



Air Quality Overview

June 2016

The HS2 Scheme and Air Quality Overview

- The main pollutants of concern in the UK are nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and its sub-fraction PM_{2.5}).
- Human activities (domestic heating and cooking, aviation, road vehicles, industrial processes, agriculture) add to the natural sources of these air pollutants. Highway vehicles are the most significant source of public exposure to these pollutants from their exhaust gases.
- HS2 is an electric railway scheme which will have no emissions at the point of use. This will help to offset the environmental impacts of planned transport growth.
- The construction and operation of the railway will cause changes in the nature and location of emissions from highway vehicles and other emissions, such as construction dust.
- The scheme has been assessed for its impact on air pollutants in the EIA process.
- Measures to control emissions are set out in the Code of Construction Practice and the Air Quality Information Paper E31.

Air quality standards for NO₂ and PM₁₀

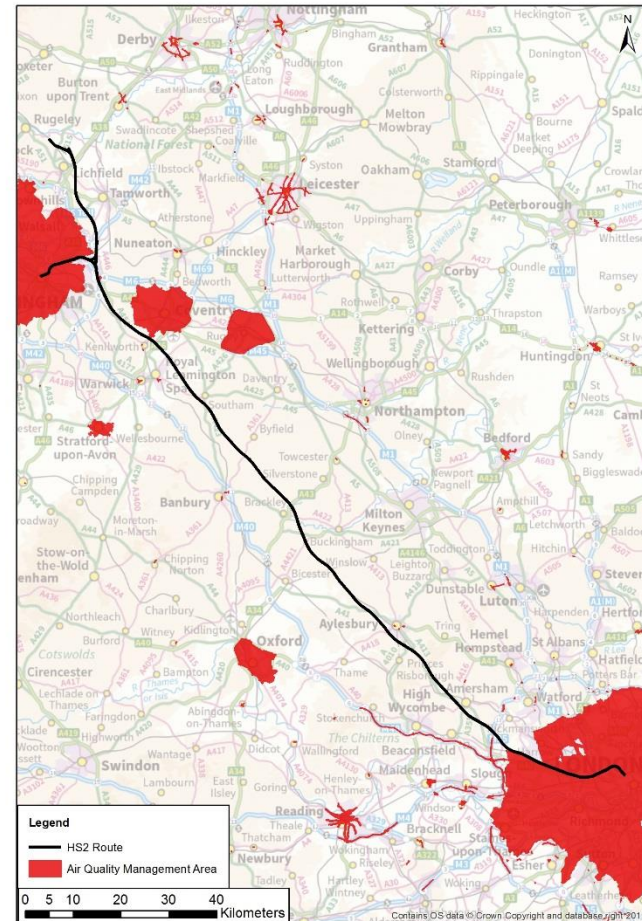
The EU and UK air quality standards for NO₂ and PM₁₀ are:

- Nitrogen dioxide: 40 microgrammes per cubic metre of air as an annual mean
- PM₁₀ particulate matter: 40 microgrammes per cubic metre of air as an annual mean

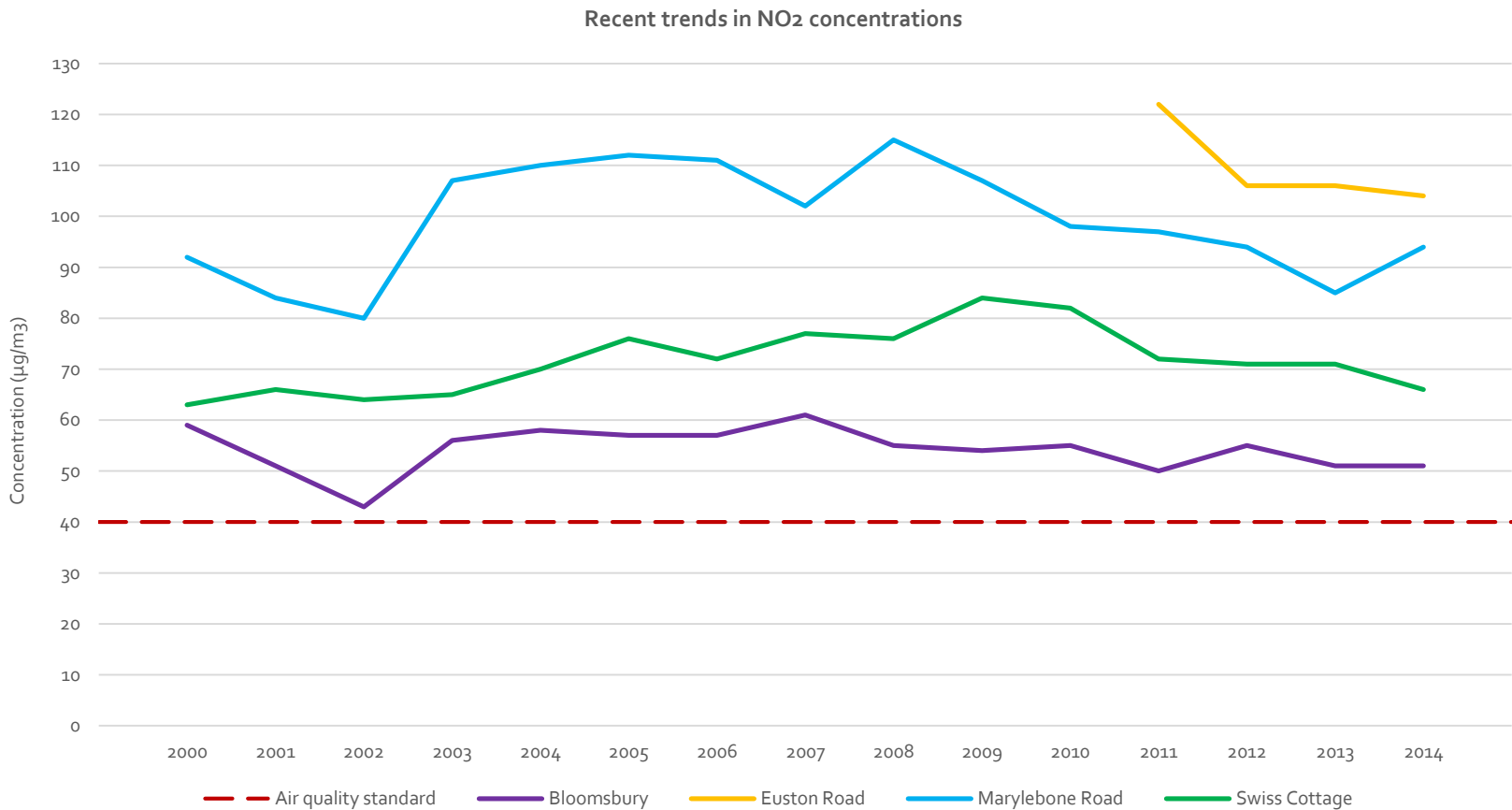
In some locations the air quality standards for these pollutants are currently exceeded.

Air Quality Management Areas

- The only locations where the Phase One route runs through existing Air Quality Management Areas are in London and Birmingham.
- These AQMAs (shown in red) were designated by Local Authorities in respect of compliance with the standards for nitrogen dioxide and/or PM₁₀ concentrations, mainly due to traffic emissions.



Example of recent trends in NO₂ concentrations on certain roads around Euston



Approach to air quality assessment

The effects of the scheme have been assessed for:

- Vehicle emissions arising from changes to traffic, road closures and diversions during construction and operation. This has been done by:
 - Traffic screening using the DMRB criteria^[1];
 - Selection of sensitive receptors within 200m of affected road network;
 - Prediction of NO₂ and PM₁₀ concentrations using air quality modelling (DMRB spreadsheet and/or dispersion software).
- Dust emissions arising from construction activities;
 - With the implementation of the measures detailed in the draft CoCP, no significant effects have been identified from dust generating activities. This is because dust can be controlled effectively by such measures.

[1] Highways Agency (2007) *Design Manual for Roads and Bridges, Volume 11 Section 3 Part 1 Air Quality (HA 207/07)*

Results of assessment of traffic emissions

- A significant effect is defined by reference to current legislation and guidance^[1].
- Where an effect on air quality is described as significant at a particular location, the significance is with respect to the air quality legislation: it does not denote a significant effect on human health. Much larger changes in air quality than are predicted to arise from the scheme would be needed to cause significant impacts on health.
- The only locations where some significant effects (beneficial or adverse) for NO₂ and PM₁₀ concentrations are predicted to occur are within the London area. This is principally due to construction traffic and highway interventions (road closures and diversions).
- The significant effects are related to the nature of the works in the urban area and the existing air quality, where there are traffic changes on heavily used roads with people living/being close to them.

[1] SMR Addendum 3, SES2 and AP3 ES Appendix CT-001-000/4

Change in guidance for describing air quality impacts

- The assessment of air quality impacts from traffic emissions included in the Hybrid Bill ES and the SES and AP₂ ES used the impact descriptors included in the Environmental Protection UK (EPUK) 2010 guidance.
- In 2015, the Institute of Air Quality Management (IAQM) and EPUK published new guidance. This includes a revised set of impact descriptors. These are much stricter and treat a similar increase in ambient pollutant concentrations as having a greater impact and therefore a greater potential for a significant effect. The new guidance has been used for the SES₂ and AP₃ ES and subsequent ES documents.
- The effect of the change in guidance is illustrated by the following example receptor for predicted NO₂ concentrations:
 - Without scheme: 38µg/m³
 - With scheme: 39.5µg/m³
 - Difference (i.e. scheme contribution): 1.5µg/m³

EPUK 2010 guidance:
slight adverse impact

→ not a significant effect

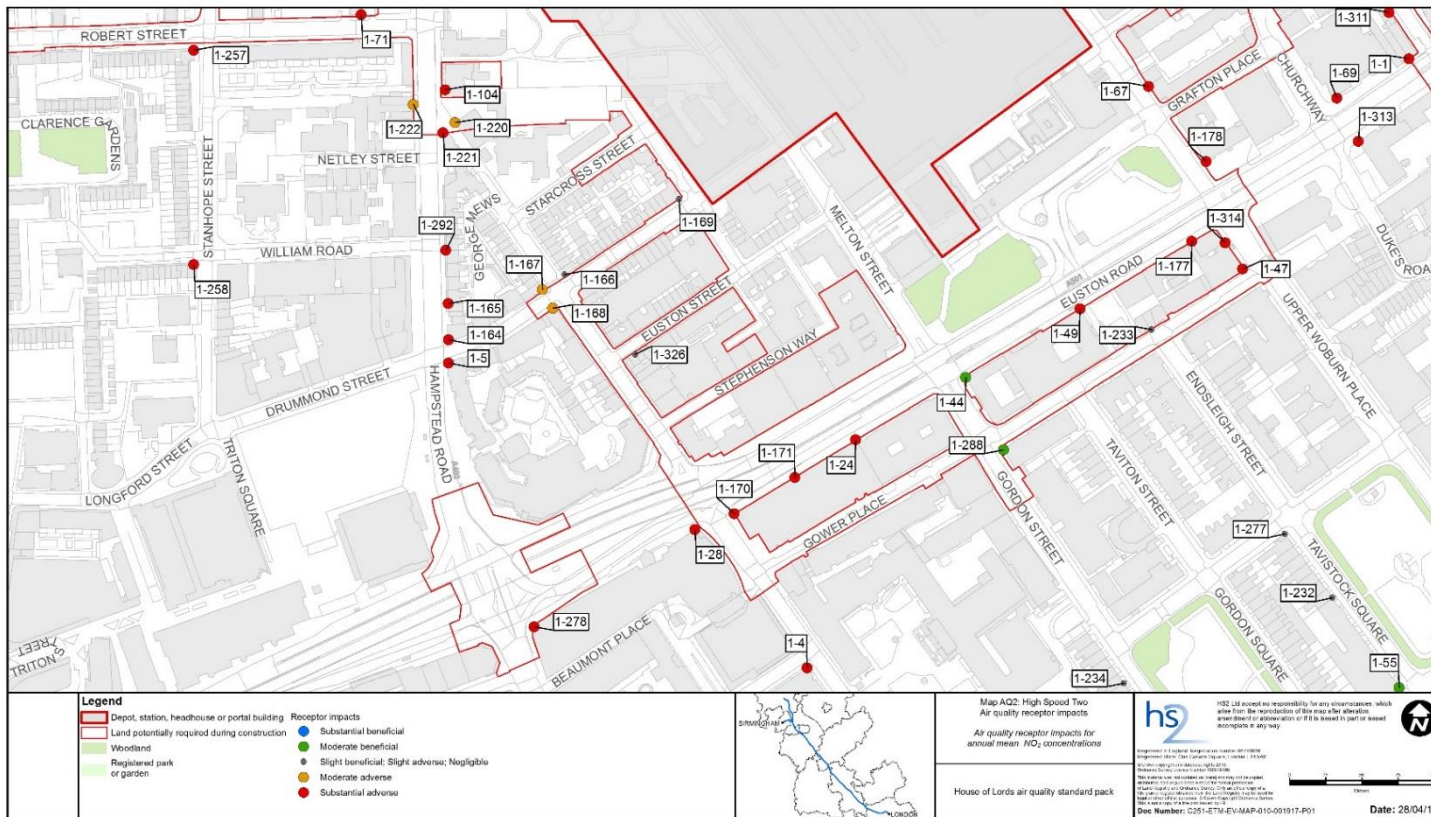


IAQM/EPUK 2015 guidance:
moderate adverse impact

→ significant effect

Assessment locations near Euston Station

The map below shows locations where air quality effects have been assessed towards the south of Euston Station.

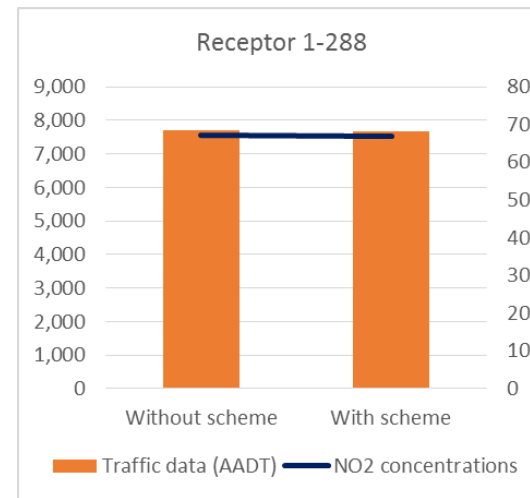
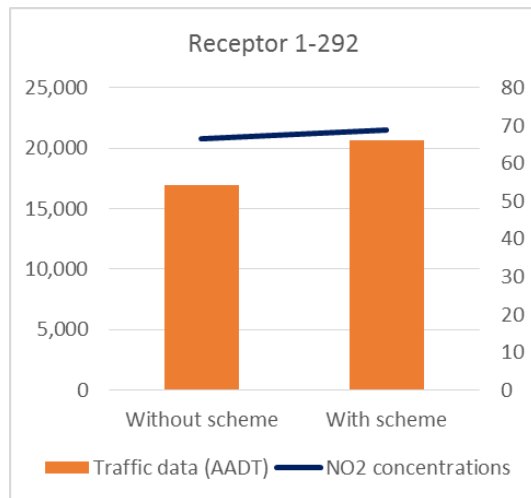


Two example locations

These example locations on Hampstead Road (ID 1-292) and Gordon Street (ID 1-288) show the way in which air quality changes are related to traffic changes during construction.

Predicted NO₂ concentrations (µg/m³)

ID	Without scheme (2017)	With scheme scenario 1 (2017)	Change in NO ₂ concentrations	Impact
1-292	66.6	68.7	+2.1	Substantial adverse
1-288	67.2	66.9	-0.3	Moderate beneficial



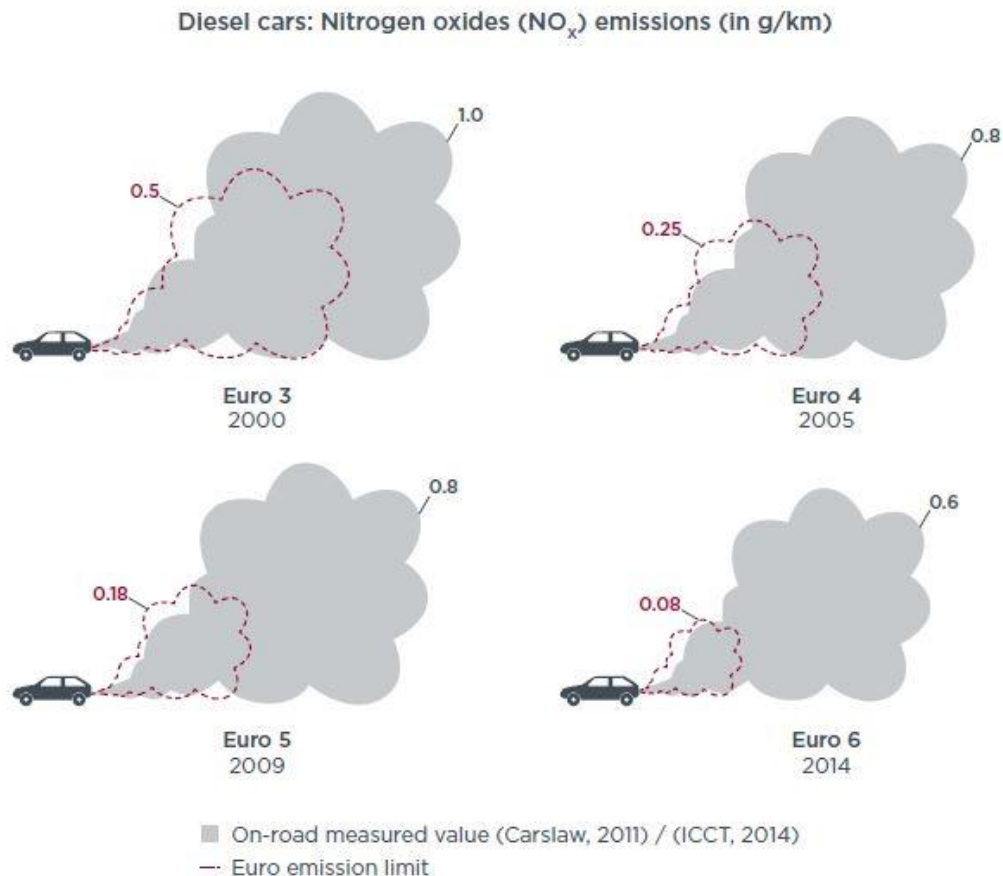
Assessment of traffic emissions – conservative assumptions

- The assessment has assumed that the peak construction flows occur every day for the whole of the year assessed. In many cases the durations are only weeks or months.
- The assessment has assumed 2017 emission factors and 2017 background pollutant concentrations for all the years of construction up to 2026. In reality, those emission factors and background concentrations should fall year on year in that period, as cleaner vehicles enter the fleet.
- The introduction of the Mayor's Ultra Low Emissions Zone (ULEZ) in London has not been taken into consideration in the air quality assessment. Its implementation is anticipated to bring improvements in background pollutant concentrations and the vehicle fleet.
- The assessment has assumed that all excavated material will be removed by road at Euston.

Comparison of diesel car NO_x emissions between Euro standard and on-road measurements

There are known discrepancies between type-approved car emissions and actual emissions on the road, as illustrated.

Air quality models that might be materially affected by such discrepancies were calibrated using ambient measurements of roadside NO₂ concentrations. This makes those assessments robust and related to the actual emissions.



Source: The International Council on Clean Transportation (2014) *Real-world emissions from modern diesel cars – Fact sheet: Europe*

Approach to air quality mitigation (1)

HS2 Ltd has published Information Paper E31 Air Quality setting out general and specific measures to avoid and mitigate emissions to air.

HS2 has set a new standard for managing its air quality effects adjacent to highways, as set out in the CoCP:

7.2.12 The nominated undertaker will manage air quality effects adjacent to the highways, where these have been identified as significant in the hybrid Bill Environmental Statement (as amended) or subsequent assessments.

7.2.13 In order to manage significant impacts related to highway traffic changes and interventions, the nominated undertaker will put in place a management process to manage those impacts through measurement of air quality and regular assessments of the air quality situation as affected by the construction of the scheme. Where significant effects are still predicted, action plans will be put in place with the objective of removing those significant effects.

7.2.14 This management process is modelled on Defra Local Air Quality Management (for which the statutory duties of Local Authorities and London Boroughs are set out in Part IV of the Environment Act 1995), and the periodic reviews and action plans are envisaged as being similar to those produced in that process.

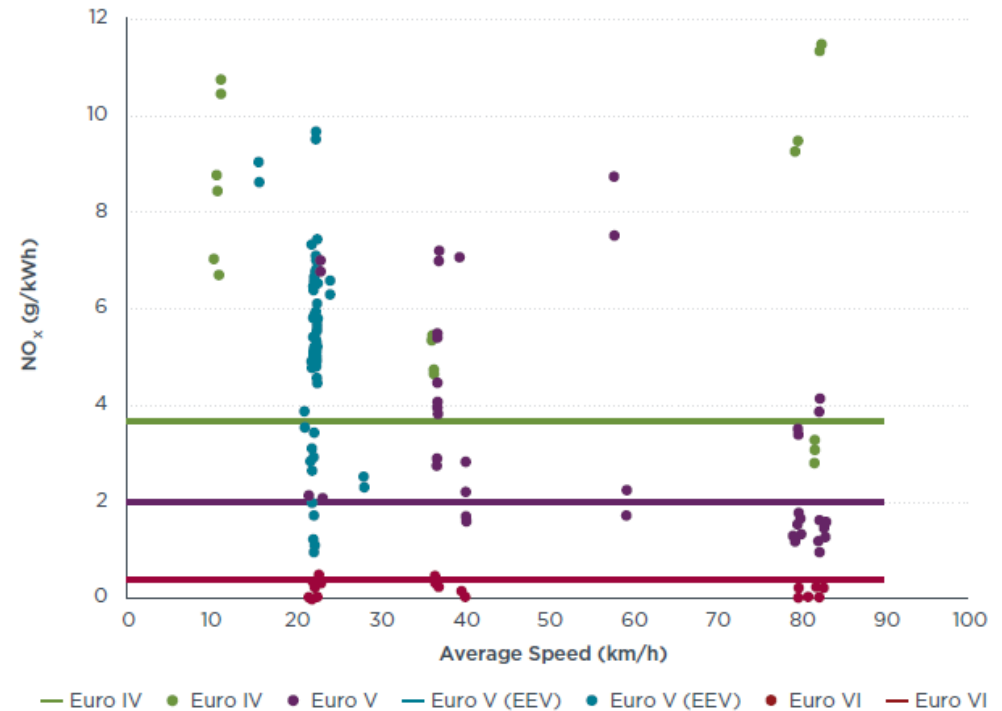
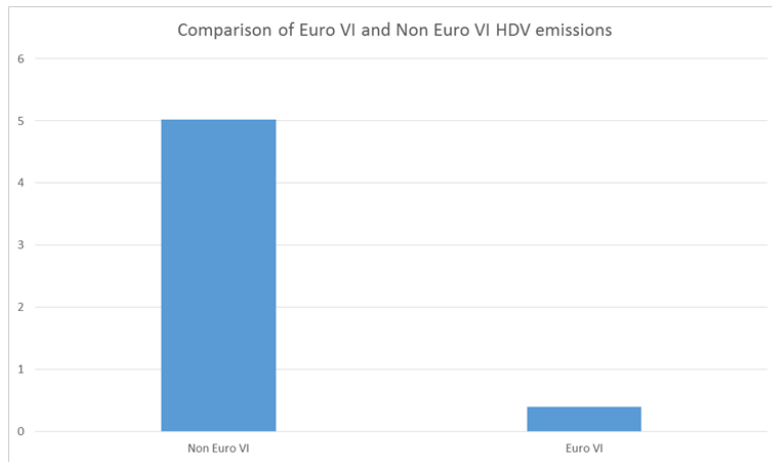
7.2.15 This process comprises: measure – review – action plan. Baseline (pre-works) air quality monitoring will be required in locations where potential significant effects are predicted. Forecast baseline and with HS2 construction traffic flows will be reviewed and updated in these locations, if necessary.

HS2 Ltd has made a commitment to use Euro VI heavy goods vehicles (>3.5 tonnes) for transporting excavated material in London.

Further undertakings and assurances have been provided to local authorities as set out in the draft register.

Euro VI heavy goods vehicles

Euro VI heavy goods vehicles (HGVs) are required to have substantially lower emissions of NO_x (which comprises the gases NO and NO₂), than the earlier Euro series. Real-world emissions testing has also shown that the Euro VI standard for HGVs is delivering the anticipated reductions in NO_x emissions.



Source: The International Council on Clean Transportation (2015) *Comparison of real-world Off-cycle NO_x emissions control in Euro IV, V and VI*

Approach to air quality mitigation (2)

Non-Road Mobile Machinery to be used along the route will comply with stringent emissions standards based on, and going further than, the relevant standards for London. This is the first time that requirements have been set outside of London, and will help to reduce workforce exposure to diesel particulate matter.

The House of Commons Committee made the following direction in respect to air quality in Camden: *"We want monitoring of air quality to feed into an assessment of whether rehousing should occur in cases where air quality deteriorates."*

In response, the Promoter has stated that it will monitor air quality at locations where significant air quality effects were identified as a direct result of HS2 construction. Where deterioration in air quality is identified, the Promoter will work with the London Borough of Camden to seek to agree appropriate mitigations, including rehousing if appropriate.

The quantified health impacts of the scheme due to air quality in Camden suggest that it is very unlikely that rehousing will be required in the absence of special circumstances related to an individual.