

Transport for London Health, Safety and Environment report

Quarter two (24 June 2018 – 15 September 2018)

MAYOR OF LONDON



**TRANSPORT
FOR LONDON**
EVERY JOURNEY MATTERS

About Transport for London (TfL)

Part of the Greater London Authority family led by Mayor of London Sadiq Khan, we are the integrated transport authority responsible for delivering the Mayor's aims for transport.

We have a key role in shaping what life is like in London, helping to realise the Mayor's vision for a 'City for All Londoners'. We are committed to creating a fairer, greener, healthier and more prosperous city. The Mayor's Transport Strategy sets a target for 80 per cent of all journeys to be made on foot, by cycle or using public transport by 2041. To make this a reality, we prioritise health and the quality of people's experience in everything we do.

We manage the city's red route strategic roads and, through collaboration with the London boroughs, can help shape the character of all London's streets. These are the places where Londoners travel, work, shop and socialise. Making them places for people to walk, cycle and spend time will reduce car dependency and improve air quality, revitalise town centres, boost businesses and connect communities.

We run most of London's public transport services, including the London Underground (LU), London Buses, the DLR, London Overground (LO), TfL Rail, London Trams, London River Services (LRS), London Dial-a-Ride, Victoria Coach Station (VCS), Santander Cycles and the Emirates Air Line (EAL). The quality and accessibility of these services is fundamental to Londoners' quality of life. By improving and expanding public transport, we can make people's lives easier and increase the appeal of sustainable travel over private car use.

We are moving ahead with many of London's most significant infrastructure projects, using

transport to unlock growth. We are working with partners on major projects like Crossrail 2 and the Bakerloo line extension that will deliver the new homes and jobs London and the UK need. We are in the final phases of completing the Elizabeth line which, when it opens, will add 10 per cent to London's rail capacity.

Supporting the delivery of high-density, mixed-use developments that are planned around active and sustainable travel will ensure that London's growth is good growth. We also use our own land to provide thousands of new affordable homes and our own supply chain creates tens of thousands of jobs and apprenticeships across the country.

We are committed to being an employer that is fully representative of the community we serve, where everyone can realise their potential. Our aim is to be a fully inclusive employer, valuing and celebrating the diversity of our workforce to improve services for all Londoners.

We are constantly working to improve the city for everyone. This means freezing TfL fares so everyone can afford to use public transport, using data and technology to make services intuitive and easy to use, and doing all we can to make streets and transport services accessible to all. We reinvest every penny of our income to continually improve transport networks for the people who use them every day.

None of this would be possible without the support of boroughs, communities and other partners who we work with to improve our services. We all need to pull together to deliver the Mayor's Transport Strategy; by doing so we can create a better city as London grows.

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Introduction

Our vision at Transport for London is that everyone will go home safe and healthy every day. Performance in the second quarter of this year shows:

- we are meeting our target for customer and workforce injuries
- 11 per cent fewer workforce injuries and 1.6 per cent fewer customer injuries across our public transport networks compared with the same quarter last year
- 17 per cent fewer injuries to our construction workforce compared with the same quarter last year
- six per cent fewer customer injuries on our bus network, as a consequence of a reduction in the number of injuries arising from slips, trips and falls, and collisions.

However, this quarter:

- our buses have been involved in collisions that have resulted in the deaths of three other road users and a customer has also been fatally injured on board a bus
- six per cent more people were killed or seriously injured (KSI) on London's roads than in the same quarter last year, with the greatest increase amongst cyclists.

During the quarter, the Mayor, TfL and the Metropolitan Police launched the Vision Zero Action Plan for London, making public our ambitious targets to eliminate death and serious injury from our road and transport networks by 2041. The Action Plan takes an internationally recognised approach to road danger reduction and is underpinned by a fundamental conviction that loss of life and serious injuries are not acceptable. Our focus is on the design and management of our transport networks to

deliver safe vehicles, travelling on safe streets and rail infrastructure at safe speeds. The final component is creating safe behaviour by those who work and travel on our networks through education, monitoring and, where necessary, enforcement activity.

Other notable health, safety and environment initiatives during the quarter include:

- the launch of our "Stairs Excellence" programme, which builds on the success of our Escalator Excellence scheme on London Underground (LU)
- the opening of the extension of Cycle Superhighway 6 and our second full Quietway; adding to London's cycling network and also introducing safety benefits for pedestrians
- the greening of our fleet through the award of the contract for the new Dial-a-Ride (DAR) fleet, introducing vehicles that meet the requirements of the Ultra Low Emission Zone
- the ongoing roll out of buses that meet the challenging EuroVI standard
- the launch of a new five-year Health, Safety and Environmental Strategy for our major projects.

We continue to influence the safety performance of others through the standards we set and the support we provide. On our bus network we received a number of positive results from the bus operator trials we funded under the Bus Safety Innovation fund. We have continued our work on both the revised standard for the Freight Operator Recognition Scheme (FORS) and the new Bus Safety Standard, in preparation for their launch in quarter 3. We are also playing a significant role in driving safety improvements on the Thames, leading on safety within the London Passenger Pier Strategy.

Gareth Powell
Managing Director
Surface Transport

Nigel Holness
Managing Director
London Underground

Stuart Harvey
Director
Major Projects

Jill Collis
Director
Health, Safety and Environment



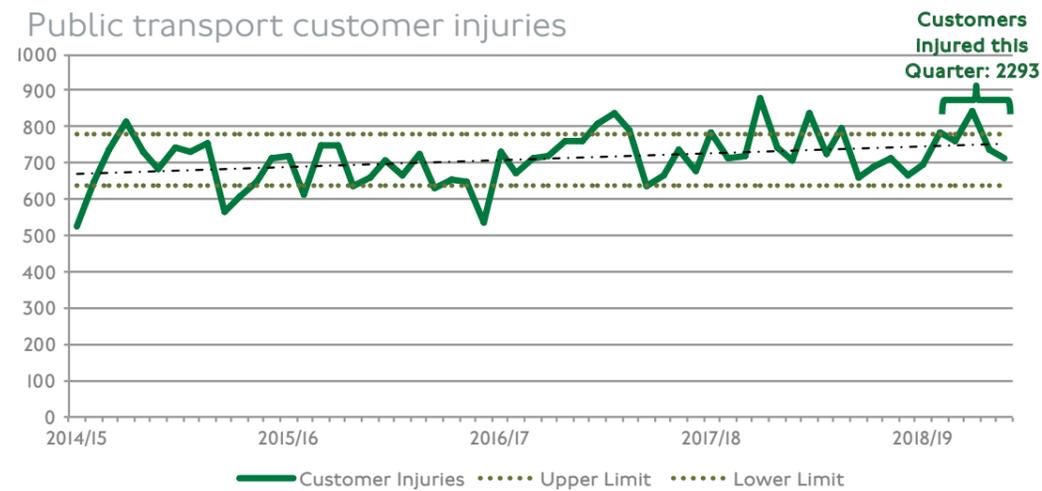
Performance at a glance

2018/19 TfL Scorecard

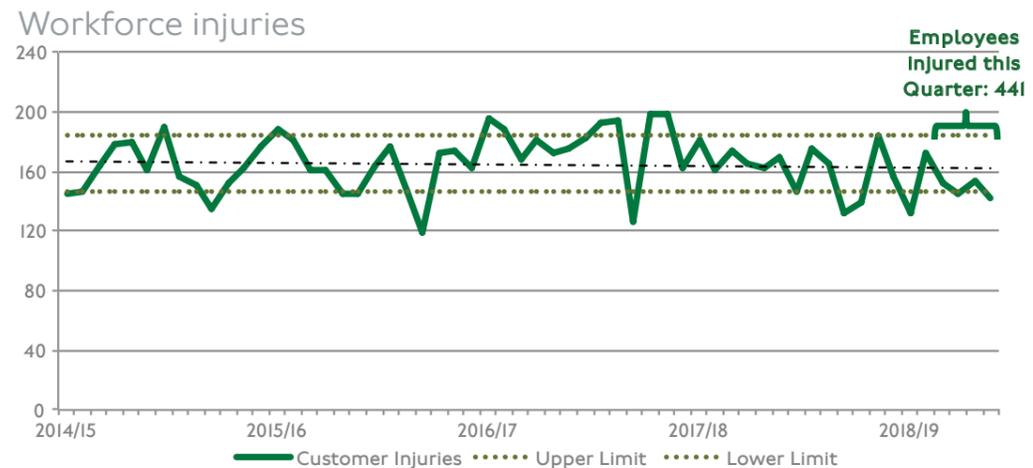
Long Term Objectives	2018/19 Scorecard	Year to date	
Outcome	Measure	Actual	Target
Healthy Streets and healthy people (18%)			
London's transport system will be safe and secure.	Reduction in people killed or seriously injured on the roads from 2005-09 baseline (%)	37.9 ■	44.4
	Reduction in people killed or seriously injured on the roads from 2005-09 baseline (incidents involving buses)(%)	67.6 ■	58.4
	Injuries on the public transport network	5418 ■	5462
London's streets will be clean and green.	Number of London's buses that are Euro VI compliant	5560 ■	n/a

Customer and workforce injuries

Public transport customer injuries



Workforce injuries

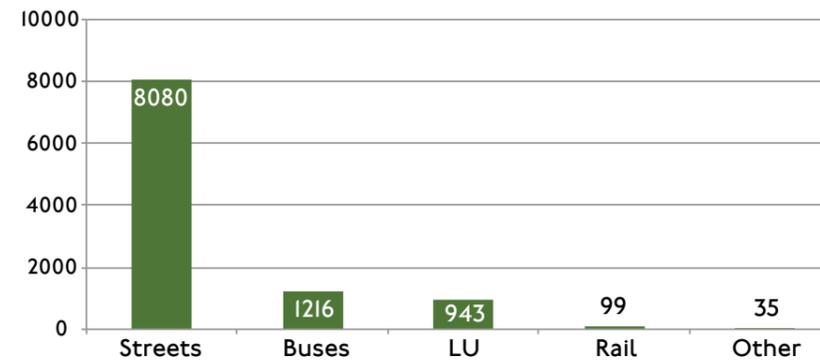


Injuries on London's road and public transport networks

There were 8,080 injuries on London's roads during this quarter. This included 27 fatalities, compared with 22 in quarter 2 last year.

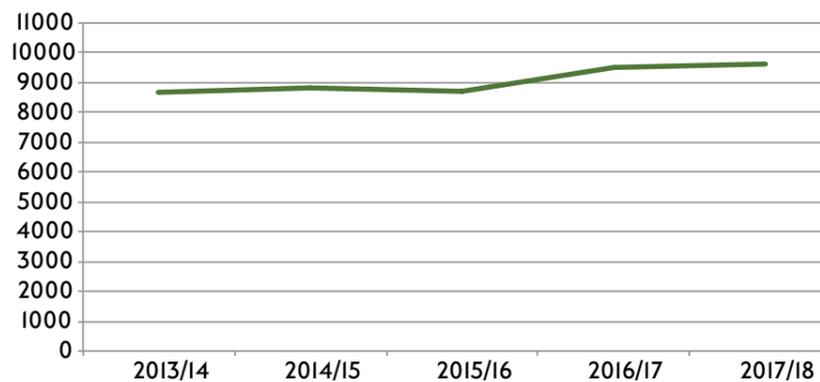
Across our public transport networks, a total of 2,293 customers were injured, down 1.6 per cent against the same quarter of last year.

Number of customer injuries on the road and public transport networks (Quarter 2)



Customer injuries

Annual totals



3.1

Number of injuries per million passenger journeys on the tube network (4% ▲ against Q2 2017/18)



2.5

Number of injuries per million passenger journeys on the bus network this quarter* (3% ▼ against Q2 2017/18)



1.1

Number of injuries per million passenger journeys within our rail division this quarter (12% ▲ against Q2 2017/18)



4.9

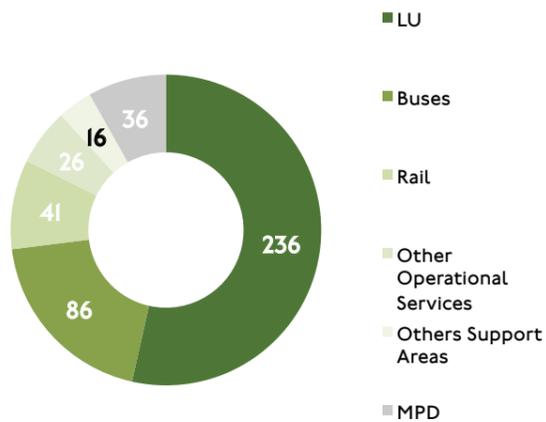
Number of injuries per million passenger journeys within our other operations this quarter (8% ▼ against Q2 2017/18)



* Injuries to members of the public who are not bus customers are included in the Killed or Seriously Injured (KSI) figures within the streets section.

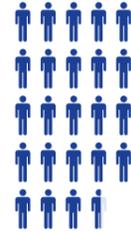
Number of workforce injuries on the network (quarterly)

There were a total of 441 injuries to our workforce, an 11 per cent decrease on the same quarter last year.



236

Number of workforce injuries on the LU network this quarter (2.2% ▲ compared to Q2 2017/18)



86

Number of workforce injuries on the Bus network this quarter (23.9% ▼ compared to Q2 2017/18)



54

Number of total construction workforce injuries quarter (10% ▼ compared to Q2 2017/18)



Significant incidents

Significant incidents are those incidents that result in a fatality, 3 or more people requiring hospital treatment, or those resulting in a loss of more than £1 million. There were 28 significant incidents across London's road and public transport networks; all of which were fatalities:

- a bus passenger died from injuries sustained in a fall on route W8 bus.
- three road fatalities during the quarter involved buses:
 - A cyclist was fatally injured in a collision with a route 370 bus on Upminster Road, Romford.
 - A pedestrian was fatally injured in a collision with a route 39 bus on Falcon Road, Battersea.
 - A pedestrian was fatally injured in a collision with a route 55 bus on Lea Bridge Road, Leyton.
- a further 24 people were killed on London's roads:
 - twelve pedestrians
 - six motorcyclists
 - two car drivers
 - three cyclists
 - one carriage driver.

Police investigations are underway for these incidents.

The Sarah Hope Line offers comprehensive help and support to anyone involved in, or affected by, a serious incident on our network. The Sarah Hope Line received 162 calls in quarter 2, resulting in 50 new cases of people needing our help. The team continue to provide support to the people affected by the Sandilands tram overturning.

The team continued to promote its services and work with stakeholders such as the London Air Ambulance, British Transport Police, King's College major trauma unit and the MPS.

28

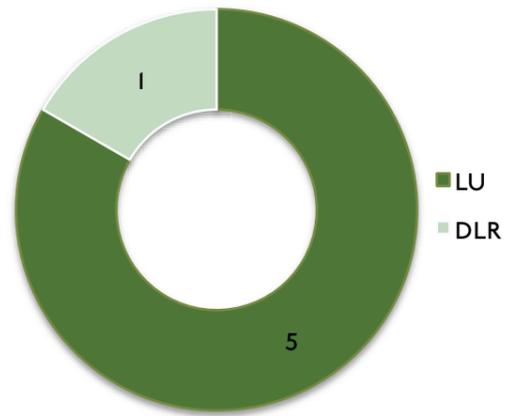
Number of accidental fatalities

(27% ▲ against Q2 2017/18)



Statutory reporting of customer and workforce injuries

Customer RIDDORs

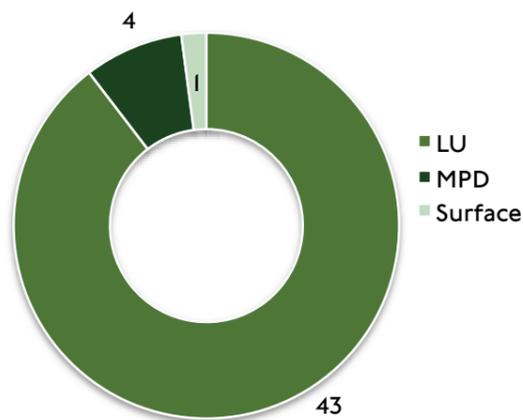


A total of 54 customer and workforce injuries were reported to our regulators; the Health and Safety Executive (HSE) or the Office of Rail and Road (ORR). Forty-eight occurred on our LU network.

Customer injuries

Injuries to six customers required reporting to our regulators this quarter. The injuries arose from four fall events from the platform onto the track and entrapment in a closing train door on our LU network. On our DLR network, a customer fell in a concourse area on a wet surface.

Workforce RIDDORs

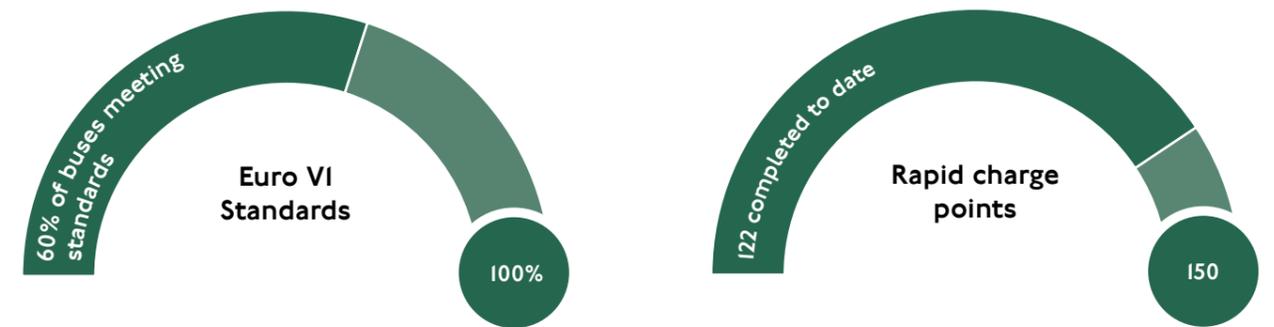
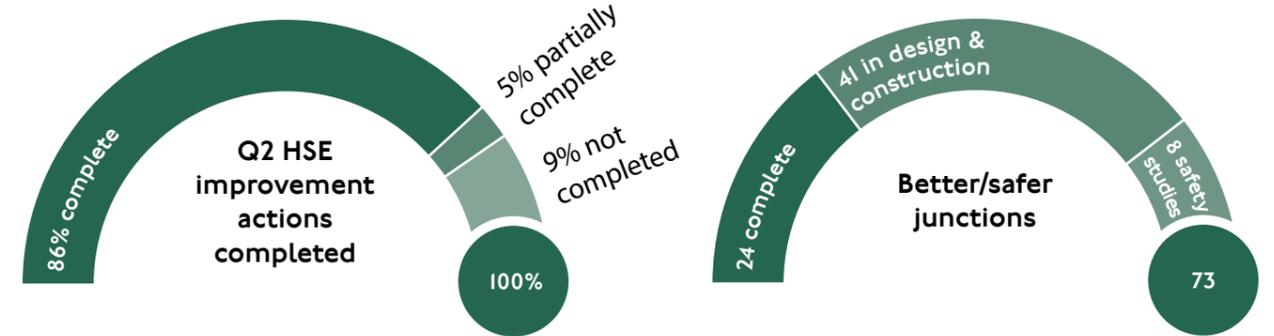


Workforce injuries

All reportable incidents affecting the workforce this quarter were minor and triggered by the seven day absence criteria within regulations, rather than the severity of the injury.

Workplace violence and slips, trips and falls accounted for 29 per cent and 25 per cent of the reportable workforce incidents respectively. This is followed by manual handling related incidents and instances of injuries connected with contact with machinery/equipment/power tools, both accounting for 21 per cent each.

Health, Safety and Environment Improvements



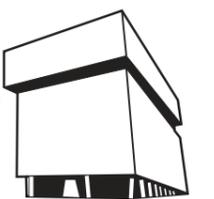
18 stations in "Stair excellence" scheme



400 Number of Zero Emission Capable taxis licensed in London



13% improvement in building energy efficiency at TfL head office





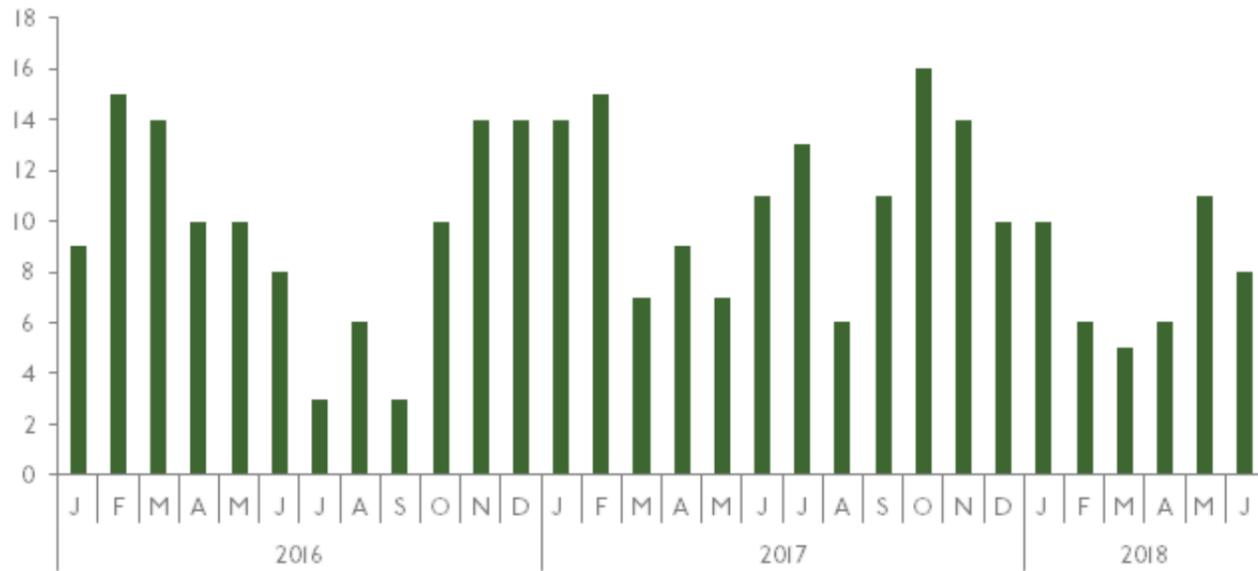
London's
transport
system will
be safe and
secure

Overview

Q2 Performance	Q2 Improvement activities
<ul style="list-style-type: none"> ✗ A total of 25 deaths were recorded on London's roads, compared with 27 in the same quarter last year ✗ Males accounted for three-quarters of all fatalities ✗ KSI increased by six per cent compared to the same quarter last year ✗ Greatest increase in KSI's was among cyclists (8.5 per cent increase in levels of cycling, with a 21 per cent increase in fatalities) ✓ Pedestrians killed or seriously injured fell by three per cent compared with the same quarter last year 	<ul style="list-style-type: none"> ✓ Vision Zero Action Plan launched ✓ Phase 2 of Cycle Superhighway 6 opened ✓ Quietway 2 opened ✓ New intelligence-led enforcement deployment system launched

Fatalities on London's roads

(2017 and 2018 figures are provisional)

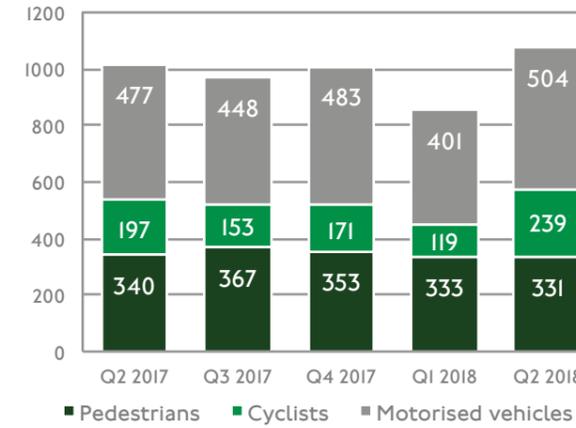


Road safety data is reported by calendar month. For the most recent quarter available, April–June 2018, a total of 25 deaths were recorded on London's roads, compared with 27 for the same period in 2017. Nineteen of the 25 people killed were male. All incidents involved adults over the age of 18; five were 60 years of age or over. The individuals killed in these incidents included pedestrians (8), pedal cyclists (4), motorcyclists (11), a car driver and a car occupant.

To ensure we understand the causes of fatalities and identify any actions we need to take, we liaise with collision investigators from the police to review the circumstances of each fatal collision. We work closely with Police Traffic Management Officers to ensure site visits are carried out to identify any issues and potential improvements to our network.

People killed or seriously injured*

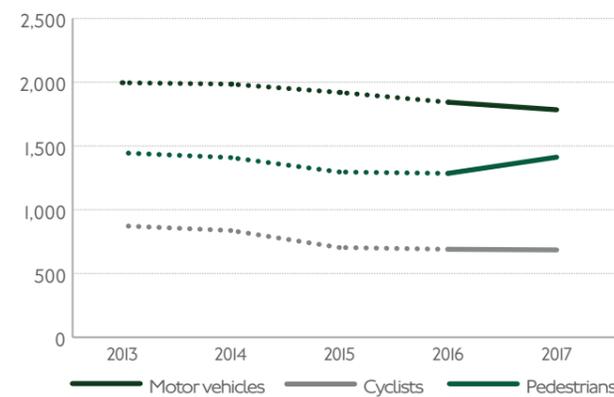
Past five quarters (type of user)



* Road safety data is based on calendar quarters rather than financial quarters. This data is subject to change as this information is reviewed and managed by the MPS.

The provisional KSI figures indicate that the number of people KSI increased by six per cent in quarter 2 of 2018 compared to the same quarter last year. The greatest increase (21 per cent) was amongst cyclists in quarter 2 of 2018 compared to the same quarter last year. This was in part due to the dry, warm weather increasing cycling levels by 8.5 per cent in central London in quarter 2. During quarter 2 there was a three per cent reduction in pedestrians killed or seriously injured compared with quarter 2 2017.

Annual totals**



** Figures from the end of 2016 have been reported using a new system (COPA). The dotted lines in the graph for calendar years 2013–2016 denote back-estimated figures following analysis undertaken with the Transport Research Laboratory to indicate how KSIs would have been reported under this system in previous years. The results of this exercise are shown as a dotted line in the chart.

Since 2013 there had been a sustained reduction in the number of cyclists and users of motorised vehicles killed or seriously injured, but in 2017 there was an increase of 9.8 per cent in the number of pedestrians killed or seriously injured.



Vision Zero action plan

Taking forward the Mayor's Transport Strategy

MAYOR OF LONDON



Vision Zero launches in London

Vision Zero action plan

The Vision Zero Action Plan was published on 24 July 2018 and outlines a range of actions to be delivered in collaboration between TfL, the Metropolitan Police Service (MPS), the London boroughs and other partners. It puts the elimination of road danger at the heart of the transport system and helps realise the ambition in the Mayor's Transport Strategy that no-one will be killed or seriously injured on London's transport system by 2041. The Plan is based on a Safe Systems approach and sets out actions with respect to vehicle speed; street design; vehicle design and compliance; behaviours and post-collision learning. The Plan focuses primarily on the period to 2022/23, in line with TfL's Business Plan.

Our focus remains on engaging with key national and regional stakeholders to help us raise public and political awareness of the Plan and our new approach to Road Danger Reduction.

We are now developing engagement programmes which will play an integral role in the delivery of the actions in the action plan. This includes boroughs, bus operators, community groups, taxi, private hire and motorcycling sectors, as well as an engagement plan for reduced speed limits on the Transport for London Road Network (TLRN) and how all levels of Government are engaged on Vision Zero.

"Travelling enriches our life and enhances our health and wellbeing by being more active. This programme will complement the existing Safer Junctions and Liveable Neighbourhoods programmes to create safer, healthier and more accessible

neighbourhoods for people, reducing danger from the road network for all users. Our Vision Zero Action Plan, aims to eliminate death and serious injury from London's roads and public transport systems by 2041."

Gareth Powell MD Surface Transport.



- Results in a fatality
- Person survives the collision

Our Vision Zero delivery plan focuses on:

Safe speeds

Reducing speed is fundamental to reducing road danger, as the speed at which a vehicle travels increases the likelihood and severity of collisions. The first phase of our programme to lower speed limits aims to reduce the speed limits to 20mph on all TLRN roads within the Congestion Charging Zone by May 2020.

Safe streets

Our analysis shows that junctions are the riskiest and dangerous locations, where cyclists and motorcyclists are particularly vulnerable. This is a key focus for our action, alongside delivering continued improvements for cyclists.

76%

of collisions in London occur at junctions



73%

of collisions resulting in death or serious injury for those on foot, bike or motorbike in London take place at junctions



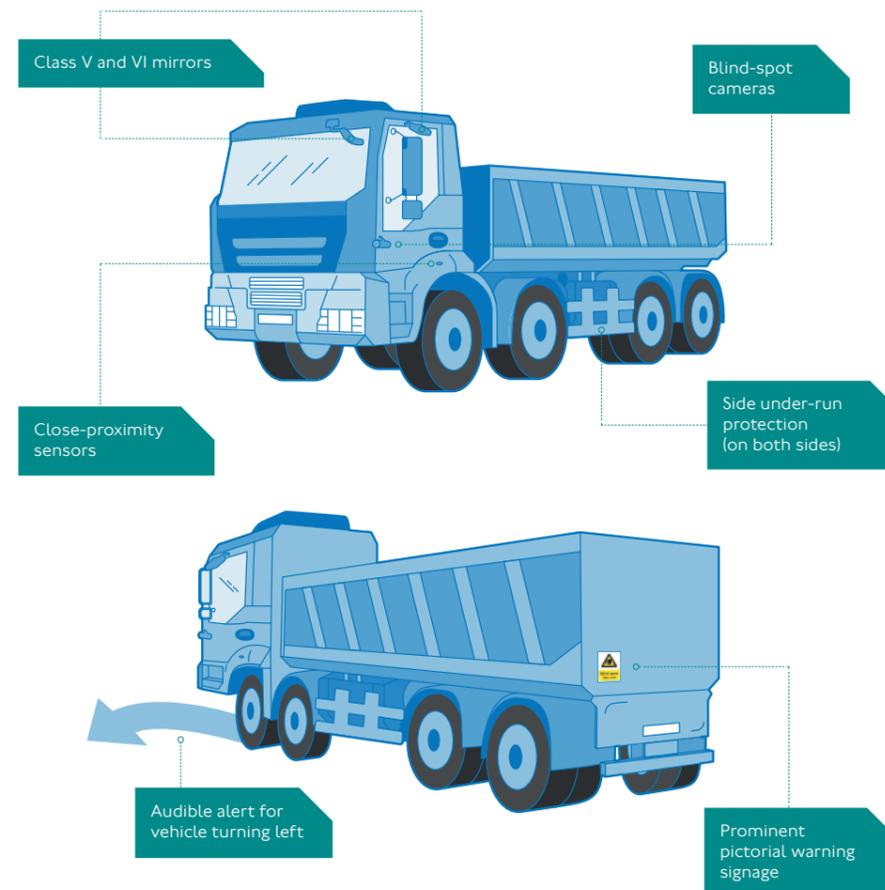
A vehicle turning right across their path is the most common manoeuvre resulting in death and serious injury for people on bicycles and motorcycles



Safe vehicles

Relative to their share of traffic, larger vehicles, such as HGVs and buses, present the greatest risk to people walking, cycling and riding motorcycles. We are taking action to reduce the danger posed by larger vehicles through improving vehicle and

operating standards. The first phase of the Bus Safety Standard is nearing completion following the conclusion of tests on collision counter-measures. The research findings from these trials will feed into a cost-benefit analysis to ensure we prioritise the measures most effective at eliminating or mitigating casualties.



The road danger reduction targets to drive action towards Vision Zero are:

By 2022

65%▼

fewer people killed or seriously injured against 2005-09 levels

70%▼

fewer people killed or seriously injured in, or by, London buses against 2005-09 levels

By 2030

70%▼

fewer people killed or seriously injured against 2010-14 levels

0

people killed in, or by, London buses

Safe behaviours

The statistics on the right indicate the significance that user behaviour plays in reducing road danger. We will use marketing and communications to tackle the behaviours that create most risk on our streets, such as inappropriate speed, which is a factor in up to 37 per cent of collisions resulting in death or serious injury. Supporting the Vision Zero safe behaviours pillar, the new, hard-hitting 'Risk Up' campaign reminds drivers and motorcyclists of the dangers they pose when travelling at an inappropriate speed, and urges them to slow down.

We will monitor the impact of these to understand how they are making a difference to reducing road danger and making our streets feel safe. This will be vital to refine and enhance our future plans to continue to deliver our Vision Zero ambition.

Plans for next quarter

During quarter 3 we will:

- Hold a summit event in November to inspire senior leaders across London to take ownership and accountability for Vision Zero within their organisations.
- Support all boroughs in developing the Vision Zero elements of their Local Implementation Plan submissions.
- Roll out the "Go, Look, See" process for fatal or serious traffic collisions.

Up to

37%

of collisions in 2014-16 resulting in death or serious injury in London have speed as a contributory factor

58%

of collisions in London result from failure to look properly

335%

rise in arrests by MPS between 2014 and 2016 following new 2015 drug-driving laws made it easier to detect people driving under the influence of drugs

12%

of Londoners say they always, regularly or sometimes use a mobile phone while driving, riding or cycling

Improving cycling

We continued to make good progress with delivering new Cycle Superhighways during quarter 2 with the completion of a major new extension to Cycle Superhighway 6. The 2.5km extension between Farringdon and King's Cross means the route now connects Elephant and Castle to King's Cross. Overall eight junctions have been made safer, including improvements at the West Smithfield/Snow Hill/Farringdon Street junction, formerly one of the most dangerous in the capital.

Following public consultation we completed concept design for Cycle Superhighway 4 (Tower Bridge to Greenwich). Detailed design will start in quarter 3.

We opened our second full Quietway route at the end of August. Quietway 2, connects Bloomsbury and Walthamstow via Angel, Haggerston, London Fields and Clapton. The route also connects with Cycle Superhighway 1 and 6. Improvements for cyclists and pedestrians along the route include safer crossings and a reduction in large vehicles through Dalston.

Improving town centres

Works at Bruce Grove town centre (in conjunction with the redevelopment of the Tottenham Hotspur football stadium) are progressing well. The scheme delivers improvements to the local environment for pedestrians, cyclists and bus passengers, with expected completion in late September.



In August, we funded Borough works to improve Mitcham town centre by delivering stepped cycle tracks and improved pedestrian crossings. Feasibility design is now underway for improvements to Peckham town centre that will deliver measures to improve safety for pedestrians.

We are also funding ongoing works to remove traffic dominated gyratories, and to improve walking and cycling at Stratford in Newham, Baker Street/Gloucester Place in Westminster and Tottenham Court Road/Gower Street in Camden.

Fleet Operator Recognition Scheme

The safety of the Heavy Goods Vehicles and other freight using London's roads continues to be a key area of focus under Vision Zero.

The Fleet Operator Recognition Scheme (FORS) Concessionaire contract with AECOM ends in January 2020. On 7 September we held the first of a series of industry events to gain opinions on the FORS Procurement Strategy.

The FORS Standard is reviewed and updated on a two-yearly cycle in order to keep fully abreast of transport legislation and emerging best practice, and to reflect the development and evolution of the scheme itself. The revised standard (version 5) will be released at the FORS Members' Conference on 16 October.

Intelligence-led enforcement

We have launched a new intelligence-led enforcement deployment system, allowing us to deploy our traffic enforcement resources more effectively. This has helped to prioritise sites by compliance levels, and highlight areas of non-compliance.

On 20 July, the Taxi & Private Hire Compliance team worked in partnership with MPS officers on a static roadside stop site in Waterloo Place, Westminster. There were a total of 54 compliant and 23 non-compliant checks.

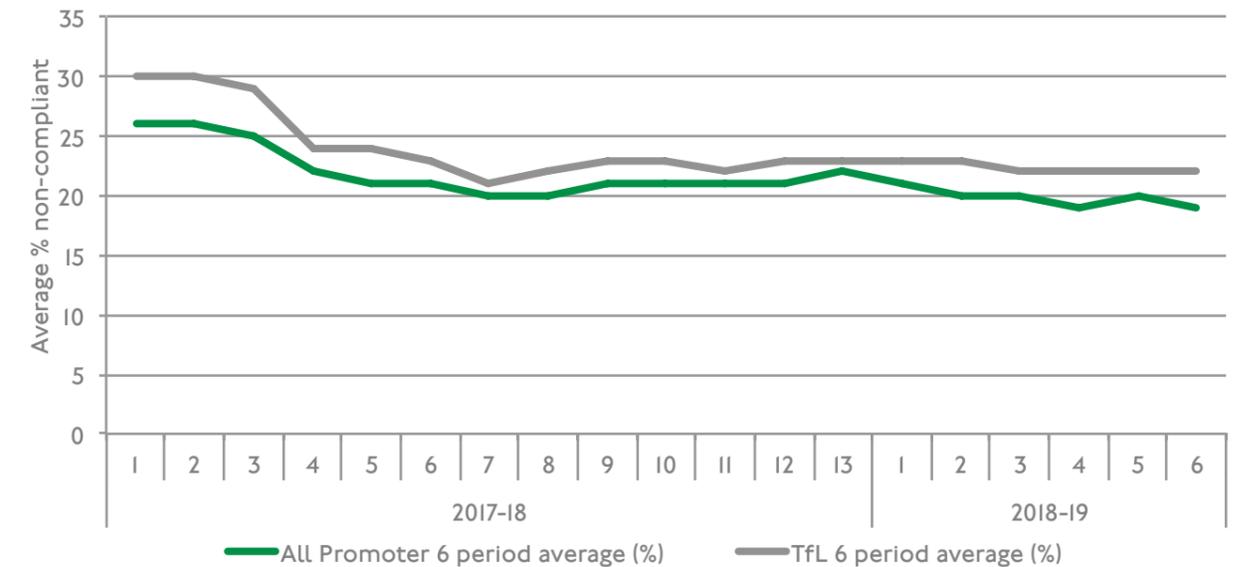
Safer Junctions

The Safer Junctions list published in April 2017 identified 73 junctions on the Transport for London Road Network with the highest vulnerable road user collision rates between 2013 and 2015. We have now completed work at 24 of these junctions and all have had measures put in place to reduce road danger. We are currently taking a further 41 through design and construction and carrying out safety studies at the remaining eight junctions. This includes improvement works at Highbury Corner and Charlie Brown's roundabout, which continued in quarter 2.

Our Safer Junctions programme includes plans to make Old Street roundabout safer by removing the gyratory, closing one arm of the roundabout and creating a new public space and building segregated cycle lanes. Work was scheduled to start early next year but, following the tragic collision on the roundabout between a cyclist and a lorry on 25 July, we have brought this work forward. Enabling works will now start in November and the main works will begin in March 2019.



Safety at roadworks (Inspection failure rate)



The inspection failure rate monitors the number of signing, lighting and guarding inadequacies at roadworks sites, observed during safety inspections (undertaken in line with the New Roads and Street Works Act Code of Practice for Inspections). The measure includes both TfL and pan-promoter data.

Payments received from works promoters under the Lane Rental Scheme are funding initiatives that will benefit vulnerable road users, including the trial of a new accessible and shallow gradient kerb ramp for

wheelchair and buggy users and a new wide-cycle-bridge to span open excavations in cycle lanes to maintain facilities in peak hours.

As part of an innovation challenge we are approaching innovation and start-up companies to develop products that enable us to provide better and more obvious segregation for vulnerable road users navigating around roadworks. Work continued during the quarter on a new Temporary Traffic Management Handbook, promoting good practice, which is due for publication in early 2019.

Plans for next quarter

During quarter 3 we will:

- Commence enabling works at Old Street Gyratory as part of the Safer Junctions programme
- Open Quietway 6, (Wanstead Flats to Barkingside), Q22 (Newham Greenway) and Quietway 14 (Blackfriars to Tower Bridge Road)
- Commence detailed design on Cycle Superhighway 4
- Complete works at Bruce Grove
- Commence public consultation on proposals for Tooting town centre, including improvements to pedestrian and cycling facilities, and a reduction in vehicle speed limits
- Release version 5.0 of the FORS Standard at the FORS Members' Conference on 16 October 2018.



Customer Safety: Buses

Overview

Q2 Performance	Q2 Improvement activities
<ul style="list-style-type: none"> ✓ 2.47 injuries per million passenger journeys: Three per cent better than the same quarter last year ✗ 4 fatalities (2 pedestrians, a cyclist and a bus passenger) ✗ Pedestrians continue to make up the largest proportion of VRUs killed or seriously injured by a bus, (86 per cent during quarter 2) ✓ Reductions in injuries arising from collisions and slips, trips and falls have driven improvement (37 per cent and four per cent reduction respectively) ✓ Focus on the quality of driving 	<ul style="list-style-type: none"> ✓ Speed limiting technology added to a third route ✓ Bus driver fatigue survey launched. ✓ Bus Safety Innovation Fund: results of trials presented to TfL ✓ Bus safety campaign at Elephant and Castle ✓ Bus driver safety training procured

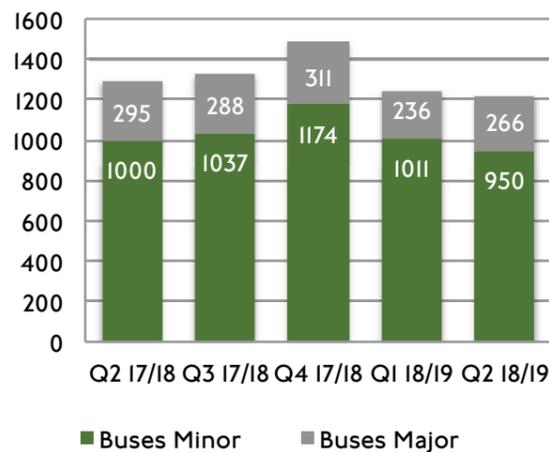
Overview: customer injuries in Q2

Accidental Fatalities	Major Injuries*	All Injuries	Near Misses**
4	266	1216	5449

* Injuries requiring hospital attendance
 ** All incidents where no injury or damage arose

There were 1,216 injuries in quarter 2, equating to 2.47 injuries per million bus passenger journeys. Twenty-two per cent of injuries required hospital treatment, 14 per cent were treated at the scene and the remaining 64 per cent required no treatment. In the quarter, four fatalities were connected with TfL's bus operations. They involved two pedestrians and a cyclist killed in collisions with our buses and a passenger who later died from injuries sustained following a fall on a bus.

Customer injuries five rolling quarters



Bus customer injuries in quarter 2 have reduced by six per cent compared with the same quarter last year. The majority of the improvement is attributed to fewer injuries as a result of slips, trips and falls (down four per cent from 702 to 674) and collisions (down 37 per cent, from 104 to 65).

This reduction in injuries follows significant efforts from the bus operators to deliver safety improvement initiatives around driver quality and passenger comfort. Many operators have scaled-up their use of the data available from on-board systems, to identify any poor driving practices, as well as driver refresher courses which include a focus on giving customers more time to get to their seat.

Quarter 2 saw a large-scale safety campaign at Elephant & Castle, a bus injury hot spot. The event, led by Go-Ahead, took place in September and was supported by all the major bus operators. On the day, there was only one minor incident and several lessons were learnt from the process; covering road layout, driver training changes, route risk assessment updates and recommendations

about line markings around the cycle superhighway. These collaborative efforts have seen a short term reduction in incidents at these hot spot locations, but also help to demonstrate to the driver community at large that both TfL and their local management teams care about their welfare and safety. All bus operators have agreed to support future quarterly safety campaign initiatives.

Top 4 causes of all bus customer injuries

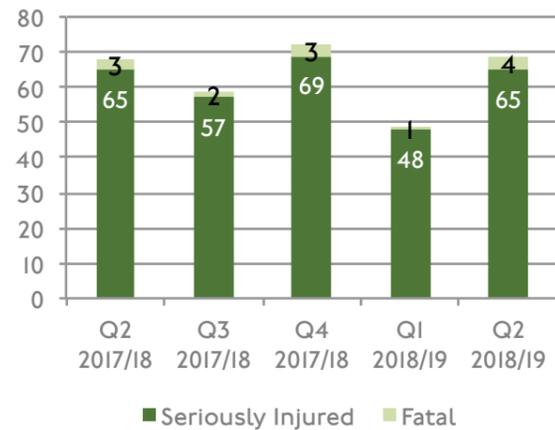
Slip Trip Fall	Struck by/ against object	Trapped fingers/ limbs	Collision
56%	23%	8%	5%

Slips, trips and falls remain the dominant cause of bus customer injuries in the quarter, accounting for 56 per cent of all injuries and 54 per cent of major injuries. There were 654 customer injuries as a result of slips trips or falls in quarter 2. This equates to 1.33 slip, trip and fall injuries per million journeys (an improvement on 1.54 compared with the same quarter last year). The majority of slips, trips and falls occur within bus aisles, with sudden bus movement being the key contributory factor to this type of fall.

Passengers striking against objects within buses (23 per cent) and entrapment of fingers and limbs (eight per cent) were other significant causes of injuries. Collisions accounted for five per cent of customer injuries during the quarter; with 176 injuries sustained from the 5,458 collisions involving buses. This equates to 2.5 collision-related injuries for every million miles operated this quarter.

Killed or seriously injured in or by London buses (STATS 19)

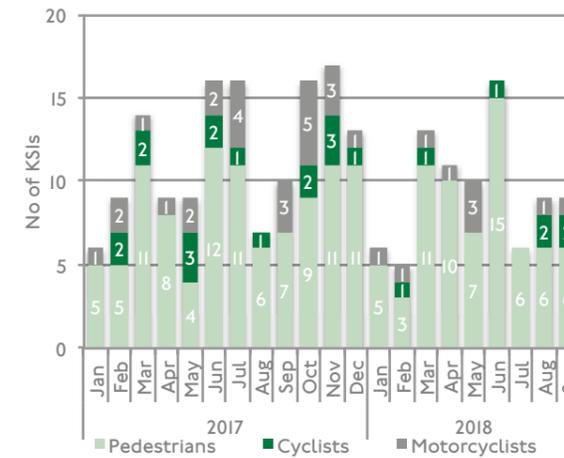
Past five quarters



The number of KSIs reported by, or to, the police in quarter 2 2018/19 rose by one per cent compared to the same quarter last year. In quarter 2, 29 (42 per cent) of the KSIs involved bus passengers and 37 (54 per cent) of those killed or seriously injured by a bus were Vulnerable Road Users (VRUs). Pedestrians continue to make up the largest proportion of VRUs killed or seriously injured by a bus, accounting for 86 per cent of all VRUs killed or seriously injured by a bus during quarter 2.



Vulnerable road user KSIs from collisions involving buses



Work continued during the quarter to evaluate a range of measures for inclusion in the Bus Safety Standard, ahead of its launch at the Bus Safety Summit in October. This will inform the bus vehicle specification and will be incorporated into bus operator contracts for new buses from the end of 2018. Some safety measures will be required on new buses from 2019.

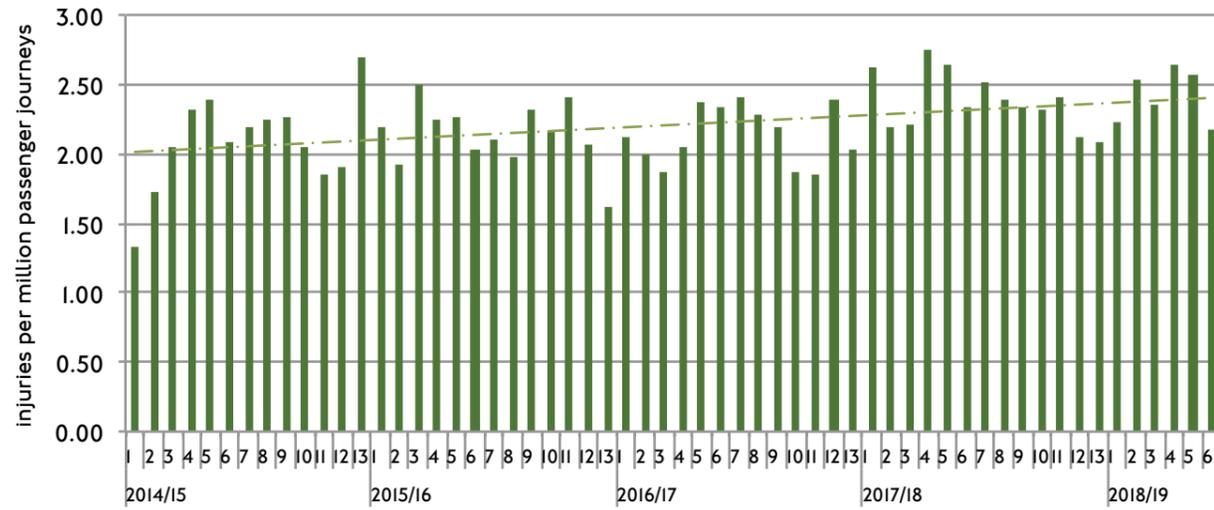
In 2019 all new buses entering the fleet will be mandated to have speed limiting technology (ISA). This will prevent buses from exceeding speed limits and in turn influence the speed of other vehicles. Following previous trials and its extension to route 114 during this quarter, ISA technology will be operating on around 700 vehicles by the end of 2018.

As part of our research into bus driver fatigue led by Loughborough University, focus groups and interviews have been carried out with drivers and a driver survey has been released. The research will continue into quarter 3 and beyond, as Loughborough University liaise with the operators for on-board monitoring and discussing future risk management techniques.

Operators who received funding through our Innovation Fund have presented their findings to us. Not all the trials are complete, but many are already showing positive results. Notably, the work involving cycling and walking training has been successfully completed with the operator looking to implement a wider application of the training course in 2019. The fatigue technology being trialled has seen a small reduction in road traffic collisions, but importantly has led to more welfare-based discussions between the management and drivers. In two cases this has led to a medical intervention, where the driver has been referred onto his GP and/or a sleep clinic for further health checks. The driver safety app at one operator has been downloaded by a large number of drivers and includes safety tips, first-use check information and improved driving techniques to assist their day-to-day activities. One operator has been testing an alarm in the cab which indicates to the driver regarding close following of other road users, over-speed, lane departure and pedestrian encroachment. Early results indicate a marked reduction in road collisions (40 per cent fewer).

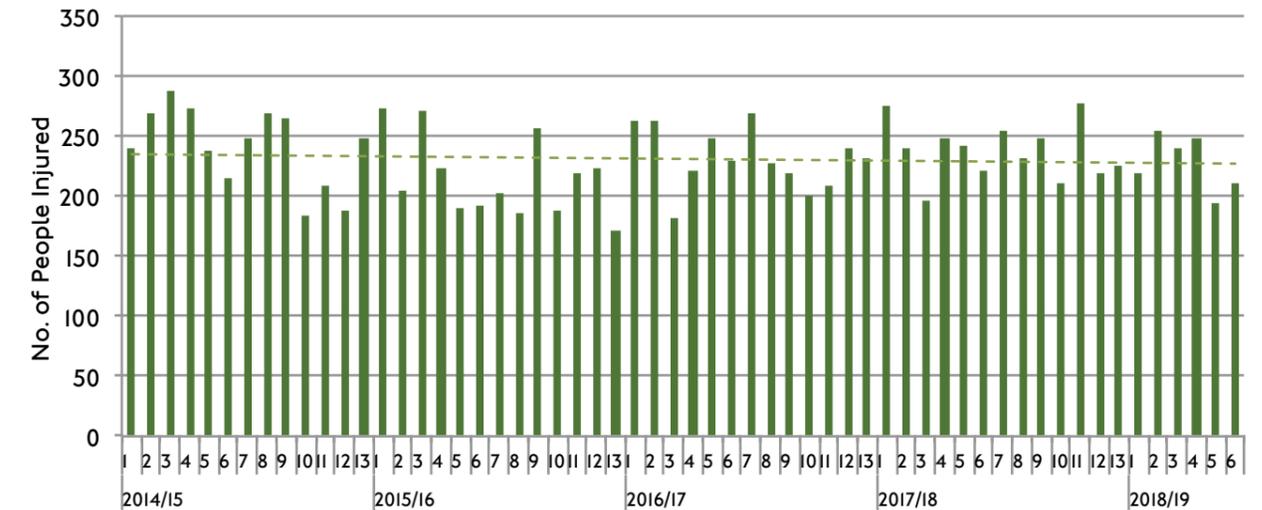
We have completed our procurement of a new bus driver safety training course to focus on their role in achieving Vision Zero through better awareness of more vulnerable passengers and road users. The contract will be awarded in quarter 3, followed by consultation with operators and wider stakeholders.

Bus customer injuries per million passenger journeys - long term trend 



Over a five year period bus customer injuries have shown a rising trend but this, alongside the decrease in incidents by 2 incidents per period since 2017/18, is not statistically significant. Our focus on the investigation and sharing of learning from significant incidents by our bus operators and enhanced monitoring of bus operator performance and safety management introduced in 2017 is helping drive improvement.

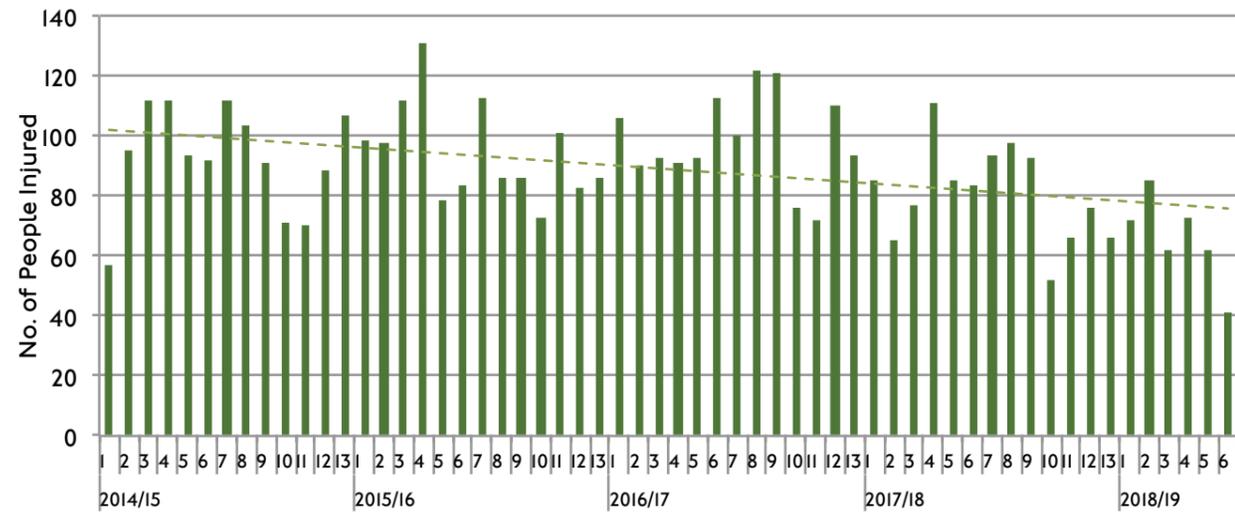
Customer safety - slips, trips and falls on buses 



Since the start of last year, there have been 1.18 fewer incidents per period of slips, trips and falls on buses. However, when normalised against passenger journeys, incidents are increasing, there were 1.35 injuries per million passenger journeys resulting from slips, trips and falls in the quarter, compared with a five year average of 1.31 injuries per million passenger journeys.

Over the last five years, most of the falls that resulted in injury occurred within the bus aisle (42 per cent), and although the longer term trend is worsening, this has slowed down since the start of last year. Injuries sustained while boarding or alighting buses account for 23 per cent and the trend for this cause continues to show improvement.

Customer safety - bus collisions



Injuries due to collisions involving buses have been steadily falling over the last five years. During this period there has been a focus on the quality of driving, including interventions to help drivers anticipate the actions of other road users and customer service training includes a focus on the safety of vulnerable customers.

Plans for next quarter

During quarter 3 we will:

- Launch the Bus Safety Standard and Roadmap at TfL's second Bus Safety Summit on 16 October, including a revised Bus Vehicle Specification
- Complete on road fatigue tests
- Receive an interim report from the bus driver fatigue research
- Have ISA operating on 700 buses and 50 routes
- Facilitate an operators' forum to enable participants in the Safety Innovation Fund projects to share their learnings
- Support the bus operator safety campaign day at Croydon in December 2018, led by Abellio
- Consult operators and stakeholders to inform the design of new driver training to embed Vision Zero.



Customer Safety: London Underground

Overview

Q2 Performance	Q2 Improvement activities
<ul style="list-style-type: none"> ✗ 3.07 injuries per million passenger journeys: Four per cent worse than the same quarter last year ✗ Seven per cent increase in injuries on escalators compared with the same quarter last year, accounting for almost half of all customer injuries ✗ Twenty-four per cent increase in injuries at the Platform Train Interface (PTI) compared with the same quarter last year, accounting for almost a quarter of all customer injuries ✓ Injuries at ticket gates down 32 per cent compared with the same quarter last year ✗ Slips trips and falls accounted for 80% of all injuries 	<ul style="list-style-type: none"> ✓ Escalator Excellence: roll out continued ✓ Stair Excellence: roll out commenced ✓ Platforms realigned at 4 stations to reduce the gap between the train and the platform ✓ Platform camera improvements commenced at two sites ✓ Platform Train Interface day: focus on train operator awareness of hot-spots.

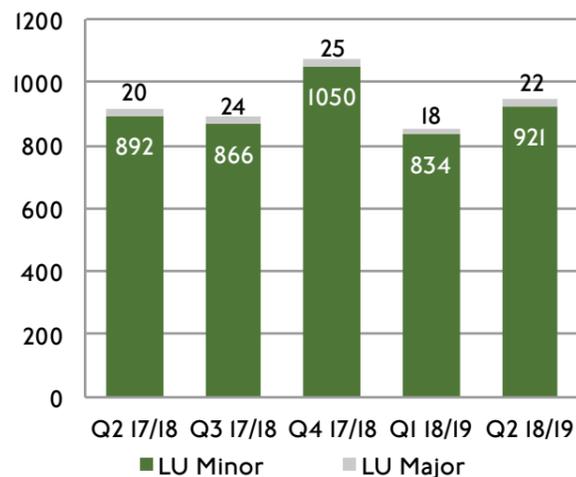
Overview: customer accidental injuries in Q2

Accidental Fatalities	Major Injuries	All Injuries	Near Misses
0	22	943	301

In quarter 2, there were 943 customer injuries, equating to 3.07 injuries per million passenger journeys, a higher injury rate than the same quarter last year (2.98). Twenty-two of these customer injuries (2.3 per cent) were major injuries.

There were 12 cases where a passenger was fatally injured following a collision with a train. The coroner's inquest has confirmed one of the cases as suicide and we await the outcome of the other 11 incidents.

Customer injuries five rolling quarters



LU customer injuries have increased by 3.4 per cent compared with the same quarter last year, with increases in both major and minor injuries. In quarter 2 most accidental customer injuries were on escalators (47 per cent), at the platform train interface (PTI) (23 per cent) and on stairs (15 per cent). Injuries at the PTI and on escalators rose 24 per cent and seven per cent respectively compared to the same quarter of last year. There has been a reduction in injuries at ticket gate lines (32 per cent improvement) and on trains (11 per cent improvement) this quarter, compared with the same quarter last year. Slips, trips and falls continue to account for the majority of injuries (80 per cent of all injuries).

Top three causes LU customer injuries

Slip Trip Fall	Hit by doors, gates or other objects	Other
80%	17%	3%

In quarter 2 we continued the roll out of the Escalator Excellence programme to the stations with the highest number of incidents and started monitoring the stations to ensure excellence in the management of this risk is maintained. Delays in obtaining the required signage have meant that full roll-out has not been completed as planned and works will continue in quarter 3. During quarter 2 we complemented this programme with the launch of our Stair Excellence programme, which is initially focused on the 18 stations (2 per line) with the highest number of stair-related injuries.

The programme includes:

- an asset condition and customer behaviour survey to identify improvements to reduce injuries.
- targeted public announcements and poster campaigns
- staff engagement with customers
- a focus on wet weather arrangements.

The PTI monthly focus days have continued with managers engaging with station staff and train operators on different PTI issues. Themes have included a focus on train operator awareness of their PTI hotspots and the importance of reporting faults associated with assets we use to manage safety of the PTI.

In September, PTI observations were completed at the ten stations with the highest number of PTI-related incidents, to

check that the correct mitigation measures and customer communications are in place. The results have been fed into the PTI safety plan to continue to reduce customer injuries across the network.

We have continued to make changes to our assets at the PTI to reduce injuries when customers are boarding and alighting. We have now completed the refurbishment of 27 Jubilee line trains, which includes putting a yellow plate in the foot-well to draw more attention to the gap between the train and the platform. We have realigned the edge of a further four platforms (Sloane Square, South Kensington and Whitechapel and Cannon Street), to reduce the gap between the train and the platform following the introduction of new trains on the Metropolitan, Hammersmith and City, District, and Circle lines. Works are underway on a further two platforms, which will be completed in quarter 3.

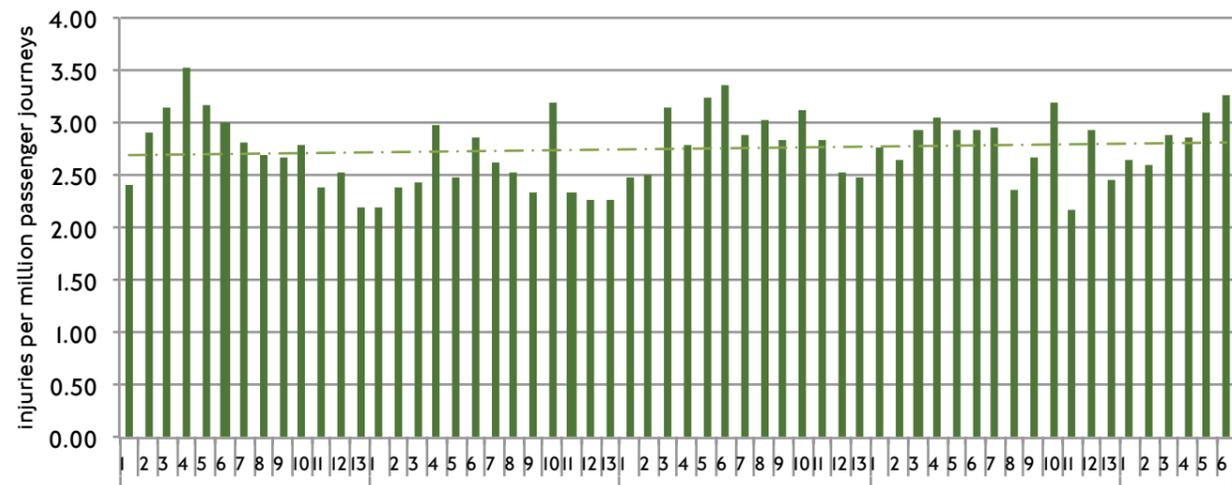
"Making sure our customers and our workforce go home safely each day is extremely important to me. It's the first thing we talk about on our morning call and at our weekly performance meeting. This focus has helped us reduce the number accidents at the Platform Train Interface during the second quarter of this year. We asked our train operators and stations staff for their ideas for improving safety and implementing those ideas has made our customers journeys safer. Our challenge now is to ensure this improvement is sustained and delivered through local ownership and accountability."

Nigel Holness
Managing Director London Underground

As part of our Platform Camera Improvement project, which improves the train operators' view of the platform, we completed concept design for the new camera layout for one station, completed detail design for ten stations and started delivering improvements on site at two stations.

Safety Culture plans are being rolled out across LU and are supported by local plans in each area. To support a positive safety culture, our Customer Risk Assessment process has been streamlined with greater emphasis on implementing improved risk controls which can be used to inform the monitoring regimes for our most important controls.

LU customer injuries per million passenger journeys - Long term trend 

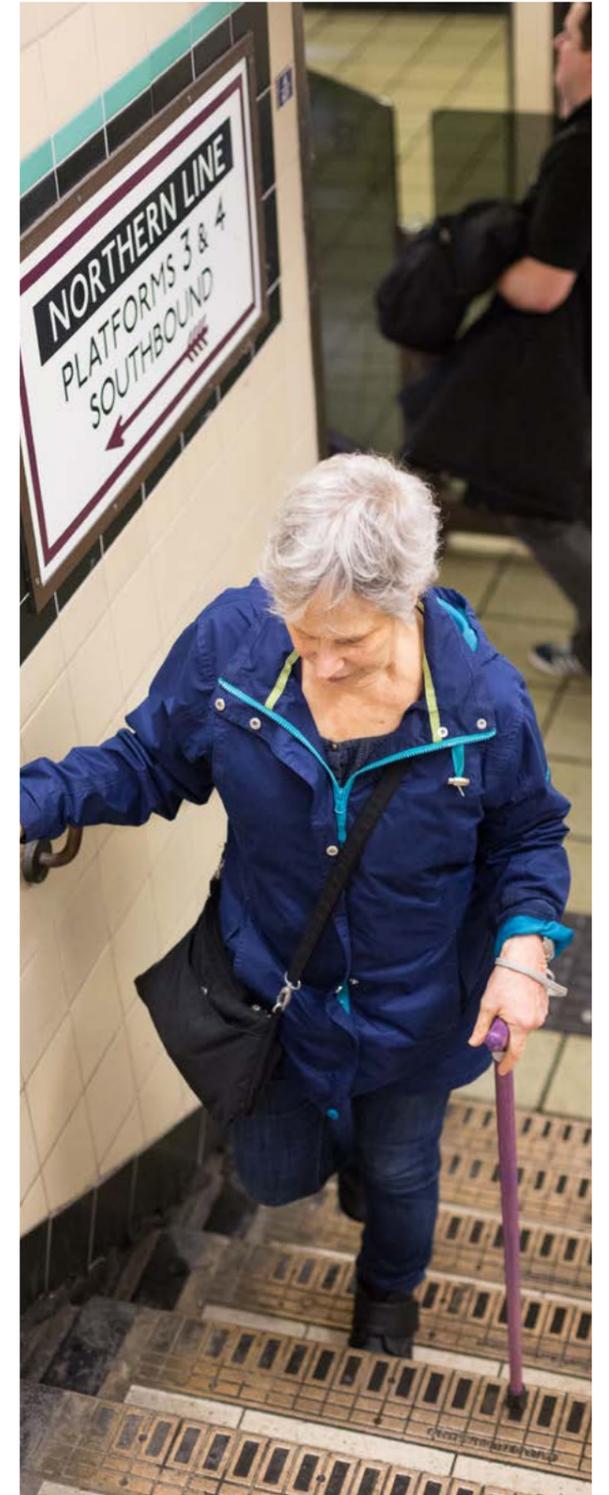


Over the longer term, LU customer injuries have risen at a rate of 0.78 injuries per period. The majority of injuries have been sustained on escalators (40 per cent), stairs (19 per cent) and at the PTI (17 per cent). On our escalators, injuries have risen every period within this quarter, which is a statistically significant trend across the rolling five years. Injuries sustained on stairs across our stations have reduced significantly this financial year compared with the same period last year (12 per cent).

Plans for next quarter

During quarter 3 we will:

- Install new "hold the handrail" escalator signage for stations outside of the top 20 for escalator incidents
- Check escalator excellence standards are being maintained at the stations with the highest number of incidents
- Roll out Stair Excellence in full across the top 18 stations
- Update all line-based PTI plans to ensure alignment to the overarching plan
- Roll out a PTI video featuring a train operator sharing their experience of a serious PTI incident
- Roll out specific safety communications over the festive holiday period
- Realign the edge of platform at Victoria and East Putney to reduce the gap between the train and the platform
- Continue delivery of our Platform Camera Improvement project.



Customer Safety: Rail

Overview

Performance	Improvement activities
<ul style="list-style-type: none"> ✗ I.I injuries per million passenger journeys: 12 per cent worse than the same quarter last year ✓ No major injuries ✗ TfL Rail injury rate per million passenger journey's significantly higher than other rail networks, but has shown significant improvement compared with same quarter last year ✗ Increase in PTI incidents, particularly on DLR ✗ Slips, trips and falls continue to be an issue across Rail 	<ul style="list-style-type: none"> ✓ Installation of Mind the Gap signage underway at 14 DLR platforms ✓ Fatigue assessment of rosters introduced on DLR ✓ Sandilands recommendation: Responses received to the Invitation to Tender for an automatic braking system for trams ✓ Sandilands recommendation: Strengthening film selected as the immediate solution to strengthen glazing on trams.

Overview: customer accidental injuries in Q1

Accidental Fatalities	Major Injuries	All Injuries	Near Misses*
0	0	99	8

*This data will be collated across our rail division and included in future reports

A total of 99 customers were injured. None of the injuries were classified as major. This equates to 1.1 customer injuries per million passenger journeys, up from 0.98 at the same time last year. The injuries occurred within TfL Rail (26), Docklands Light Railway (DLR) (27), London Overground (LO) (40) and Trams (6).

The number of customer injuries increased by 11 per cent compared to quarter 2 last year. A significant proportion of the increase occurred within DLR, where the number of injuries increased from 10 to 27 compared with quarter 2 last year. In DLR, this is equivalent to 0.66 injuries per million passenger journeys; broadly consistent with the same quarter last year. Twelve (44 per cent) of the customer injuries resulted from falls, with five occurring on escalators. Customer intoxication was a factor in four instances. As a consequence of this and

an anticipated seasonal increase expected next quarter, plans are being put in place for a specific communications campaign featuring posters and announcements targeting slips, trips and falls during the autumn and winter months.

LO reported 1.05 injuries per million passenger journeys in the quarter, compared with 1.02 injuries per million passenger journeys in the same period of last year. Slips, trips, and falls were the predominant cause of customer injuries (78 per cent).

On the TfL Rail network, 26 customers were injured, a reduction of 32 per cent compared with last year. Customer injuries is equivalent to 2.14 injuries per million passenger journeys; an improvement on the same quarter of last year (2.6). Slips, trips and falls, were the predominant cause of injuries.

The trams network reported six customer injuries, up from five for the same period of last year. This is equivalent to 0.89 injuries per million passenger journeys, up from 0.79 in the same quarter last year. There is no discernible trend since the start of last year influencing the level of injuries on the tram network.





Our rail operators continue their focus on management of the PTI, in line with the approach taken to the management of the PTI across our other rail operations. A number of DLR stations, with larger stepping distances between the platform and train, we have continued to target with platform edge signage and PA announcements. Work to fit "mind the gap" signage at 14 platforms is progressing well.

DLR is assessing the impact of a three second door chime to warn of doors closing and the impact of different door warble durations. On the weekend of 21/22 July DLR trailed a three second door chime. The trial involved platform observations of passenger behaviour, a customer questionnaire and feedback from the on train staff (PSAs). As this is part of our assessment of compliance with the Rail Vehicle Accessibility Regulations (RVAR), the results of the trial will be discussed with the Department for Transport during quarter 3.

Work is ongoing between LO and our operator Arriva Rail London (ARL) to develop and implement a PTI risk reduction strategy. This project has involved working with the RSSB's PTI Strategy Working Group to develop the strategy in alignment with Industry Guidance. An improved PTI tool was launched by the RSSB in August. It will be trialled by DLR during quarter 3 and plans are already in place for its adoption by LO.

Work has continued with our tram operator to strengthen the way in which safety issues are managed, including reporting, recording and prioritisation to allow early warnings

of emerging trends. Work is also ongoing to further develop the Safety Risk Model for our tram network, with the current emphasis being on the identification and management of risk mitigation measures.

We are making good progress with the procurement of a new safety system on the London Trams network, which automatically applies the brakes should the speed limit be exceeded at high-risk locations. We are aiming to award the contract by the end of the year.

We have also assessed the options available to strengthen the type of glazing fitted on the tram fleet. The application of strengthening film to the existing tempered windows is being progressed as immediate solution.

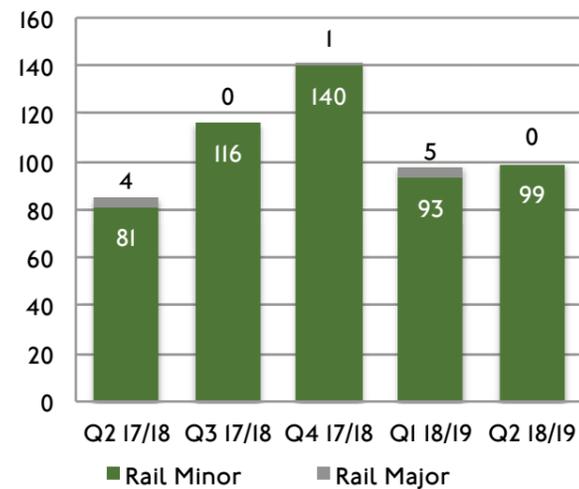
We are working closely with other UK tram operators and infrastructure managers to establish the structure, governance and function of a Light Rail Safety & Standards Board, which the Rail Accident Investigation Branch (RAIB) recommended should be formed in response to the tram overturning at Sandilands. An update on the actions being taken in response to the RAIB can be found in Appendix I.

Our focus on improving safety at tram crossings continues. The Crossings Review Panel met for the first time in September, to agree the actions in response to our Road Safety Auditor's risk assessment of town centre crossings.

Rail customer injuries five rolling quarters

Customer injuries

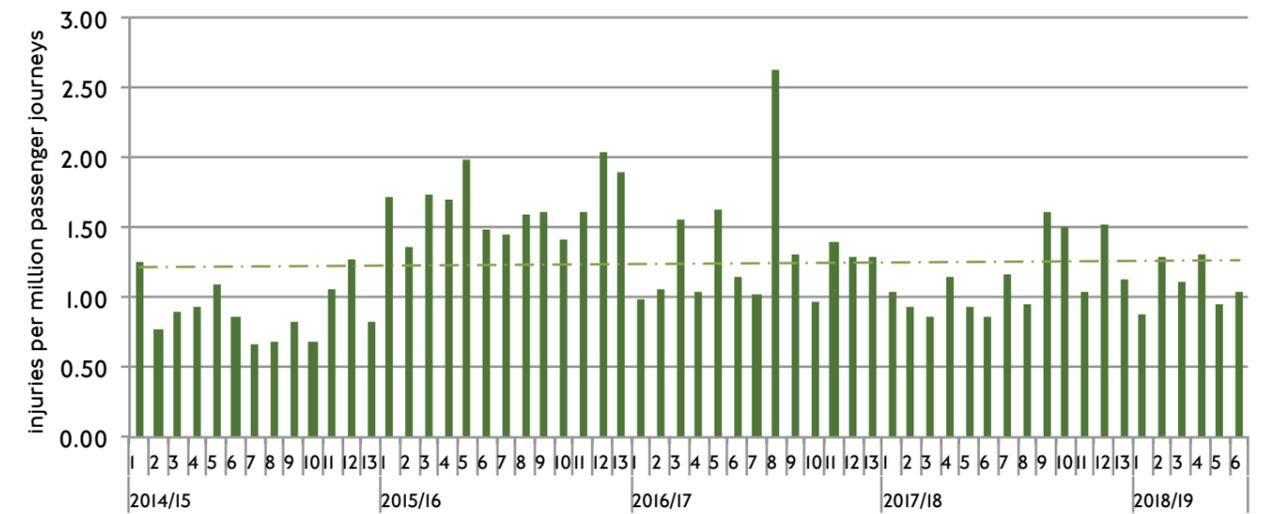
Past five quarters



Fatigue management arrangements on the DLR have been reviewed against ORR's good practice guide. Procedures have been updated to require a fatigue review to be undertaken for all rosters. The trial of "readibands", a device worn on the wrist to monitor fatigue has also been concluded. The results will be available during quarter 3.

ARL took part in RSSB's Fatigue Management Survey and the data is now being analysed by RSSB. ARL will attend a workshop, along with other representatives from Train Operating Companies that took part, to discuss the survey results and to formulate action plans. Further actions have also been incorporated into the refresh of ARL's Health, Safety and Wellbeing Strategy which will include briefings to staff on wellbeing, fatigue and lifestyle.

Rail customer injuries - long term trend



Overall, the injury trend for our rail customers continues to show an improving trend, indicating the number injuries are reducing over the long-term. However, when normalised by passenger journeys completed across our rail division, the trend is steady. On the LO and tram networks, the longer term trends show reductions in the number of injuries and also when normalised. In respect of DLR, the longer term trend is steady, but shows a reduction in injuries when normalised by passenger journeys. Within TfL Rail, the number of injuries shows an increasing trend, but when normalised, there is a steady reduction in injuries to customers using this network.

Plans for next quarter

During quarter 3 we will:

- Formally launch the Trams HSE Improvement Programme
- Report the results of the DLR “readiband” trial
- Commence the trial of the RSSB’s new PTI tool to evaluate its value for DLR
- Launch a slips and trips poster and public announcement campaign across the DLR network to coincide with the anticipated increase in hazards during the autumn and winter
- Prioritise tram crossings for assessment
- Continue to work with the manufacturers of our trams to implement in-cab warnings to alert drivers to higher risk locations.



Customer safety: Other operations



Overview

Performance	Improvement activities
<ul style="list-style-type: none"> ✓ 4.9 injuries per million passenger journeys: Eight per cent worse than the same quarter last year ✗ Dial-a-Ride accounts for the largest proportion of "other services" injuries ✗ All "other services" major injuries arose from 2 causes; collisions and slips, trips and falls 	<ul style="list-style-type: none"> ✓ Work on the first Safety Improvement Plan for the Thames commenced ✓ Contract for new Dial-a-Ride vehicles introduced new safety features

Overview: customer accidental injuries in Q2

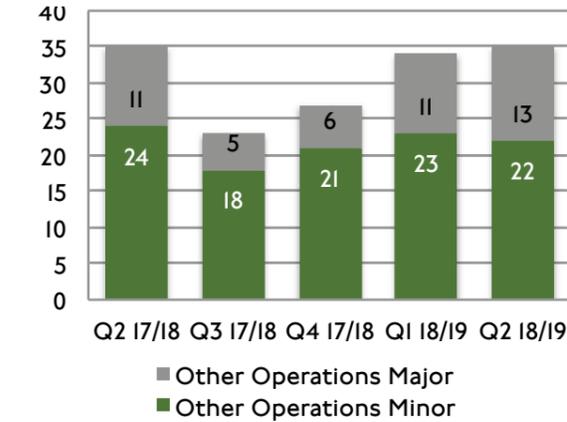
Accidental Fatalities	Major Injuries*	All Injuries	Near Misses**
0	13	35	123

*Injuries requiring hospital attendance
** All incidents where no injury or damage arose

Thirty five customers were injured across our other operations, this equates to 4.9 customer injuries per million passenger journeys. This is better than the same quarter last year when it was 5.1 injuries per million passenger journeys.

Thirteen of the injuries were classified as major within Santander Bikes (8), Dial-a-Ride (DaR) (4), Victoria Coach Station (VCS) (1). Collisions with cars and fall from bikes were the two causes of the major injuries within Santander Bikes; this is the consistent theme for this group of customers. In the quarter, a significant proportion of injuries occurred within DaR (43 per cent) of all the operations injuries, unchanged compared with quarter 2 last year. Santander Bikes accounted for 37 per cent, both VCS and Emirates Air Line (EAL) accounted for 14 per cent each. The remainder of the injuries occurred within London River Services (LRS) (3 per cent).

Other operational services customer injuries five rolling quarters



The number of customer injuries remains unchanged when compared with quarter 2 last year.

Top 4 causes of injuries

Slip Trip Fall	Collision	Cut/abrasion	Trapped fingers/limbs
52%	11%	11%	9%

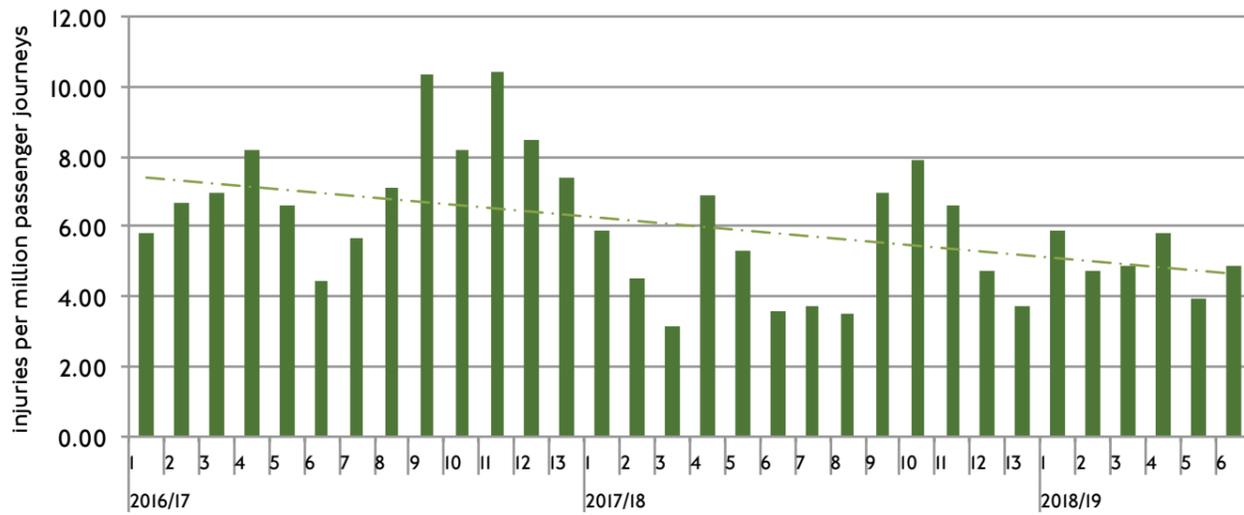
Slips, trips and falls and collisions were the causes of all major injuries in the quarter; Santander Bike customers accounted for four collisions and four slips, trips and falls, and DaR customers were injured as a result of one collision and four slips, trips and falls.

During the quarter TfL led work to develop the first Safety Improvement Plan for the Thames. The plan will be integral to the delivery of the London Passenger Pier Strategy. A Thames Partnership Group has been set up to deliver the plan, bringing together TfL, the Port of London Authority, Marine Coastguard Agency and the Metropolitan Police Service.

In response to the incident of a passenger's leg being caught between the pier and a boat in quarter 1, the boat operator, City Cruises are reviewing how they board and alight passengers. They are looking at installing gangways at some piers in line with the practice already applied by Thames Clippers.

In July, we awarded the contract for the new DaR vehicles. The safety features of the new vehicles will include low-floors, a reduced incline on ramps, as well as seats and aisles widths that ease movement. These measures are expected to help reduce slips, trips and falls and injuries arising from manual handling.

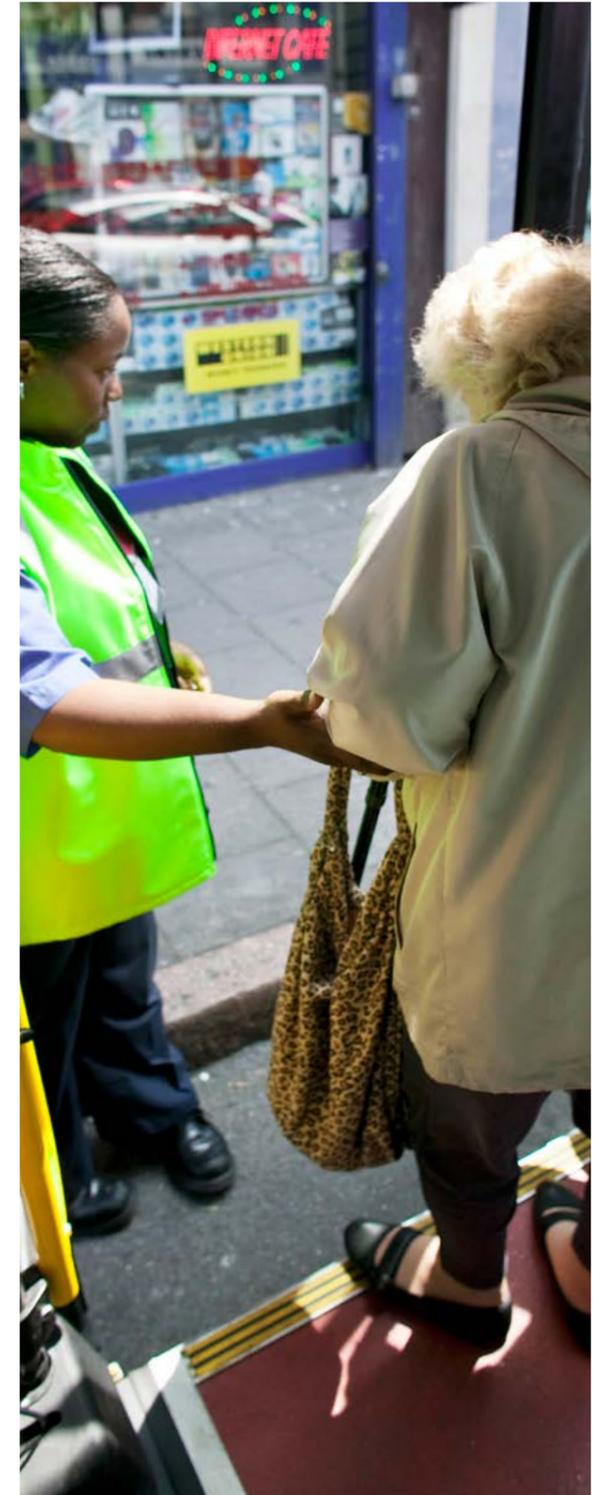
Other operational services customer injuries - long term trend 



Overall, the trend for our other operational areas continues to show an improving trend indicating injuries are declining over the long-term. This is also the case when normalised by journeys completed across our other operational services. However, within DaR, we observe a worsening trend, with the numbers of injuries to DaR customers when boarding and alighting worsening (36 per cent of cases). These incidents, combined with other types of fall events, are the main reason for the overall rising trend for DaR customers.

Plans for next quarter

- Formally launch the Safety Improvement Plan for the Thames.

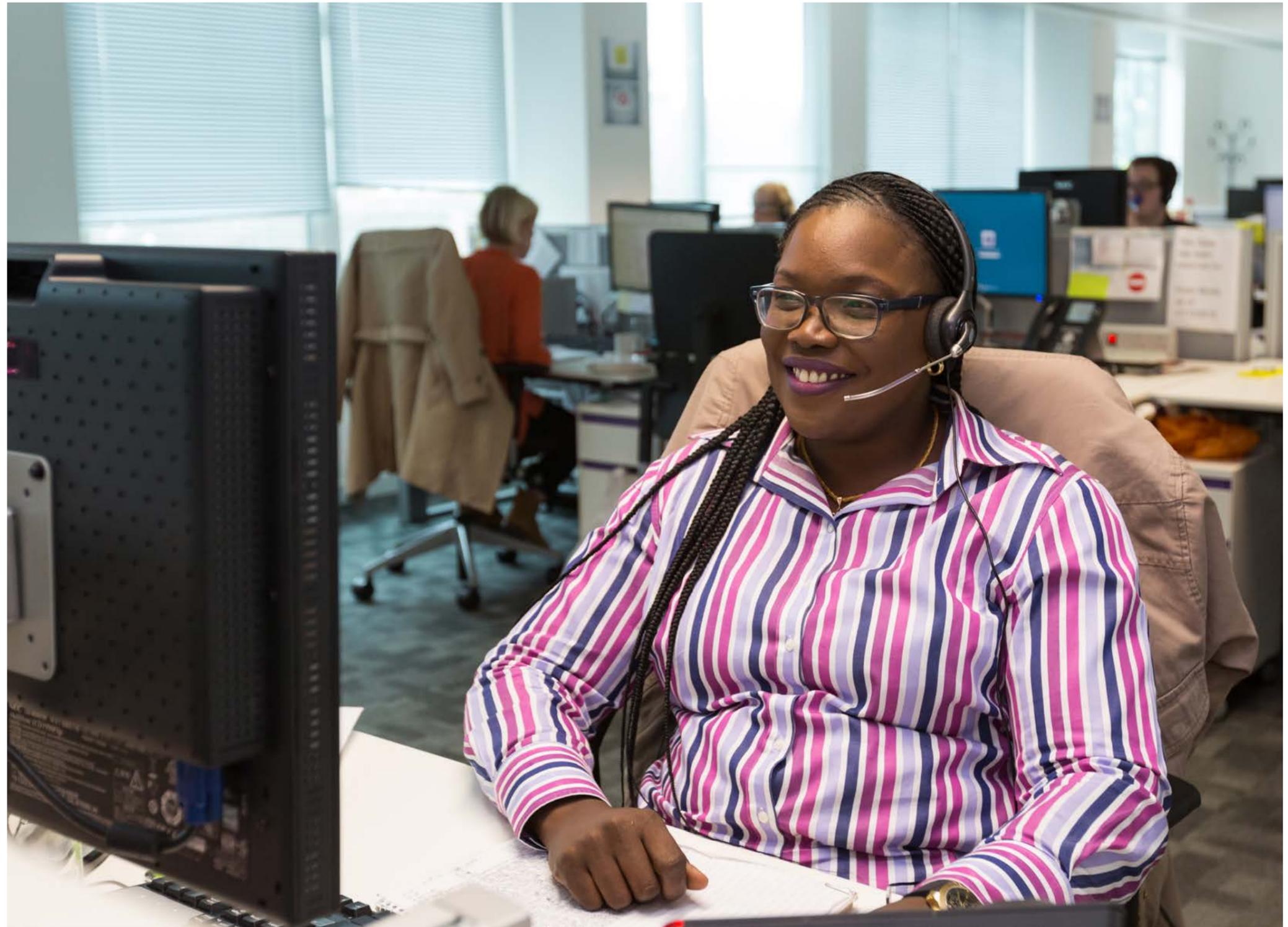


Safety – feedback from customers

The slight increase in safety complaints reported this quarter is in line with an increase in complaint volumes as a whole. The main area of increase was Buses, with injuries to person and vehicle damage both up on the same quarter last year.

We have updated our website and introduced a specific category for safety incidents and concerns that customers can use when contacting us. As well as encouraging reports about safety, the new category will help ensure that they are prioritised for review.

	Q2 2017/18	Q2 2018/19	Trend
London Underground	325	312	↕
London Buses	979	1,115	↗
DLR	20	16	↕
London Overground	55	38	↕
TfL Rail	19	25	↗
London Trams	8	7	↕
Emirates Air Line	0	0	↔
Congestion Charge	0	0	↔
Dial-a-Ride	12	3	↕
London River Services	0	1	↗
Santander Cycles	1	0	↕
Taxis	n/a	3	
Private Hire	n/a	1	
Total	1,419	1,521	



Workforce injuries

Overview

Q2 Performance	Q2 Improvement activities
<ul style="list-style-type: none"> ✓ Workforce injuries 11 per cent better than same quarter last year ✓ Injury reductions driven by improvements in buses and construction ✗ Workforce injuries in LU have increased; in particular injuries to those undertaking fleet and other maintenance activities ✓ Accident Frequency Rate improving for LU construction teams and there have been no reportable injuries associated with our highway projects this quarter ✓ Violence against our total workforce 13 per cent better than same quarter last year, but worse for our direct employees. ✗ Sickness absence due to mental health issues is 9.3 per cent worse than the same quarter last year, continuing the rising trend 	<ul style="list-style-type: none"> ✓ Workforce safety video targeting slips, trips and falls rolled out in LU ✓ New 5 year HSE strategy launched for major projects ✓ New incident and near miss reporting application for our construction workforce ✓ Supplier Assessment Tool (SAT) revised for use across TfL construction projects ✓ Revised spit kit provision is improving availability of evidence in assault cases ✓ Preparation for World Mental Health Day

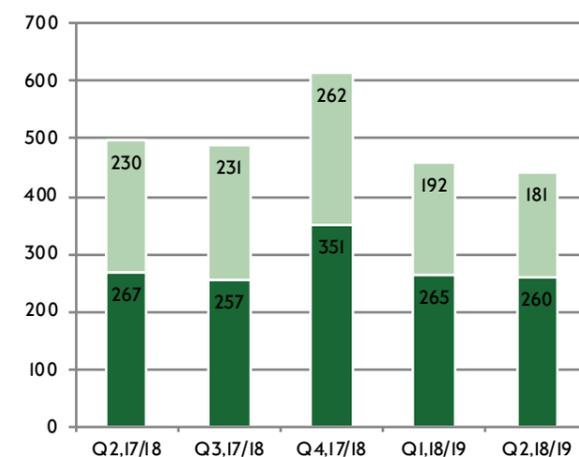
Overview: workforce accidental injuries in Q2

Fatalities	RIDDORs*	All Injuries
0	49	441

*Reporting arrangements for our bus suppliers being developed

There were 11 per cent fewer workforce injuries compared with the same quarter last year; with reductions in the number of injuries to both our direct employees and our suppliers' staff. Of the 441 workforce injuries during the quarter, 49 were reported to regulatory authorities (information on pages 20 to 21) and a further 12 were classified as major in connection with bus driving as they required hospital attendance.

Workforce injuries five rolling quarters



Our direct employees accounted for 59 per cent of workforce injuries, with 86 per cent of these incidents occurring within LU, which accounts for 71 per cent of direct employees in TfL, many of whom are undertake maintenance and construction related activities. Injuries to our supplier staff accounted for 41 per cent of our workforce injuries. Bus drivers were the group most affected, accounting for 43 per cent of supplier staff injuries. This is followed by our major project teams where 36 injuries (20 per cent) were reported. Within our Rail modes, we recorded 34 injuries (18.7 per cent). LU reported 17 injuries (9.4 per cent) and in other operational services we recorded 13 injuries (7.2 per cent). The remainder were reported in other support areas (1.2 per cent).

Top 4 causes of injuries (all areas)

Machinery/ Equipment/ Powered Tools	Slip, Trip, Fall	Manual Handling	Struck by/ against an object
24%	15%	10%	3%

In LU the highest number of workplace accidents are due to slips, trips and falls, contact injuries and manual handling. There has been an increase in injuries within those undertaking maintenance of fleets and other assets. In response, plans are being rolled out including a video focusing on prevention of slips, trips and falls and a review of local safety plans. The Go, Look, See process continues to ensure senior managers and those who are injured meet in the workplace, to explore how the injury occurred and identify any steps that need to be taken in response.

Within our LO operation, a new inspection and management tour programme has been launched to refocus these activities across the executive, maintenance, operational and project delivery teams to increase engagement in safety, improve the safety culture and identify trends and improvement opportunities.

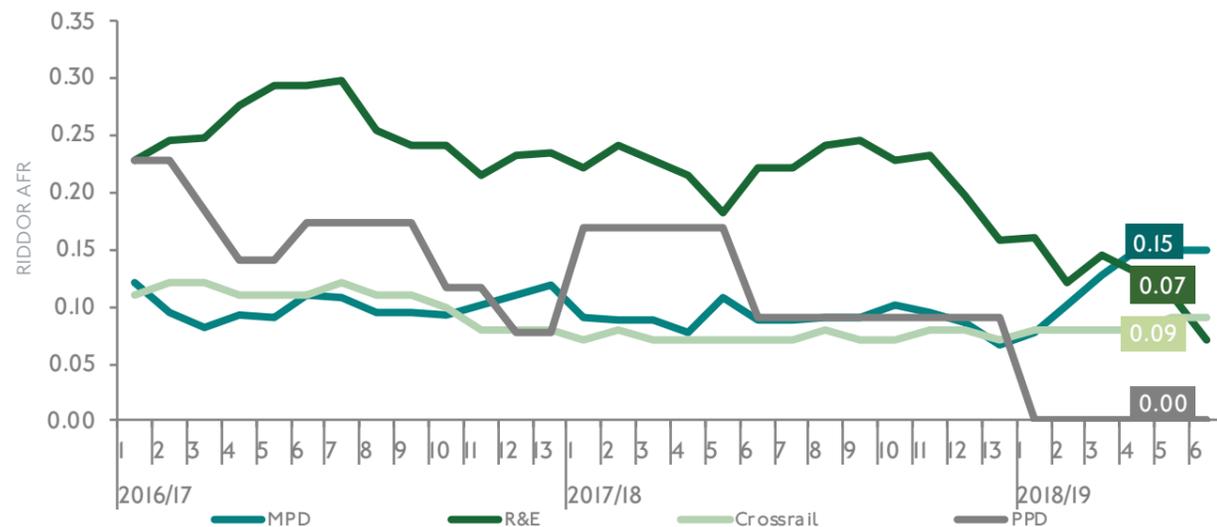
A Fatigue Management Improvement Plan has been agreed for tram maintenance staff. A working group has been established and its first task is a gap analysis between current processes and practice and the good practice defined by the ORR.

Workforce injuries have been discussed with bus operators during all HSE Maturity Assessment visits, as part of our ongoing programme to understand the operators' commitment and action plan to reduce workplace injuries. Since the Mayoral announcement in February this year, good progress has been made on the provision of toilets for bus drivers, in order that all bus routes have access to toilet facilities during all hours of operation. Needing the toilet is a distraction for bus drivers, impacting their ability to concentrate on the road. Facilities, which utilise environmentally friendly solar power, were delivered at ten sites at the end of the quarter.

Quarter 2 saw the launch of a new simplified risk assessment process for TfL. The new process seeks to place greater emphasis on seeking and implementing improved risk control measures and informing monitoring regimes for risk controls.

The draft design of new training for middle managers concluded during the quarter. All managers will complete online learning covering their HSE roles and responsibilities outlined in the TfL HSE management system. For operational managers, this will be supplemented by classroom based training, delivered by TfL HSE Managers. The training will be launched in quarter 3.

Construction workforce Accident Frequency Rate (AFR)



Our construction workforce accounted for 50 of workforce injuries in the quarter. This is a 17 per cent improvement on quarter 2 last year. Four of the injuries in the quarter were reported under RIDDOR, triggered by the length of absence from work, rather than the severity of the injury.

For our direct employees, incidents involving machinery, equipment or powered tools were the main cause of injuries. The majority of these occurred within LU, where there has been a stable trend since the start of last year. Slips, trips and falls is the second most common cause of injury for our construction workforce within LU and Surface Transport.

In August we launched a new five year HSE strategy for our major projects and the first of five supporting HSE Improvement Plans, which will run for each year of the strategy.

The specific focus is on making HSE personal for our people across TfL and our supply chain, the embedment of HSE at the core of business delivery, including the provision of suitable tools and processes and the increased use of sustainable design, construction methods & materials that facilitate alignment to hierarchical risk management practices, prevent pollution & nuisance and help protect & enhance biodiversity.

During quarter 2 we revised our Supplier Assessment Tool (SAT) to enable its use across all TfL construction-related activities. This tool facilitates a consistent approach to the seeking, recording and communication of TfL HSE assurance activities. Work commenced to revise and expand the use of our 'Beacon' HSE award, which recognises excellence in site management across all TfL Capital Delivery projects. Currently Beacon

is utilised within our Major and Renewal & Enhancement projects.

Training and competence for those maintaining the tramway is being improved by supplementing the current training with the addition of a mentoring and assessment process, before an individual is considered fully competent to manage construction works on the tramway. A working group representing key stakeholders is developing the mentoring and competence process.

Work continues to develop the Behavioural-Based Safety (BBS) programme that promotes "working HSE together". The programme will provide the guidance and the tools to enable capital delivery teams to engage with their HSE support and to improve their HSE capabilities, skill set and knowledge. An integral part of the BBS programme is to encourage more engagement with the supply chain; share common HSE values and use their expertise and knowledge to continually improve HSE performance.

We have launched a new incident & near miss reporting application to improve the ease and efficiency of reporting. Construction teams within our major projects have been the first to use the new tool, helping ensure it works correctly. The "app" has been well received with a demonstrable improvement in levels of reporting and will be rolled out more widely during quarter 3.

Within our major projects we have taken action to improve the timeliness and

quality of the investigation, close out and communication of findings from our incidents and near misses. We:

- Coached our project teams on the importance of timely and quality investigations, including what to look for and how to use our reporting system;
- Ran a campaign, featuring our senior leadership team, highlighting their commitment to high-quality, factual investigation;
- Increased the visibility of our incident close-out rates, including how we use the data to improve HSE performance;
- Started to review our tools and forums for sharing lessons learned.

The Crossrail Health and Safety Performance Index (HSPI), has shown a consistently good level of performance overall, with all indicators performing well during quarter 2. The overall performance at the end of quarter 2 was 2.57, significantly above the target level of 2.20 (maximum score 3.00). The RIDDOR

"I am passionate about getting everyone who works for or on behalf of MPD home safe and healthy every day. Launching our new MPD HSE Strategy I have ensured the focus is on making HSE personal; empowering each and every one of us to be HSE leaders; developing & sharing good practice and creating a safe space for challenge and improvement when we think things can be made better."

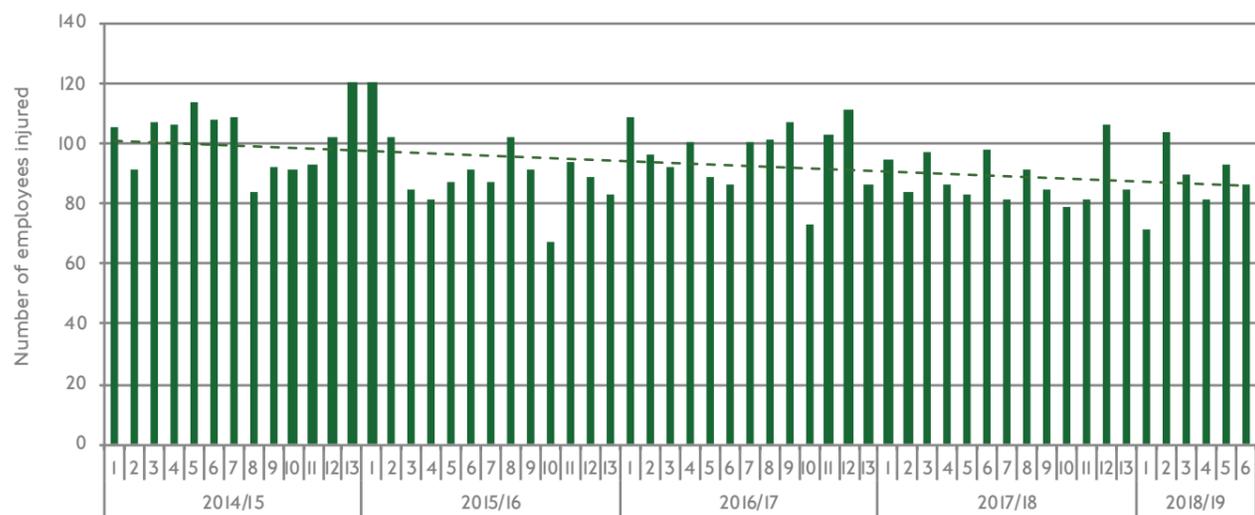
Stuart Harvey
Director Major Projects

Accident Frequency Rate (AFR) rate is better than the target of 0.15. We maintain our objective of seeing this trend to 0.06 and launched our 'Finish Safe' campaign to support this. The campaign focuses on ensuring basic safety rules are followed; increasing the impact of increased senior management engagement on site and promoting the importance of the role of site supervisors in ensuring site safety.

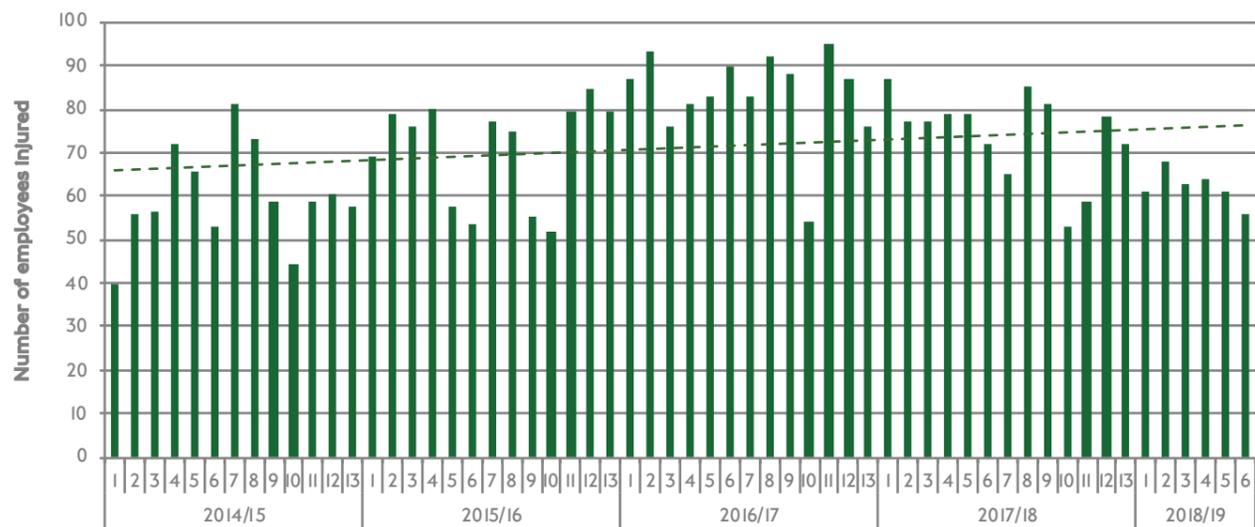
We aim to really learn from all incidents and the monthly Crossrail Health and Safety Learning Forum has continued to be a very successful way of sharing lessons from both incidents and best practice initiatives. Themes during the quarter included the detection of buried services, the management of energised systems and mental health wellbeing.



TfL direct employee total injuries - long term trend 



TfL supplier total injuries - long term trend 



The overall trend for total workforce injuries since 2015/16 is improving. This is the case for both TfL's own staff and our suppliers' staff. However, we observed a faster rate of reduction in injuries within our supplier workforce since the start of last year. Injuries to bus drivers, which account for the majority of our suppliers' workforce injuries, has reduced by 23 per cent compared to the same quarter last year.

Plans for next quarter

During quarter 3 we will:

- Extend the successful near miss reporting campaign used within LU Renewal & Enhancements to our LU operations and maintenance teams
- Start a root and branch review of the communication of safety critical information in LU
- Deliver additional bus driver toilets on 20 routes by December 2018
- Launch new HSE training for middle managers
- Complete gap analysis fatigue management for tram maintenance staff
- Baseline fatigue risk profiles for trams maintenance staff
- Launch the revised Beacon award scheme across TfL
- Extend the use of the reporting app for incidents and near misses
- Hold a pan-TfL Zero Harm Forum to promote a partnership approach to HSE management between TfL and its supply chain
- Continue the Finish Safe campaign on Crossrail.



Workplace Violence

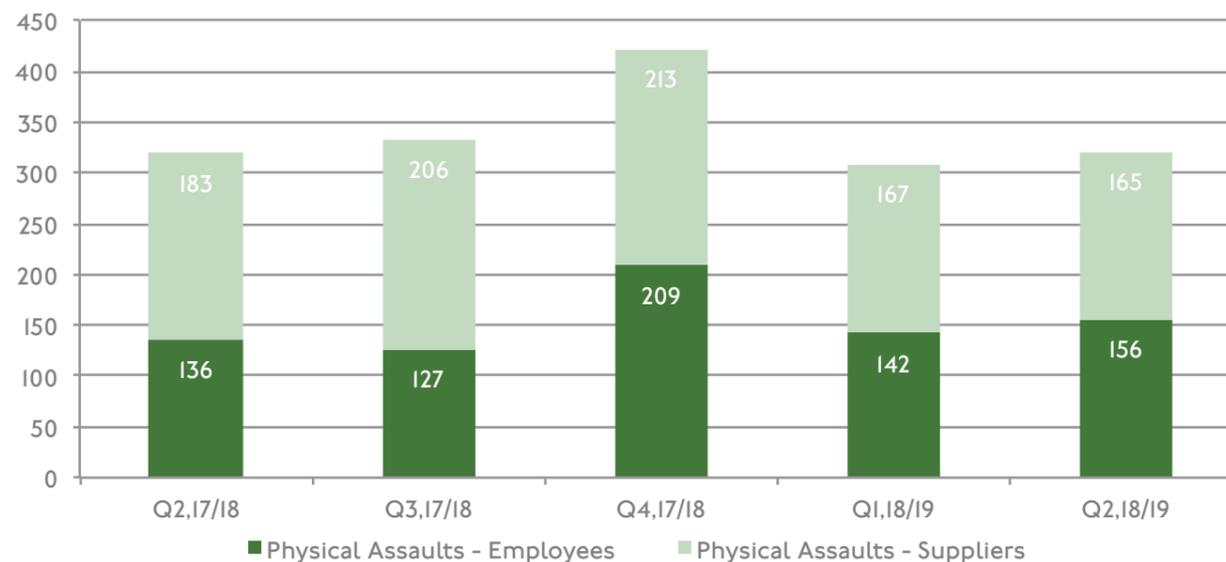
Overview: workplace violence in Q1

Physical Assaults	Non-physical Assaults	Total Assaults
321	773	1094

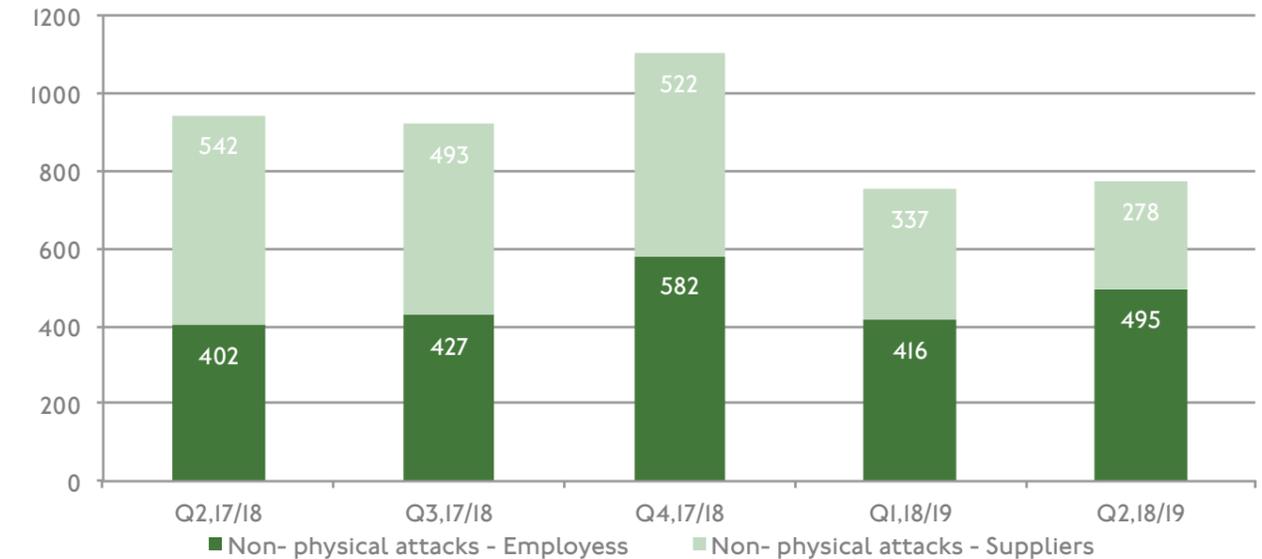
In the quarter, there were a total of 1,094 acts of violence towards our workforce, 29 per cent of which were physical assaults. Incidents tend to be connected with revenue collection and temporary LU station closures as part of our congestion control plans. These incidents mainly result in verbal abuse. Road-rage also features as a cause for our road-based operations.

For our direct employees, there were a total of 651 acts of violence in the quarter, 24 per cent of which were physical assaults. For our suppliers, a total of 443 staff were affected by workplace violence in the quarter, 37 per cent of which were physical assaults. Eighty per cent of all acts of violence against our supplier's workforce were recorded on the bus network (our largest customer-facing supplier workforce). DLR and LO recorded ten per cent and six per cent respectively.

Physical assaults on workforce - five rolling quarters



Non-physical assaults on workforce - five rolling quarters



The total level of violence against our workforce in the quarter shows a reduction of 13 per cent compared to the same quarter last year, resulting mainly from a reduction in assaults to supplier staff of 39 per cent. However, there was an overall 21 per cent increase in the assaults reported by our direct employees arising from a 15 per cent increase in physical assaults and a 23 per cent increase in verbal assaults when compared to quarter 2 last year.

Through dedicated teams in our operational businesses, we support our workforce to take formal action through the police, against those who commit acts of violence. The workplace violence support teams worked closely with the police to assist their investigations. At the TfL and British Transport Police (BTP) Strategy and Performance Meeting in September, special

focus was given to violence and aggression towards LU staff.

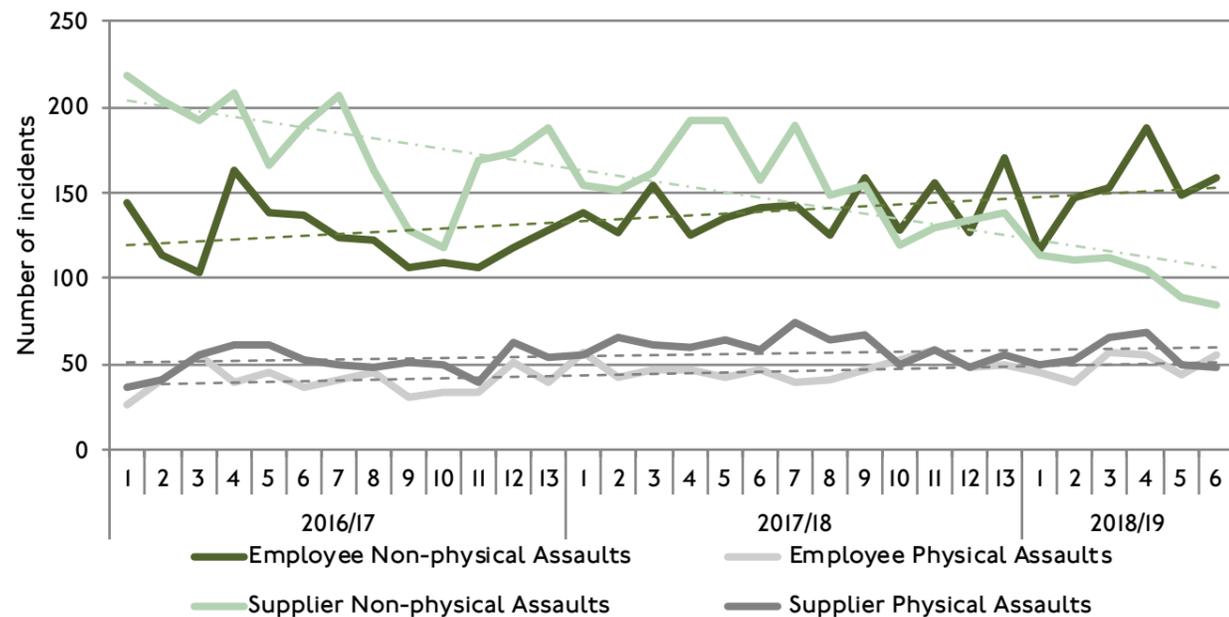
During the quarter, reviews of workplace aggression and our staff assault process were completed for our LU and road-based operations. The reviews included looking at how we could better assist and support staff who experience workplace violence. A few small gaps in the system were found and those gaps have successfully been filled. The result is that staff who are assaulted are supported quicker and a police statement obtained in a shorter time frame. This makes the statement fresher and enables the police to pursue investigatory avenues immediately. Consultation on the actions to address the findings of the LU review is underway with stakeholders.

Other key areas of activity during the quarter include a focus on the use of spit kits for staff, in particular bus drivers. Bus Operators are now increasingly providing a spit kit in the bus cab, which removes the need for the driver to carry the kit around. We are now seeing a significant increase in bus drivers using spit kits, enabling the identification of more suspects. Spit kits have been used to

collect evidence in 90 per cent of spitting cases, which is a positive step forward for crime detection.

The support teams have also targeted staff at operational hubs eg Victoria bus station, to promote the support that is available to members of our workforce who experience violence in their workplace.

Workplace violence - long term trend



The trend for physical assaults on our workforce has risen since 2016/17. However, non-physical violence towards our workforce has declined on our bus network, which in turn has contributed to an overall decline within our supplier workforce.

Our staff are encouraged to report all acts of aggression towards them, it is therefore accepted that higher levels of reported non-physical violence is a sign of positive culture, and enables effective deployment of enforcement personnel.

Health & Wellbeing

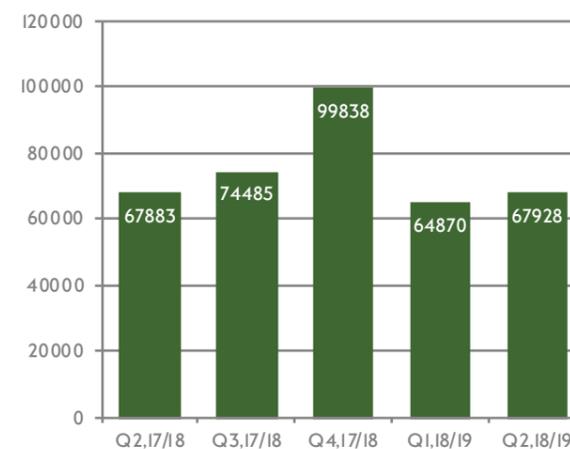
Workforce sickness absence

Working days lost to sickness	% working days lost to sickness
67,928	4.37%

We employ close to 26,000 staff in TfL. Within our direct employee workforce, a total of 67,928 working days were lost due to sickness in quarter 2; with 81 per cent of the working days lost within LU and 12 per cent within Surface Transport.

We currently implement work-related risk controls and employee support in respect of musculo-skeletal issues, mental health and accidents/assault. During the quarter, 56 per cent of the days lost were attributed to these three causes.

Days lost to sickness absence – rolling 5 quarters



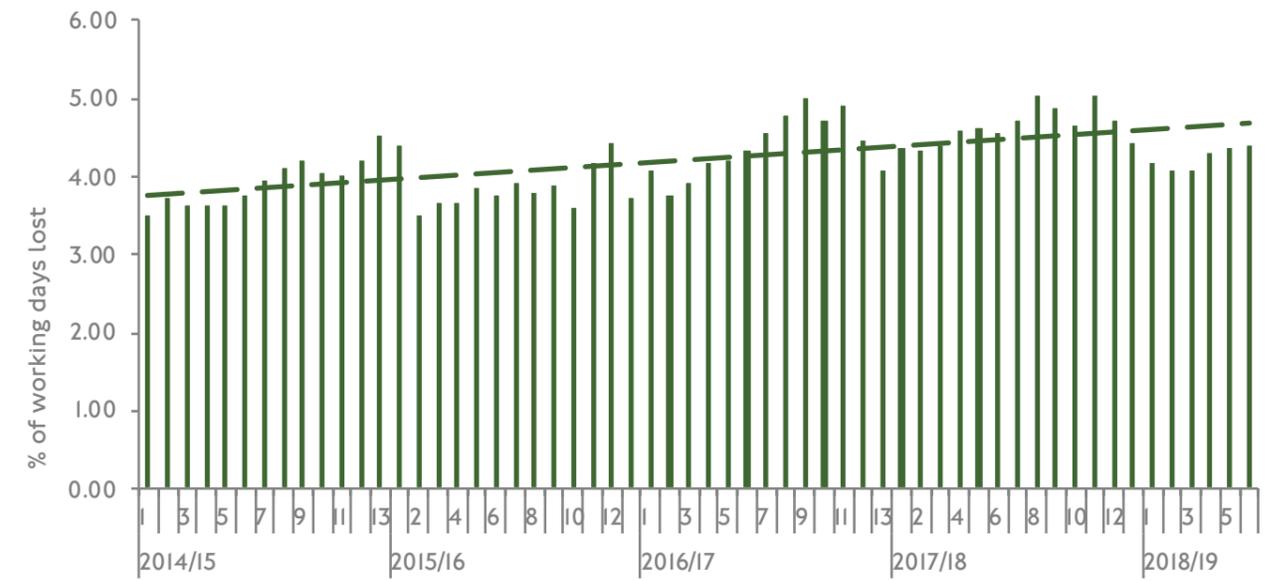
The total number of working days lost to sickness shows an increase (0.07 per cent) on the same quarter last year. The number of working days lost due to mental health rose 9.3 per cent compared with the same period of last year.

However, there was a reduction of 8.3 per cent in the number of working days lost to musculo-skeletal conditions, compared to the same period of last year.

We also observed increases in the proportion of working days lost to Accident /Assaults, Neurological issues and Heart Disease, compared to quarter 2 last year.

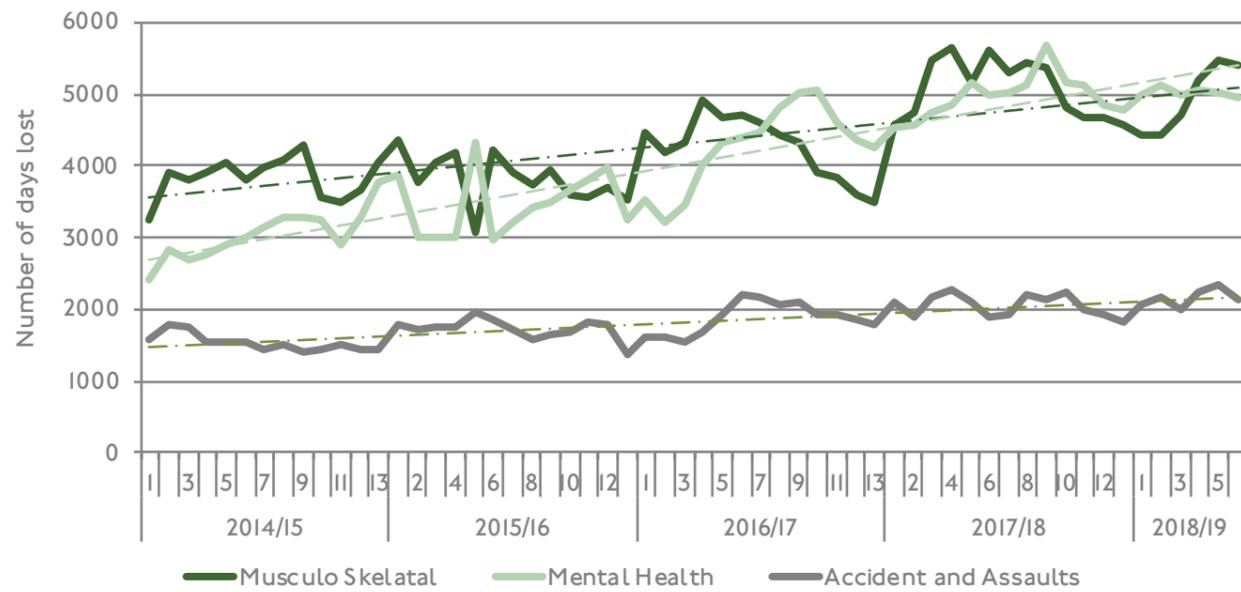


% Available working days lost - all sickness absence - long term trend 



We have observed a worsening trend in working days lost (when considered over 5 years), including when shown as a proportion of available working days.

Working days lost due to sickness causes for areas with specific work related risk controls - long term trend 



The long term trend for the number of working days lost to musculo-skeletal, mental health and accidents/assaults causes is increasing.



London's streets will be clean and green

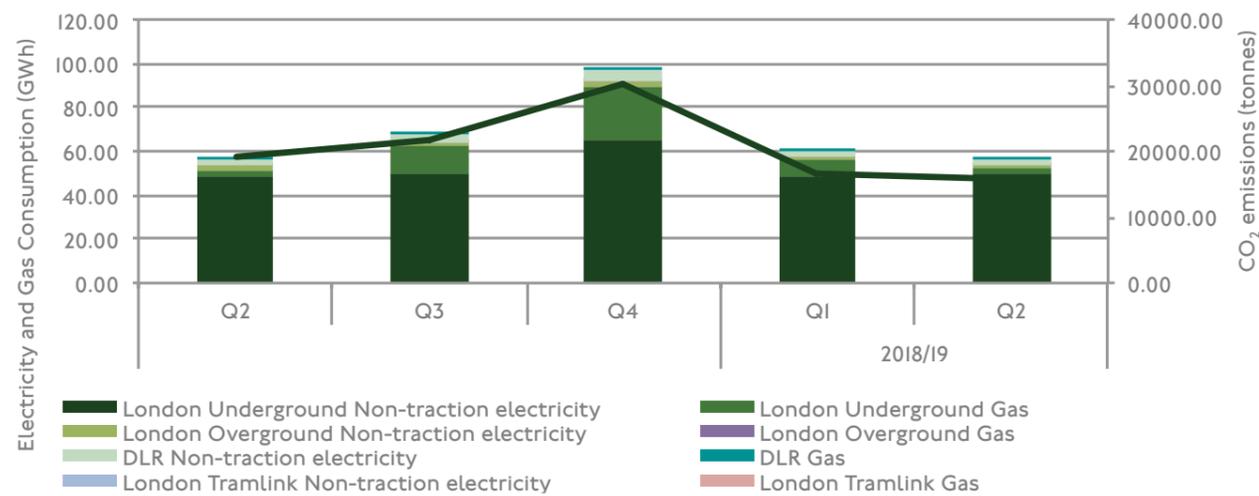


Energy Usage and Emissions

Overview

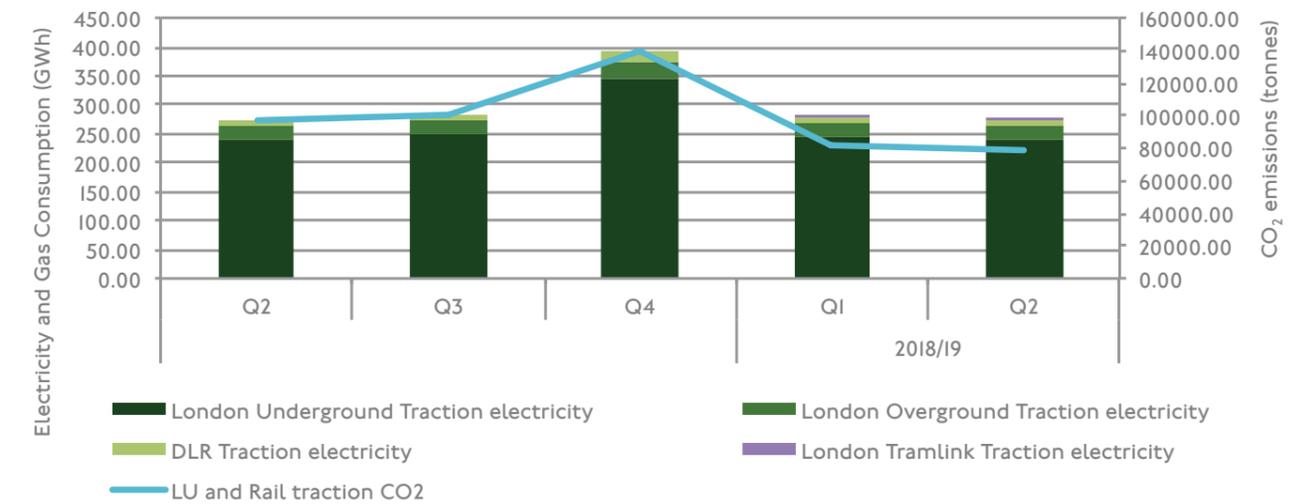
Performance	Improvement activities
<ul style="list-style-type: none"> ✗ Year to date traction electricity consumption up one per cent on last year ✓ Recommissioning of Combined Heat and Power plant at Palestra head office has delivered 13 per cent energy efficiency improvements and saved over £200K ✓ On track to meet target for 100 per cent Euro VI standard buses by 2020 ✓ On track for delivery of rapid charging points for electric vehicles. 	<ul style="list-style-type: none"> ✓ Support the implementation of the schools air quality audit recommendations. ✓ Completed the trials of the biodiversity base-lining tool; commended by Environment Agency ✓ Contract awarded for Ultra Low Emission Zone compliant Dial-a-Ride vehicles ✓ Launched on-street electric charging points procurement framework for boroughs.

Non-traction electricity and gas use rolling 5 quarters (GWh)



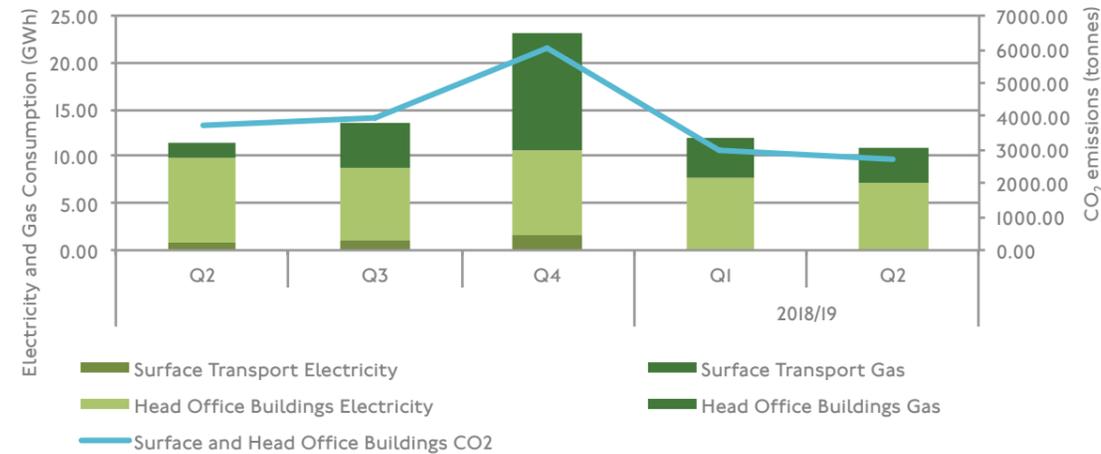
Our usage of non traction energy rose marginally by 0.8 per cent with a total of 53.5 GWh used during quarter 2. So far this year, we have used 107.1 GWh of non traction energy (up 0.1 per cent on the equivalent period of last year). LU is responsible for the majority of consumption and recorded a 1.8 per cent increase on quarter 2 last year, following increases in service levels, such as the introduction of the new Jubilee line timetable in May this year. Energy use reduced in London Overground and DLR. Total CO2 emissions from rail non-traction energy were 15,790 tonnes in quarter 2, an improvement of 18 per cent compared to quarter 2 last year, due to decreases in grid electricity emissions intensity.

Traction electricity use rolling 5 quarters (GWh)



Our usage of traction energy rose marginally by 0.9 per cent with a total of 275.5 GWh used during quarter 2. So far this year, we have used 558.9 GWh of traction energy (up 1 per cent on the equivalent period of 1). LU is responsible for the majority of consumption and recorded a static performance compared to the same period of last year. For London Overground, there was a 2.4 per cent increase and DLR recorded a reduced consumption by 3.7 per cent. Total CO2 emissions from rail traction energy were 78,862 tonnes in quarter 2, an improvement of 18 per cent compared to quarter 2 last year.

Surface transport and head office gas and electricity consumption (GWh)



Within our head office buildings, we used 3.53 GWh of gas, up from the 1.7 GWh used in the same quarter last year. For electricity, we saw a reduction of 18.9 per cent in usage. Although our gas usage increased, overall energy efficiency and carbon emissions have improved by 9 per cent this year to date. This is predominantly following the successful recommissioning of the gas Combined Cooling, Heat and Power plant at our Palestra head office in December 2017. This plant generates electricity by burning gas, resulting in an increase in gas consumption, as electricity consumption has decreased.

RE:FIT energy efficiency improvements

On-site works have now been completed under TfL's £2.6m programme of energy efficiency improvements using the Mayor's RE:FIT framework. Working with RE:FIT supplier E.ON Control Solutions, energy conservation measures were installed at nine of our buildings including head offices, bus garages and London Underground operational sites.

We have installed LED lighting throughout Trackside House lighting and a building management system at Walworth and Uxbridge bus garages. Our next phase of works under the RE:FIT framework will

include a programme of solar PV installations, working in partnership with Engie.

The recommissioning of the gas Combined Cooling, Heat and Power plant at our Palestra head office in December 2017 were our largest and most complex works, complemented by improvements to domestic hot water and cooling systems. Monitoring of improvements over the first nine months of operation shows an improvement in building energy efficiency of 13 per cent at Palestra and delivered utility cost savings over of £235k.

Environmental incidents in Q2

LU	Major Projects	Surface	Other	Total
48	7	0	0	55

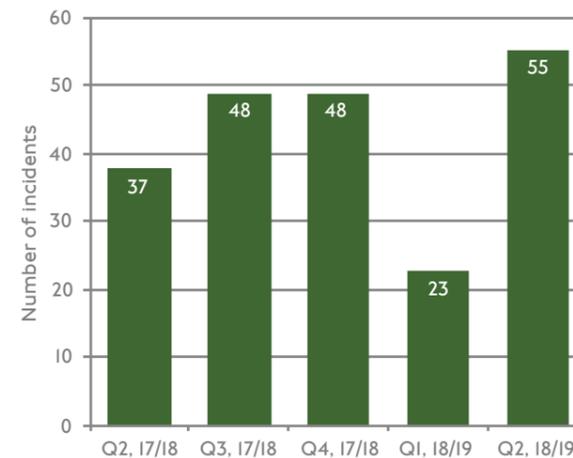
Top 4 causes of environmental incidents

Pollution	Waste & Resource	Noise & Vibration	Other
47%	33%	18%	2%

There has been a 49 per cent increase in environmental incidents in Q2 compared with the same quarter last year. The increase is being driven in particular by the trebling of the number of pollution incidents reported and a doubling of the number of waste & resource incidents in LU. This aligns with a period of training and awareness-raising on environmental matters.

The pollution incidents relate to small-scale spillages of potential pollutants eg. hydraulic fluid. The use of spill kits and rapid clean up of the spills prevents harmful substances entering the environment.

Environmental incidents



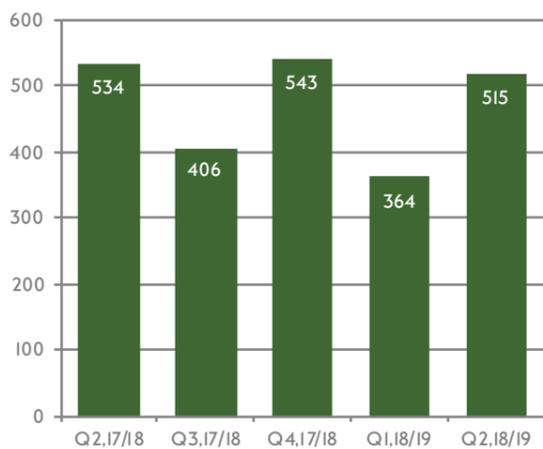
Environmental complaints

Streets	Buses	LU	Rail	MPD	Other	Total
41	125	269	76	1	3	515

Top 4 causes of environmental complaints

Operational noise	Smell/Cleanliness	Worrrks noise	Vegetation
31%	19%	19%	17%

Number of environmental complaints in last 5 quarters



A total of 515 environment related complaints were received during quarter 2, with the majority related to our public transport operations.

Operational noise continues to be the dominant cause of complaints (31 per cent), followed by smell/cleanliness (19 per cent), works noise (19 per cent) and vegetation. All complaints are investigated to ensure that our environmental management arrangements are being complied with in order to protect the environment and prevent nuisance to those living and working alongside our networks.

Environment-related complaints have fallen six per cent compared with the same quarter last year. This has been driven by a fall in complaints related to air pollution, operational noise, smell/cleanliness and vandalism/waste/ litter/graffiti associated with our bus operations. Improvements have also been seen in the number of complaints related to habitats and vegetation on the LU network; although there has been an increase in complaints relating to street vegetation. On our rail networks, complaints relating to operational noise and smell/cleanliness have increased. The LU network has seen a rise in complaints about works noise.

The Mayor's School Air Quality Audit Programme

The GLA, supported by TfL, have held meetings with representatives of 36 of the 50 audited schools; with the remaining 14 scheduled to take place by the end of the year. These meetings are an opportunity for school and borough representatives to establish implementation plans for each of the 50 participating primary schools as well as to discuss how they wish to spend the £10,000 funding made available to them. Going forward, we will support the 50 primary schools in taking forward the transport-related interventions recommended in the audits.

A cleaner fleet for TfL

Sixty per cent of our fleet now meets Euro VI emissions standards. There are now 5,650 Euro VI standard buses, compared with the baseline of 1,194 in 2016, with an average 8g/km saving. Given the average bus travels approximately 60,000 km per annum, the saving is 2,138 tonnes of NOx each year. This represents a 60 per cent reduction in NOx emissions since the Mayor came into office and we remain on track to meet the 100 per cent target by the end of 2020.

Over 75 per cent of the central London fleet is now Ultra Low Emission Zone (ULEZ) compliant and we have 106 zero emission buses in the fleet (96 pure electric and ten fuel cell). This number is set to grow later this year and we are accelerating this transition through the introduction of Low Emission Bus Zones beyond the proposed ULEZ.

On 19 July, we awarded the contract for the delivery of 90 ULEZ compliant Dial-a-Ride minibuses to Mellor Coachcraft ahead of

the introduction of the first stage of ULEZ in April 2019. In addition to being much cleaner, the new buses are expected to help reduce fuel consumption across the fleet.

Electric vehicle and charging infrastructure

To support the growing number of zero emission capable taxis and the take up of electric vehicles, we are building a network of rapid charge points across London. We have installed 122 to date, as part of our target of 150 rapid charge points by December 2018 and 300 by December 2020. 57 charging points are taxi dedicated, to support a fleet of over 400 Zero Emission Capable taxis licensed in London.

The Electric Vehicle (EV) Infrastructure Taskforce has been launched looking at where, what and how many charge points we need in London up to 2025. Two workshops have been held to discuss user requirements and to identify barriers to delivery. In addition to this, the Transport and Environment Committee (TEC) sub group is seeking to enhance the provision of rapid electric vehicle charge points across London through discussion and provision of advice to TEC. The sub group met in July and proposed each London Borough put forward 20 possible rapid charge point locations.

We have been working with London Councils, car club operators and boroughs to allocate Go Ultra Low Cities Scheme funding for the installation of car club and residential charge points. In August we launched a procurement framework for boroughs to install on-street charge points. Boroughs have so far shown a strong preference for lamp post charge

points, with approximately 80 per cent of initial orders placed favouring this type of charge point.

Net gain for biodiversity

Our trials of the TfL net gain biodiversity toolkit have progressed. This allows us to calculate the baseline biodiversity value prior to development and inform potential mitigation for biodiversity loss on a number of projects. This will allow us to understand the potential for rolling the toolkit out more widely across a range of small, medium and large projects going forward.

We have included the requirement for achieving net gain for biodiversity within contracts for Rotherhithe to Canary Wharf and Sutton Link Project. This commitment and action has been commended by the Environment Agency. We have also presented our goals and approach at the London Boroughs Biodiversity Forum (LBBF), and our work has been used by the Institute of Environmental Management & Assessment (IEMA) and Greenspace Information for Greater London (GiGL) as case studies for net gain biodiversity.

Plans for next quarter

During Q3 we will:

- Deliver three Low Emission Bus Zones.



Regulatory investigation and enforcement update

On 4 June 2016 a contractor working on track improvements was injured as a result of being crushed against a platform at Whitechapel Station by a road rail vehicle and suffered severe injuries. The Office of Rail and Road (ORR) issued criminal proceedings in the Magistrates' Court against London Underground and Balfour Beatty Rail Limited (BBRL) for breach of section 3(l) of the Health and Safety at Work etc. Act 1974. At the first appearance hearing on 17 May 2018 at Thames Magistrates' Court, LU and BBRL both pleaded guilty and a sentencing will take place on 29 November 2018, the outcome of the sentencing hearing will be provided in the next quarter's report. LU has been taking steps to prevent a reoccurrence of such an incident by reviewing its approach and the contractor's approach to manage safety during works. Safety performance has improved significantly over the past 12-18 months due to an increased focus on safe working environments.

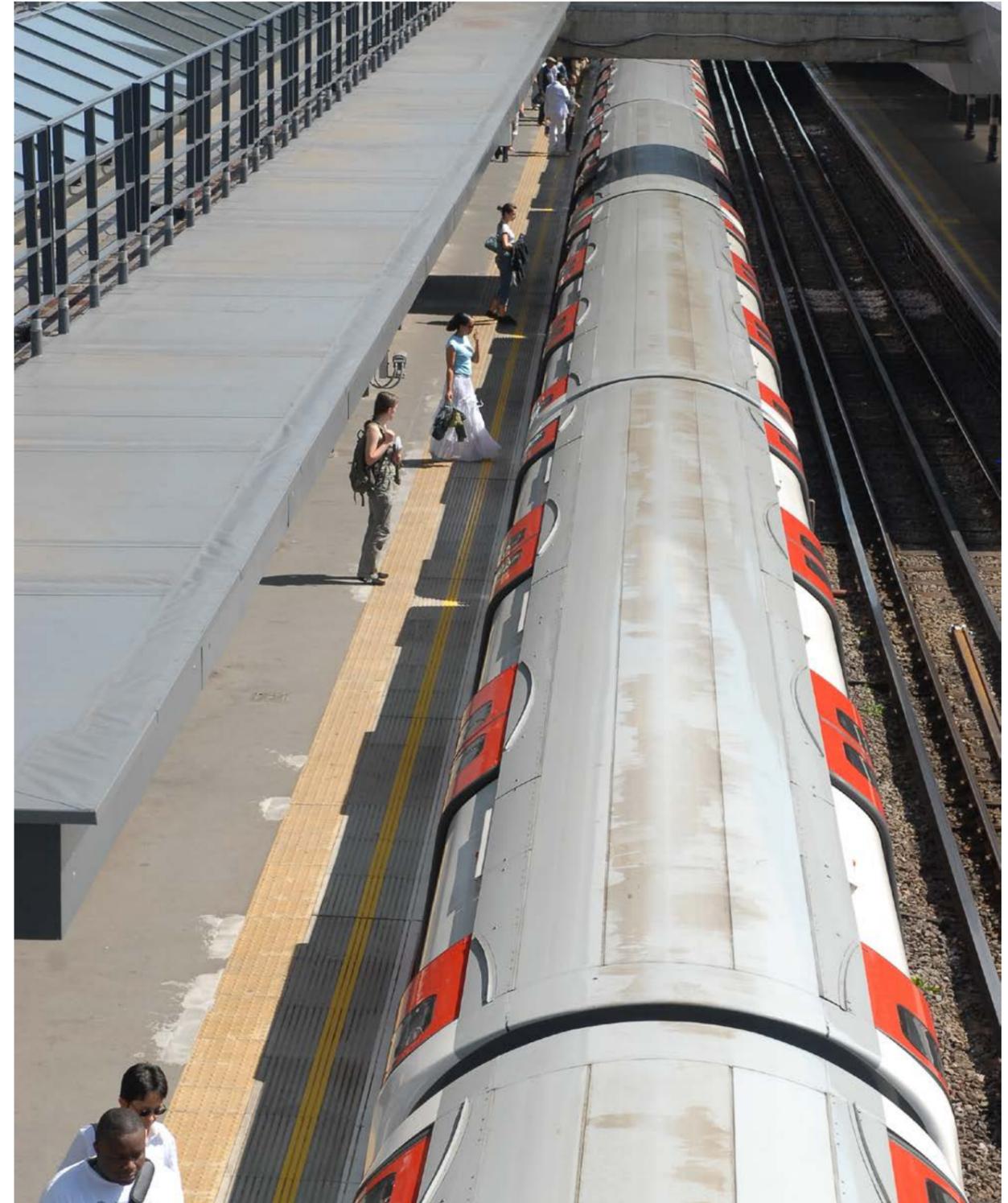
On 1 September, a Jubilee line train was operated between West Hampstead to Finchley Road with 11 doors open. The RAIB and ORR are investigating. We are carrying out a formal investigation which is considering failure modes of the train stock and human factor aspects relating to operation of the train. The report will be finalised early in November.

On 3 September 2018, the RAIB published their independent investigation into an incident at Notting Hill Gate station in January 2018 in which a 76 year old woman was caught in the doors of a Central line train and dragged under the train. In response to

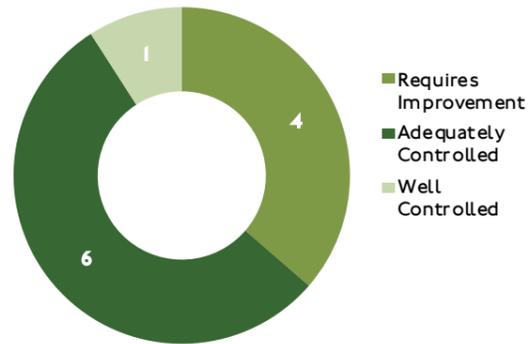
the RAIB's recommendations, the following action is underway:

- We have started research to understand how to improve train operators' awareness and help them maintain concentration.
- Our current rolling stock requirements which manage the risks relating to dragging are being reviewed to identify any further measures that can be taken.
- We are reviewing the techniques used by train operators to scan their cameras, including how we train them for this task.
- We are improving how we communicate risks at the PTI to customers

Surface Transport previously reported an incident on the A40 in November 2011, in which a motorcyclist was injured as a result of temporary bridging plates installed over defective expansion joints on the A40 Westway. The HSE investigation is still ongoing and no formal warnings or notices have been issued to date.



Audit conclusions



A total of 11 health, safety or environmental related audits were conducted in quarter 2. Of the audits completed, one concluded that risks were 'well controlled', six concluded risks were 'adequately controlled' and in four cases the audits concluded that the management of risk 'requires improvement':

1. The LU Stations Competence Management System (CMS): A number of key documents or elements of the CMS were not fully developed or maintained in accordance with regulatory guidance: The control and quality assurance of a number of CMS procedures was weak.

2. Cutting, drilling and fixing to existing LU Structures: Standards did not adequately account for managing non-compliance with, or change to design. Assurance had not been provided as the surveillance plan had not been implemented. Key roles and responsibilities had not been defined.
3. Piccadilly Line HSE Management: A wide range of HSE management system activities had been inadequately implemented.
4. Supplier audit: supplier of LU engineering parts. Despite advance

notice of the audit, the supplier was unable to provide evidence of compliance with its own quality management system.

Where any risk management is identified to be deficient of the required standard, a corrective action plan is implemented to ensure improvements are made.



Appendix I: Sandilands investigation recommendations applicable to TfL

Table I: Sandilands investigation recommendations applicable to TfL and its subsidiaries

Recommendation	Progress to date
UK tram operators, owners and infrastructure managers should conduct a systematic review of operational risks and control measures associated with the design, maintenance and operation of tramways.	<p>TfL and London Trams (LT) are represented on the UK Tram Industry Sandilands Sub Committee, established to consider the RAIB findings and take action on behalf of the UK tram industry.</p> <p>LT and Tram Operations Ltd (TOL) review of route risk assessments and the network risk model has been shared with the wider UK tram industry. The industry is reviewing all risk assessments within the industry to agree a standard approach. The LT/TOL risk assessments have been reviewed and revised in line with this approach. An industry risk model is under development via UK Tram and the Light Rail Safety and Standards Board.</p>
[RAIB recommendation 2. Links with RAIB Recommendation 1, 10, and TfL Recommendation 5]	TfL presented an overview and findings of Risk Model work to Rail Safety and Standards Board Risk Management Forum in June 2018.
UK tram operators, owners and infrastructure managers should work together to review, develop, and install suitable measures to automatically reduce tram speeds if they approach higher risk locations at speeds which could result in derailment or overturning.	<p>The tender process for the installation of a new safety system on the London Trams network that will automatically apply the brakes should the speed limit be exceeded at high risk locations, continues.</p> <p>The initial evaluation of suppliers is underway. The Invitation to Tender was issued 31 July and the contract is due to be awarded by the end of the year. The ambition is that the system will be installed and in operation by the end of 2019, including a period of training and familiarisation with tram drivers ahead of it becoming fully operational. TOL are an active stakeholder in this.</p> <p>The new system will automatically bring a moving tram to a controlled stop if it were to exceed the speed limit at a designated location. The system would also automatically alert the operations control centre.</p>
[RAIB recommendation 3. Links with TfL recommendation 2]	The system will initially be configured to priority locations as suggested by the RAIB but will have the flexibility to be introduced elsewhere on the tram network.
UK tram operators, owners and infrastructure managers should work together to research and evaluate systems capable of reliably detecting driver attention state and initiating appropriate automatic responses if a low level of alertness is identified.	<p>Complete: Working closely with TOL, LT has procured and commissioned the 'Seeing Machine Guardian' driver protection system fleet wide. This system uses proven facial movement technology to monitor driver fatigue and distraction. The system was fully installed across the LT fleet in October 2017.</p> <p>An additional feature of the Guardian system is that it is programmed to alert drivers if the maximum speed goes above 70kph.</p> <p>TOL were closely involved in the selection and implementation of this system and played the major role in securing driver support.</p>
[RAIB recommendation 4]	LT and TOL have already hosted several delegations, including UKTram and others, to demonstrate the technology in operation.

Recommendation	Progress to date
UK tram operators, owners and infrastructure managers, in consultation with the DfT, should work together to review signage, lighting and other visual information cues available on segregated and off-track areas required by drivers on the approach to high risk locations.	<p>LT under took a comprehensive review of tram speeds and speed signage across its network.</p> <p>As a result the following measures were put in place by September 2017. TOL are an active and engaged stakeholder on this initiative:</p> <ol style="list-style-type: none"> 1. The maximum tram speed on the network was reduced by 10kph, from 80kph to 70kph. The effect is that the potential for coasting in high speed areas has been removed, and that continual speed management is required in these low workload areas so increasing driver alertness. 2. Additional step down speed signage was implemented in all locations where speeds reduced by more than 20kph, enhancing driver visual cueing and orientation. 3. Where speed signs are located immediately in advance of higher risk locations, e.g. a tram stop or a curve with low approach visibility, the sign has been enhanced with the addition a high visibility outer border as an additional visual cue to drivers of an approaching hazard. <p>iTram</p> <p>Prior to the implementation of an automatic braking system, LT will implement iTram to provide audible in-cab over speed alerts. iTram is a performance monitoring tool that as well as driving safety improvements by trend analysis of tram speeds, also utilises GPS technology to provide over speed warnings to drivers at all points across the network. It is therefore an enhancement on the Guardian system which can only alert drivers if they exceed the maximum speed limit.</p> <p>The software release design continues and installation resource has been established. A Human Factors specialist has reviewed tram drivers' task load. The first fit trial iTram equipment installation has taken place on trams, with engagement ongoing with original equipment manufacturers to engage them to act as Design Authority.</p> <p>Review of Visual Cueing</p> <p>LT and TOL have completed a comprehensive Route Hazard Analysis. The conclusion is that the already completed installation of additional speed signage work improves driver visual cueing on the network. Conceptual designs for enhanced visual cueing in Sandilands tunnel are under TOL driver consultation.</p> <p>Tunnel Lighting</p> <p>Post the Sandilands incident we installed additional temporary lighting on the approach to the Sandilands tunnel.</p> <p>An updated specification and outline design has been issued by TfL highway engineers to implement a comprehensive improvement to the existing Sandilands tunnel lighting. The new design will adopt best practice from the automotive industry to reduce the impact of glare on driver's eyes both when entering and exiting the tunnel. Work is expected to be complete on the improved tunnel lighting in early 2019.</p> <p>We are also trialling illuminated warning signs, similar to those used on roads to warn drivers their speed is above the limit. The effectiveness of these signs will be evaluated in summer 2018 and the feedback will be shared with the UK tram industry.</p>
[RAIB recommendation 5. Links to TfL Recommendation 1]	

Recommendation	Progress to date
UK tram operators and owners should, in consultation with appropriate tram manufacturers and other European tramways, review existing research and, if necessary, undertake further research to identify means of improving the passenger containment provided by tram windows and doors. [RAIB recommendation 6. Links to TfL Recommendation 8]	<p>LT has commissioned the manufacture and testing of several prototype windows that may provide an appropriate level of additional containment. These prototypes have been assessed against the conditions likely to have been encountered during the Sandilands incident, and take into account any affect they may have on ease of access for the emergency services.</p> <p>LT have decided that mainline rail crash worthiness standard GM/RT2100 is more likely to offer protection against the conditions experienced during the Sandilands event. Strengthening film on top of the existing tempered glass has been selected as the immediate solution to strengthen glazing on trams.</p> <p>LT is investigating the practicalities of modifying tram doors and we will consider the recommendations made by the RAIB when designing new vehicles in the future.</p>
UK tram operators and owners should install (or modify existing) emergency lighting so that the lighting cannot be unintentionally switched off or disconnected during an emergency. [RAIB recommendation 7]	<p>In conjunction with industry experts, LT have formulated a Technical Specification for the retrofitting emergency lighting to its fleet. The system will be fully autonomous, and will operate independently of the trams battery system in the event of an emergency.</p> <p>Additionally, LT are aware of the conditions resulting in the failure of its existing standby lighting system during the Sandilands incident, and are also investigating how the existing system may be modified in order to achieve the desired emergency lighting outcomes in a simpler and more cost effective manner.</p> <p>TOL are an active and engaged stakeholder on this initiative.</p>
UK tram operators and owners should review options for enabling the rapid evacuation of a tram which is lying on its side after an accident. [RAIB recommendation 8]	<p>We will work with tram operators and tram manufacturers to identify and evaluate options to achieve this objective.</p>
TOL and LT should commission an independent review of its process for assessing risk associated with the operation of trams. [RAIB recommendation 10. Links with RAIB recommendation 2]	<p>The network risk model and route risk assessments have been reviewed and updated. They have been shared with the wider UK tram industry and TfL also presented an overview and findings of Risk Model work to Rail Safety and Standards Board Risk Management Forum in June 2018. Work has also been completed on our tram crossing risk assessments for Croydon town centre.</p> <p>A joint management process for the embedment of the models has been developed.</p> <p>The industry is reviewing all risk assessments within the industry to agree a standard approach. The LT/TOL risk assessments will be further reviewed and revised in line with this approach.</p>

Recommendation	Progress to date
TOL should review and, where necessary, improve the management of fatigue risk affecting its tram drivers with reference to the ORR's good practice guidance. [RAIB recommendation 11]	<p>TOL are implementing a safety improvement plan designed to address the intent of this recommendation through their own internal safety governance arrangements. An action plan is being developed for our next phase of action.</p>
TOL should commission an external organisation to review, the way that it learns from operational experience. [RAIB recommendation 12]	<p>TOL have implemented a "Just Culture" Programme designed to address the intent of this recommendation through their own internal safety governance arrangements.</p>
TOL and LT should review and improve the process for managing public and employee comments that indicate a possible safety risk. [RAIB recommendation 13]	<p>Complete: We have reviewed our customer complaints procedure and implemented improvements to ensure that any safety issue raised by a customer is dealt with efficiently and thoroughly across the TfL network.</p>
TOL and LT should review and improve their processes for inspecting and maintaining on-tram CCTV equipment to greatly reduce the likelihood of recorded images being unavailable for accident and incident investigation. This recommendation may apply to other UK tram operators. [RAIB recommendation 14]	<p>All LT Bombardier fleet has been fitted with new CCTV image recorders. CCTV health checkers which actively monitor the status of recording units and identify faults.</p> <p>A review is underway to establish whether similar remote monitoring capabilities can be introduced on the Stadler vehicles as is now used on the Bombardier vehicles. The review will be completed by September 2018.</p>
TOL and LT should review and revise where required existing tram maintenance and testing documentation to take account of experienced gained, and modifications made, since the trams were brought into operational service. [RAIB recommendation 15]	<p>LT has undertaken a comprehensive review of its written standards, maintenance processes and identified quality deficiencies. LT has appointed an independent entity to author new written standards, maintenance processes and forms addressing all quality gaps. This process will be in two phases, with sixteen critically prioritised standards and associated documents being delivered in the first phase. 4 standards have been issued for review.</p>
Review available driver cues in relation to braking points on approaching a curved section of the tramway. [TfL recommendation 1. Links to RAIB recommendation 5]	<p>Overall network top speed has been reduced from 80kph to 70kph. Additional 70kph signs have been provided to aid driver awareness of the permitted maximum speed.</p> <p>A design and signal sighting exercise has been concluded and the provision of additional step down speed signage to aid driver speed awareness and visual cueing is complete.</p> <p>Additional visibility signs have also been provided, which will heighten driver speed awareness in high risk areas.</p>

Recommendation	Progress to date
<p>Review of arrangements for the monitoring and management of speeding.</p> <p>[TfL recommendation 2. Links to RAIB recommendation 3]</p>	<p>LT has commissioned the installation and commissioning of the 'iTram' system, which will provide driver over-speed alerts network wide. iTram will also provide oncoming hazard awareness to drivers of high risk areas.</p>
<p>Review of traction brake controller (TBC) driver's safety device design.</p> <p>[TfL recommendation 3]</p>	<p>LT has procured and commissioned the 'Seeing Machine Guardian' driver protection system fleet wide. This system provides proven driver fatigue and distraction management via facial recognition technology.</p>

