

The Mayor's School Air Quality Audit Programme

Air Pollution at Schools

Toolkit of Measures to Improve Air Quality at Schools

May 2018

MAYOR OF LONDON

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Introduction

Developing the Toolkit

This toolkit of measures for addressing air quality issues has been created for use in developing the recommendations for a school. The toolkit will be used as a source of reference in completing school air quality audits.

The toolkit was compiled from a review of best practice approaches and new technologies. It includes well established measures as well as more innovative solutions and quick wins. The range of measures includes hard hitting solutions and contains both physical and behavioural measures.

The toolkit is multi-disciplinary and holistic in its nature, as promoted by the Healthy Streets approach, in seeking to address a broad range of factors which each influence how streets are used, how people travel and consequently how clean the air is in and around schools.

The toolkit provides information which includes:

- Comprehensive set of measures
- Detailed description of measures
- Identification of their scale of impact and benefits
- Precedents of measures, including photos

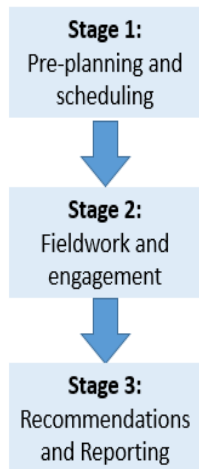
The toolkit of measures and audit templates will serve as a replicable good practice approach, but are also intended to be live documents, to build on our knowledge of how effective different measures prove to be over time, allowing the toolkit to be continually refined for future audits.

Who is the Toolkit for?

The toolkit can be used by boroughs, schools and other organisations who will be involved in completing school air quality audits. However, a certain level of technical expertise is required to understand what the measures represent and when it is appropriate to use them. The detailed description of the measures has been written on the basis that suitably experienced professionals will be the main audience. The naming of the measures has been kept as simple and concise as possible so that the terms are, as far as possible, easily understood. However, the use of technical terms is unavoidable.

Applying the Toolkit

When to use the Toolkit



The audit approach can be considered in terms of the following components:

- Technical Content of Audit.
- Audit day – scheduling, operations, running times.
- Toolkit of Solutions.
- Engagement Activities.

The audit will consist of the three key stages shown opposite, within which there are the following tasks:

1. Air quality assessment and context plan preparation.
2. Fieldwork – complete audit templates with input from the school and borough officers (air quality, school travel, transport planning).
3. Review findings and identify key issues, sources of emissions and causes of exposure.
4. Identify measures from the toolkit to address these issues, informed by the audit findings.
5. Reporting on audit process, issues and recommendations.

The toolkit can be used as a source of reference on the day of the audit as well as in the subsequent development of recommendations and in the reporting. The audit will involve engagement with school representatives and borough officers to discuss issues and opportunities for improving air quality. The toolkit will help in facilitating the discussions and in generating ideas.

Suitability of Measures

The characteristics of the local area, school site and school building must be carefully considered when identifying and tailoring a suitable package of measures to address the issues identified in causing sources of pollution or exposure to air pollution. These recommendations should also be developed with an appreciation of any relevant existing plans for the local and wider area around the school.

The auditors and stakeholders should be aware of the potential wider benefits of each measure and also how well the package of measures works together. The audit promotes a holistic approach to improving air quality and reducing exposure in the area, such that benefits may also be gained for walking, cycling, public realm and road safety. This is fully accordant with the principles of the healthy streets approach which aims to create more pleasant, safe, attractive, and ultimately more liveable environments.

Key assessment criteria

The measures and initiatives have been categorised as either highways, school grounds, school building, behaviour change or wider measures, and are assigned an indicative rating against a series of key criteria, including:

- **Potential Air Quality Improvement**
 - Low – nominal measureable change but a tangible reduction in sources or exposure.
 - Medium – a small measurable change in air quality.
 - High – a large measureable improvement in air quality.
- **Wider Benefits**
 - Such as improved safety, visual amenity, child health and welfare, improve learning environments, costs savings, promotion of sustainable transport, contributes to STARS or Healthy Schools London.
- **Cost** (*Note these reflect the overall costs, but these may vary amongst difference stakeholders*).
 - Low - <£10k
 - Medium - £10k-100k
 - High - >100k
- **Deliverability**
 - Quick Win – readily deliverable within 12 months.
 - Medium term – deliverable within 1-3 years.
 - Longer term – only deliverable in the longer term (i.e. over 3 years).
- **Stakeholder Support**
 - Low – likely to be significant objections which could delay/prevent the scheme.
 - Medium – may be some objections and will require consultation but not significant delays.
 - High – likely to be strong support from key stakeholders.

In addition, the toolkit indicates whether the measures:

- Primarily target reducing the source of pollution and/ or reducing exposure.
- May be suitable for introducing as a trial at relatively low cost, within minimal/no consultation for a period of days, weeks or months in order to determine their suitability and impact.
- Are suitable for introduction on a main road and/or minor roads – some measures restrict traffic flow which on main roads may not be suitable, particularly Transport for London roads and the Strategic Road Network.

Summary of Measures

Air Pollution at Schools



MAYOR OF LONDON

Summary of Measures

1. HIGHWAY MEASURES	
A	Anti-idling
A1	Fines
A2	Campaigns, including driver engagement
A3	Information signage
B	Reducing traffic flow
B1	'School Streets'
B2	Collapsible bollards
B3	'Play Streets' (<i>temporary measure</i>)
B4	Road closure
B5	Filtered permeability
B6	One-way streets/ No entry restrictions
B7	ULEV-only streets
B8	Width restriction (e.g. 7ft)
B9	Environmental weight limit signs
B10	Reallocate roadspace
B11	Weight restrictions
C	Smoothing traffic flow/speed
C1	Modify traffic calming
C2	Optimise traffic signals
C3	Junction improvements
D	Reducing drop-off activity
D1	Public Space Protection Orders
D2	School Keep Clear markings
D3	Double/single yellow lines
D4	Improve enforcement of restrictions
E	Improved pedestrian and cyclist environment
E1	Improved pedestrian environment - footway widening, kerb build-outs
E2	Improved crossing facilities on desire lines
E3	Traffic calming
E4	Improve Visibility of the School
E5	Cycle hangers
F	Promote a switch to low emission vehicles
F1	Ultra-low Emission Zone (ULEZ) & Low Emission Zone (LEZ)
F2	Comprehensive charging provision for ULEVs

G Parking/loading	
G1	Identify a Park & Stride site
G2	Remove or relocate parking/ loading bays and/or amend restrictions
G3	Introduce kerb blip loading restrictions
G4	Enforce parking restrictions
G5	Additional parking charges for more polluting vehicles
G6	Introduce or amend CPZ restrictions around school to restrict non-residents parking
G7	Parking rationalisations with ULEV car clubs
H	Buses
H1	Bus stop relocation
H2	Low emission buses
I	Freight and Deliveries
I1	Engage with local businesses to reduce freight/ delivery emissions
I2	Promote low emission vehicles for freight and deliveries
I3	Delivery Servicing Plans (DSPs) for new developments
I4	Re-time Borough commercial waste collection
J	Construction
J1	Planning conditions to reduce impacts of freight traffic
J2	Managing the impact of dust and emissions during construction and demolition
J3	Retrospective discussions with already permitted developments to lessen the impacts
J4	Non-Road Mobile Machinery Audit
K	Planning Policy and Strategy
K1	Healthy Streets approach, sustainable transport and roadspace reallocation from vehicular traffic
L	Green Infrastructure
L1	Green screens
L2	Trees, shrubs, planters
L3	Green Gateways
L4	Pocket parks

2. SCHOOL SITE MEASURES	
M	School Grounds
M1	Additional scooter/ cycle parking
M2	Staff car parking
M3	Anti-idling for deliveries
M4	Re-timing for deliveries
M5	Reduce number of deliveries, staff/visitor vehicle trips and/or use more sustainable modes
M6	Relocate pedestrian entrances
M7	Green screens
M8	Trees/ shrubs/ planters
M9	Green spaces
M10	Pupil & staff cycle parking
M11	Reduced waiting times to enter school grounds
M12	Relocate playgrounds and free flow spaces
M13	Co-ordinate start/ finish times with nearby schools
M14	Reconsider playground layouts to reduce exposure
M15	Sheltered waiting areas for parents/ guardians
School Building	
N	School boilers/ heating
N1	Upgrade aging boilers
N2	Install Optimising Compensator Control System for School Boilers
N3	Boiler flues and extraction equipment
N4	Reducing over-heating and tackling heat gain
N5	Replace aging radiators
O	Improve product choice (e.g. cleaning products)
O1	Improve product choice (e.g. cleaning products)
P	Regular service & maintenance of appliances and equipment
P1	Regular service & maintenance of appliances and equipment
Q	Improve school building insulation
Q1	Improve school building insulation
Q2	Upgrade windows
Q3	Replace temporary classrooms with permanent structures
Q4	Green Roofs
R	Ventilation / Air Filtration
R1	Installation of Air Conditioning Units
R2	Introduce Air Filtration Systems
R3	Install HEPA Filters in Air Handling Units
R4	Other air filtration systems - air purifiers
S	Other
S1	Air quality monitoring and information provision eco-monitors and walking route maps.

3. BEHAVIOURAL MEASURES	
T1	Attain improved STARS accreditation status, ultimately Gold status.
T2	Promote cleaner walking routes to school
T3	Promoting Park & Stride
T4	Promoting car sharing
T5	Walking Route Maps / Leaflets
T6	Parent and Public Workshops
T7	Prepare 'Welcome Packs' for new pupils / parents
T8	Deliver Air Quality focused lesson/s to children
T9	Awareness raising session amongst staff
T10	Daily monitoring of London Air website/ app
T11	Add Air Quality to Junior Citizenship Scheme
T12	Anti-idling campaign
T13	Attain an improved Award in Healthy Schools London, ultimately a Gold Award
T14	Awareness raising events amongst the wider community
T15	Cycle training and promotional initiatives
T16	Gamification to promote active travel
T17	Restrict or reduce personal deliveries
T18	CPD supporting teachers subject knowledge on air quality
T19	Walking Buses

4. WIDER MEASURES	
U1	Targeted scrappage scheme for polluting vehicles entering London
U2	Reform Vehicle Excise Duty
U3	Promote a transition to electric heating and heat pumps
U4	Reform Buildings Regulations to promote heat pumps
U5	Zero emission zones

Summary of Measures, including Assessment Criteria

Highway Measures

Air quality audit approach: A.) Air quality assessments and context plan preparation B.) Fieldwork – complete audit templates with input from the school and borough officers (air quality, school travel, transport planning). Use Toolkit as reference. C.) Review findings and identify key issues, sources of emissions and causes of exposure D.) Identify measures from the Toolkit to address these issues, informed by the audit findings E.) Identify funding sources and task owners F.) Establish an approach to monitoring the effectiveness of measures		Purpose		Assessment Criteria				Wider Benefits										Suitability		
		Reduce Sources	Reduce Exposure	Potential Air Quality Improvement	Cost	Deliverability	Stakeholder Support	Road safety	Promotion of sustainable transport	Visual amenity	Security, privacy	Noise reduction	Biodiversity	Improved learning environment	Reduced operating costs	Awareness raising	Support STARS and HSL objectives	Main roads	Minor Roads	Suitability for a trial
1. HIGHWAY MEASURES (Key Stakeholder: Borough/ TfL)																				
A	Anti-idling																			
A1	Fines	X		L	L	L	H									X	Y	Y	Y	
A2	Campaigns, including driver engagement	X		L	L	L	H									X	Y	Y	Y	
A3	Information signage	X		L	L	L	H									X	Y	Y	Y	
B	Reducing traffic flow																			
B1	'School Streets'	X		L	M	M	M	X										Y	Y	
B2	Collapsible bollards	X		L	L	M	M	X										Y	Y	
B3	'Play Streets' (<i>temporary measure</i>)	X		L	L	S	H	X	X					X				Y	Y	
B4	Road closure	X	X	H	L-M	S-M	L-M											Y	Y	
B5	Filtered permeability	X		M	M	M	L	X	X									Y	Y	
B6	One-way streets/ No entry restrictions	X		M	L-H	S-M	M	X	X									Y	Y	
B7	ULEV-only streets	X		M	M	M	L		X									Y	Y	
B8	Width restriction (e.g. 7ft)	X		L	L	S	M											Y		
B9	Environmental weight limit signs	X		L	L	S	M											Y		
B10	Reallocate roadspace	X		M	H	L	M		X								Y	Y		
B11	Weight restrictions	X		M	L	M	M	X										Y		
C	Smoothing traffic flow/speed																			
C1	Modify traffic calming	X		L	M	S	H											Y	Y	
C2	Optimise traffic signals	X		L	L-M	S-M	M											Y	Y	Y
C3	Junction improvements	X		L	M-H	M-L	L											Y	Y	
D	Reducing drop-off activity																			
D1	Public Space Protection Orders	X		L	M	M	M	X										Y	Y	
D2	School Keep Clear markings	X		L	L	S	M-H	X										Y	Y	
D3	Double/single yellow lines	X		L	L	S	M	X										Y	Y	
D4	Improve enforcement of restrictions	X		L	L	S-M	M	X										Y	Y	

Summary of Measures, including Assessment Criteria

Highway Measures

1. HIGHWAY MEASURES (Key Stakeholder: Borough/ TfL)																					
E	Improved pedestrian and cyclist environment																				
E1	Improved pedestrian environment - footway widening, kerb build-outs	X	X	L	L-M	S-M	H	X	X										Y	Y	Y
E2	Improved crossing facilities on desire lines		X	L	L-M	S-M	H	X	X										Y	Y	Y
E3	Traffic calming	X		L	L-M	S-M	H	X	X										Y	Y	Y
E4	Improve Visibility of the School	X		L	L	S	H	X											Y	Y	
E5	Cycle hangers	X		L	L-M	S	M		X								X		Y	Y	
F	Promote a switch to low emission vehicles																				
F1	Ultra-low Emission Zone (ULEZ) & Low Emission Zone (LEZ)	X	X	H	H	M	M		X										Y	Y	
F2	Comprehensive charging provision for ULEVs	X		L	M	M	M		X										Y	Y	Y
G	Parking/loading																				
G1	Identify a Park & Stride site	X		L	L	M	M														Y
G2	Remove or relocate parking/ loading bays and/or amend restrictions	X		M	L	S-M	M												Y	Y	
G3	Introduce kerb blip loading restrictions	X		L	L	S	M												Y	Y	
G4	Enforce parking restrictions	X		L	L	S	M	X											Y	Y	
G5	Additional parking charges for more polluting vehicles	X		M	M	M	L												Y	Y	
G6	Introduce or amend CPZ restrictions around school to restrict non-residents parking	X		M	M	M	L	X											Y	Y	
G7	Parking rationalisations with ULEV car clubs	X		L	M	L	L		X										Y	Y	
H	Buses																				
H1	Bus stop relocation	X		M	M	M	L												Y		
H2	Low emission buses	X		H	H	M	M												Y		

Summary of Measures, including Assessment Criteria

Highway Measures

1. HIGHWAY MEASURES (Key Stakeholder: Borough/ TfL)																				
I	Freight and Deliveries																			
I1	Engage with local businesses to reduce freight/ delivery emissions	X		M	L	M	L	X												Y
I2	Promote low emission vehicles for freight and deliveries	X		M	L	M	L		X											Y
I3	Delivery Servicing Plans (DSPs) for new developments	X		L	L	M	L													Y Y
I4	Re-time Borough commercial waste collection	X		L	M	M	M													Y Y
J	Construction																			
J1	Planning conditions to reduce impacts of freight traffic	X		M	L	M	L		X											Y
J2	Managing the impact of dust and emissions during construction and demolition	X	X	L	L	S	M												X	Y
J3	Retrospective discussions with already permitted developments to lessen the impacts	X		M	L	L	L		X											Y
J4	Non-Road Mobile Machinery Audit	X		L	L	S	M					X								
K	Planning Policy and Strategy																			
K1	Healthy Streets approach, sustainable transport and roadspace reallocation from vehicular traffic	X	X	H	H	L	L		X											Y Y
L	Green Infrastructure																			
L1	Green screens		X	L	L	S	H			X	X									Y Y
L2	Trees, shrubs, planters		X	L	L	S-M	M			X										Y Y
L3	Green Gateways		X	L	L	S	H			X										Y Y
L4	Pocket parks		X	L	M	S-M	H													Y Y

Summary of Measures, including Assessment Criteria

School Site Measures: school building

2. SCHOOL SITE MEASURES (Key Stakeholder: School/ Borough)																				
School Building																				
N	School boilers/ heating																			
N1	Upgrade aging boilers	X		L	L-H	S-M	M-H											X		
N2	Install Optimising Compensator Control System for School Boilers	X		L	L	S	H											X		
N3	Boiler flues and extraction equipment		X	L	L	S	M													
N4	Reducing over-heating and tackling heat gain	X		L	L-M	S	H											X	X	
N5	Replace aging radiators	X		L	M	S-M	M											X	X	
O	Improve product choice (e.g. cleaning products)																			
O1	Improve product choice (e.g. cleaning products)	X	X	L	L	S	H													
P	Regular service & maintenance of appliances and equipment																			
P1	Regular service & maintenance of appliances and equipment	X		L	L	S	H													
Q	Improve school building insulation																			
Q1	Improve school building insulation	X		L	L-M	S-M	M-H					X	X	X						
Q2	Upgrade windows		X	L	L-H	S-M	M-H					X	X	X						
Q3	Replace temporary classrooms with permanent structures	X		L	H	M-L	M											X	X	
Q4	Green Roofs		X	L	M	M	M			X			X							
R	Ventilation / Air Filtration																			
R1	Installation of Air Conditioning Units		X	L	L-H	S-M	M-H											X		
R2	Introduce Air Filtration Systems		X	L	M	M	M											X		
R3	Install HEPA Filters in Air Handling Units		X	L	L	S-M	M											X		
R4	Other air filtration systems - air purifiers		X	L	L-M	S-M	M											X		
S	Other																			
S1	Air quality monitoring and information provision eco-monitors and walking route maps.	X	X	L	L	S	H												X	

Hard Hitting Measures

The combined package of measures that will be developed for schools can have a significant impact on mitigating air quality issues as well as generating some of the wider benefits that are described earlier.

However, some of the measures can be hard hitting in themselves, and some of these are described below:

- **School Streets:** traffic access restrictions at school opening and closing times to help create a safer, more pleasant environment for children travelling to school, by removing air quality and road safety problems associated with through traffic and drop-off activity on the street/s outside the school. The benefits to be gained will be dependent on how much traffic there is at present.
- **Road closures:** A full road closure where possible would remove the associated vehicle emissions and free up space for alternative uses.
- **Bus stop relocation:** In some cases bus stops near the school may serve as a major source of emissions from buses frequently braking and accelerating hard when pulling up to the stop. They may also result in queuing traffic and congestion, and it may be possible to relocate the stop to lessen these issues.
- **Filtered permeability:** The introduction of filtered permeability serves to close a road to motorised vehicles, whilst retaining routes through for pedestrians and cyclists.
- **Ultra-low Emission Zone:** The introduction of the ULEZ in 2019 and the proposed expansion of the ULEZ and tightened emissions standards for the Low Emission Zone will significantly improve air quality. The ULEZ expansion and LEZ proposals are subject to consultation.
- **Low emission buses:** TfL has plans to introduce around 3,000 Ultra Low Emission double-deck buses in central London by 2019 and over 250 Zero Emission single-deck buses into central London by 2020. From 2018, all new double-deck buses entering the TfL fleet will be diesel-hybrid meeting Euro VI emissions standards. TfL is planning to re-fit around 5,000 buses so that they meet the highest emissions standards (Euro VI) as quickly as possible.
- **Wider schemes:** there are a range of potential measures which if introduced can help London take a significant step forward in creating a cleaner city. These include: a targeted scrappage scheme, reform of Vehicle Excise Duty, promoting a transition to electric heating and heat pumps and introducing zero emission zones in central London and town centres and larger inner London and London-wide zones in the longer term.

Case Studies

Air Pollution at Schools



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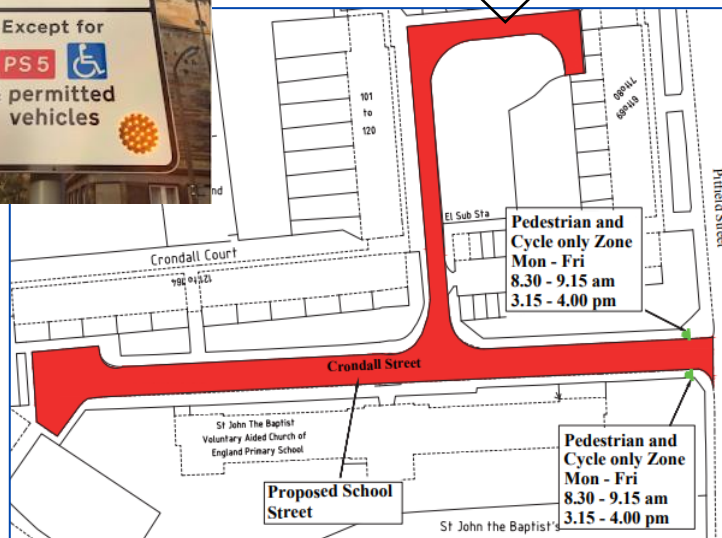
B1 ‘School Streets’

- Potential Air Quality Improvement = Low
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Medium
- Wider benefits: Road safety
- Suitable for: Minor roads

School Street introduced in Edinburgh - Sciennes Primary School (2015)



LB Hackney is introducing ‘school street zones’ around 5 primary schools as a 9-month trial. Plan for St John the Baptist School shown below



Description

Traffic access restrictions at school opening and closing times to help create a safer, more pleasant environment for children travelling to school, by removing air quality and road safety problems associated with through traffic and drop-off activity on the street/s outside the school.

Purpose

- Restrict through traffic and drop-off activity in school peak periods
- Reduces emissions and improves road safety

Approach

- Introduced as part of Pedestrian Zones or Pedestrian & Cycle Zones
- Use of access signs and ANPR cameras.
- Exemptions for residents, blue badge holder etc through permits
- Issue penalty charge notices for contraventions
- Can use experimental traffic order
- Need to be aware of knock-on impacts on surrounding streets

Precedents

- Schemes in Scotland running for a few years now
- School streets being introduced in several boroughs, including LB Hackney and LB Croydon

B3 'School Streets'

- Potential Air Quality Improvement = Low
- Cost = Low
- Deliverability = Short-term
- Stakeholder support = High
- Wider benefits: road safety, sustainable travel
- Suitable for: Minor roads



Hackney schools were the first in the UK to run school hosted play streets. Thomas Fairchild School in Hoxton was the first school to run a play street in 2013.



Source: Hackney Play Association

Description

'A 'play street' is a timed closure on the street/s outside the school during a certain period of the day (e.g. on Friday after the school day ends). A play street can be run periodically, say once a term. Games and activities are organised for children and parents on the reclaimed street space. Signing and enforcing the closure is a joint exercise between the borough and the school.

Purpose

- Restrict through traffic and drop-off activity.
- Reclaims the street temporarily so children can play and the school community can socialise.
- Raises awareness of air quality & sustainable travel.

Approach

- Organisers may be parents or school staff.
- Need to gain support from head teacher and residents/businesses before applying to the council for permission.
- Session typically last between one and three hours. They can take place weekly, monthly, or once a quarter.
- Councils usually provide the 'Road Closed' signage.

Precedents

- Schemes started in 2013, now commonplace.
- Play streets regularly run in several boroughs, including LB Hackney, LB Islington and LB Camden.

B5 'Filtered Permeability'

- Potential Air Quality Improvement = Medium
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Low
- Wider benefits: road safety, sustainable travel
- Suitable for: Minor roads



Waltham Forest



Hackney

Haringey



Description

The introduction of filtered permeability serves to close a road to motorised vehicles, whilst retaining routes through for pedestrians and cyclists. The scope to introduce road closures and filtered permeability measures depends on the wider road network, routing options and the impact of displaced traffic, as well as any requirements for preserving emergency access. Where implemented they can be paired with footway extensions, planting and public realm improvements.

Purpose

- Reduce volume of through traffic travelling through a residential area.
- Often introduced as part of a range of measures to improve the liveability of a neighbourhood.

Approach

- Restrict access at a point or through a section of street.
- Maintains access for cyclists and pedestrians.
- Can use bollards, planters or build-out the footway across the road.
- Needs area-wide approach to consider permeability so traffic not just displaced to nearby roads.

Precedents

- Waltham Forest Mini-Holland 'villages', 2016
- Schemes introduced in LB Hackney, LB Haringey
- Some measures introduced as part of Quietways

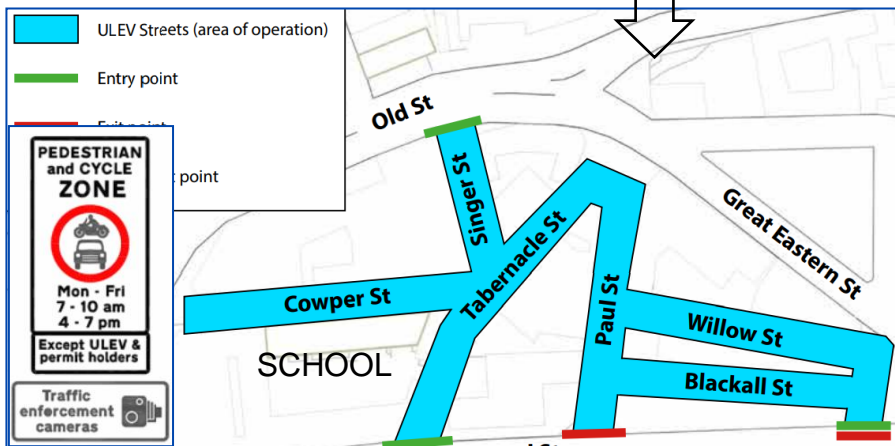
Highway Measures – ULEV Only Streets (B7)

B7 'ULEV-only street'

- Potential Air Quality Improvement = Medium
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Low
- Wider benefits: promoting sustainable travel
- Suitable for: Minor roads

Camden – 23 schools will benefit from a 'School Low Emission Neighbourhood' in the Frognal and Fitzjohns area. The proposal will see 8,500 pupils at 23 schools benefit from streets in the vicinity being restricted to electric vehicles and local access only.

LB Hackney & LB Islington are introducing London's first ULEV-only streets in Shoreditch. One of the streets runs alongside a school. The ULEV-only zones will operate 7am-10am and 4pm-7pm Monday to Friday



Description

Ultra-low emission vehicle (ULEV) only restriction, utilising a recently approved exemption for ULEVs paired with access restrictions such as Pedestrian Zone, No Motor Vehicles or Bus Lane to promote ULEV uptake and significantly reduce traffic emissions. Like School Streets, ULEV-only streets can have exemptions for permits holders such as residents, businesses and blue badge holders.

Purpose

- Restrict through traffic and drop-off activity but also promotes use of ULEVs.
- Reduces emissions and improves road safety.
- Can introduce in streets with high footfall/cycling where current exposure to emissions is high.

Approach

- Restrict access at entry cordon points to the ULEV only streets.
- Use Pedestrian Zone/ Pedestrian & Cycle Zone or No Motor Vehicle signs, with exemptions for ULEVs and permit holders.
- Restrictions during certain times/days or 24/7.
- Use ANPR to enforce restrictions.

Precedents

- Two areas in Shoreditch: ULEV-only zones in 2018
- Camden: planning ULEV-only streets at 23 schools

L2 Trees, shrubs, planters

- Potential Air Quality Improvement = Low
- Cost = Low
- Deliverability = Short-Medium term
- Stakeholder support = Medium
- Wider benefits: improved visual amenity
- Suitable for: Major and Minor roads



Trees on carriageway outside school. Provides visual road narrowing and encourages considerate driving behaviour



Trees and planting introduced on footway buildout outside school in Waltham Forest. Narrowed road also deters drop-off activity. Planting area provides sustainable drainage.

Description

Installation of trees and planting captures some emissions from traffic, thus reducing exposure to children when approaching the school and when within the school grounds/buildings.

Purpose

- Help to block pollutants but also provide shade, improve the look and feel of the area, and create visual cues to drivers that considerate driving behaviour is appropriate around the school environs.
- Can act as means of sustainable drainage.

Approach

- Planting and trees on the footway or buildouts immediately outside the school, around the school boundary or on key walking routes to school.
- If to be introduced on footways then care should be taken that adequate width will remain.
- Careful planning is required for the introduction of trees to ensure that the right species are used to maximise exposure reduction benefits, retain sightlines, provide shade, minimise maintenance etc. If used in the wrong location then trees can block airflow and therefore trap pollution.

Precedents

- Boroughs and TfL have programmes of tree planting .
- Mayor's Greener City fund provides grants for tree planting.

M7 Green screens

- Potential Air Quality Improvement = Low
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Medium
- Wider benefits: visual amenity, security/privacy, noise reduction, biodiversity



At Sir John Cass School 45m2 of green ivy screens were installed in the playground and roof garden and pupils planted 170 air quality plants. Six mobile green ivy screens with chalkboards were delivered to create unique play areas.



Screens alongside perimeter fence

Movable green screens

Description

Exposure to roadside pollutants can be reduced through using green screening. Certain types of plants can trap airborne particles and act as a pollution sink.

Purpose

- Traps airborne particles.
- Green screens provide aesthetic benefits as well as increased privacy, biodiversity and noise reduction.

Approach

- Green screens can be installed or grown along fences and other barriers/structures. Can also be installed on movable planters.
- The screens can be planted directly into the ground or into planters and are maintained with the option of a drip line irrigation system.
- It should be noted that green screens need ongoing maintenance which has associated time/cost considerations which need to be borne in mind.
- The most effective types are generally those with a dense vegetation layer and a high leaf density, and/or waxy leaves (such as ivy).
- Benefits will be heavily dependant on proximity to the pollution source and school, and screen height and orientation to prevailing wind or wind circulation.

Precedents

- Precedents: Bowes Primary (Enfield), Oxford Gardens (RBKC) and Sir John Cass (City of London)

N1 Boiler upgrades and heat pumps

- Potential Air Quality Improvement = Low
- Cost = Low-high
- Deliverability = Short-Medium term
- Stakeholder support = Medium-High
- Wider benefits: reduced operating costs



Heat pump condenser units
(centralised & stand alone)



Aging gas fired boiler

Description

Consider replacing older boilers which are less efficient and contribute to worsening air quality. Where possible replace with Heat Pumps.

Purpose

- Reduces or eliminates a source of local emissions. Older boiler emissions rise as combustion efficiency drops.
- Improved provision of heating (& potentially cooling).

Approach

- Where possible replace with Heat Pumps with zero local emissions, particularly where more significant building changes are planned.
- Whilst there are significantly higher costs to install and require remedial works, they will reduce ongoing costs and greatly reduce emissions, increasingly so as electricity generation becomes increasingly decarbonised.
- If direct replacement is required, consider replacing with an Ultra Low NO_x gas boiler with dry NO_x emissions not exceeding 40 mg/kWh (at 0% O₂).

Precedents

- Brandlehow Primary School, Putney
- King Edward VII High School, Kings Lynn

R2 Air Filtrations Systems

- Potential Air Quality Improvement = Low
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = High
- Wider benefits: reduced operating costs

Example of classroom air filtration system – floor mounted, stand alone system.



Research has shown that the drop in attention from high CO2 is of similar magnitude to that observed when students skip breakfast.



Description

Consider investing in air filtration systems in classrooms most exposed to poor air quality and reliant on natural ventilation. These systems are relatively high cost, only cover a single room per unit, and require ongoing maintenance and power consumption, but have demonstrated some encouraging initial scientific evidence of efficacy, with titanium dioxide proven to act as a reducer for NOx and NO2, and some claims it will eliminate 99.5% of NO2. They can also assist with virus reduction and PM reduction.

An air filtration system will not reduce CO2 levels. High CO2 can result in reduced attention and therefore learning, so some fresh air is going to be needed through windows, vents or air handling unit.

Purpose

- Reduces NOx and NO2 levels in classroom.

Approach

- For classrooms with poorest air quality or high exposure, consider installation of these units.

Precedents

- Limited use in UK so far – some recent testing carried out in three London schools (results TBC).
- Widely used in South Korea.

Appendix A – Detailed Description of Measures

Air Pollution at Schools



MAYOR OF LONDON

Detailed description of potential measures

Highway Measures

Toolkit Measures	Description	Purpose		Potential Air Quality Improvement	Wider Benefits										Cost	Deliverability	Stakeholder Support	Suitable for trial	Suitability			
		Reduce Sources	Reduce Exposure		Road safety	Promotion of sustainable transport	Visual amenity	Security/privacy	Noise reduction	Biodiversity	Improved learning environment	Reduced operating costs	Awareness raising	Support STARS and IJSL objectives					Main roads	Minor Roads		
1. HIGHWAY MEASURES (Key Stakeholder: Borough/ TfL)																						
A	Anti-idling																					
A1	Fines	Adopt legislation that will allow the borough to fine idling drivers near schools, and ensure the measures are enforced, delivered as part of wider campaign to raise awareness in the first instance, resorting to fines for persistent offenders.	X		L											X	L	L	H	Y	Y	Y
A2	Campaigns, including driver engagement	Initiate a campaign, such as Westminster's #DontBeldie campaign, and look to deploying some of the local volunteers to act as 'Vehicle Idling Action Champions' to raise awareness of the impacts idling can have and benefits of turning off your engine.	X		L											X	L	L	H	Y	Y	Y
A3	Information signage	Signage at the front of the school to raise awareness, accompanied by banner to further promote anti-idling (in a number of languages if required).	X		L											X	L	L	H	Y	Y	Y
B	Reducing traffic flow																					
B1	'School Streets'	Traffic access restrictions at school opening and closing times to help create a safer, more pleasant environment for children travelling to school, by removing air quality and road safety problems associated with through traffic and drop-off activity on the street/s outside the school. Signs will inform drivers of the restrictions. Non-registered vehicles entering the street during the times of operation will be identified by camera and issued a fixed penalty notice. Existing residents would be exempt from any penalties. The impacts of displaced traffic need to be carefully considered, and whether it would result in more 'park and stride' journeys to school, a switch to public transport, or just displace the activity to a different nearby street.	X		L	X											M	M	M	Y		Y
B2	Collapsible bollards	As an alternative to the 'School Street' measure, a collapsible bollard or bollards can be used to prevent vehicle access through the street/s outside the school over specified periods. This could be manually operated by a member of staff if granted the necessary permission by the borough, allowing continued access to the school and nearby homes for those who need it. This measure has been successful at a number of schools, including St Joseph's Catholic Primary School in Camden.	X		L	X											L	M	M	Y		Y
B3	'Play Streets' (temporary measure)	A 'play street' is effectively a timed closure on the street/s outside the school during a certain period of the day (e.g. on Friday after the school day ends). The play street can be run periodically, say once a term. Games and activities are organised for children and parents on the reclaimed street space. Signing and enforcing the closure is a joint exercise between the Borough and the school. 'Play streets' involve quite a lot of organisation and it is best if a local resident or parent is closely involved in the process who can rally others to the cause.	X		L	X	X								X		L	S	H	Y		Y
B4	Road closure	A full road closure where possible would remove the associated vehicle emissions and free up space for alternative uses. Traffic surveys would need to be undertaken to understand typical traffic flows and potential impacts on surrounding streets. Operational and emergency access requirements would also need to be considered.	X	X	H												L-M	S-M	L-M	Y		Y
B5	Filtered permeability	The introduction of filtered permeability served to close a road to motorised vehicles, whilst retaining routes through for pedestrians and cyclists. The scope to introduce road closures and filtered permeability measures depends on the wider road network, routing options and the impact of displaced traffic, as well as any requirements for preserving emergency access. Where implemented they can be paired with footway extensions, planting and public realm improvements.	X		M	X	X										M	M	L	Y		Y
B6	One-way streets/ No entry restrictions	Investigate options for restricting a road to one-way operation or retain two-way with a No Entry point access restriction. This will reduce traffic flows past the school, which could also enable the footway space to be widened, potentially incorporating trees and shrubs. All of which contribute towards TfL's Healthy Street agenda. Traffic surveys would need to be undertaken to understand typical traffic flows and potential impact on surrounding streets.	X		M	X	X										L-H	S-M	M	Y		Y
B7	ULEV-only streets	Introduce an ultra-low emission vehicle (ULEV) only restriction, utilising a recently approved exemption for ULEVs paired with access restrictions such as Pedestrian Zone, No Motor Vehicles or Bus Lane to promote ULEV uptake and significantly reduce traffic emissions. Like School Streets, ULEV-only streets can have exemptions for permits holders such as residents, businesses and blue badge holders. LB Hackney & LB Islington are introducing London's first ULEV-only streets in Shoreditch. One of the streets runs alongside a school.	X		M		X										M	M	L	Y		Y
B8	Width restriction (e.g. 7ft)	The introduction of a width restriction will mean that certain larger (often more polluting) vehicles will have to use alternative routes. The location of the narrowing would need to be considered carefully as it is likely to create some bunching of vehicles which may increase emissions at this point.	X		L												L	S	M			Y
B9	Environmental weight limit signs	These weight limits prevent large vehicles from using inappropriate roads, routes and areas in order to: reduce emissions, prevent damage to buildings, preserve the character, amenity and environment of an area.	X		L												L	S	M			Y
B10	Reallocate roadspace	Investigate the scope for reallocating some roadspace currently open to all vehicles to promote a wider shift towards more sustainable modes, for example through introducing a new segregated cycle route or bus lane to improve public transport provision and discourage travel by car to reduce local emissions. The likely resulting impact on traffic congestion would need to be considered.	X		M		X										H	L	M		Y	Y
B11	Weight restrictions	Introduce a weight restriction to prevent large freight vehicles routing past a school to reduce local traffic emissions and road safety issues. Alternative more suitable routes would need to be available and the impacts of re-routing would need to be considered carefully.	X		M	X											L	M	M			Y

Case studies

Detailed description of potential measures

School Site Measures: school grounds

Toolkit Measures	Description	Purpose		Potential Air Quality Improvement	Wider Benefits								Cost	Deliverability	Stakeholder Support	Suitable for trial	Suitability	
		Reduce Sources	Reduce Exposure		Road safety	Promotion of sustainable transport	Visual amenity	Security, privacy	Noise reduction	Biodiversity	Improved learning environment	Reduced operating costs					Awareness raising	Support STARS and HSL objectives
2. SCHOOL SITE MEASURES (Key Stakeholder: School/ Borough)																		
M	School Grounds																	
M1	Additional scooter/ cycle parking																	
M2	Reduce staff car parking																	
M3	Anti-idling for deliveries																	
M4	Re-timing for deliveries																	
M5	Reduce number of deliveries, staff/visitor vehicle trips and/or use more sustainable modes																	
M6	Relocate pedestrian entrances																	
M7	Green screens																	
M8	Trees, shrubs, planters																	
M9	Green spaces																	
M10	Pupil & staff cycle parking																	
M11	Reduce waiting times to enter school grounds																	
M12	Relocate playgrounds and free-flow spaces																	
M13	Co-ordinate start/ finish times with nearby schools																	
M14	Reconsider playground layouts to reduce exposure																	
M15	Sheltered waiting areas for parents/ guardians																	

Case studies

Detailed description of potential measures

Wider Measures

Toolkit Measures	Description	Purpose		Potential Air Quality Improvement	Wider Benefits										Suitability							
		Reduce Sources	Reduce Exposure		Road safety	Promotion of sustainable transport	Visual amenity	Security, privacy	Noise reduction	Biodiversity	Improved learning environment	Reduced operating costs	Awareness raising	Support STARS and HSL objectives	Cost	Deliverability	Stakeholder Support	Suitable for trial	Main roads	Minor Roads		
4. WIDER MEASURES (Key Stakeholder: Borough/ TfL/ GLA/ Central Government)																						
U1	Targeted scrappage scheme for polluting vehicles entering London	Engage with any future proposals or consultations regarding the introduction of a targeted scrappage scheme, aimed at more polluting vehicles recorded entering London regularly over an extended period, promoting a transition to ultra-low emission vehicles, in conjunction with measures to promote more sustainable transport.	X		H													H	L	L		
U2	Reform Vehicle Excise Duty	Lobby national government to reform Vehicle Excise Duty to reflect emissions of local pollutants as well as CO2, and remove the ongoing incentivisation this lends to diesel vehicles.	X		H													M	L	L		
U3	Promote a transition to electric heating and heat pumps	Seek to promote the principles of 'an all-electric city', including reducing/eliminating the use of gas in buildings, which city wide account for over 33% of emissions, by requiring or incentivising the use of electric heating/cooling via heat pumps in new buildings and major redevelopments.	X		H													M	L	L		
U4	Reform Buildings Regulations to promote heat pumps	Support and promote dialogue at a national level concerning buildings regulations and how they're calculated to better account for local air quality issues as well as energy efficiency, and so promote wider deployment of technologies such as heat pumps.	X		M													M	L	L		
U5	Zero emission zones	Review the effectiveness of planned measures and develop an approach for introducing a zero emission zone in central London and town centres in the short to medium term, and larger inner London and London-wide zones in the longer term. To be developed in conjunction with other policies such as the creation of Liveable Neighbourhoods, reducing road danger and making more efficient use of the street network, including for freight and servicing. Any specific schemes would be subject to statutory consultation.	X	X	H													H	L	L		