Green Person Authority – Trial Report

December 2021

Content

1. Exec Summary

This report details the outcomes of the Green Person Authority (GPA) trial. This innovative technique to improve priority for pedestrians at standalone crossings was trialled at 18 locations from May 2021. The concept fundamentally changes the way traffic signals have operated at standalone pedestrian crossings by providing priority to pedestrians unless there is a vehicle approaching the crossing.

The trial collected data on driver, cyclist, and pedestrian behaviour before and after GPA was implemented, primarily investigating changes in compliance. Performance data was also analysed to understand the impact to different road users as a result of the GPA technique.

Analysis of the behavioural data showed that after implementing GPA:

- Pedestrian compliance increases by an average of 13%
- Red-light violations for motor traffic remain similar
- Red-light violations for pedal cycle remain similar at locations with 150 pedal cycles per hour or less

Analysis of the performance data showed:

- GPA sites deliver an average of 56 minutes additional pedestrian green time per 12 hour daytime period
- The cumulative time saved by pedestrians using a GPA enabled crossing averages at 1.3 hours per day
- Journey time changes for buses and general traffic were minimal with the largest increase for buses being 9 seconds and for general traffic being 11 seconds with several sites showing a small improvement in journey times.

The small changes in bus and general traffic performance is likely to have been influenced by normal fluctuations in vehicle demand and network conditions. Therefore, it can be been concluded that GPA has had a neutral impact on bus performance.

TfL Engineering has approved the GPA technique for business-as-usual deployment within TfL with caveats. The two main caveats identified were:

- GPA can only be installed at sites with 150 pedal cycles per hour or less. Further analysis of sites with higher pedal cycle flows will be required to see whether this threshold can be amended
- GPA cannot be installed at sites with a speed limit of more than 30mph
- GPA cannot be installed at sites with an 85th percentile speed of 35mph or more

The performance data for GPA sites the objectives of the trial have been met delivering benefit for pedestrians with no measurable detrimental impact for buses or general traffic. The data shows that pedestrian benefits increase as vehicle flows decrease. Deployment of

future sites will, therefore, focus on locations with less than 7000 vehicles during a 7am to 7pm period, particularly focussing on one-way streets and areas protected by Low Traffic Neighbourhoods.

A business case is being prepared to assess the potential deployment of additional sites. If successful, further sites could be implemented in future TfL business plans.

2. Background

The 'Green Person Authority' (GPA) project is an innovative solution to contribute to Healthy Streets in London and is an initiative forming part of the Walking Action Plan. The aim is to provide the following benefits to pedestrians:

- Improved journey times for pedestrians from reduction of the time needed to wait at a crossing
- Improved pedestrian safety through reduction of the likelihood that pedestrians will cross on a red signal as a result of the reduced waiting times.

These benefits will help to make walking more attractive, contributing to Mayor's Transport Strategy (MTS) objectives to increase the number of people choosing active travel.

Introducing GPA at a pedestrian crossing means the traffic signals show a green signal for pedestrians continuously, until vehicular traffic is detected, at which time the pedestrians are stopped on a red signal, and vehicles are given a green light to proceed. In effect, this switches the need to 'demand' a crossing from pedestrians to vehicles, giving priority to pedestrians at all times other than when a vehicle is detected approaching the crossing.

The GPA concept was first tested at two locations in Morden and Hounslow. Both locations were "Bus only" sections of the network and have a high pedestrian footfall. The introduction of GPA was judged to have provided significant benefits for pedestrians, allowing the green time for pedestrians to continue until a bus approaches the stop line.

This concept was further developed and tested at 9 sites in 2018. The data showed good operational benefits for pedestrians. For example, at some trial locations during certain parts of the day, over one minute of continuous green time is provided for pedestrians at the crossings. But the data was inconclusive on the behaviour of pedestrians, cyclists, and drivers and as a result the technology was deactivated at four locations.

Following this initial test, 18 further crossing locations had GPA technology installed between July 2020 and May 2021. Nine additional sites were provided with the infrastructure which enabled the standalone crossing to operate the GPA technique but have not yet had the GPA technique enabled, awaiting the outcomes of the trial in December 2021.

Detailed monitoring of the initial 18 sites was carried out, looking at impacts on pedestrians and drivers, as well as at pedestrian, driver, and cyclist behaviour at GPA crossings. This report describes the outcomes of this monitoring, recommendations based on the monitoring, and proposed next steps.

3. GPA technology

A typical standalone pedestrian crossing operates with a demand unit. The signal shows a green light for vehicles and a red person for pedestrians as its normal state. When a pedestrian arrives at the crossing, they press the button indicating that they wish to cross.

GPA technology means the normal state of the crossing is a green person for pedestrians, and a red light for vehicles. Rather than the pedestrian needing to operate the demand unit to call the crossing, the crossing will show a red signal to vehicles and a green person to pedestrians and only ask pedestrians to wait if a vehicle is detected approaching the crossing.

When a vehicle is detected approaching the crossing, the pedestrian signal changes to provide a green signal for traffic after a safety clearance period. The calculation for the safety clearance period is the same as any typical standalone pedestrian crossing.

The following link contain a video illustration of a GPA sites in action
https://youtu.be/csrWHw7mauc

The vehicle detection strategy used at GPA crossings was designed bespoke by TfL. It includes two forms of vehicle detection, for extra surety:

- Distant detection in each lane approaching the stop line(s) of the crossing – this means a vehicle is detected well in advance of its arrival at the stop line, reducing delay to road traffic by minimising the need to stop (the signal would change before the vehicle arrives at the crossing)
- Stop line detection on each approach to the crossing – this can both call and extend the green phase for vehicles. Therefore, should there be a continuous stream of vehicles without a pedestrian demand, the crossing can remain on green for the vehicles. The stop line detectors are also provided as redundancy, should the distant detection not be triggered

Sites can operate with GPA 24/7 but can be switched on and off using TfL's Urban Traffic Control (UTC) system. When there are larger flows of traffic, the crossings would operate like a 'typical' pedestrian crossing finding an automatic balance between pedestrian and

vehicle green time in order to minimise impact on road users during periods of congestion. However, at quieter times with only occasional vehicle demand, pedestrians will receive significantly more green time.

All GPA sites have pedestrian countdown to give pedestrians a clear indication that their priority is ending after an approaching vehicle is detected.

The operation of tactile /audible facilities at crossings with GPA technology has been designed to mimic existing operation as close as possible to cater for people with visual/auditory disabilities:

- During the pedestrian green, tactiles and audibles work for six seconds then stop
- If the push button is pressed whilst the pedestrian is still green, tactile/audible facilities restart for another six seconds
- This can reoccur as long as the pedestrian green is active

The design of all the trial sites was undertaken in accordance with current TfL Engineering traffic signal design procedures and standards. This included undertaking traffic signal safety audits.

4. Trial

4.1Installation of trial sites

18 sites were modified to enable the crossing to operate the GPA technique (the "trial sites"). The location of the trial sites are shown in **Table 1.**

TfL Reference	Site Address
00/000089	LONG LANE BY WEST SMITHFIELD
00/000115	A10 BISHOPSGATE BY GREAT SAINT HELENS
01/000242	CAVENDISH SQUARE BY HENRIETTA PLACE
05/000130	DEVONS ROAD BY D.L.R STATION
05/000193	DEVONS ROAD BY WHITETHORN STREET
08/000272	SAINT GEORGE'S WAY BY EBLEY CLOSE
16/000053	GALE STREET BY BECONTREE STATION
16/000078	LONDON ROAD BY JAMES STREET
17/000087	PRINCE REGENT LANE BY ALNWICK ROAD
20/000281	WOODCOTE GROVE ROAD BY SMITHAM DOWNS ROAD
21/000033	WRYTHE LANE BY MUSCHAMP ROAD
21/000036	GREEN WRYTHE LANE BY AULTONE WAY
22/000145	KINGSTON ROAD BY ROTHESAY AVENUE
24/000050	RED LION STREET BY CHURCH TERRACE
24/000051	QUEENS ROAD BY QUEENS CRESCENT
24/000092	CASTELNAU BY NEWPORT ROAD
25/000312	HESTON ROAD BY HOGARTH GARDENS
26/000133	THE GREENWAY BY MERRYFIELD

Table 1: List of site address for 18 trail sites

Sites were chosen based on:

- Suitability of pre-existing technology at that site
- Proximity to locations such as schools, shopping centres, and stations, which could be expected to have a high pedestrian flow
- Suitability of the site for the installation of vehicle detection at the appropriate distance from the crossing

Sites were modified between August and October 2020. This involved installing new software, additional vehicle detection and communication lines. Some sites first required modernising due to the age of the equipment.

Following installation, 18 sites were switched on between May and June 2021. The start of the trial was postponed until May 2021 due to the tighter COVID restrictions which were re-introduce in November 2021 and the requirement for traffic levels to begin to return to normal

As part of the switch on process, each site was monitored in person by one of TfL's Network Managers to ensure the technology was operating correctly.

4.2Monitoring methodology

Vehicle and pedestrian compliance were surveyed at 16 sites during the weekday and 9 sites during the weekend. These surveys were undertaken whilst the traffic signal sites were operating a regular operational mode (before surveys) and whilst the traffic signal site was operating the GPA technique (after surveys).

The data collected was:

- A count of motorised vehicles
- A count of pedal cycles
- Red light violation of all vehicles except pedal cycles
- Red light violation of pedal cycles

Traffic signal timing data was also collected to allow analysis of the data within the context of the amount of red time provided to road traffic during the time period which the surveys were undertaken.

The data collected was:

- Average cycle time
- Count of cycles over the time period
- Red time for traffic

5. Results of the trial

5.1Impact on Road Users

Pedestrian Performance

Overall, there is an average of 56 additional minutes of pedestrian green time per 12 hour daytime period as a result of the GPA technique. As well as delivering safer journeys through increased compliance, the cumulative time saved by pedestrians using a GPA enabled crossing averages at 1.3 hours per day.

The amount of additional pedestrian green time is a function of the vehicle demand at each site. The data shows a clear drop off in additional pedestrian green time when there are more than 7000 vehicles in a 7am to 7pm 12-hour period. Sites with over 7000 vehicles during a 12-hour period are likely to receive between 10-35 minutes additional pedestrian green time, whereas sites with less than 7000 vehicles during a 12-hour period received between 60-120 minutes of additional pedestrian green time.

Bus Performance

Bus journey time performance was collected for before and after the implementation of GPA. Data was collected on weekdays between the hours of 7am-7pm. 16 of the 18 crossings had bus routes operating through them. Overall, the results show that GPA had a minimal effect on bus journey times with the biggest increase being 9 seconds. The majority of sites indicated a small improvement in journey time. As the change in bus journey times is relatively small, the change in bus performance is likely to have been influenced by normal fluctuations in vehicle demand and network conditions. Therefore, it can be been concluded that GPA has had a neutral impact on bus performance.

General Traffic Performance

General traffic performance was analysed before and after the implementation of GPA using data supplied by INRIX. INRIX supply data on traffic performance including journey times that is predominately collected from GPS enabled vehicles. Overall, the results showed that GPA had a minimal effect on general traffic performance with the biggest increase being 11 seconds. The average journey time change across the GPA crossings showed 0.1 second improvement as approximately half the locations had a small journey time improvement. As the change in general traffic journey times is relatively small, this change is likely to have been influenced by normal fluctuations in vehicle demand and network conditions. Therefore, it can be been concluded that GPA has had a neutral impact on general traffic performance.

Cycle performance

Journey time for bicycles has not been calculated as part of this study.

5.2Compliance

Pedestrians

Overall, average pedestrian compliance improved when the GPA technique was implemented by 13%.

During the 48 weekday periods (AM, inter and PM peaks) and 9 weekend periods, pedestrian compliance was observed to change as follows:

- Improved during 47 periods
- Remained the same or similar during 4 periods (no decrease or a decrease of no more than 5%)
- Slightly worsen during 3 periods (a decrease between 5-15%)
- Significantly worsen a during 3 periods (a decrease between 15-30%)

The sites which showed a worsening compliance either had low pedestrian volumes, so a slight change had a significant impact on compliance percentage, or they had high compliance beforehand, so a decrease of a few percentage points must be considered in that context.

Motor traffic

Overall, average red-light violation per traffic signal cycle remains similar when GPA was implemented at an increase 0.0118 violations per cycle.

During the 48 weekday periods (AM, inter and PM peaks) and 9 weekend periods, motorised red-light violations per traffic signal cycle were observed to change as follows:

- Improved during 22 periods
- Remained the same or similar during 18 periods
- Slightly worsen during 12 periods (an increase 0.02 to 0.10 violations per cycle)
- Significantly worsen a during 5 periods (increase above 0.10 violations per cycle)

The 5 periods of significantly worse red-light violations were at locations that were operating a “revert at max” facility. This is a facility which can be set to force the standalone crossing to revert to pedestrian green if road green has reached a pre-defined maximum value because of a continuous flow of traffic. These increases are likely to be a result of drivers perceiving the crossing to be faulty or unwilling to accept the level of services. As a result, this facility was discontinued and switched off at all sites.

If the data from the “revert at max” sites is removed, the average change in red light violation per traffic signal cycle is -0.0076 violations per cycle.

Pedal Cycles

Overall, the pedal cycle red light violations per traffic signal cycle remain the similar when GPA was implemented with an average increase of 0.0106 pedal cycle violations per traffic signal cycle.

During the 48 weekday periods (AM, inter and PM peaks) and 9 weekend periods, pedal cycle red light violations per traffic signal cycle were observed to change as follows:

- Improved during 20 periods
- Remained the same or similar during 19 periods
- Slightly worse during 16 periods (an increase 0.02 to 0.10 violations per cycle)
- Significantly worse during 2 periods (increase above 0.10 violations per cycle)

At one location, Bishopsgate with St Helen Street, a significant increase in pedal cycle red light violations per traffic signal cycle was observed. This increase is above the trend experienced at other sites and is likely to be a result of large cycle numbers, which is around 600-1000 more pedal cycles per period than other sites. This site has been switched off pending further investigations into the effect of GPA on sites with higher pedal cycle flows. This would be investigated during the next stage of the project.

If the data from the Bishopsgate site is removed, then the average change in red light violations per traffic signal cycle is 0.0001 violations per traffic signal cycle.

5.3Conclusion

Overall, the GPA is considered beneficial to pedestrians with 13% increase in pedestrian compliance and an average increase in pedestrian green time of 56 minutes per 12 hour daytime period. The pedestrian green time benefits are more significant at lower vehicle flow sites with over 60-120 minutes seen at sites of 7000 or less vehicles during a 7am-7pm periods.

Analysis of Journey Time data for before and after GPA is implemented shows that there is a minimal change in journey times for buses and general traffic. It can, therefore, be concluded that GPA has a neutral impact on journey times.

Compliance data for motor vehicles shows red-light violations are similar once GPA is implemented. This is also true for pedal cycles where there are 150 pedal cycles per hour or less. Further investigation is required into the effect of GPA on sites with higher pedal cycle numbers.

6. Costs

The Estimated Final Cost of designing and delivering these sites was £554,000 of which £416,000 was capital costs to pay for the infrastructure, upgrades to equipment and its physical delivery by contractors. £138,000 was for TfL internal resource to administer and manage the project, coordinate non-physical activities and technical configuration.

7. Recommendations

The trial has informed our understanding of how GPA works on street. It has shown that GPA offers a clear benefit to pedestrians, with pedestrian green time increasing on average

by 56 minutes per site. At the trial sites, this has been achieved without impacting bus and general traffic performance.

As a result, the trial sites will be retained on GPA and the operation reviewed periodically through our Signal Timing Review Programme

It is clear from the data that vehicle demand is the clear driver for increased pedestrian green time. As flows increase particularly above 7000 vehicles during a 7am to 7pm period, benefits to pedestrians decrease. There is also a trend that lower vehicle demand results in larger improvements in pedestrian compliance. Therefore, future deployment should focus on locations of less than 7000 vehicles in a 12-hour period, particularly crossings on one-way streets or part of Low Traffic Neighbourhoods to maximise benefits.

TfL Engineering recommends that the GPA technique is approved for BAU within TfL, with the following caveats:

- GPA technique can only be implemented at locations with 150 pedal cycles per hour or less over all time periods. A further study looking at road safety data and consequences of additional cycle detection would be required to amend this threshold.
- The “revert at max” facility, which can be set to force the standalone crossing to revert to non-road green if road green has reached a pre-defined maximum value, will be discontinued from use.
- All new GPA sites will require speed surveys to ensure the location of the distant detection is optimal for the speed vehicles approach the pedestrian crossings
- GPA cannot be implemented on any site with an 85th percentile speed of above 35mph

8. Next steps

A business case appraising the costs and benefits of the trial and the implementation of the GPA technique is being drafted. Additional sites are being identified as being suitable as the next tranche of sites for GPA, however, a request for funding would only be made once the business case work is complete, once the business case for the GPA technique can be proven and once TfL’s long-term financial situation is clarified.

Additional work to improve GPA technology which will be considered by TfL and includes:

- Adapting the GPA technology to activate audible units only when pedestrian green is demanded, rather than every time the signal reverts to pedestrian green after the passage of a vehicle
- Adapt the function of the distant detection to enable a vehicle demand to extend the road green should a pedestrian not be present at the crossing.
- Investigating additional detection for cyclists

- Expanding the range of traffic signal controllers to which GPA can be applied, reducing the need for signal modernisation before the technology can be applied, thus reducing installation costs

9. Glossary

Green Person Authority – Traffic signal control methodology that will allow a pedestrian crossing to remain on a green person unless there is a vehicle demand

Urban Traffic Control – Traffic signal computer system which controls the timings for around 4200 sets of traffic signals in the Greater London Area

12 hour daytime period – Monday to Friday 7am to 7pm

Traffic signal cycle – The time taken for a set of traffic signals moves through all traffic, cycle and pedestrian green signals and return to its original green signal(s).

Pedestrian green time – the time a pedestrian received a green signal informing them that they have priority to cross the road

Revert to max – A facility in Green Person Authority which enable the signals to automatically return to the green signal for pedestrians after a pre-defined period of traffic green time has expired regardless of the on-street presence of vehicles or pedestrians

INRIX – A supplier of traffic performance data including journey times, flow and congestion collected from GPS enabled vehicles

GPS – Global Positioning System

Distant detector – Used to detect vehicles or cyclists at a significant distance away from the traffic signals

Stop line detector – Used to detect vehicles or cyclists immediately adjacent to the traffic signals


EVERY JOURNEY MATTERS