Transport for London
P2W in bus lanes study

Main Report

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1.0 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 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 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 significantly limited by the high costs of relatively large numbers of collisions and casualties.

The number of trips and kilometres travelled by this mode have been increased in London steadily from 1995 to 1999 and has remained at 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 will 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) but it also refers to the 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 incalculable value to the cause of improving the safe use of P2Ws, and road safety in general throughout the capital and the UK.

2.0 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 rate 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 comprehensive 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.

3.0 Report Structure

3.1 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 – instigated as part of the Mayor's commitment in his transport strategy to reduce P2W casualties.
- Extended trial – undertaken as a result of the findings of the original report.
- Final trial – re-write of the extended trial to address the issues raised by the stakeholders.

These are detailed in the sections below.

3.2 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.

3.2.1 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.

3.2.1.1 Methodology.- Key criteria for selection of trial and control sites[3]

- 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

3.2.1.2 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.

3.2.1.3 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

3.3 Extended trial report

Following the publication of the 18 month report, the trial was extended for a further 18 months and the method of control was changed from the route based comparison using similar bus routes 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.

However, 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.

The main areas of contention that were relayed at the seminar were:

- As a result of extending the trial period to 36 months before and after analysis of the casualty data the method of control altered in mid trial from control routes to the use of the Tanner Test which allowed for a more rigorous statistical analysis. However, the stakeholders were not informed of the change.
- As a result of this 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.

3.3.1 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 3.2, 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.

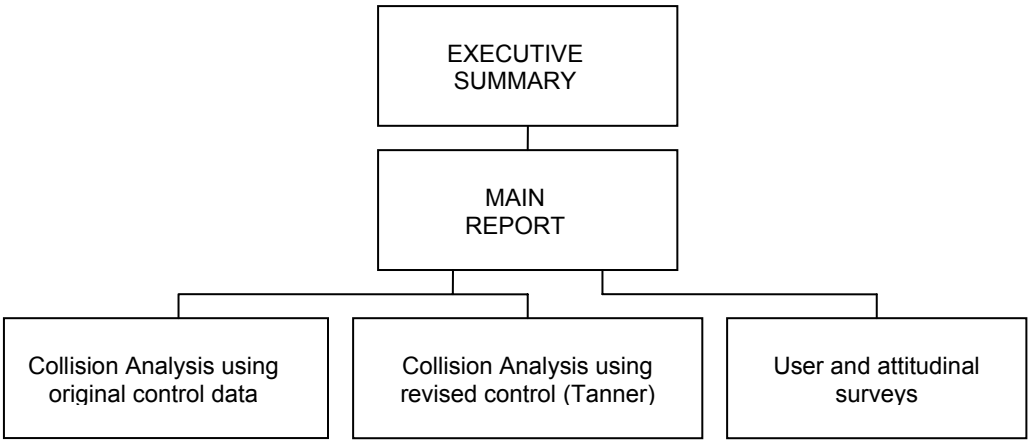
The second change involved the method of assessing the trial corridors against the control data. To satisfy the Tanner Test, collision figures from the entire TLRN were divided into three sets of figures from the boroughs nearest to the trial corridors.

3.4 Final trial report

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 three 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 included, such as the experiences of some of the other schemes that have been introduced in the UK and overseas, and the issue surrounding migration of P2Ws between bus lanes.

3.4.1 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) and analysis of both is contained within this section.

However, in order to address other concerns raised by the stakeholders, the following issues are considered;

1. The section of carriageway of the A13 used for this trial underwent considerable roadworks during the after period of the trial. The extent of the works culminated in a 22% increase in KSIs, compared to a 35% fall in the KSI rate across the TLRN network[5]. It is for this reason that the final report does not consider these data to be valid and therefore the comparisons in this final report disregard the A13 data, when the assessment involves either the original control data or the Tanner Test control.

2. The original control corridor of the A5 runs roughly parallel to the trial site of the A41. This scenario not only allows comparisons of the casualty data, but helps understand the migration of P2Ws from the A5 to the A41 trial route (see section 5.2). This comparison of collision rates can only be undertaken using the A5 and A41 as they largely follow similar routes

(north west to central London) into London. For comparison of south west to central London journeys, the report considers the migration to the A23 trial route from the A24, a route which follows in close proximity the A23 trial route.

4.0 Collision Analysis - Before and after data comparison

The 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 and histories. These have been produced following the most recent review commissioned after the October 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 3.3), and including use of the Tanner formula.

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 3.4.1, 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 here 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. This also enables vehicle usage to be factored in to assist the comparison as it is vital to note that during the trial, P2W use of the A41 rose dramatically, whereas P2W use of the A5 control site dwindled. This indicates a rider preference for routes permitting access to the bus lane (see section 5.2).

The VRU groups reported on are:

- P2Ws
- Pedal Cycles
- Pedestrians
- Bus occupants

4.1 Vulnerable Road Users

The assessments contained within sections 4.1.1. to 4.1.4 below consider all collision types where the casualties (of all severities) have been the respective vulnerable road user.

Each assessment investigates four scenarios

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

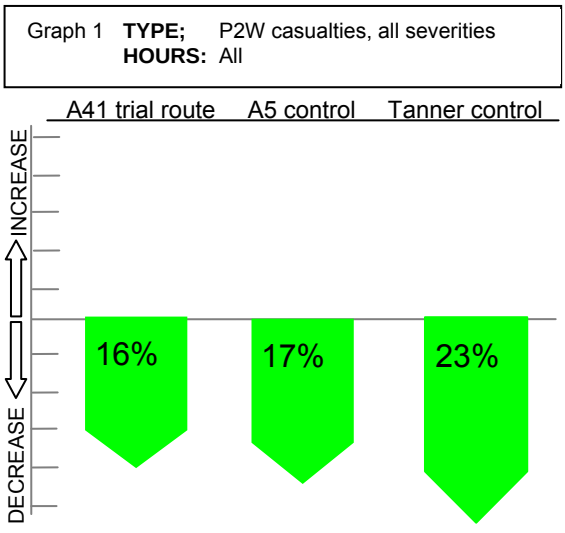
The assessments provide a very useful picture of how the measure performed in relation to VRUs but the true extent of the benefit from P2W access to bus lanes is better understood when the migration of P2Ws between the two routes is factored in (see section 6.0)

4.1.1. Powered Two Wheelers

GRAPH 1

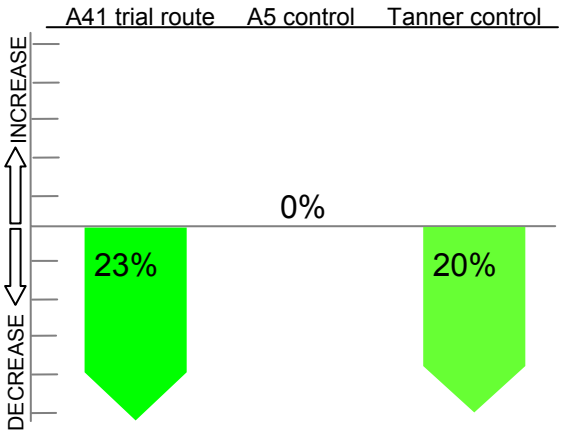
Table 4.13 from Appendix I shows that collisions on the A41 have reduced from 56 to 47 (↓16%) and the A5 control route is showing a reduction from 53 to 44 collisions (↓17%), whilst the Tanner control area returned a reduction of 23% (Appendix II, Table 10.13)

The figures show a neutral position when comparing the A41 the original control data but a negative benefit when the Tanner Test is considered.



GRAPH 2

Graph 2 **TYPE;** P2W casualties, all severities
HOURS: Operating



Using Tables 4.14 and 10.14 from Appendices I and II respectively the A41 comparison with the original control route returns a reduction of 26 collisions to 20 (↓23%) whereas the data for the control shows 28 collisions before and after (↔0%).

The Tanner Test returned a reduction of 20%.

The assessment shows the benefit of the measure to P2Ws during the operating hours of the measure, although the Tanner Test control reflects a similar reduction to that of the trial route.

GRAPH 3

Graph 3 **TYPE;** P2W casualties all severities
HOURS: All

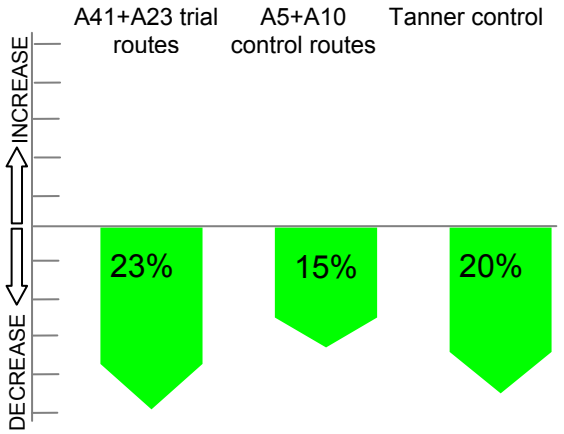


Table 4.13 and 10.13 (Appendices I and II respectively) provide the combined information necessary for this comparison.

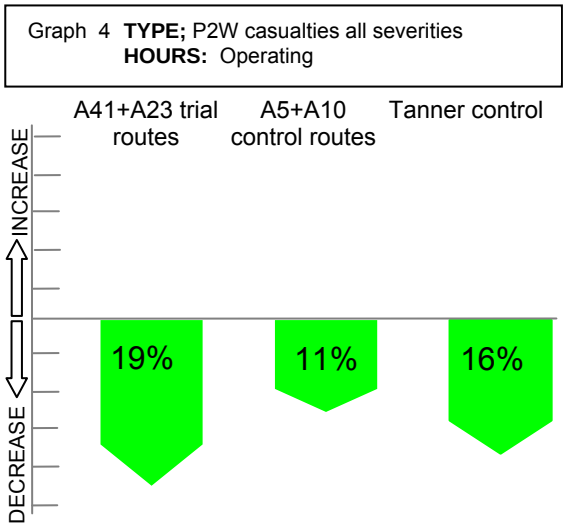
The combined trial routes saw a reduction from 236 to 182 (↓23%) but the combined control routes achieved a reduction from 59 to 50 (↓15%).

The Tanner Test showed a reduction of 20%, less than the trial data.

These figures indicate a benefit to the safety of P2Ws when assessing the combined routes against the original control route and a slight benefit against the Tanner control.

GRAPH 4

The combined route data during operating hours shows a reduction from 107 to 87 on the trial route (↓19%) whereas the control data returned a reduction from 54 to 48 collisions (↓11%). The Tanner Test showed a 16% reduction in collisions.



4.1.1.1. Summary

Using the original control data, the four graphs indicate a safety benefit (not statistically significant) in three cases, and no benefit when all collisions on the A41 are considered in isolation.

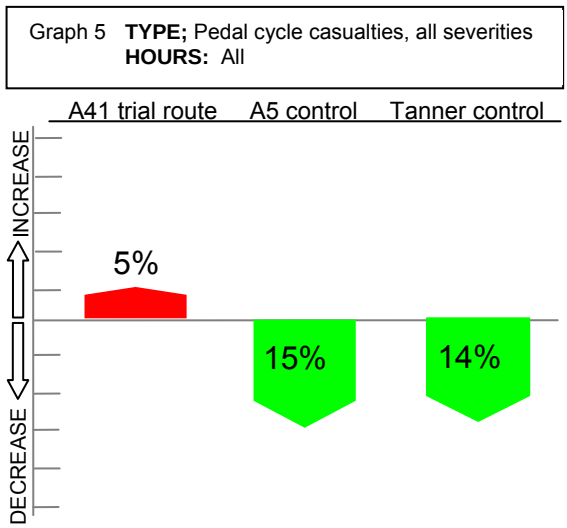
Using the Tanner control data, the graphs reflect a benefit in three cases but a negative impact in the fourth.

4.1.2 Pedal Cycles

GRAPH 5

Table 3.9 from Appendix I shows that collisions on the A41 have increased from 20 to 21 (↑5%) and the A5 control route is showing a reduction from 13 to 11 collisions (↓15%), whilst the Tanner control area returned a reduction of 14%.(Appendix II, Table 9.9)

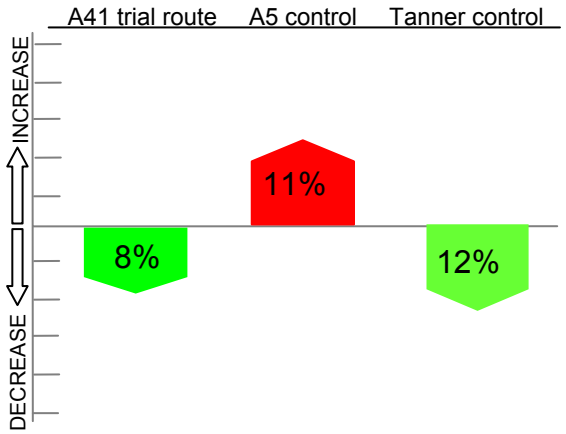
The trial route experienced an adverse effect when the collisions during all hours are considered.



GRAPH 6

Table 3.10 from Appendix I shows that collisions on the A41 have decreased from 13 to 12 (↓8%) and the A5 control route shows an increase from 9 to 10 collisions (↑11%), whilst the Tanner control area returned a reduction of 12% (Appendix II Table 9.10).

Graph 6 **TYPE;** Pedal cycle casualties, all severities
HOURS: Operating



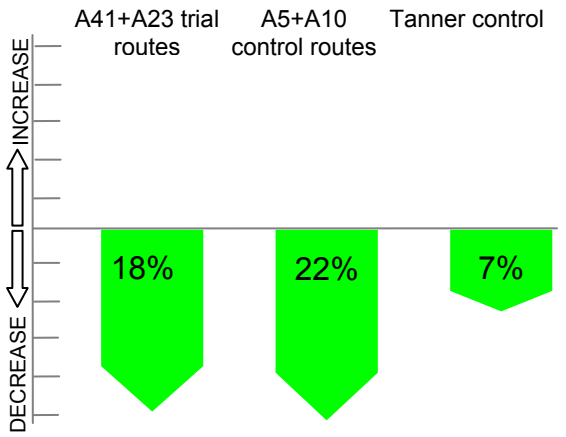
GRAPH 7

Table 3.9 and 9.9 (Appendices I and II respectively) provide the combined information necessary for this comparison.

The combined trial routes saw a reduction from 93 to 76 (↓18%) while the combined control routes only achieved a reduction from 18 to 14 (↓22%).

The Tanner Test showed a reduction of 7%, much less than the trial data.

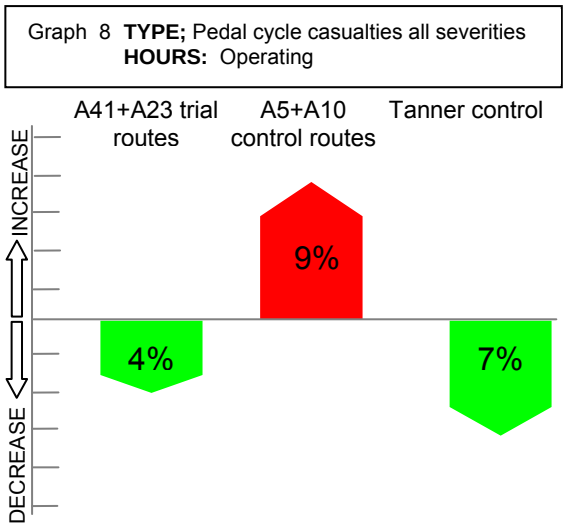
Graph 7 **TYPE;** Pedal cycle casualties all severities
HOURS: All



The history of collisions that resulted in a pedal cyclist being injured on the trial routes has returned a roughly neutral net benefit when comparing the combined trial routes but a benefit when the Tanner Test is considered.

GRAPH 8

Table 3.10 and 9.10 (Appendices I and II respectively) provide the combined information necessary for this comparison.



The combined trial routes saw a reduction from 46 to 44 (↓4%) while the combined control routes achieved an increase from 11 to 12 (↑9%).

The Tanner Test showed a reduction of 7%

There is a safety benefit to pedal cyclists when considering the trial against the original control data, but a slightly negative position is shown in the comparison with the Tanner control data.

4.1.2.1. Summary

The two graphs displaying the assessments of injuries to pedal cyclists during bus lane operating hours both return a benefit (not statistically significant) in the comparison between the trial route(s) and either control data sets.

Collisions during all hours returned a disbenefit.

As the operating hours assessment shows a benefit it would suggest that the increase in cyclists' injuries might not occur during these hours and are therefore not attributed to the measure.

The above results do not consider the increase in usage, either of pedal cycles or P2Ws, and with this element factored in, there may be further safety benefits to consider.

4.1.3 Pedestrians

GRAPH 9

Graph 9 **TYPE;** Pedestrian casualties, all severities
HOURS: All

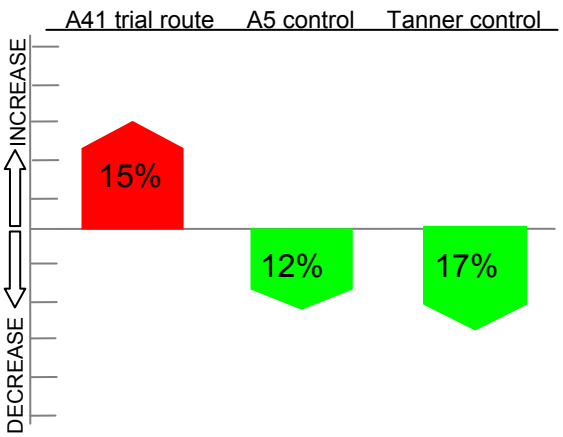


Table 2.5 from Appendix I shows that collisions on the A41 increased from 41 to 47 (↑15%) while the A5 control route shows a decrease, from 50 to 44 collisions (↓12%), whilst the Tanner control area returned a reduction of 17%.(Appendix II, Table 8.5).

The effect on the measure on pedestrian casualties shows there to be a disbenefit when the A41 is considered against both the original control data from the A5 and the Tanner test.

GRAPH 10

Graph 10 **TYPE;** Pedestrian casualties, all severities
HOURS: Operating

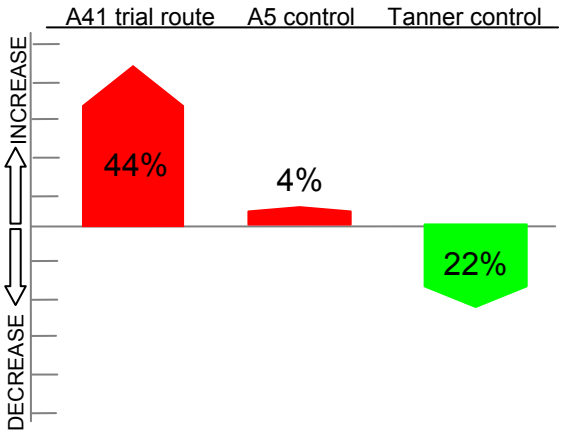


Table 2.6 from Appendix I shows that collisions on the A41 increased from 16 to 23 (↑44%) and the A5 control route also returns an increase, albeit smaller, from 23 to 24 (↑4%), whilst the Tanner control area returned a reduction of 22%.(Appendix II, Table 8.6).

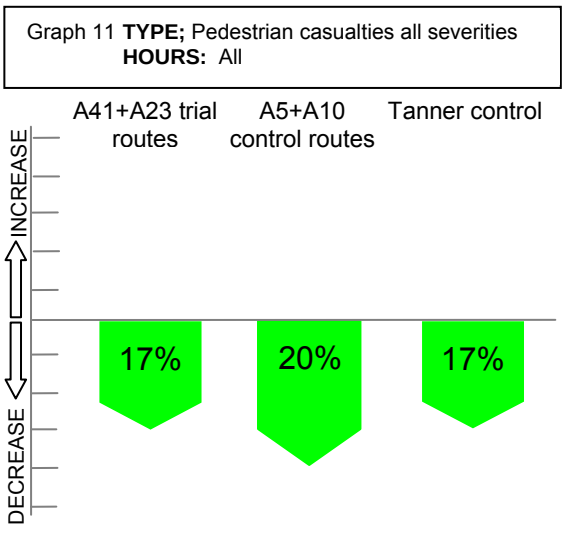
The effect of the measure on pedestrian casualties shows there to be a disbenefit when the A41 is considered against both the original control data from the A5 and the Tanner Test.

GRAPH 11

Table 2.5 and 8.5 (Appendices I and II respectively) provide the combined information necessary for this comparison.

The combined trial routes saw a reduction from 206 to 170 (↓17%) and the combined control routes achieved a reduction from 66 to 53 (↓20%).

The Tanner Test showed a reduction of 17%.



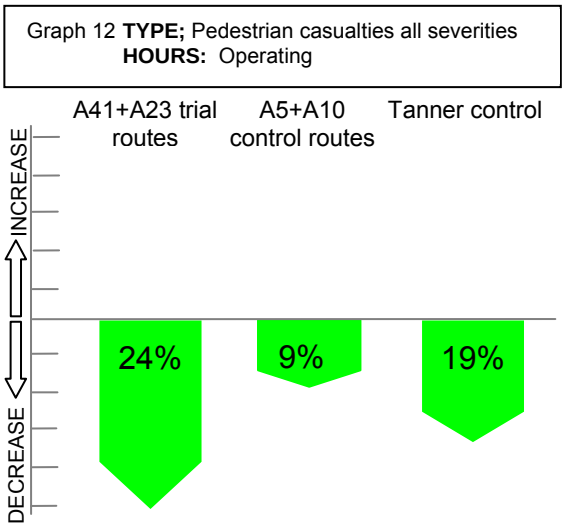
The results from the combined trial routes during all hours showed less benefit when compared to both controls though the difference was marginal against the Tanner Test.

GRAPH 12

Table 2.6 and 8.6 (Appendices I and II respectively) provide the combined information necessary for this comparison.

The combined trial routes saw a reduction from 78 to 59 (↓24%) and the combined control routes achieved a reduction from 33 to 30 (↓9%).

The Tanner Test showed a reduction of 19%.



The results from the combined trial routes during operating hours showed a benefit when compared to the original control data from the combined routes but the reduction was largely in line with that achieved by the Tanner Test.

4.1.3.1. Summary

There does not appear to be a straightforward answer when assessing the results from collisions involving pedestrians.

On the face of it, the overall results from the combined assessments in graphs 11 and 12 suggest a safety benefit. However, when drilling down to the

performance of the individual routes, the A41 shows a clear disbenefit to pedestrians which appears to be when the bus lanes are operational. The overall net benefit is returned because of the relatively larger casualty savings on the A23.

The problem lies with the pedestrian casualties on the A41 and in order to understand why, it is necessary to investigate the causation of these crashes and whether they involved P2Ws.

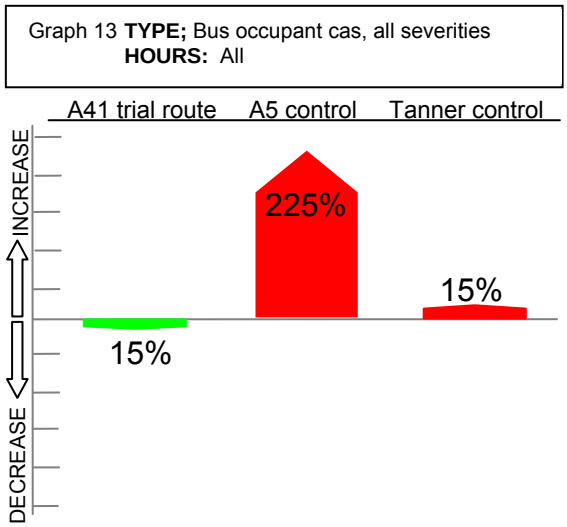
Further examination of the tables in Appendices I and II shows that of the 16 collisions in the before period on the A41, 3 were attributable to incidents involving P2Ws and there were 5 in the after period.

Parallel figures from the A5 show a similar return of 3 and 5 respectively. As there is an apparent increase from both sets, it might be possible that the increases are attributable to an upturn in usage. Later sections in this report (5.1, 5.2, and 6.2) demonstrate that there was a significant migration of usage of P2Ws from the A5 to the A41 which, when taken into consideration, delivers a net safety benefit to pedestrians.

4.1.4 Bus Occupants

GRAPH 13

Table 5.17 from Appendix I shows that collisions on the A41 have decreased from 20 to 17 (↓15%) and the A5 control route shows a quite significant increase, from 4 to 13 collisions (↑225%), whilst the Tanner control area returned an increase of 15% (Appendix II, Table 11.17).

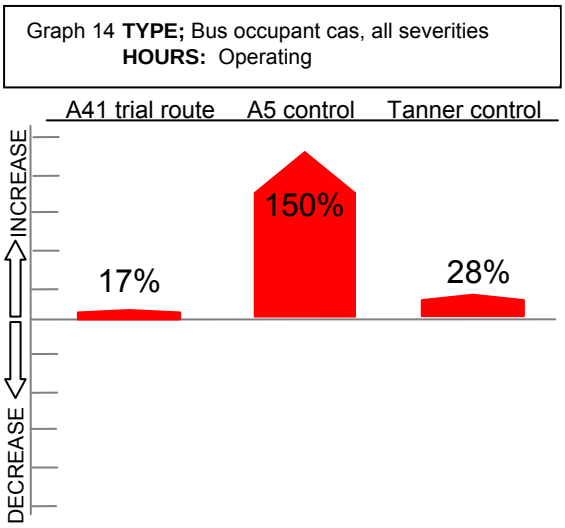


The effect of the measure on bus occupant casualties shows there to be a benefit when the A41 is considered against the original control data from the A5 but a disbenefit when the Tanner Test is considered.

GRAPH 14

Table 5.18 from Appendix I shows that collisions on the A41 have increased from 6 to 7 (↑17%) but the A5 control route returns quite a significant increase, from 4 to 10 collisions (↑150%), whilst the Tanner control area returned an increase of 28%.(Appendix II, Table 11.18).

When considering operating hours on the A41 the collisions involving bus occupants have increased, but the increase is around 9 times less than the original control route and less than the Tanner Test.



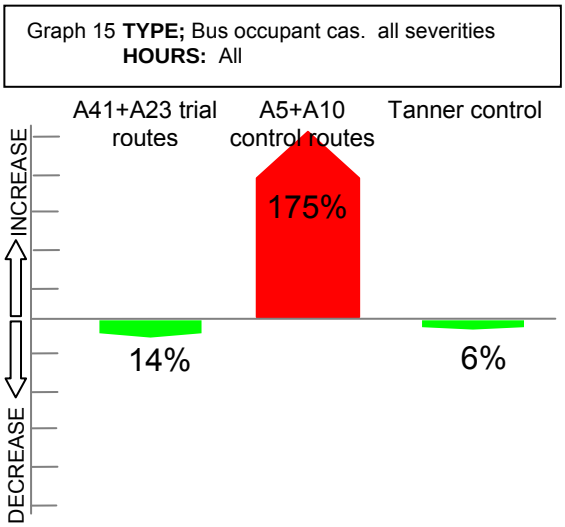
GRAPH 15

Table 5.17 and 11.17 (Appendices I and II respectively) provide the combined information necessary for this comparison.

The combined trial routes saw a reduction from 105 to 90 (↓14%) but the combined control routes returned an increase from 8 to 22 (↑175%).

The Tanner Test showed a reduction of 6%.

The results from the combined trial routes during all hours showed a benefit when compared to the original control data from the combined routes but the reduction was only slightly larger than that achieved by the Tanner Test.



GRAPH 16

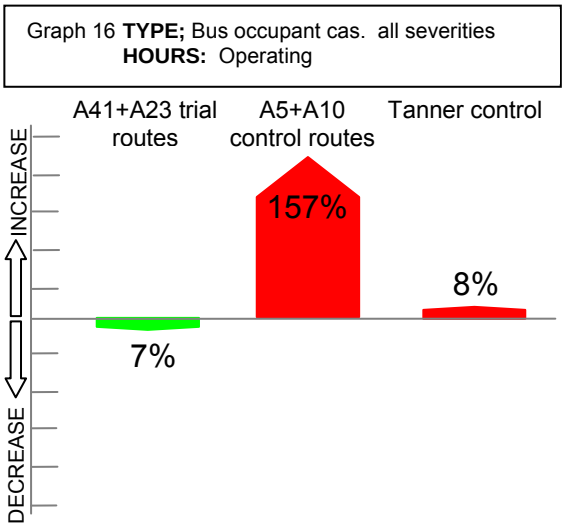


Table 5.18 and 11.18 (Appendices I and II respectively) provide the combined information necessary for this comparison.

The combined trial routes saw a decrease from 27 to 25 (↓7%) but the combined control routes returned a large increase from 7 to 18 (↑157%).

The Tanner Test showed a decrease of 8%.

The results from the combined trial routes during operating hours showed a benefit when compared to the original control data from the combined routes and a lesser benefit when compared to the Tanner Test.

4.1.4.1. Summary

In all cases the trial route(s) have shown a benefit over the original control routes. The benefit is also apparent against the Tanner Test, though this is much less clear.

However, there are some increases in the categories and it is necessary to assess whether these are attributable to the measure. Further scrutiny of Table 5.20, which shows P2W collisions where a bus occupant was injured, reveals that none of the injuries were caused by collisions with motorcycles.

Therefore it can be stated that there is no adverse effect on the safety of bus occupants that can be attributed to the measure.

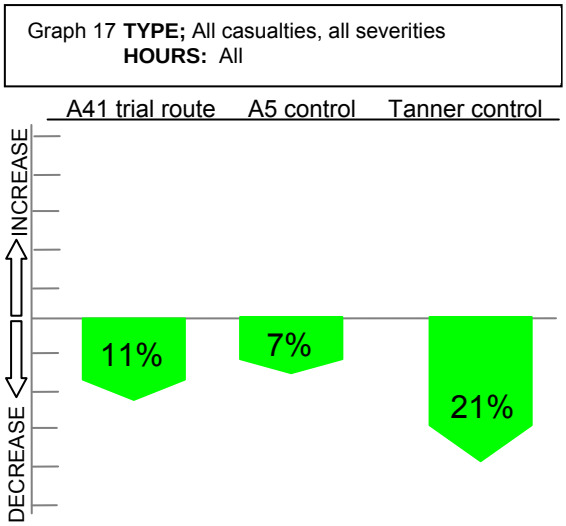
4.1.5 All Users

As a summary to the casualty analysis section the same assessments are carried out on the figures collated for all casualties of all types on the trial and control routes. Graphs 17 to 20, (over page) show the results.

GRAPH 17

Table 1.1 from Appendix I shows that collisions on the A41 have decreased from 199 to 177 (↓11%) and the A5 control route shows a decrease from 183 to 171 collisions (↓7%), whilst the Tanner control area returned a decrease of 21% (Appendix II, Table 7.1).

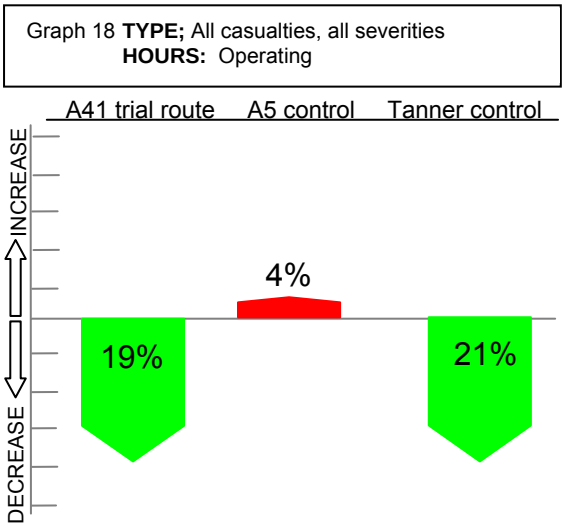
All collisions during all hours shows a safety benefit when considering the A41 against the original control route, A5 data. However, there is a negative safety benefit when the Tanner Test is considered.



GRAPH 18

Table 1.2 from Appendix I shows that collisions on the A41 have decreased from 75 to 61 (↓19%) but the A5 control route shows an increase from 93 to 97 collisions (↑4%), whilst the Tanner control area returned a reduction of 21% (Appendix II, Table 7.2).

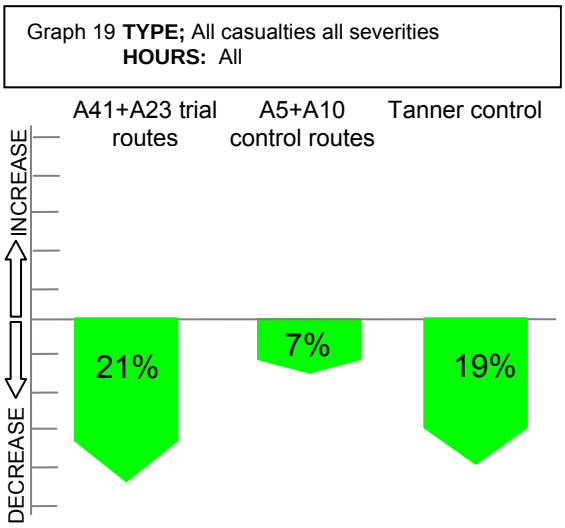
There is a clear safety benefit when considering all collisions in operating hours against the original control data. However a slight disbenefit is returned when the Tanner Test is considered.



GRAPH 19

Table 1.1 and 7.1 (Appendices I and II respectively) provide the combined information necessary for this comparison.

The combined trial routes saw a reduction from 852 to 670 (↓21%) but the combined control routes returned a lesser decrease from 249 to 231 (↓7%).



The Tanner Test also showed an increase of 19%.

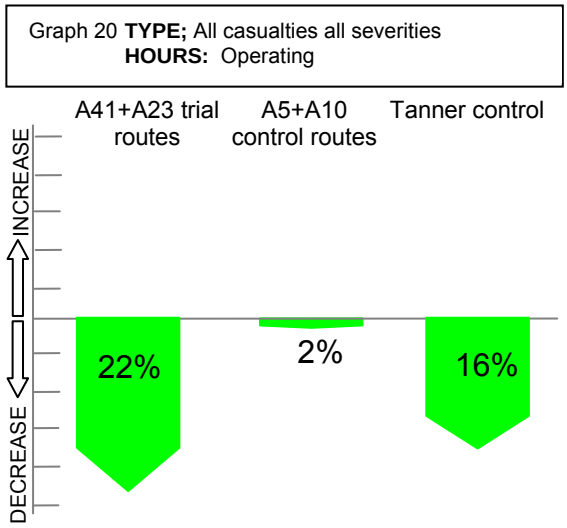
The results from the combined trial routes during all hours showed a safety benefit when compared to the original control data from the combined routes and a slight benefit when compared to the Tanner Test.

GRAPH 20

Table 1.2 and 7.2 (Appendices I and II respectively) provide the combined information necessary for this comparison.

The combined trial routes saw a reduction from 302 to 237 (↓22%) but the combined control routes returned a lesser decrease from 128 to 126 (↓2%).

The Tanner Test showed a decrease of 16%.



The results from the combined trial routes during all hours showed safety benefits of differing degrees when compared to the original control data from the combined routes and the Tanner Test.

4.1.5.1. Summary

In all the cases examined, the overall situation demonstrates a safety benefit (not statistically significant) when comparing the trial routes to the original control routes, and a neutral safety benefit when the assessment uses the Tanner test for comparison.

4.2 Conclusions – Casualty analysis

P2Ws – The four graphs indicate a safety benefit in three cases, and a neutral one when the A41 is considered in isolation.

Pedal cycles – The majority of the assessments reflect a safety benefit to users of pedal cycles because of the measure. The only situation when the results are adverse is when considering the pedal cyclists' safety in collisions that occurred at all hours. However, as the results for the operating hours are favourable, it would suggest that the increase in cyclists' injuries occur when bus lanes are not operational and therefore not attributed to the measure.

Pedestrians – The overall picture demonstrates a safety benefit to pedestrians from the measure. However, detailed analysis of the individual routes shows that the A23 performs better than the A41, the latter returning an increase in casualties. Drilling down further into the cause of the collisions indicates that the increases might not be attributable to the measure and consequently it could be

said that a neutral benefit is returned for this route. Pedestrian casualties that occurred when in conflict with P2Ws reduced by over half in all hours and bus lane operating hours.

All collisions - The overall situation demonstrates a safety benefit when considering the trial routes to the original control routes, and a neutral safety benefit when the assessment uses the Tanner test for comparison.

None of the assessments carried out in this section investigates the potential impact that the increased usage of P2Ws may have on the results. This is investigated in section 6.0.

5.0 User and Attitudinal surveys

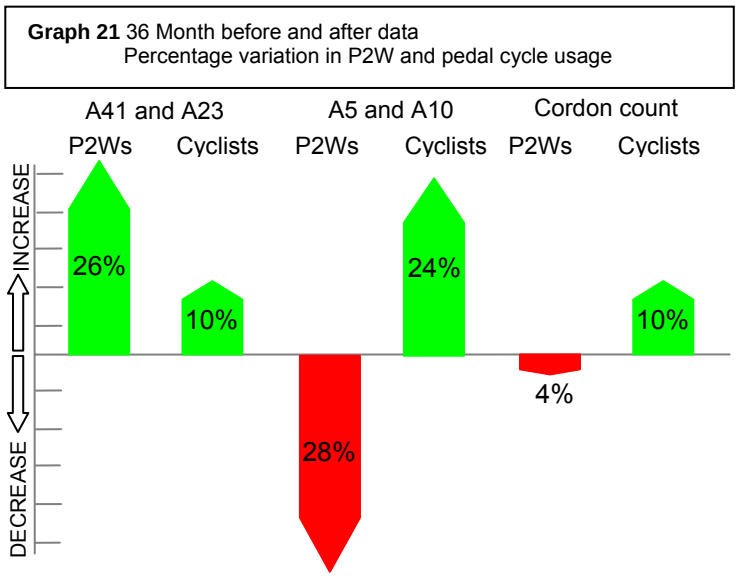
To understand fully how riders of P2Ws and pedal cycles would adjust to the measure, vehicle counts before and after the implementation of the measure were assessed. The attitude of all road users towards the measure was also investigated using opinion poll surveys

The full report and data sets used can be found in Appendix III, and this section summarises the effect. The estimated Annual Average Daily Traffic (AADT) flows were taken from DfT counters for actual flows along the trial routes. For a comparison against the general trend in traffic flows, the TfL cordon count data were used.

5.1 Vehicle usage

GRAPH 21 Comparison of trial routes and control routes
(Appendix III, Table 8a)

When comparing the trial routes to the control routes, it can be seen that the P2W riders used the bus lane trial routes considerably more than in the 36 months before, and considerably less on the adjacent A5 control route. In fact a 26% increase was recorded on the A41 and A23 combined with a corresponding 28% decrease on the A5 and A10. This compares with a minor decrease (4%) in the general trend of usage across the inner cordon.



The measure does not seem to have affected pedal cycle use too adversely as their use on the trial routes continued in line with the general trend figures, but the control routes did seem to experience a larger increase in usage than the cordon count data.

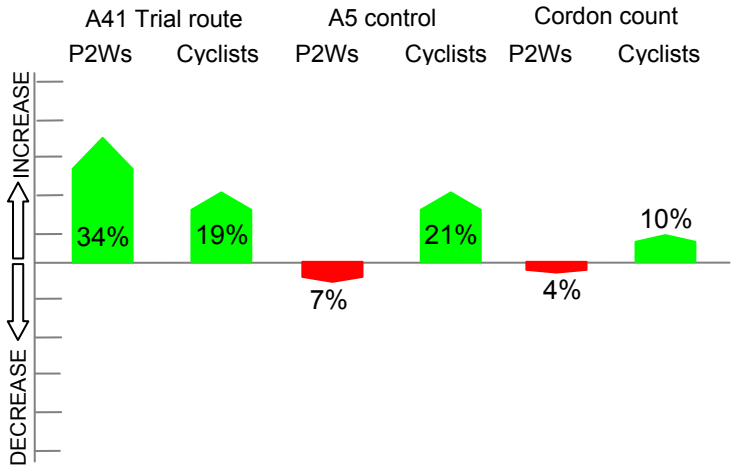
5.2 Migration

The potential for migration of P2Ws and indeed cyclists to or away from the trial routes must be understood in order to gauge the impact this might have when comparing casualty statistics.

To assess both trial routes it is necessary to compare user rates with a similar route that follows the trial route in relatively close proximity. Consequently, the data of the A41 were compared to the control route A5 corridor. However, the path of the A23 in south west London bears no similarities to that of the other control route, the A10. Therefore, for this exercise only, a new data set was introduced to enable a more accurate comparison and that was collected from AADT flows on the A24 in south west London.

A5 to A41 (GRAPH 22)
(Appendix III, Table10a)

Graph 22 36 Month before and after data
Percentage variation in P2P usage



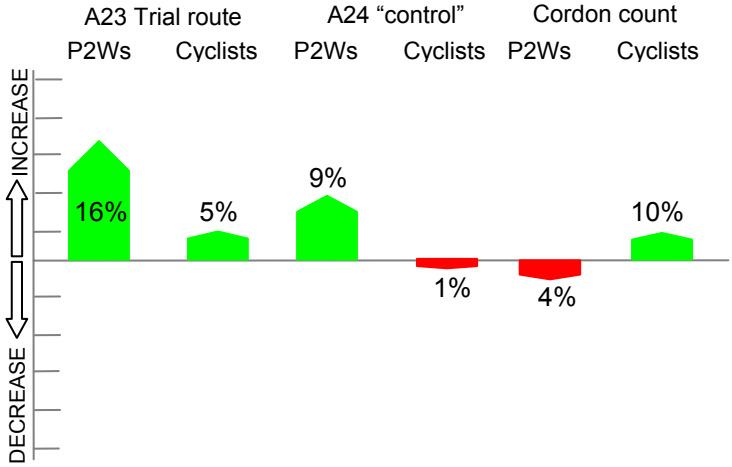
The numbers of powered two wheelers using the A41 increased significantly, by 34% against the A5 decrease of 7% and overall trend figures which showed a 4% decrease. This would suggest that P2W riders were altering their journey and joining the A41 from routes other than the A5.

The pedal cycle figures show the number of cyclists increased by 19% and 21% on the A41 and A5 respectively which compares to the trend figure of +10%. These results suggest that the inclusion of P2Ws in the bus lanes has not obviously deterred cyclists from using them.

A24 to A23 (GRAPH 23)
(Appendix III, table 11a)

The use of PTWs increased on the A23 by 16% and a lesser increase was experienced by the A24 (9%). Both these increases were disproportionate to the cordon counts which recorded a drop of 4%.

Graph 23 36 Month before and after data
Percentage variation in P2P usage



Pedal cycling activity recorded an increase of 5% which was not as large as the general trend but when compared against a drop of 1% on the A24 suggests that again the cyclists have probably not been deterred by the presence of P2Ws in the bus lanes. The cordon count reflected an increase of 10% in usage.

5.2.1 Migration summary

There has been a significant increase in the number of P2W journeys recorded on the trial routes. In the case of the A41, the swing from the A5 is 41% and when compared to the trend the swing still achieved a 38% shift.

Pedal cycle usage also increased more than the trend with a net 9% swing recorded.

The A23 followed suit albeit to a lesser extent, with a net increase of 7% over the A24, and cycle usage seeing a 6% increase. The impact of these increases is investigated in section 6.0.

5.3 Opinion surveys

Opinion surveys on behalf of TfL were made available for this study. Studies targeted motorcyclists, cyclists, bus drivers, car drivers, pedestrians and the general public and details of all surveys can be found in Appendix III.

The surveys did not reveal many surprises in their findings with only motorcyclists and car drivers (who are not bus users) being the two user groups who approved of the measure.

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

The findings also showed that pedal cyclists are viewed by bus drivers as being the most problematic of all road users.

It must be noted that the small size of the response groups to some of the surveys might not be representative of that groups' opinion.

5.4 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.

This "before" and "after" data (Table 1 - shown below) only provides 18 months figures but is sufficient enough to make a valid comparison.

Table 1 – 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.

5.5 Conclusions - usage, speeds and attitudinal surveys

The measure is undoubtedly very popular with P2W users. This is evident from the results from the opinion surveys and the increase in usage of the trial routes - a net increase of 54% against the control routes and a net 30% increase against the general trend were recorded.

Pedal cyclists, whilst generally in opposition to the measure continued to use the trial bus routes in numbers that increased in line with the general trend.

There is a significant element of migration from adjacent routes to the trial routes. This effect on the collision numbers on the trial routes is investigated further in section 6.0.

The data available to assess the impact of the measure on bus speeds and journey times is too limited for robust analysis but would suggest that the measure does not hinder the expeditious movement of buses or other vehicles.

6.0 Collision Rates

The issues to consider are the casualty numbers and the number of vehicles using the routes. One of the advantages of returning to the original control data is that it can be compared with the traffic flows along a route. The comparisons will be made with the collision histories for all hours of the day as AADT flows cannot specify bus lane operating hours.

This section considers the impact of the measure and the comparisons give a collision rate in the form of the number of collisions per 10,000 P2W journeys.

Appendix III contains the full tables but a summary involving each user group is contained here.

The analysis focuses on those collisions where it has been specified that a P2W was involved with a user from another group, and all collisions involving a specific user group. All summaries include collisions of all severities.

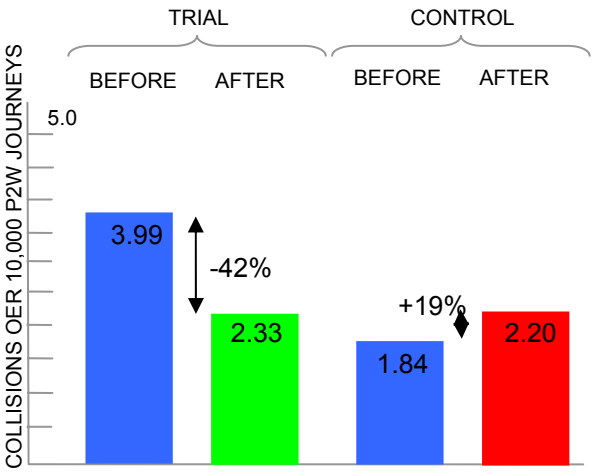
As an overview the first summary (Graphs 24 and 25) shows the results of all collisions.

6.1 All P2W collision rates

GRAPH 24 shows the collision rate summary for the combined trial routes compared to the combined control route data for all collision type and all casualty types

Graph 24 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial:** A41and A23, **Control**: A5 and A10
COL TYPE	ALL
CAS TYPE	ALL
SEVERITY	ALL



The casualty numbers reduced by around 21% and the control reduced by 7% (Graph 19).

However, when the usage rate is factored in, the savings in casualties become more obvious, with the collisions rate dropping by 42% due to the increase in P2W journeys.

Whilst there was a small decrease in the corresponding collision numbers for the control routes, when the reduced flows are considered, the collision rate increases by 19%.

This equates to the following:

Trial route crash rates being equivalent to:

1 collision every 2,506 P2W journeys BEFORE the trial started.

1 collision every 4,287 journeys AFTER the trial started.

And on the control routes:

1 collision every 5,427 P2W journeys BEFORE the trial started.

1 collision every 4,546 journeys AFTER the trial started.

GRAPH 25 gives details of the combined route results for all collisions where the casualty type was defined as a P2W.

The trial and control routes saw a drop in collision numbers of 26% and 8% respectively (Appendix I, Table 1.3).

However, the collision rates show that collisions became much less frequent in the trial, down by 45% whilst the control routes experienced a 19% increase in their frequency.

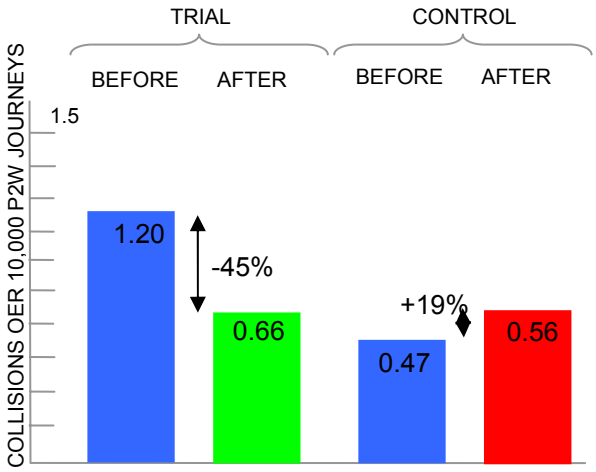
This equates to the following:

Trial route crash rates being equivalent to:

1 collision every 8,308 P2W journeys BEFORE the trial started.

Graph 25 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial:** A41and A23, **Control**: A5 and A10
COL TYPE	ALL
CAS TYPE	P2W
SEVERITY	ALL



1 collision every 15,117 journeys AFTER the trial started.

And on the control routes:

1 collision every 21,113 P2W journeys BEFORE the trial started.

1 collision every 17,798 journeys AFTER the trial started.

6.1.1 Summary

The net 61% reduction in the collision rate when comparing the combined trial routes to combined control routes indicates a benefit in introducing the measure.

The benefit is even greater (64%) when considering the collisions in which the casualties included a P2W rider.

6.2 Pedestrian collision rates

GRAPH 26 shows the results from the combined routes, both for trial and control for all collisions involving pedestrians.

Actual collision numbers fell for both from 206 to 170 for the trial route, and from 66 to 53 on the control route. (Appendix 1, Table 2.5)

This equates to a 17% and 20% drop respectively (Graph 11).

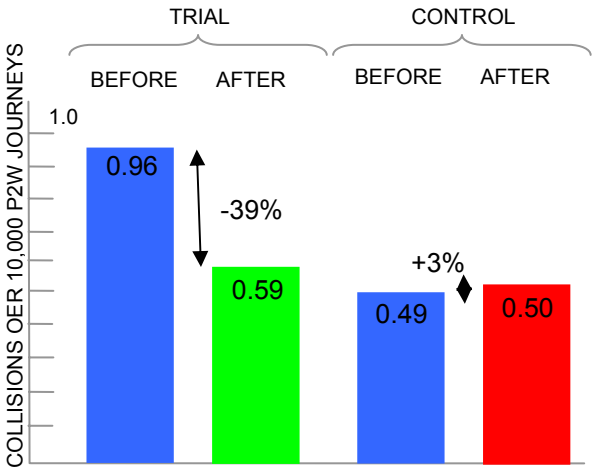
The rate of collisions again favours the trial routes due to the significant increase in the usage of the routes and a reduction of 39% is returned for the trial whilst a 3% increase is recorded for the control.

This equates to the following:

Trial route crash rates being equivalent to:

Graph 26 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial:** A41and A23, **Control**: A5 and A10
COL TYPE	ALL
CAS TYPE	PEDS
SEVERITY	ALL



1 pedestrian collision every 10,365 P2W journeys BEFORE the trial started.

1 pedestrian collision every 16,895 journeys AFTER the trial started.

And on the control routes:

1 pedestrian collision every 20,473 P2W journeys BEFORE the trial started.

1 pedestrian collision every 19,813 journeys AFTER the trial started.

GRAPH 27 shows the results from the combined routes, both for trial and control and examines the situations that involved collisions between P2Ws and pedestrians.

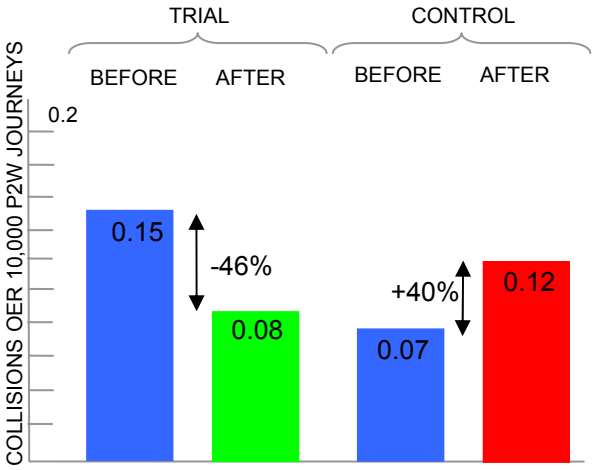
Actual collision numbers fell on the trial routes from 33 to 24 (↓27%), but rose from 10 to 13 (↑23%) on the control routes (see Appendix I, Table 2.7).

These percentages change to reflect a 46% reduction in collisions between P2Ws and pedestrians on the combined trial routes but a 40% increase in collisions on the control routes.

This equates to the following:

Graph 27 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial:** A41and A23, **Control**: A5 and A10
COL TYPE	P2Ws
CAS TYPE	PEDS
SEVERITY	ALL



Trial route crash rates being equivalent to

1 pedestrian collision every 64,705 P2W journeys BEFORE the trial started.

1 pedestrian collision every 119,674 journeys AFTER the trial started.

And on the control routes:

1 pedestrian collision every 135,123 P2W journeys BEFORE the trial started.

1 pedestrian collision every 80,777 journeys AFTER the trial started.

As stated in 4.1.3.1 the A41 warrants investigation in isolation as the combined figures for the trial routes screens a possible safety problem for pedestrians on the A41. The analysis of casualty rates in Graphs 28 and 29 assess this situation.

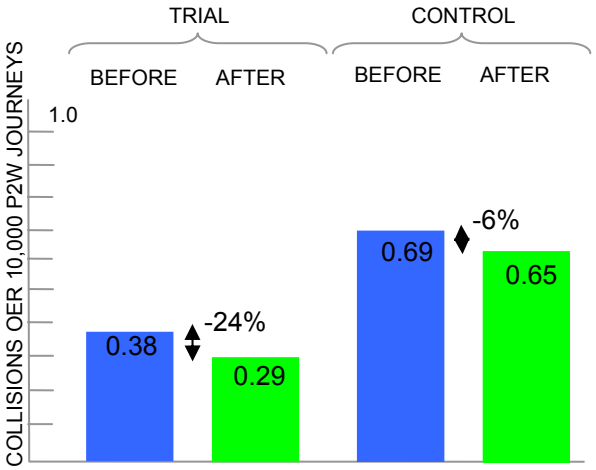
GRAPH 28 shows the results from the A41 trial route and the A5 control route, and examines the situations that involved all collisions with pedestrian casualties.

Actual collision numbers increased on the A41 from 41 to 47 (↑15%), but fell from 50 to 44 (↓12%) on the A5 control route (see Appendix I, Table 2.5).

These percentages change to reflect a 24% reduction in collisions between P2Ws and pedestrians on the A41 and a 6% decrease in collisions on the A5.

Graph 28 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial**: A41, **Control:** A5
COL TYPE	ALL
CAS TYPE	PEDS
SEVERITY	ALL



This equates to the following:

Trial route crash rates being equivalent to:

1 pedestrian collision every 26,066 P2W journeys BEFORE the trial started.

1 pedestrian collision every 34,225 journeys AFTER the trial started.

And on the control routes:

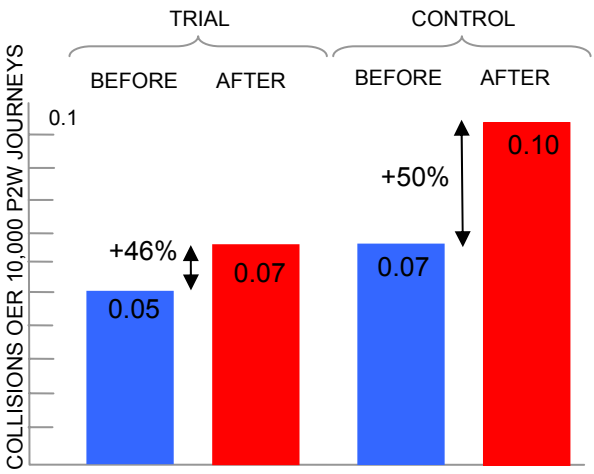
1 pedestrian collision every 14,498 P2W journeys BEFORE the trial started.

1 pedestrian collision every 15,355 journeys AFTER the trial started.

GRAPH 29 assesses the results from the A41 trial route and the A5 control route, and examines the situations that involved P2W collisions with pedestrian casualties.

Graph 29 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial**: A41, **Control:** A5
COL TYPE	P2Ws
CAS TYPE	PEDS
SEVERITY	ALL



Actual collision numbers increased on the A41 from 5 to 11 (↑120%), and from 5 to 7 (↑30%) on the A5 control route (see Appendix I, Table 2.7).

These percentages change to reflect a 46% increase in collisions between P2Ws and pedestrians on the A41 and a similar (50%) increase in collisions on the A5.

This equates to the following:

Trial route crash rates being equivalent to:

1 pedestrian collision every 213,744 P2W journeys BEFORE the trial started.
1 pedestrian collision every 146,232 P2W journeys AFTER the trial started.

And on the control routes:

1 pedestrian collision every 144,978 P2W journeys BEFORE the trial started.
1 pedestrian collision every 96,518 P2Wjourneys AFTER the trial started.

6.2.1 Summary

The number of collisions in which pedestrians were casualties reduced by 17% on the trial routes compared to 20% on the control routes. This suggests the measure did not benefit pedestrian safety. However, when the migration of P2Ws away from the control routes to the trial routes is considered, the frequency of collisions which resulted in pedestrian casualties reduced by 39% but increased by 3% on the control.

The reduction in collision rate involving P2Ws in which pedestrians were injured was 46% and but the rate increased by 40% on the control. These results are not statistically significant but do suggest the measure benefits pedestrians.

However, as stated in 4.1.3.1, the analysis of the casualty figures for the A41 in isolation needs to be assessed as this saw a rise in collisions involving pedestrians. This issue was investigated and the results displayed in Graphs 28 and 29.

These results show that the potential compromise in safety for pedestrians is negated when the migration issue is considered. All collisions where pedestrians were hurt showed a reduction in the casualty rate of 24% on the A41 whereas the A5 control only achieved a 6% reduction. When the P2W/pedestrian collision rate is considered the trial route increased by 46%, which was a smaller increase than the control which returned a 50% increase.

None of the results in this assessment are statistically significant.

6.3 Pedal cycle collision rates

GRAPH 30 Assessment of the pedal cycle casualties shows a decrease in collisions involving them from 93 to 76 (↓18%) on the trial routes and 18 to 14 on the control routes (↓22%), (see Appendix I, Table 3.9).

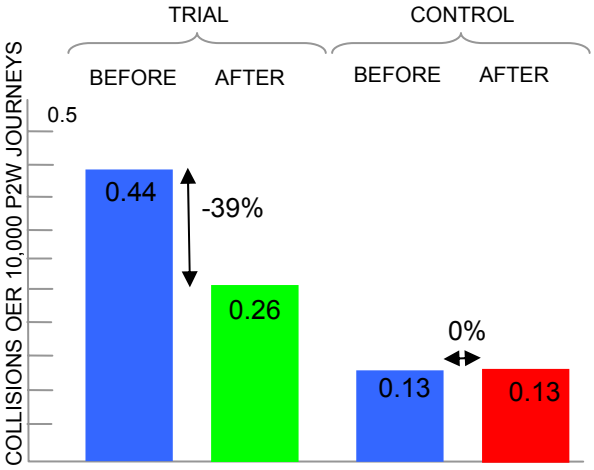
These figures suggest that there is a disbenefit to pedal cycles from the measure when the number of collisions is compared in isolation, but a distinct benefit in that the collision rate is down a net 39% on the trial routes.

This equates to the following:

Trial route crash rates being equivalent to:

Graph 30 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial:** A41and A23, **Control**: A5 and A10
COL TYPE	ALL
CAS TYPE	CYCLES
SEVERITY	ALL



1 pedal cycle collision every 22,960 P2W journeys BEFORE the trial started.

1 pedal cycle collision every 37,792 journeys AFTER the trial started.

And on the control routes:

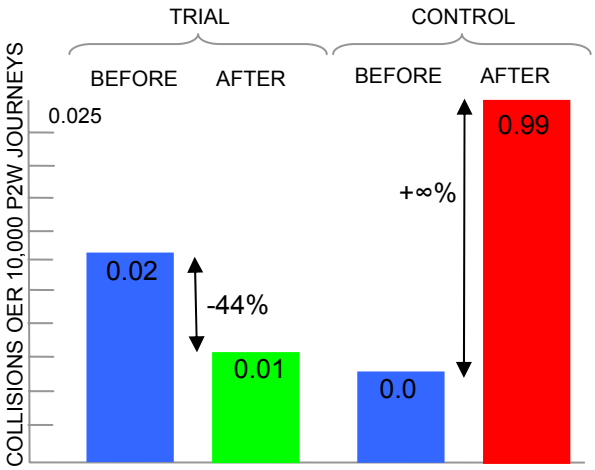
1 pedal cycle collision every 75,068 P2W journeys BEFORE the trial started.

1 pedal cycle collision every 75,008 journeys AFTER the trial started.

GRAPH 31 shows the results from the combined routes, both for trial and control and examines the situations that involved collisions between P2Ws and pedal cycles.

Graph 31 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial:** A41and A23, **Control**: A5 and A10
COL TYPE	P2W
CAS TYPE	CYCLES
SEVERITY	ALL



Actual collision numbers fell on the trial routes from 4 to 3 (↓25%), but rose from 0 to 1 (↑∞%) on the control routes (see Appendix I, Table 3.11).

These figures suggest that there is no net benefit to pedal cycles from the measure, but this changes to a benefit greater than 44% when the collision rates are considered.

A closer scrutiny reveals that there was a slight increase in the collisions involving cyclists on the A41 (20 to 21) but in order to put it in context the rates were assessed in Graph 32.

This equates to the following:

Trial route crash rates being equivalent to:

1 pedal cycle collision every 533,813 P2W journeys BEFORE the trial started.
1 pedal cycle collision every 957,395 journeys AFTER the trial started.

And on the control routes:

1 pedal cycle collision every 13,512,300 P2W journeys BEFORE the trial started.
1 pedal cycle collision every 1,050,105 journeys AFTER the trial started.

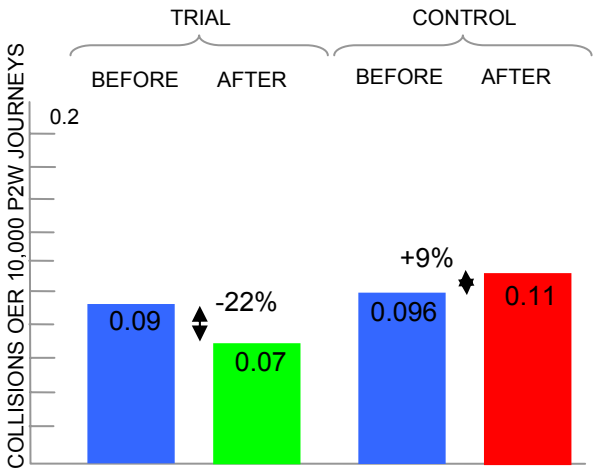
GRAPH 32 shows the results from the A41 trial route and A5 control route, for all collisions involving pedal cycles.

Actual collision numbers rose on the trial routes from 20 to 21 (↑5%), but fell from 13 to 11 (↓15%) on the A5 control routes (see Appendix I, Table 3.9).

These figures suggest that there is no net benefit to pedal cycles from the measure, but this changes to a benefit because when the migration of P2Ws to the A41 is considered, the collision rate is down a net 22% on the trial routes. This benefit is further increased when the control (which returned a 9% increase) is considered.

Graph 32 Collision rate (collisions per 10,000 P2W trips)

ROUTE(S)	**Trial**: A41, **Control:** A5
COL TYPE	ALL
CAS TYPE	CYCLES
SEVERITY	ALL



Trial route crash rates being equivalent to:

1 pedal cycle collision every 106,763 P2W journeys BEFORE the trial started.

1 pedal cycle collision every 136,771 journeys AFTER the trial started.

And on the control route:
1 pedal cycle collision every 103,941 P2W journeys BEFORE the trial started
1 pedal cycle collision every 95,464 journeys AFTER the trial started

6.3.1 Summary

The collision rate has been assessed for the combined trial and control routes and a net safety benefit is apparent in all cases, with the collision rate reducing by 44% when considering collisions involving P2Ws and pedal cycles being the largest.

When the A41 is considered in isolation there was a marginal increase in the actual collision numbers (20 to 21). The collision rates demonstrate that all collisions in which a pedal cyclist is injured become more infrequent with a net reduction of 22% in collision rates.

6.4 Conclusions - collision rates

The collision rate analyses indicate that there is a safety benefit for all vulnerable road users.

The trial routes benefit from a 42% reduction in collision rates for all collisions and the benefit is even greater (45%) when considering the collisions in which the casualties included a P2W rider. Both these results are against a 19% increase in the control routes.

For pedestrians, the benefit is most apparent when the migration of P2Ws away from the control routes to the trial routes is considered, a net reduction in pedestrian casualties in all collisions of 39% can be seen (against a 3% increase in the control routes casualty rate. In fact the net reduction in collisions involving P2Ws in which pedestrians were injured was greater at 46% against the control routes' 40% increase. This suggests the measure benefits pedestrians.

For pedal cyclists, the collision rates show a 44% when considering collisions involving P2Ws and pedal cycles.

The analyses also produce figures for the frequency of crashes according to the number of trips by a P2W. These figures in all cases demonstrate that crashes involving P2Ws and other vulnerable road users become more infrequent even when considering the increased concentration of riders on the trial routes due to the migration effect.

7.0 Experiences from other schemes

During the last eleven years, P2W access to bus lanes has been successfully 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. Deployment of this measure in the City of Bristol has continued since 1996.

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. The primary reason of all schemes is to improve road safety. Indeed, there are also a number of schemes that have been implemented in London by TfL and some London boroughs.

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 successfully adopted in Barcelona in Spain and some Italian cities.

As far as could be established by the authors, no trial of P2W in bus lanes anywhere in the UK – or anywhere else in the world – has ever 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 by nearly twice as much – from 12 to 4 which equates to 67%.

7.2 Other London borough schemes

There have been other trials in three London boroughs, Westminster, Kingston and Richmond. Table 2 gives a summary of the performance of each scheme.

In September 2005 the City of Westminster authority 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 one of Kingston's neighbours, 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.

None of these schemes has been implemented against a control area so no comparison can be made with the general trends. However, it does give an indication that the measure in differing scenarios can provide safety benefits to vulnerable road users in the vast majority of cases.

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.*"

7.4 Conclusions – experiences from other schemes

No trials in the UK have been removed for safety reasons, though there have not been any comprehensive casualty analysis trials undertaken.

The trials that have occurred have shown a reduction in casualties by up to 25% though none of the trials has used a control for objective comparison with collisions after its introduction.

Since 2002, authorities in London have recently embarked on implementing a variety of trials, the most significant of which was the eastbound M4 offside bus lane which returned a 67% reduction in P2W injuries and a statistically significant 36% reduction in all collisions despite simultaneously increasing the speed limit.

Table 2 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 Conclusions

8.1 Context

It is anticipated that the impact of this TfL study will extend beyond Greater London. Although the experiment was designed to generate evidence that is specifically related to P2W use of bus lanes in the capital (and indeed only those on the TLRN), the results are likely to be of great significance for all authorities with interests in improving road safety in relation to P2W use. Interest in this study has been expressed throughout the UK and internationally.

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.

A key factor to consider is that this test is of what happens when P2W access is permitted in one bus lane at a time – in a system of roads with bus lanes where P2W use is prohibited. Analysis of changes in mode use shows that deployment of the measure on one road prompted significant migration of P2W riders to that trial site – and away from other routes without the measure. In some ways this allows the experiment to assess an extreme scenario regarding fears that the measure may have adverse effects on other vulnerable road users. This aspect of method does however limit the extent to which the trial precisely replicates what happens when the measure is deployed throughout a bus lane network, as is the practice in various cities such as Bristol.

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.

TfL has 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

It can be argued that the Tanner Test calculations, to extrapolate figures for control data on casualties, offer a more statistically robust outcome than use of figures from control sites that are of correspondingly small size to trial sites.

However, what the Tanner method cannot do is allow for any fluctuations in vehicle usage, and therefore cannot account for the impact of migration on the results to be used 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.

It must be stated that because of the small size of all the data sets (even when the Tanner control was applied), none of the results returned were statistically significant.

8.3 Findings

8.3.1 Opinion surveys

The views collected from the opinion surveys were as expected.

Powered two wheeler riders responding to the survey favoured the measure as they felt it made the network safer for them.

Pedestrian and cyclist respondents expressed more negative views, formed by expectations that they would be less safe.

Bus driver respondents indicated a preference for sharing bus lane road space with P2Ws rather than pedal cycles.

8.3.2 Cyclists

The evidence from casualty and collision data shows that cyclists' concerns that their casualty rates would rise, and use of their mode would decline, were unfounded in practice.

The evidence from trial site casualty and usage data and comparisons with control sites shows that the safety records for cyclists significantly improved where the measure was deployed. Results also show that cycling rose on trial sites – despite the presence of P2W riders in bus lanes and a significantly above average rise in P2W use of trial routes.

The report concludes from the evidence that conditions for cyclists did not significantly deteriorate as expected by some. User levels for the mode did not decline on trial routes, and casualty numbers and rates reduced.

In practice, results indicate that the measure has benefits to cycling safety and coincides with rising cycle use. The experiment found no discernible evidence of

practical disbenefits, although there were indications that some cyclists did not like the idea of sharing use of bus lanes with P2W riders.

8.3.3 Pedestrians

The sum of casualty evidence shows that fears of significant rises in pedestrian injuries during the three year trial were not well founded, with the overall figures demonstrating a significant net safety benefit to pedestrians when considering the collision rates.

When looking at the actual casualty numbers from the individual trial routes without considering the migration issue, the experiences have been conflicting. In one trial site, pedestrian casualties from P2W collisions halved (A23), and in the other they doubled (A41).

It is possible to conclude that the A41 data shows what happens when a dramatic, and significantly above average rise in P2W use is focused on the one and only site where access to bus lanes is allowed, and where the number of pedestrians may be increasing.

The evidence shows that, overall, deployment of the measure has a net beneficial impact on pedestrian collision rates. Results also prove that this improvement is greater during operating hours when the measure can have maximum impact.

8.3.4 Bus occupants

There is no evidence from the experiment to indicate that the measure has any significant impact on bus occupants.

8.3.5 Powered Two Wheelers

The evidence from the trial indicates that the measure has allowed P2W riders on the trial routes to experience an increased level of safety that is not experienced elsewhere on the network. This is reinforced by the fact that there was migration from other routes.

8.4 Change in use by modes

P2W use of trial sites rose significantly in contrast to control sites and the average rise in use of the mode in London during the trial period.

The evidence of change in P2W usage between trial and control sites may be taken as a good indicator that P2W users recognise access to bus lanes as a safety enhancing measure.

The evidence also sheds informative light on concerns that deployment of the measure could encourage more motorcycling generally. However, evidence of preferences for the trial routes does not indicate that deployment of the measure prompts a rise in preference for modal shift to P2W use.

The rise in P2W use of trial routes resulted primarily from riders abandoning journeys on the adjacent routes, and that the extent of such changes ranged from 25% to 40%.

The evidence suggests that the measure does address an acute need to improve P2W rider safety, and without encouraging a corresponding increase in P2W use above existing rates of rising usage.

8.5 Summary

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.

When the VRU collisions were assessed against the original control routes, a net benefit to all groups was returned. However, included in this reduction were localised increases in pedestrian casualties on the A41. None of the results were statistically significant.

When the collision rates were analysed (ie taking into consideration the increase in usage of P2Ws) there was a safety benefit to all VRUs with no localised increases in collisions.