took place.

The scope of the original trial did not include the collection of meaningful vehicle flow data to assess this potential effect, and so alternative data sets were sought.

The only data available retrospectively for the six year period of the trial is the Department for Transport’s (DfT) Average Annual Daily Flow (AADF) data. Consequently, investigation of the DfT AADF data was undertaken for both trial routes and control. This data is presented in Tables 5 (for the trial) and 6 (for the control) below, for each of the DfT AADF count sites.

However, this data has some key limitations in its appropriateness for use in any statistical analysis of collisions and casualties:

- the data is based on a small sample – typically a one-day survey in each year – and so has an element of uncertainty around it, and can reflect specific circumstances on the survey day (such as weather).
- in some cases, the DfT will use data estimation techniques if no survey has taken place in a particular year at a given location, with estimation based on national growth rates.

These issues are evident in Tables 5 and 6 where, for example, cyclist flows vary between 218 and 717 at the central counting point on the A41, with the highest point in 2002.

Given these data limitations, this report concludes it is not feasible to carry out a robust casualty rate analysis using the available flow data.

Table 5. Estimated AADT flows of P2Ws and cyclists for A41 and A23 trial routes

P2W	2000		2001		2002		2003		2004		2005	
	A41	A23	A41	A23	A41	A23	A41	A23	A41	A23	A41	A23
Outer	712	624	770	685	737	773	762	799	728	632	668	1173
Central	1370	1503	896	1673	1548	1895	2440	1974	1190	2049	2004	2043
Inner	768	509	866	567	1121	531	1540	553	1999	582	1894	580
Average	950	879	844	975	1135	1066	1581	1109	1306	1088	1522	1265
CYCLISTS												
Outer	50	130	55	315	57	136	83	197	72	332	73	450
Central	300	1152	218	1312	717	927	488	1082	252	797	419	1030
Inner	191	441	198	502	477	511	350	596	500	632	564	615
Average	180	574	157	710	417	525	307	625	275	587	352	698

Table 6. Estimated AADT flows of P2Ws and cyclists for A5 and A10 control routes

P2W	2000		2001		2002		2003		2004		2005	
	A10	A5	A10	A5	A10	A5	A10	A5	A10	A5	A10	A5
Outer	656	533	709	577	350	695	362	719	346	367	598	338
Central	656	658	709	732	350	685	362	667	346	700	318	698
Inner	656	658	709	732	350	685	362	667	346	700	66	698
Average	656	616	709	680	350	688	362	684	346	589	327	578
CYCLISTS												
Outer	48	256	53	281	52	253	75	367	66	152	66	155
Central	48	304	53	346	52	352	75	417	66	441	66	569
Inner	48	304	53	346	52	352	75	417	66	441	66	569
Average	48	288	53	324	52	319	75	400	66	345	66	431

7.0 Experiences from other schemes

During the last eleven years, P2W access to bus lanes has been trialled or introduced as a permanent measure in a number of locations throughout the UK. The first Local Authority to implement this measure was Bristol, following a trial scheme. By the end of 2006, seventeen UK local authorities[6] had introduced this measure in varying forms, and it is also deployed as a permanent measure throughout Northern Ireland. There are also a number of schemes that have been implemented by some of the London boroughs. The primary objective of all schemes is to improve road safety.

A growing number of European towns and cities deploy this measure for road safety purposes. Motorcycles have been allowed in the bus lanes of Sweden's capital, Stockholm, since 1986, and the same approach has been adopted in Barcelona and some Italian cities.

As far as could be established by the authors, no trial of P2W in bus lanes has resulted in a rejection of the measure for safety reasons. Similarly, in all known trials to date, once P2W access to bus lanes has been granted, such access has never been subsequently rescinded.

Since the TfL trial started, the DfT published 'The Government's Motorcycling Strategy[7] which followed a five year study by the Government Advisory Group for Motorcycling (GAGM). In essence, government and the DfT now formally acknowledge that the P2W mode has vital contributions to make in developing sustainable transport throughout Britain. The P2W offers an extremely efficient and low financial cost alternative to four wheeler modes in many situations where walking, cycling or public transport cannot meet demand for transporting people and goods.

The national strategy document makes it clear that more can and should be done by Local Transport Planning authorities to improve the safe use of P2Ws throughout the UK.

The principle aim of this major nationwide policy initiative is to 'mainstream' motorcycling. In particular it says that taking account of motorcycling is to play a greater part in plans for road design and traffic management.

7.1 Bus Lane trials in London – M4 motorway

Aside from the trials that are the subject of this report, a number of trial and permanent schemes have been implemented in London.

Perhaps the most high profile of these is the offside bus lane implemented on the eastbound carriageway of the M4 motorway from Junction 3 to the elevated section.

In July 2002 the eastbound carriageway speed limit was increased to 60mph from 50mph and motorcycles were allowed to use the offside bus lane. The site was monitored by TfL's London Road Safety Unit who undertook a 36 month before and after study.

The study showed that the number of collisions involving injury decreased from 44 in the 36 months to July 2002 to 28 in the 36 months after. This decrease of 36% was found to be statistically significant at the 10% level using the K test[8]. Collisions involving P2Ws reduced from 12 to 4.

7.2 Other London borough schemes

There have been other trials in three London boroughs, Westminster, Kingston and Richmond. Table 8 gives a summary of the performance of each scheme.

In September 2005 the City of Westminster introduced the measure in the form of a trial on a total of ten lengths of bus lane. The overall impact suggests that there are safety benefits for all vulnerable road users. In the 14 months of the measure, the figures have returned a 24% reduction in pedestrian casualties, and 17% reduction for both pedal cycles and P2Ws.

There are four schemes introduced in the Royal Borough of Kingston, with two having collected 36 months after data sets and two with 31 months data sets. The collective casualty figures have shown reductions for all vulnerable road users with pedestrian casualties down by 17%, P2Ws down by 29% and pedal cycle casualties down by 50%.

Two schemes have been introduced in Richmond. These schemes have been operating for 31 months and have seen a 33% reduction in pedestrian casualties, and 67% reduction in P2W casualties. There has, however, been an increase from 0 to 3 in pedal cycle injuries.

However, none of these schemes has been assessed against a control, so comparisons cannot be made of the statistical significance of the results compared with general trends.

7.3 UK schemes outside London

There has not been a trial of the measure in the UK that has undertaken a comprehensive "before and after" casualty analysis using control sites. The majority of studies failed to introduce trial routes and supplement the data with vehicle usage surveys and journey times. However, some useful studies have been undertaken which have been assessed using differing methodologies over the last decade.

Avon County Council first resolved to introduce motorcycles to bus lanes in Bristol using an Experimental Order on 14th February 1995. The experimental order came into effect in June of that year and was confirmed as a Permanent Order on 12th March 1996 when the Committee, anticipating the imminent Local Government Reorganisation, strongly recommended that its four successor Unitary Authorities should extend the scheme to their areas (which each has subsequently done).

There has been much written on the Bristol scheme but the evidence recently given to the aforementioned Transport Select Committee by the Motorcycle Industry Association (MCIA) probably sums the results most succinctly.

"During the 36 months prior to the implementation, accidents involving motorcyclists averaged 1.1 per month, compared to 0.8 during the six-months of the experiment, suggesting a 25% decrease, and that no motorcycle accidents were recorded in the bus lanes and no collisions with pedestrians or cyclists were recorded".

The same evidence also stated that "*an 18-month experiment by Sheffield City Council during 2003/04 which also reported a 25% decrease in monthly average motorcycle accidents."*

Table 8 Before and after collisions for borough P2W in bus lane schemes at all times (by November 2006 data provisional)

N.B. This is for all hours/days and not just the bus lane hours of operation.

Borough	Scheme name	Months	Collisions Before							Collisions After							Change in collisions (Numeric)						
			Fat	Ser	Sli	Pedn	P2W	PC	Tot	Fat	Ser	Sli	Pedn	P2W	PC	Tot	Fat	Ser	Sli	Pedn	P2W	PC	Tot
Westminster	Cockspur Street	14	0	1	12	6	0	3	**13**	1	0	7	5	1	0	**8**	1	-1	-5	-1	1	-3	-5
Westminster	Kensington Gore	14	0	0	3	0	0	0	**3**	0	1	0	0	1	0	**1**	0	1	-3	0	1	0	-2
Westminster	Kensington Road	14	0	2	8	2	6	1	**10**	0	3	3	1	1	2	**6**	0	1	-5	-1	-5	1	-4
Westminster	Knightsbridge	14	0	0	4	2	3	0	**4**	0	0	1	0	0	0	**1**	0	0	-3	-2	-3	0	-3
Westminster	Baker Street	14	0	1	14	6	3	1	**15**	0	0	10	3	3	1	**10**	0	-1	-4	-3	0	0	-5
Westminster	Haymarket	14	0	2	10	5	2	2	**12**	1	1	8	3	1	3	**10**	1	-1	-2	-2	-1	1	-2
Westminster	Bayswater Road	14	0	2	1	3	0	0	**3**	0	1	4	0	2	1	**5**	0	-1	3	-3	2	1	2
Westminster	Piccadilly (SW end)	14	1	0	6	1	2	1	**7**	0	2	5	3	3	1	**7**	-1	2	-1	2	1	0	0
Westminster	Piccadilly (NE end)	14	0	5	30	14	7	3	**35**	0	4	23	13	6	2	**27**	0	-1	-7	-1	-1	-1	-8
Westminster	Gloucester Place	14	0	1	6	2	1	1	**7**	0	1	9	3	2	0	**10**	0	0	3	1	1	-1	3
Kingston	Cambridge Road	36	0	0	8	2	1	2	**8**	0	0	6	2	2	0	**6**	0	0	-2	0	1	-2	-2
Kingston	Cambridge Road	36	1	6	25	7	8	2	**32**	0	8	22	7	9	3	**30**	-1	2	-3	0	1	1	-2
Kingston	London Road (SB)	31	0	0	6	2	3	0	**6**	0	0	1	0	0	0	**1**	0	0	-5	-2	-3	0	-5
Kingston	London Road (NB)	31	0	0	11	1	5	2	**11**	0	2	4	1	1	0	**6**	0	2	-7	0	-4	-2	-5
Richmond	London Road, TW10	31	0	1	7	3	1	0	**8**	0	1	5	2	2	2	**6**	0	0	-2	-1	1	2	-2
Richmond	Eton Street	31	0	0	10	3	5	0	**10**	0	0	5	2	0	1	**5**	0	0	-5	-1	-5	1	-5
Total			**2**	**21**	**161**	**59**	**47**	**18**	**184**	**2**	**24**	**113**	**45**	**34**	**16**	**139**	**0**	**3**	**-48**	**-14**	**-13**	**-2**	**-45**
															% change		0%	14%	-30%	-24%	-28%	-11%	-24%
Total for schemes in Westminster			1	14	94	41	24	12	109	2	13	70	31	20	10	85	1	-1	-24	-10	-4	-2	-24
															% change		100%	-7%	-26%	-24%	-17%	-17%	-22%
Total for schemes in Kingston			1	6	50	12	17	6	57	0	10	33	10	12	3	43	-1	4	-17	-2	-5	-3	-14
															% change		-100%	67%	-34%	-17%	-29%	-50%	-25%
Total schemes in Richmond			0	1	17	6	6	0	18	0	1	10	4	2	3	11	0	0	-7	-2	-4	3	-7
															% change		0%	0%	-41%	-33%	-66%	300%	-39%

8.0 Concluding comments

8.1 Context

The evidence from this experiment offers more information about the impact of allowing P2W access to bus lanes than any study to date. Nevertheless, it is vital to recognise the scope and limitations of this test of a potential enhancement to road safety in a live experiment with several significant other variables; one of the most important being changes in highway usage by different modes during the investigation.

Changing the methodology for generating control data for the experiment during the second 18 month phase of the trial gave rise to problems. It rekindled initial questions about the experiment design, and generated new concerns among some stakeholders that the clarity, reliability and validity of results and conclusions might be reduced from optimum levels.

In addition to concerns about changes in control method, questions focused on the scientific value of data collected from attitudinal surveys. Queries also arose regarding the collection of speed and journey time data and vehicle usage of the actual bus lanes themselves. The largest gap in the data sets concerned the vehicle usage data. The lack of these data resulted in the inability to produce any robust modal migration assessment and consequently any casualty rate analysis.

TfL has, where possible, addressed such questions and concerns with freshly focused action and this final report results from that action. The suite of reports and these conclusions are made in response to input from all concerned with the experiment, inside and outside TfL, and to optimise the value of the study to all parties interested in improving road safety for all road users.

8.2 Control method changes

The Tanner Test approach offers a more statistically robust outcome than the use of figures from control sites that are of correspondingly small size to trial sites.

However, the Tanner method cannot allow normalisation of data for any divergence in vehicle usage patterns between the trial and the control, and therefore cannot account for the impact of potential effects such as migration in assessing the impacts of the measure under test.

The original control data method does allow direct comparisons between adjacent routes for trial and control, and it allows the influence of migration to be taken into account when analysing the impact of the measure on casualty numbers and rates. However, the very limited vehicle usage data available meant that no meaningful assessment could be carried out.

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