



# Environmental Report 2003

In keeping with our commitment to the environment, this report has been published principally in electronic form and can be found on our website, [www.tube.tfl.gov.uk](http://www.tube.tfl.gov.uk) . Paper copies and large print versions can be obtained upon request.

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# Environmental Data

<b>London Underground Data</b>	<b>2002/2003</b>	<b>2001/2002</b>	<b>2000/2001</b>	<b>1999/2000</b>	<b>1998/1999</b>
Passenger journeys (millions)	942	953	970	927	866
Passenger kilometres (millions)	7367	7338	7470	7171	6716
Train kilometres (millions)	65.4	65.4	63.8	63.0	61.2
Total length of track (km)	408	408	408	408	392

## Resource Use

Total electricity supplied (gigawatt hours)	1091	1017	1006	1101(a)	1021
Energy efficiency (watt hours/passenger km)	148	139	135	154	152
Water used (litres, millions)	638	670	899	661(b)	480(b)

## Waste generated (tonnes)

General	5866	5732	5592	5116	4228
Track (ballast, sleepers etc)	7486	6236	3345	5075	10804
Skip/compacted	2026	2208	2023	2261	3013
Special (solid)	91 (e)	(d)	(d)	2000(c)	2376
Special (liquid)	166,795 (litres)	n/a	n/a	n/a	n/a

(a) Includes electricity used for testing on the extended Jubilee line prior to opening

(b) Not including power station water consumption.

(c) This is an estimate – special waste was only monitored in volume rather than actual weight.

(d) Special waste transported as part of multi-load consignments

(e) Excludes special waste transported as part of multi-load consignments

**NB: Waste weights reduced in 1999/00 due to improvements in data recording and increased accuracy in recording track waste, using weigh-bridge tickets rather than vehicle capacity.**

# Message from the Managing Director

I am pleased to introduce the seventh annual report on the Tube's environmental performance. Our commitment to work towards improving our environmental performance remains as strong as ever. The managers and staff of London Underground are enthusiastic about their responsibility to "think global and act local".

This report once again comes at a time of considerable change for our company. All three contracts with private sector infrastructure companies (Infracos) that form the Public Private Partnership (PPP) have been signed within the last year. Tube Lines, Metronet Rail SSL and Metronet Rail BCV are now beginning to invest heavily in the Underground. We will be entering a phase of major renewals, maintenance and infrastructure works on our network, through contracts that will last for the next 30 years. In July 2003 we became become part of Transport for London (TfL) and in doing so have joined the Greater London Authority (GLA) 'family'.

These organisational changes have enormous potential for the improved efficiency and effectiveness of our network for Tube users, and this will have considerable environmental benefits for London as a whole. They will also provide plenty of opportunities for us to build on past good practice, whilst working to further improve our future environmental performance.

This report reflects the work that London Underground Limited (LUL), the Infracos, and other suppliers working on our network have been involved in during 2002/2003 to work towards continuous environmental improvement. It sets out the key environmental impacts of our activities, how we seek to manage these, and it also shows how we are seeking to improve over time.

London requires a world class infrastructure, and a transport system which maximises the city's economic efficiency and the quality of life of its citizens, if it is to sustain the crucial role it plays in both UK and Europe. All aspects of our business will need to be world class if we are to achieve this vision, and this clearly includes our environmental performance.

The Mayor of London, the GLA, TfL and the public are looking to us to help provide answers to the capital's congestion and associated environmental problems. We must continue to maintain and improve our service standards and reliability, whilst providing our services in an efficient and environmentally sustainable way.

Our environmental performance is likely to come under closer scrutiny in future years, and we will be working to ensure that it remains a central consideration in all our activities. I hope that you will find this report both informative and interesting.



**Tim O'Toole**  
**Managing Director – London Underground Ltd**

*Paper and large print copies of this report are available, but it is published principally in electronic form on our web site [www.tube.tfl.gov.uk](http://www.tube.tfl.gov.uk).*

# Environment and Energy Policy

London Underground will continually improve its contribution to improving the quality of the urban environment by promoting use of the Underground and by managing its impact on the environment in ways that are economically and socially justified, within the resources available.

We care about good environmental performance and, as a public transport operator we make a significant contribution to improving the quality of the urban environment. We will continually improve this contribution by promoting use of the Underground and by managing our impact on the environment in ways that are economically and socially justifiable, within the resources available to us.

We are committed to achieve this by:

- complying with all applicable environmental and energy legislation
- seeking to identify and manage our environmental impacts
- applying industry best practice to improve our environmental performance and reduce our negative impacts
- consideration of energy efficiency, whole life costs and the principles of sustainability to be included in the planning, design, operation and decommissioning of all our services and operations
- assessing environmental impacts prior to making major investment decisions
- setting clear targets for the purchase of renewable energy and the levels of energy use
- using environmentally responsible procurement and disposal arrangements for the goods and services we buy and consume
- monitoring, protecting and enhancing wildlife habitats
- developing relationships with our partners and stakeholders, informing them of our environmental and energy management performance, and seeking their help in achieving our objectives where appropriate
- acting sensitively to the needs and concerns of neighbouring communities
- setting clear objectives and targets, and developing management systems, which prevent pollution and promote continuous improvement in environmental performance
- ensuring that instruction, guidance, and training are in place to raise staff awareness and to enable all our staff to contribute towards caring for the environment
- playing a key role in the delivery of the Greater London Authority's environmental strategies, and applying the Mayor's energy and waste hierarchies to our operations
- regularly monitoring, auditing and reviewing the effectiveness of our environmental management regime and this policy; and undertaking improvement actions where necessary
- reporting on our performance on an annual basis.

**LUL Board, June 2003**



# Contributing to a better environment

Travelling by Underground has environmental advantages over private cars. These include:

- reduced road congestion
- greater carbon efficiency: Underground trains produce less carbon dioxide per passenger kilometre than private cars
- reducing/preventing local vehicle emissions, and
- more efficient resource use: private vehicles require more fuel and other resources per passenger kilometre than Underground trains.



There are significant environmental and sustainability benefits in encouraging the use of public transport rather than cars in London. It is clear that in running the Underground that LUL has a major role to play in improving the quality of life in London. LUL managers are committed to working with our partners and continue to work with the Infracos, TfL, the GLA, local authorities, our staff, residents, workers and visitors to improve integration, accessibility, efficiency and effectiveness.



To reflect our changing organisation, last year we restated our vision and mission.

Our vision is: 'A world class Tube for a world class city'.

Our mission is: 'We will open London's rich potential for all by delivering a dynamic public service that puts customers first.'

Along with our policies, standards and working practices, we are increasingly guided by the principles of sustainable development. Reducing our negative environmental impacts and improving our positive contribution to environmental improvement will be fundamental to achieving our vision.

## Our environmental responsibilities and impacts

London Underground carries approximately 3 million passengers around London every day. Our network serves 273 stations and runs over 408 kilometres (km) of track. 45% of this track is underground with the remaining 55% being overground and boasting over 200km of trackside habitat.



From central London, our trains run 29km to Epping in the north, 29km to Upminster in the East, 16km to Morden in the South and 43km to Amersham in the west.

Trains begin running soon after 5am and finish between midnight and 1am. We have over 4,100 'cars' in the fleet with approximately 500 trains being in service during the morning and evening rush hours.

The size and scope of our operations is considerable. We have a large buildings portfolio with around 20 head office buildings and a number of smaller offices. There are 20 main depots servicing the Underground lines and a number of smaller workshops. We also let out over 2000 commercial units both in stations and under railway arches. In addition to this, we have 61 car parks at stations, and have a few remaining sports grounds.

Housed in our buildings and stations and working on our infrastructure, are approximately 13,500 LUL staff and the some 6,000 staff employed by the infrastructure companies: Tube Lines, Metronet Rail SSL and Metronet Rail BCV.

The positive environmental impact that the Tube has in transporting people around London on a daily basis cannot be underestimated. The additional pollution and congestion caused should all these passengers seek to use private vehicles would be considerable. However, the operation of our services, and the maintenance and renewals that are an essential part of running a railway does have negative environmental impacts

Our key environmental impacts derive from:

- energy consumption (including emissions from electricity generation)
- waste management
- water management
- noise and vibration
- air quality - heat and dust
- track-side habitat management and
- engineering works management.

The challenge of managing and improving our performance in respect to these environmental impacts is considerable given the size and scope of our organisation. This challenge is amplified when put into the context of other competing business priorities which include providing a safe, reliable, integrated and efficient service to our customers.

## LUL's Environmental Management Structure

### **Business Planning**

Each year LUL produces a Service Plan. This is the cornerstone of our business planning process. The actions in our 2002/2003 Service Plan were organised into five sections, one of which was '*Environmental Management: our commitment towards a green environment*'. The Service Plan provides a direct feed into our business unit action plans. These lead to the implementation of service improvements through the allocation of responsibility to teams and individual staff. There are numerous staff involved in environmental improvement across a number of business units. These include Contracts, Procurement, Energy Contracts Management Team, Facilities, Chief Engineers, Customer Services and Safety, Quality and Environment.

The London Underground Board Health, Safety and Environment Committee (HSEC) has overall accountability for our environmental performance. The Managing Directors of the Infracos are members of this committee, which ensures that they are aware of our proposals in respect to environmental management matters. They are also able to comment, and ultimately agree, on any actions that impact upon them.

In recent months the HSEC agreed reports and subsequent actions on a number of environmental issues. These included our future environmental reporting and how to integrate this with the Infracos and TfL, our energy strategy, and the proposed revision of our environment policy.

### **Infrastructure Maintenance**



**Tube Lines**

To deliver an outstanding Tube for London



Tube Lines, Metronet Rail SSL and Metronet Rail BCV are now responsible for the maintenance and renewal of the Underground infrastructure. This includes the management of our heritage, habitat and depots; and for track replacement and station upgrades.

The Infracos are committed through their contracts to achieving certification to ISO 14001:1996. This is the internationally recognised standard for environmental management. This contractual obligation must be fulfilled within 3 years from the date that the contracts started.

The Infracos are now responsible for improving environmental performance in a number of key areas, and we shall be working in partnership with them to ensure that this is achieved. The Infracos have been developing their own environmental management structure during the 3 year period of 'shadow running', and they report regularly to us on how they are progressing.

### ***Environmental Management Systems***

LUL's operations are subject to a Health, Safety and Environmental Management System (HSEMS). Our environment policy is the foundation of the environmental element of this system. HSEMS has undergone considerable development since its introduction in 1996 and during the past 12 months has been undergoing a radical overhaul. The new system is based on the model of continuous improvement and is closely aligned to the requirements of ISO14001, and the occupational health and safety management standard OHSAS 18001. The revised HSEMS was implemented in July 2003. The three Infracos must comply with the requirements of our HSEMS system, and must write their own procedures or standards to ensure that these are met.

LUL and the Infracos use a Quality, Environment, Safety and Health standard (QUENSH) as a contract management tool for managing contractors on and around our premises and network. This contains requirements for the assessment of environmental impacts; for the production of a plan indicating how these impacts will be managed; and clear guidelines on specific requirements regarding environmental issues. The QUENSH standard has been under review and is due to be published in winter 2003. The Infracos carry out audits of contractors and suppliers environmental performance against the requirements of QUENSH. In addition to this, more regular on-site inspections, or planned general inspections, are carried out by Infracos to ensure that the requirements of QUENSH are being met.

LUL carries out audits of our own trains and stations operations. The system for auditing was revised last year and now includes environment as part of the overall scoring system. During 2002/2003 a total of 41 audits were carried out on our stations using the 'old' style of audit and 17 audits using the new approach (which is carried out on a station group basis) were completed. We carried out 8 audits of our train operations using the new audit style, which again includes environment. Our Chief Engineers Department also conducts audits of our Infraco partners. All these audits help managers to identify, control and reduce negative environmental impacts and provide important trend information.

### ***Continuous Improvement***

LUL and the Infracos are committed to continuous improvement in all activity areas that have a significant impact on the environment. We are seeking to actively manage any adverse effects to improve today's environment and the prospects for future generations. We are also committed to improving our services to maintain the positive environmental impact that they have, and during the last 12 months, LUL and Infracos have worked hard to enhance the reliability and quality of our services.



In line with the commitments we state in our environmental policy, we will, wherever possible:

- Use our policies, standards and services to promote sustainable development
- Support central government policy by responding to targets and programmes on climate change
- Promote the use of the Underground and support the promotion of other forms of public transport
- Encourage the use of environmentally and socially responsible goods and services consistent with good performance, and encourage all our contractors and suppliers to do the same
- Aim to prevent or limit environmental accidents and to have measures in place to minimise the effects if they do happen.

At present we are not able to report fully on some of our significant environmental impacts. Over the next 3 years we plan to improve the information we have. We will do this in conjunction with the Infracos, so we can work jointly towards managing our impacts more carefully and improving our performance.

LUL also seeks to contribute to developing policies and technologies, and to work in partnership with others to improve the performance of the rail industry in general. As such we remain active in a number of different groups and forums including the Railway Forum Environment and Noise groups; and the Community of Metros (CoMET) programme of international benchmarking where best practice is shared.

### **Target summary - what we have achieved:**

A number of initiatives have been taken to encourage the greater use of the Tube over the last year, these included:

- Introduction of Oyster cards for staff in readiness for customer launch in 2003/2004.
- Increasing the number of Queue Buster machines for credit/debit card use from 55 to 85
- Updating our website to increase its ease of use
- Capping fares last year
- Producing information leaflets to encourage Tube use to access London's theatres and markets
- Introduced new timetables to increase reliability and efficiency on the Bakerloo, Northern, Victoria, East London and Piccadilly lines.



We have worked to improve our own environmental management systems and this year have:

- Reviewed and enhanced HSEMS standards
- Undertaken environmental training for key staff in Infracos and LUL
- Held 4 meetings of the Environmental Forum Working Group which facilitates environmental management between LUL and the Infracos
- Fully integrated environmental considerations into LUL's internal operational audit processes.

We have worked in partnership to improve our contribution to environmental improvement including:

- Contribution to the GLA's final air quality strategy and to the draft Noise, Energy and Waste strategies
- Continuing to work towards actions attributable to us in the Mayor's strategies including transport and biodiversity strategies
- Provision of information for benchmarking against CoMET members in respect to environmental management
- Working with the Railway Forum in the preparation of a Railway Industry Sustainable Development Statement
- Participation in TfL and GLA environmental liaison group meetings.

### **What we plan to do:**

- Introduce full 'on-system' Oyster cards for the travelling public during 2003/2004
- Implement congestion Relief Schemes at Brixton, Elephant and Castle, and Hounslow East 2003/2004
- Increase the number of Queue Buster machines from 85 to 94 by April 2004
- Adjust timetables to improve reliability, increase peak services on lines including Bakerloo, Piccadilly, Jubilee and Victoria lines
- Run a New Year service
- Work with the Railway Forum to further develop the rail industries Sustainable Development Strategy
- Complete review and rewrite of QUENSH
- Carry out a fundamental review to identify our 'internal' environmental impacts and risks
- Agree with Infracos the scope of their environmental review
- Work with TfL on LUL's inclusion in their Environmental Action Plan

# Managing our Environmental Impacts

In this section we look at our key environmental impacts in more detail. We highlight progress that we have made in the last year and outline our future plans. Although climate change is a consequence of our actions rather than an environmental impact, a section has been devoted to this subject due to the potential consequences for our business and to reflect the increasing amount of work being undertaken in this area.

## Energy

### Target summary – what we have achieved:

- Completed a strategic review of our energy procurement and demand management processes
- Reduced energy consumption in stations by 17% against a baseline figure
- Specified regenerative braking on all new rolling stock
- Introduced 2,590 flat screen monitors into the business to replace the less energy efficient old style monitors
- Started to introduce computers into stations
- Purchased 12% of our total electricity requirements from renewable energy, compared with 9% in 2001/2002
- Made energy efficient improvements to lighting in depots during refurbishments
- Victoria line 'Ethernet' (see page 10) installed to monitor energy usage
- Used Greenwich power station to reduce our impact on the UK's electricity transmission system and losses

### What we plan to do:

- 'Energy efficient station' – consideration of measures such as the use of solar panels on stations to improve our energy efficiency in 2004/2005
- Increase our stations energy savings target to 17.5% against a baseline figure
- Implement recommendations from strategic energy review
- Maximise % of energy procured from renewable sources when awarding energy contracts, to work towards all offices, stations and depots, being powered from 100% renewables
- Set a target of 17% for total renewable energy purchased
- Include all TfL electricity supplies within LUL's renewable energy contracts

LUL is a significant consumer of energy. This is primarily in the form of electricity, but we do also buy a reasonable quantity of gas. We consume about 3.5% of London's total electricity use. Approximately 90% of this is used to power the trains, the remainder is used for heating, lighting and other electrical equipment.

In October 2002 Lots Road power station finally closed after 97 years of electricity generation to power the Underground. Since this time the national grid has supplied all our electricity. In the event of a national grid failure, Lots Road's smaller sister station at Greenwich, equipped with quick start gas turbines, could be used for emergency power. It may also be used to reduce our demand on the local and national electricity systems. In closing Lots Road, we have greatly reduced the level of greenhouse gases for which LUL was accountable.



Seeboard Power Link have been employed through a private finance initiative (PFI) contract to manage, maintain, develop and finance our power supply system. In partnership with Seeboard Power Link, we are in the early stages of looking to develop either a small renewable energy source in London or to develop a long-term relationship with a suitable renewable energy generator.



During 2002/2003 approximately 12% of the electricity that we purchased was produced from renewable sources, an increase of 3% from 2001/2002. Currently, energy produced from renewable sources is used for 44% of our two smaller energy contracts. As a result, our larger office buildings including both our head offices, TfL's head office and larger stations are currently powered by energy produced from renewable sources.

Looking ahead, we are committed to increasing this percentage when we let the contract for our smaller sites and offices.

In April 2002, LUL began a prototype project on the Victoria line to connect all of our station's electricity and meters to our 'Ethernet'. This will allow the remote collection of data on energy consumption and demand. This is to be extended across our network, and once completed (expected 2007), this will greatly enhance our ability to understand and therefore to control how we use our energy, so leading to further savings in cost and carbon dioxide emissions.

Over 40% of our train fleet uses regenerative braking. This braking design is now specified on all new rolling stock. Regenerative braking recovers energy as the train brakes are applied, this is then used to power other trains. In using this system, the electricity required to power trains is reduced by 20 - 25%.

LUL are in discussion with our Infracos and PFI partners on future asset replacements, and how we can ensure the most energy efficient equipment is installed, to ensure long term efficiencies are achieved. These discussions also include ensuring that our partners have due regard to their operations with respect to LUL's energy consumption, and to minimise this impact wherever possible.

LUL station staff are encouraged to improve energy efficiency through a Stations Energy Savings Competition. This 'Energy Challenge' aims to reduce energy consumption by adding a competitive edge between stations, groups and lines. Reductions are achieved through good energy housekeeping, such as making sure lights are switched off when not required and turning off escalators outside peak hours. The competition has proved a real success and last year achieved a saving of 17% against a target baseline. This exceeded the target that we set ourselves of 15% and is 4% more than the previous year's achievement of 13%. We aim to build on this success and have set a target of 17.5% for next year.

LUL has continued to improve energy efficiency in office buildings. We have approximately 4,800 personal computers and this year, 2,590 were replaced with LCD flat screen monitors. These are 20% more energy efficient than traditional screens. All offices undergoing refurbishment have existing lights replaced with high efficiency lighting which is installed as standard: these have controls that respond to occupation and dim with daylight. In addition, all refurbishments are specified to achieve independent BREEAM (Building Research Establishments Environmental Assessment Method) ratings of excellent. There is rigorous control over refrigerants used and an active avoidance of HCFC's (hydrochlorofluorocarbons). Where gas is used to heat offices, regular checks are made and strict standards are in place to control boiler efficiency and minimise emissions.

We are continuing to work to improve the information and data on energy use and efficiency for LUL and Infracos to ensure that we are able to identify areas for future improvement.

# Climate Change

## Target summary – what we have achieved:

- Taken action to reduce LUL's contribution to climate change, please see energy and air quality sections
- Maintained our processes for risk mitigation in respects to climate change

## What we plan to do:

- Work with GLA Climate Change Partnership
- Work with Newcastle University on a study into the effects of climate change on embankments
- Re-evaluate our risk register
- Work with researchers at London's South Bank University on studies into cooling the Underground
- Consider how to solve the problem of heat on our system, through the services of a range of leading consultants and experts, within relevant fields
- Continue to plant trees on and about our network: these absorb carbon dioxide, one of the principal greenhouse gases
- Work proactively to purchase increased levels of renewable energy for LUL and TfL
- Strive to reduce our energy consumption levels where possible

Our climate is changing: some of these changes are due to natural phenomena such as variations in solar radiation and volcanic activity, others are due to man's activities which emit greenhouse gases. London's future climate may be quite different from the climate that we currently experience in the city.



It is predicted that summers may become hotter with higher summer temperatures becoming more frequent. Daily maximum temperatures of 33°C, which currently occur about one day per summer in the southeast, could occur every 10 days per summer by the 2080's. Summers may also become drier by 20 – 40% in the 2050's.

It is possible that winters will be warmer and very cold winters will become increasingly rare. They may become wetter by between 10 – 20% by the 2050's and heavy winter rainfall could occur twice as frequently by the 2080's.

Two examples of extreme weather events last year indicate the problems that we might have to cope with more regularly in the future. In August 2002, freak 'monsoon' rains saw two-thirds of the month's rainfall dropping in just 30 minutes. As a result, seventeen stations and some sections of the railway were affected by temporary closures. In October 2002, some of the worst storms since 1987 hit London. This caused tree and leaf fall and some serious delays on a number of Underground lines.

At present, London is exposed to greater potential damage from flooding than any other urban area in the UK. An increase in the intensity of rainstorms is likely to lead to flash floods; and more intense winter rainfall will lead to a more frequent threat of flooding from the Thames. The Underground is also vulnerable to flooding, and the sections on energy and air quality highlight how we are working to contribute to reducing the effects of climate change.

We will have to react to climate change to ensure that we are able to mitigate the risks that it poses to our services. In future, our infrastructure will have to be able to cope with a different climate. Increased rainfall and temperatures have the potential to cause considerable damage. We will have to review how we manage issues such as biodiversity, drainage, water pumping, ventilation and embankment stability.

In addition to this, any increased temperatures will reduce the comfort of people travelling on the Tubes, in stations and in office buildings. Over the next few years, all trains being refurbished will be fitted with a new ventilation fan system and other potential solutions are also being considered.

# Water

## Target summary – what we achieved:

- Continued involvement in the London Underground/Thames Water Utilities GARDIT project which is helping to control rising groundwater
- Continued installation of waterless urinals
- Continued installation of low flush toilets
- Introduction of water saving features during the refurbishment of train washing facilities
- Mapped seepage of water into Circle Line tunnels from water mains and repaired water mains

## What we plan to do:

- Investigate areas of high water demand with our partners, and look to agree consumption reduction targets within depots
- Continue to install water saving devices during refurbishment's
- Continue to support GARDIT (Ground Aquifer Research and Development Implementation Team)

London Underground has two main areas of interest in water:

- the rising water table which causes large volumes of water to seep into our tunnel system and
- water used at our offices and operational sites.



This presents us with two major challenges. To reduce the quantity of water consumed by our business and to cope with the problems of underground seepage as the water table under London continues to rise.

In 2002/2003 we used a total of 638 million litres of water. This equates to 1.75 million litres of water used per day and includes water used in offices, stations, workshops and train washing in depots. To help reduce our water requirements, we have water efficient train washing facilities at 3 of our depots and are looking to increase this number as units are refurbished.

LUL is currently pumping out over 30 million litres of water from our system every 24 hours. This is achieved using a network of 1,030 pumps at 630 locations. Water testing at the points where water is pumped into sewers shows very little contamination. Specialist teams are employed to maintain the pumps and drainage system. This includes regular cleaning, emptying and 'scraping' of gullies and drains. A considerable amount of debris is removed as a result of these operations and this is removed as special waste.

In an effort to reduce the water seepage problem in some of our tunnels, Metronet SSL worked with Thames Water to identify leaking water mains that were causing water seepage problems in the northern part of Circle Line tunnels. Thames Water has subsequently been repairing the leaks, so saving this water loss. Metronet SSL is also benefiting by no longer having to deal with this water seepage problem.

We are continuing to work with partners in the Ground Aquifer Research and Development Implementation Team (GARDIT). This aims to develop and implement a London-wide pumping strategy for controlling rising ground water. These control measures have been instrumental in the additional utilisation of existing, and the installation of new, abstraction boreholes in London over the last 3 years. Our contribution supports the continued safe running of our railway and the improved environmental management of infrastructure beneath London.

LUL is working to adopt industry best practice regarding the conservation of water in buildings. Our programme to install waterless urinals, which saves approximately 46,000 litres of water per year compared to traditional urinals continues. Waterless urinals and low volume flush toilets are installed as part of on-going refurbishment works.

# Air Quality

## Target summary – what we have achieved:

- Phase-out of company cars issued to LUL employees for private use has continued
- Commissioned the Institute of Occupational Medicine to carry out a study into the health effects of dust on the Underground
- Piloted the use of specialised ‘vacuum’ cleaners to aid dust removal
- Continued to issue staff and their dependants with free Underground travel
- Drafted an air quality monitoring standard
- 5 continuously re-circulating particulate traps (CRTs) fitted to Emergency Response Vehicles
- Re-routed distribution vehicles to reduce congestion
- Closed Lots Road power station



## What we plan to do:

- Publish and implement the air quality monitoring standard
- Publish the Institute of Occupational Medicine study
- Infracos to investigate improvements to the tunnel cleaning regime

The volume of traffic on the roads continues to keep public interest high in London's air quality. The Government's National Air Quality strategy, the GLA's Air Quality strategy and local borough air quality action plans all contain targets and actions to improve London's air quality. Key to their success will be the reduction in pollution from individual vehicles and reducing overall traffic levels. LUL can play a major role in these strategies by providing an attractive public transport option and by working towards improvements in services to maximise our potential for carrying people.

Whilst the Underground itself does not contribute directly to air pollution at street level in London, we do utilise a range of vehicles in our fleet provide to us by Tube Lines. These and some of our other activities will contribute a small percentage to the total air pollution in London and we continue to work to seek measures to reduce this contribution further.

The LUL vehicle fleet now consists of just 110 vehicles, 50 of these are multi-purpose vehicles for business use, the remainder being LUL employee company cars. . Ultra low sulphur diesel is used by 65% of these, with 35% using petrol. Continuously re-circulating particulate traps (CRTs) were retrofitted to 2 refuse collection vehicles during 2001/2002, and during 2002/2003 a further 6 Euro II vehicles were replaced by 6 Euro III vehicles and 5 of these had CRT's fitted. Routine emission testing is carried out to supplement MOT testing. During 2002/2003, funding was secured and spent on the retrofitting of CRTs to over 50% of the Emergency Response Unit vehicles.

Baseline fuel utilisation data for non-HGV vehicles is produced. This data enables managers to set clear targets. All vehicles are maintained under a strict regime, and staff are trained in driving techniques to reduce environmental impacts and minimise nuisance.

Efforts to reduce emissions and road traffic congestion, and to improve the efficiency with which our distribution and refuse collection vehicles operate, have continued. Last year we transferred 5% of our scheduled distribution routes to nights, with further talks planned with key customers to identify other routes that can be transferred next year. In addition to this we continue to work and consult our customers in an effort to source and provide alternatively fuelled vehicles and last year Metronet BCV purchased a gas fuelled vehicle.

In addition to the use of these fleet vehicles, we also hire approximately 120 taxis a day. These are used primarily to transport our staff working very early or very late to and from work, and are regulated through the Public Carriage Office which is part of TfL. At present the taxis are emission tested every six months and through the Mayor's Air Quality Strategy, targets will be set for air quality standards for these vehicles.

As part of our employment conditions, all staff and their dependants, and all previous employees are issued with free travel passes. There are approximately 27,000 of these in circulation (this includes passes issued to TfL staff). This encourages staff to maximise their use of London's public transport system, rather than using private vehicles.

There has been ongoing interest in airborne dust on our system. This dust is created by a number of sources including the passage of trains over rails, the use of the system by customers, engineering works in tunnels, and to a lesser extent the operation of machinery such as lifts and escalators. Dust generation has been reduced by the introduction of regular and programmed cleaning regimes for trains and tunnels, and improved braking systems on rolling stock.

The Dust Action Group met 4 times this year to continue to consider the issue of 'tunnel dust' and to examine its proper and improved management. A number of studies have taken place on our system to examine this dust and its impacts. These analyses have indicated that the dust levels and constituents, are well below the safe limits set for occupational exposure by the Health and Safety Executive.

The Institute of Occupational Medicine was commissioned to consider further and more thoroughly, the health impacts on staff of exposure to tunnel dust. They have drawn together research results on dust and health carried out on both our network and elsewhere, and have coupled this with their own extensive surveys and analyses. The final report will be published in autumn 2003.

In addition, a standard for monitoring dust on our network has been drafted which outlines our current arrangements for air quality monitoring on our system. This will be reviewed in light of the Institute of Occupational Medicine report, prior to implementation.

# Noise and Vibration

## Target summary – what we have achieved:

- Continued to support the CONVURT project (see page 16)
- Carried out rail grinding to reduce noise
- Installed more continuously welded tracks
- Improved our mechanisms for dealing with customer complaints on noise
- Worked closely with Government on the UK noise mapping exercise
- Lubricated key areas of known ‘wheel squeal’ to reduce noise problems
- Fitted a noise monitor in our Lillie Bridge workshop

## What we plan to do:

- Improve our wheel/rail lubrication regimes
- Consider the feasibility of using new technology on track support to limit vibration transmission from rails to the supporting structures
- Work on developing a predictive monitoring tool to forecast rail condition deterioration
- Work with Government to produce noise maps of the Underground network

The operation of the Underground produces noise and vibration. The principal noise sources are caused by contact between the wheels and the rails, and from engineering works. We also create noise from tannoy announcements and the use of support vehicles.



Surveys undertaken by the GLA indicate that 2% of Londoners consider themselves to be seriously disturbed by train or Tube noise, (this includes mainline trains) which compares favourably to the 13% seriously disturbed by road noise. However, we recognise that noise and vibration can be a nuisance to people living or working near our railway lines, stations or depots and continue to work to minimise the environmental impact of noise arising from our activities.

Noise created as the wheels run over the rails can produce the clattering and ‘wheel squeal’ commonly associated with railways. This can result in air-borne noise or vibration conducted through the ground or through bridges. To mitigate elevated noise levels caused by wheel squeal we lubricate and grind rails. A predictive monitoring tool is being developed which will be able to forecast deterioration in the condition of the rail. As rail deteriorates, noise levels may increase, so the results will be used for planning preventative maintenance of the rail.

Major engineering works are usually undertaken at night so as not to disrupt Underground services, and for health and safety reasons. In the coming years there will be an increase in the amount of engineering activity taking place on and around our network. Works are scheduled and contractual requirements are set to ensure that noise nuisance is minimised. Both LUL and Infracos auditors monitor contractors regularly in respect to noise.

Inevitably, these engineering works will create some noise. The Infracos must adopt the best practical means of working and mitigation measures are routinely used in an effort to minimise disturbance to neighbours. In addition to this, the Infracos work in partnership with local authorities to ensure noise complaints are minimised. They are also working towards identifying residents likely to be affected by noise created by planned larger project work, and informing them of the purpose and length of time that such works are likely to take.

In 2002/2003 we received 217 complaints (compared with 182 in 2001/2002) in respect to noise and vibration and 1 noise abatement notice from the London Borough of Hounslow. This was served on LUL as a result of a neighbour complaint regarding increased tannoy volumes during the day. This increase was required by Her Majesty's Railway Inspectorate (HMRI) to ensure that customers were able to hear safety announcements. A compromise has now been reached that satisfies all parties.

LUL Customer Services and the Infracos will soon be using a common database to improve how we manage complaints. This will ensure that we are able to accurately monitor levels and types of noise complaints, and to respond quickly and effectively where necessary.

Where noise levels are found to be excessive, either from monitoring carried out routinely using a track-recording vehicle, or initiated by a complaint, a number of measures may be considered. These include re-profiling/grinding rail; lubrication of the track; re-profiling wheels; installing continuously welded rail, which is quieter than the jointed type; using resilient rail mountings; introducing speed restrictions and possibly erecting (or planting) noise barriers.

LUL has been working with consultants employed by the Department of the Environment, Food and Rural Affairs who are noise mapping England. The end result will be the production of a noise map of the Underground, which we will then be able to use to manage our noise impacts more effectively.

London Underground has joined with other European metros and industrial and academic partners to undertake a comprehensive research project to improve the prospects for reducing the levels of noise generated. The Project is called CONVURT (Control of Vibrations from Underground Rail Traffic) and is co-ordinated by LUL. Comprehensive measurements have been undertaken on the Bakerloo Line in the Regent's Park area. This involved noise and vibration measuring plus testing the track, the ground characteristics, and buildings. These will be used to help towards the improved management of noise and vibration on our network.

# Waste Management

## Target summary – what we have achieved:

- Increased on-train and on-station litter collection and cleaning
- Signed the Mayor's Green Procurement Code
- Increased the use of intranet and e-mail for communications
- 6% increase in amount of waste recycled
- 6% decrease in the waste sent to landfill
- 2,147 computers sent for reuse
- 14,986 reams of recycled paper purchased

## What we plan to do:

- Introduce a paper recycling service on stations
- Work with current waste contractors to maximise recycling of waste
- Investigate the possibility of recycling CCTV video tapes as part of the contract
- Work with London Remade to identify further opportunities for green procurement
- Introduce Oyster cards across the network to reduce the need for paper-based tickets

The London Underground network generates large quantities of waste materials. We generate waste from all our offices, head offices and satellite offices, including all of our stations. Waste is also generated in depots; this includes office waste and waste from maintenance, servicing and repairs. Litter waste left by customers is collected from our trains and stations and we have large consignments of ballast, track and other bulky materials that are removed during track refurbishment, engineering and construction works.



Tube Lines are responsible for the collection of waste from our trains, stations, as well as some offices and some engineering waste. They have been certified to ISO 14001 for 2 years, and continue to make progress in bringing about significant improvements in waste management. We also employ other contractors to remove waste and paper for recycling from some of our head offices, and to manage waste from our construction activities.

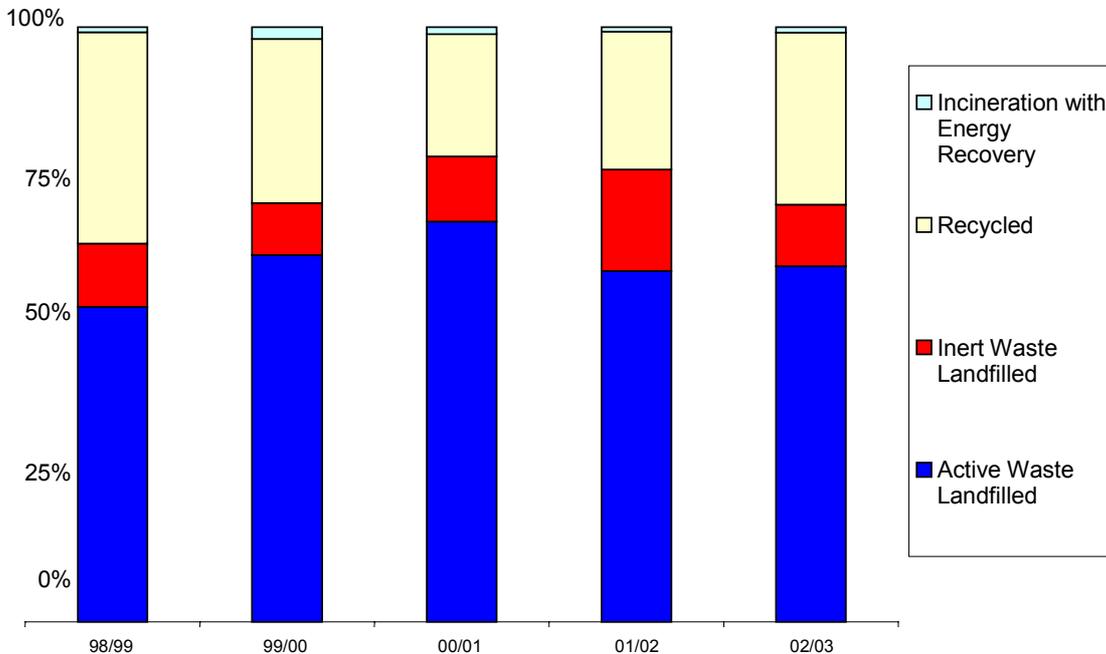
We have detailed figures from Tube Lines on the amount of waste that they manage on behalf of LUL and the Infracos, but this is not currently a full picture of the amount of waste that we produce. The total waste levels vary according to the amount of maintenance and renewal works being undertaken. As a result of the increased investment and maintenance under the PPP, it is expected that waste levels will rise in future years as investment in the Underground increases. As such it will become increasingly important to maximise opportunities for reuse and recycling.



Last year Tube Lines collected 15,380 tonnes of waste was collected. 5,866 tonnes (38%) of this was station waste and over 13% of this waste stream was recycled. At thirteen depots and maintenance sidings, containers are provided for fluorescent light tube recycling. Services are provided at certain locations for recycling paper, dry cell batteries, wood, metal, rags and toner cartridges. In addition, gloves and high visibility jackets are reused where possible.

Last year the rate of growth for station waste was 2% compared with 3% last year and 9% the year before. Overall there was a 6% decrease in the amount of waste sent to landfill over the last year and a corresponding rise in the proportion recycled. Track waste and sleepers are relatively easy to recycle and/or reuse, but a proportion is contaminated and is disposed of as special waste.

The graph below shows how waste disposal methods used for waste generated by LUL and the Infrastructure companies have changed in recent years.



Within LUL's head offices, we are increasing the amount of reuse and recycling that is carried out. The availability of paper and toner cartridge recycling facilities in our offices has increased. We have also undertaken a programme of renewing our desk-top computers and have sent 2,147 of these units to 'Tools for Schools' for reuse. Other opportunities for recycling are identified where possible. For example, customer service staff leaving employment with LUL are required to return their staff uniforms, these are then shredded and recycled.

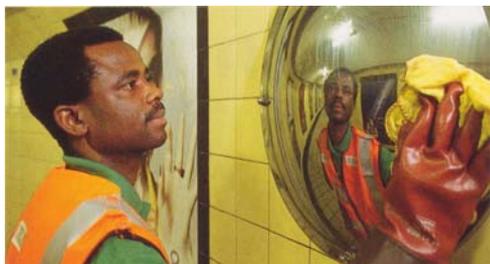
In addition to this, we are working to increase the quantity and types of products that we purchase that are produced from sustainable or recycled sources. Re-manufactured toner cartridges are available for most of the printer units that we use, and we can buy paper that is made from recycled paper, or wood produced from a sustainable source. Last year we purchased 14,986 reams of recycled paper, this equates to a saving of 417 trees.

Waste minimisation lies at the heart of good waste management and we are working to decrease the amount of waste we produce. We are also seeking to identify opportunities to reuse materials and purchase recycled products where quality and price allow. We have signed the Mayor's Green Procurement Code and have met with the London Remade, who are sponsoring the Code, to identify potential areas for improvement. Already a number of our publications are printed on recycled paper, and when contracts are let through our Procurement Department, contractors are required to quote for using recycled paper.

Last year the LUL Board requested that all committee reports be presented on double-sided paper. Estimates indicate that this will save 140 reams of paper a year. All photocopiers and printers ordered through our Procurement Department have the capacity to print double-sided and computers are networked to default to this option.

A new initiative started this year to install computers in all stations by the end of 2004. This will give all staff access to our Intranet, and will mean that an increasing amount of paper based systems can be transferred to electronic systems. Forms can be filled out on-line and an increasing amount of correspondence can be carried out electronically. This will save a considerable amount of paper.

The Cleaning Action Plan has continued to be successful. The Infracos have continued to improve their cleaning regimes. Train windows are cleaned daily at Ealing and Upminster and the frequency of 'deep' cleaning of trains has increased. These activities improve the general ambience of the travelling environment. It is hoped that this will discourage anti-social behaviour such as graffiti and the dropping of litter.



However, it is recognised that litter is still a problem on our Tubes. To help combat this, litter picking at stations has increased. For example, Tube Lines now have 74 staff cleaning around 1,500 trains a day and it is estimated that they will collect between 700 and 900 bags of rubbish a day.

LUL also work to support other initiatives and have continued to work with local authorities to increase recycling activity. There are paper recycling bins outside our stations in Westminster City Council and 17 bins now outside Tube stations in the London Borough of Camden. The aim is to encourage people to recycle their newspapers, such as The Metro, as well as reducing litter on the network.

# Heritage, habitats and biodiversity

## Target summary – what we have achieved:

- Planted over 30,000 trees on our network
- Sown wild flower and grass seeds on embankments
- 100 bird boxes were donated to London Borough of Hackney
- 100% of wooden sleepers purchased from Forestry Stewardship Council (FSC) sources
- Construction of bird boxes from waste wood

## What we plan to do:

- Continue tree planting regimes
- Review our current standards to identify further opportunities for the use of FSC certified hardwoods
- Use waste wood from depots to make bird boxes to be put up over the network
- Fund the Lower Lea Trust in the production of floating reed beds to enhance the biodiversity of the River Lea (District Line).

LUL owns a rich and diverse heritage, habitat and biodiversity, and as such we can make a significant difference to both the natural and built environments of London. Over half of our network is above ground and the 'green corridors' along which the trains pass are a valuable haven for plants and animals.

The maintenance of our trackside habitat and our buildings is something that we take seriously. Responsibility for its maintenance, upkeep and renewal has now transferred to the Metronet and Tube Lines. We have clear standards that set out our requirements in respect to our heritage and habitat to ensure that their character and appearance is protected and enhanced.



In 1999, London Ecology Unit undertook a survey to assess the biodiversity and the wildlife potential of the Underground. Most of the 4,000 hectare area of lineside habitat were designated as 'semi-natural'. This is roughly equivalent to around 8,000 football pitches or over 10% of the wildlife habitat available in Greater London. A large variety of habitats were identified, from ancient woodlands such as Croxley Hall Wood on the Metropolitan line to areas of open grassland and tall herbs. Over 500 species were recorded across the network, including badgers, pipistrelle bats, slow-worms, frogs, toads, and bluebells.

Our trackside standards ensure that native trees, shrubs and flowers are planted that are compatible with the operation of the railway, encourage species diversity and enhance the landscape. The plant species suggested for use include those that will reduce the need for excessive maintenance and that will minimise potential safety issues, such as leaves on the tracks and overhanging branches. As well as contributing positively to the biodiversity and to people's journeys, plants and trees on embankments help to maintain their stability and act as a natural noise barrier to neighbouring properties.

Teams of workers repair fences, kill weeds, remove unsafe trees and bushes and replant according to the trackside standard. These teams wait for the young birds or squirrels to leave nests before branches are removed or trees felled. They are also aware of the natural biodiversity and work hard to enhance this. For example, although not a species native to our trackside environment, a 51 year old tortoise that had been missing for over a month was found by a track worker and subsequently returned to her owner.

LUL uses a considerable amount of wood. At present, about 50% of our timber purchases are hardwood and softwood sleepers. All of these are bought from Forestry Stewardship Council (FSC) sources. This means that the forest is managed in an environmentally and socially responsible manner. Next year work will begin to revise existing standards so that FSC hardwoods from Brazil can be used, instead of the current non FSC hardwood used for other purposes such as crossings which make up the remaining 50% of our timber use.

We also produce waste wood as a consequence of our operations. Some of this is recycled from depots, and Metronet Rail BCV has taken the initiative of reusing some of the wood cut-offs to make bird boxes. These will be put up during autumn 2003 and are suitable for tawny owls, barn owls, tits, robins, kestrels, crows, and woodpeckers.



We have a total of 49 buildings, including our head office at 55 Broadway, that are listed as Grade II buildings by the Department for Culture, Media and Sport.

These buildings are listed because of their special architectural or historic interest and importance. We also have 12 stations situated in conservation areas. Last year Lots Road was decommissioned, and has taken its place as a heritage building.



The London Transport Museum continues to play an important role in preserving and recording London's transport heritage that includes the history and role that the Underground has played in the development of London. The Museum also has a section dedicated to the environmental benefits of public transport.

# Sustainability

## Target summary – what we have achieved:

- TfL has signed up to the International Association of Public Transport (UITP) Sustainable Development
- Carried out a gap analysis of LUL in respect to Corporate Social Responsibility (CSR)
- 78 new apprentices taken on
- Increased accessibility of Tube stations

This environmental performance report has naturally focused on environmental issues, but in the wider context of sustainable development, there are a range of other LUL activities that contribute to sustainability. These include equal opportunities, accreditation to Investors in People, supporting urban regeneration through new transport infrastructure provision, promoting the Underground through a range of methods, improving accessibility of public transport, and raising funds for local initiatives and charities.

The Government and the GLA are increasingly asking organisations to operate according to the principles of sustainable development. This requires equal consideration to be given to environmental, social and economic criteria. Sustainability is increasingly becoming a key factor in political and corporate decision making. CSR is also becoming increasingly high profile, and last year LUL carried out a gap analysis of our organisation in respects to CSR.

In 2002/2003 we worked with the Railway Forum on a sustainability statement for the rail industry and TfL signed up to the UITP Charter for Sustainable Development, an action fully supported by LUL.



We are working closely with the GLA and TfL in planning for the sustainable development of public transport in the future. This will ensure that areas where public transport could be promoted or improved to meet emerging needs are met. We promote the use of our service regularly and in doing so encourage public transport use. Bike parking is provided at some Tube stations and consideration is increasingly given to integrated transport in planning options for the future.

We need to continue to promote equality of access to our system wherever practicable. We have 102 lifts and 409 escalators on our network. We are working to increase these numbers and are making progress towards much wider accessibility. This year, work has begun on the installation of new lifts at Earls Court and the upgrading and installation of new escalators around the business continues. We have also increased the amount of tactile paving on platforms, this aids sensory-impaired passengers.

We are also working to ensure that we represent our communities in our workforce and last year we carried out a recruitment campaign to encourage more women to work on our network. We also promoted a poster campaign launched by Scope, the disability charity, encouraging increased employment of mobility impaired people.

In September 2002, LUL reaffirmed its commitment to staff training and the workforce of the future by opening an extension to its Apprentice Training Unit at Acton Town in west London. This will give young people an opportunity to train and gain qualifications as part of a nationally recognised scheme and make a valuable contribution to LUL.

LUL also supports community initiatives and in 1999 began 'Platform for Art'. This seeks to support artists as well as to provide a welcoming, interesting and stimulating environment for customers, using redundant spaces to stage art exhibitions. For example, last year exhibitions included 'Glorious African Birds' which were steel sculptures of birds made from recycled oil drums.

# Progress against our Environmental Targets

The following is a summary of LUL's performance against our environmental targets.

## Develop and implement environmental management systems

Target	Progress to date	Status
London Underground group members to develop documented Environmental Management Systems to meet the requirements of ISO14001.	6 sites have ISO14001. Infracos are now working to develop their company wide environmental management systems; they must each achieve ISO 14001 by 2006	Ongoing – for completion 2006
LUL Environment Policy 'Caring for the Environment' to be revised to more fully reflect energy and GLA policy requirements	Revised policy distributed for comment Completion date June 2003	Completed June 2003
Review London Underground's HSEMS (Health, Safety and Environment Management System)	Review completed – new HSEMS to be launched Summer 2003	Completed and launched July 2003
Review and publish LUL's QUENSH standard	Review completed – new QUENSH standard to be published 2004	Ongoing – to be completed 2004

## Reduce energy consumption and air pollution

Target	Progress to date	Status
Introduce measures at Underground stations to reduce energy consumption.	Stations energy champions league achieves a second year saving of 17% against normal usage.  17.5% target set for 2003/2004	Ongoing
Reduce the environmental impact of energy consumption by incorporating renewable energy into the corporate energy basket.	101 GWh's of renewable energy purchased for 2002/2003.	Further opportunities to purchase renewable energy to be investigated as contracts come up for renewal
Lots Road generating station closure	Closed September 2002	Completed

## Reduce noise created by operations

Target	Progress to date	Status
Carry out research into railway noise. Study how tunnel activities cause noise and vibration problems.	European funding gained for CONVURT project with RATP, and Milan Metro. Intensive study of Bakerloo line completed	Ongoing (due for completion end 2004)
Collate and reduce complaints about noise from Underground operations.	Noise complaints collated for all lines.	Infracos to use same complaints capture system as LUL to work towards improved management
Carry out rail grinding to restore suitable rail profiles.	Annual programme completed	2002/2003 programme complete

## Manage other environmental aspects

Target	Progress to date	Status
Develop performance indicators for the LUL group	Provisional indicators agreed, data collection to begin for reporting in 2003/2004	LUL Environment Forum, autumn 2003 to formally agree indicators.
London Underground will work to promote environmental procurement of goods and services with exact measures subject to business case.	Joined London Remade and working towards identifying 'green' procurement opportunities	Ongoing

### We welcome your comments:

We hope that this report has shown that in aiming for continuous improvement in environmental performance, we have made many advances and that we have practical plans to achieve our further objectives.

We always welcome your comments. If you have any suggestions or comments concerning this report or about any aspect of our environmental performance, please contact:

Roan Willmore by email: [roan.willmore@tube.tfl.gov.uk](mailto:roan.willmore@tube.tfl.gov.uk), by telephone: 020 7918 3054, or in writing to: London Underground Ltd, Safety Quality and Environment Department, Floor 5, Albany House, 55 Broadway, London SW1H 0BD for further help and information.