

**CASE STUDY: *Sir Robert McAlpine,*
*Broadgate projects***



In conjunction with our work on the Institute of Civil Engineers' London Air Quality Taskforce and our framework with British Land to redevelop Broadgate, we have looked at two areas where we can push the boundaries and contribute to improving the air quality in London.

Air Quality Monitoring

When setting up the site at Broadgate we looked at the locality of the site, the planned construction works over the next ten years, the ambition to create a retail destination and then considered how we could improve the air quality impact of the overall development. We were also conscious of the location of Liverpool Street's bus station adjacent to the Broadgate site and, whilst there is a long term ambition to electrify the buses in London, in the short term we need to consider the station's impact on the locality.

We put together a proposal (please see below) for setting up air quality monitoring at key areas around the site so that we could establish background levels for the air quality and then continue to monitor these as the works progressed so that we established whether the works and/or completed buildings had a positive, negative or neutral impact on the surrounding area. The existing development also included underground gyratory systems which were more enclosed by their nature. This meant we had to be more careful about the ambient air quality levels as a result of construction activity particularly construction plant (Non Road Mobile Machinery.)

We consulted with the City of London Air Quality Team and Kings College London to ensure we were using the most appropriate type of meters and that their location was beneficial not only to the Broadgate Development but also the wider City of London air quality monitoring. The City were particularly interested in monitoring the bus station as its impact could be determined by comparison of data when it was operational and while shut. We also discussed with Kings College the possibility of making the results available for student research into air quality matters. The preferred monitor locations were agreed and installed on site in conjunction with our noise and vibration monitors and we employed SRL to record and interpret the results on our behalf.

The monitoring has now been operational on site for nearly 12 months and has already delivered additional benefits including identifying that the air handling plant for the new building at 100 Liverpool Street would require filters on the air intake to deliver the required internal air quality. This would not have been identified had the baseline monitoring been installed.

The bus station has closed in the past few weeks as planned, so we have good background data with bus station operational and will now be able to demonstrate the effect of the closure on air quality.

In discussion with Transport for London the ICE Air Quality Task Force have identified that air quality monitoring is an important consideration when preparing construction logistics plans (CLPs). These CLPs need to be produced as part of the developer's planning submission, and in an ideal situation supported by input from their proposed construction partner. It may not always be appropriate to install sophisticated air quality monitoring as at Broadgate but there are alternative types of monitors that also deliver beneficial monitoring output on smaller developments and it may be appropriate for a combined monitoring strategy where multiple developments are planned in the same area – such as Battersea.

Please see the air quality monitoring plan below for Broadgate for information that not only includes the air quality monitors but also the noise and vibration monitors. We have traditionally installed noise and vibration monitors over recent years to assist with managing our interface with stakeholders on construction impact so the addition of air quality monitoring should be a positive and natural development of this process when considering setting up projects.

Construction has traditionally had a bad image because of the dust that is often generated during the construction process but over recent years there has been a significant improvement primarily because of the associated awareness of Health, Safety and Wellbeing impact on the work force. Therefore taking a forward looking approach to air quality monitoring will demonstrate best practice to one of the most significant challenges currently across London and other major cities in the UK.

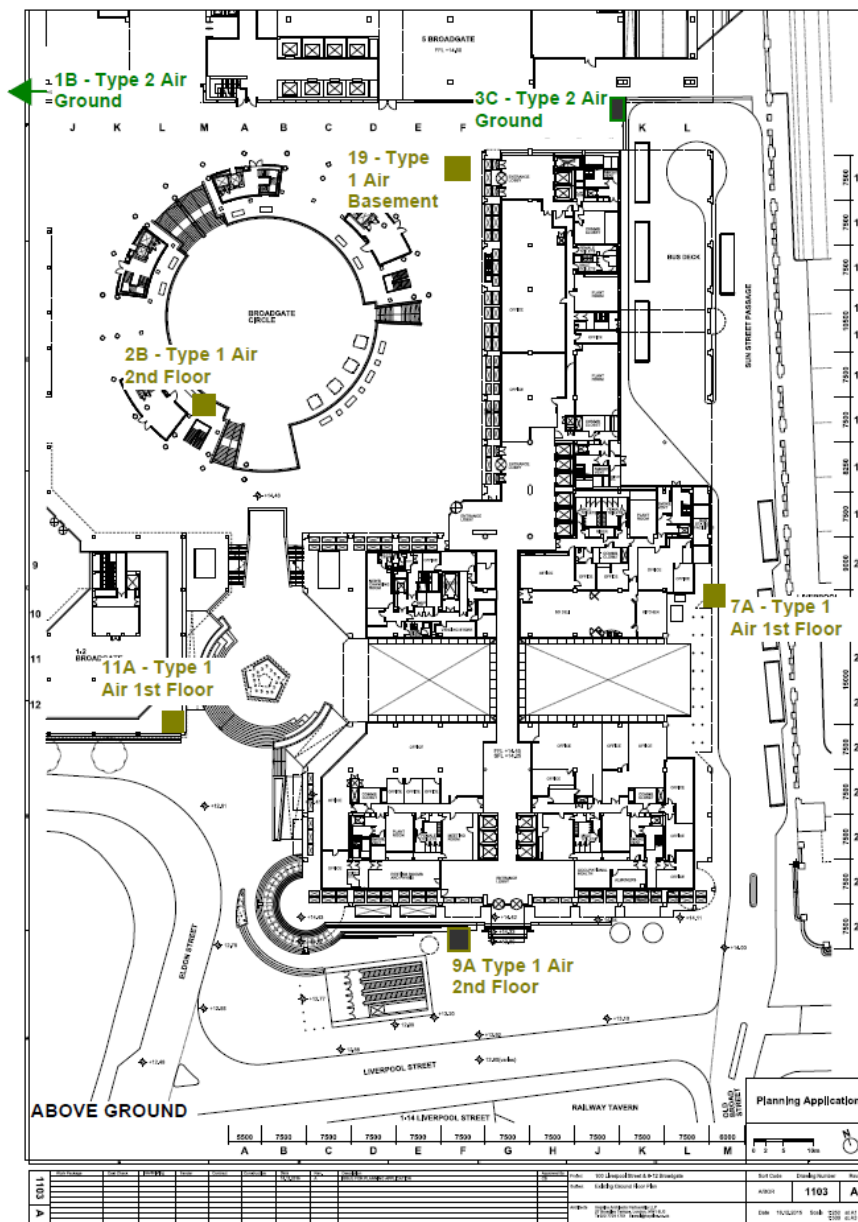


Figure 1: Map detailing the locations of monitoring stations around the site

Air quality monitoring proposal

Scope

To install and maintain multiple noise, vibration and air quality monitoring units that are required for the entire 100 Liverpool Street demolition and construction project.

To engage with specialist support for air quality, noise and vibration monitoring package to provide support on locations/equipment, appropriate trigger levels, mitigation techniques, etc.

One aspect of this is that as part of the framework agreement SRM are undertaking an in depth air quality survey in collaboration with Kings College University and City of London Environmental Health team.

Air Quality Monitoring

Air quality onsite will be measured utilising two monitoring systems and will be undertaken in accordance with The London Councils' Best Practice Guidance: The control of dust and emissions from construction and demolition (November 2006).

Type 1: Automated particulate and air quality monitoring of a 15-minute average to be undertaken, both PM10 and PM2.5 dust, specifically ES 642 Live PM10.

Type 2: Automated emissions air quality levels are to be captured, utilising Enviro Technology Chemiluminescent T200

- PM10
- PM2.5
- NOx

These are fixed monitoring positions are located in a multiple locations, due to power demands mobile monitoring is not viable.

Construction Monitoring

In accordance with the London Councils' Best Practice Guidance: The control of dust and emissions from construction and demolition (November 2006) specifies air quality monitoring alert protocols that should be followed during site demolition.

Amber – 220 $\mu\text{g}/\text{m}^3$ of PM10

Red - 250 $\mu\text{g}/\text{m}^3$ of PM10.

These will be evaluated and added to as the data gathered from the site is understood more, to develop more stringent action alerts.

NOx limits are 40 $\mu\text{g}/\text{m}^3$ per annum with an allowance for an hourly level to exceed 200 $\mu\text{g}/\text{m}^3$ no more than 18 times per year.

Management and Reporting

Real-time monitoring data can be viewed or downloaded from the online portal which allows for current 'real-time' and historical data values to be viewed. Tiered access allows the level of detail available to be regulated, appropriate site personnel will receive automated alerts when monitoring records specified trigger levels.

Normal operation of the meters must be verified automatically via a remote modem/Wi-Fi link. The monitors will receive site calibration during periodic visits to site and laboratory calibration at predefined times. During offsite calibration replacement units will be provided to ensure continuous monitoring.

Bi-monthly summary reports will be issued to required relevant parties detailing the reporting period's measurements, together with comments on site activities and any additional mitigation carried out.

Non Road Mobile Machinery (NRMM)

The most recent evidence on NOx source apportionment in Greater London apportions 7% to NRMM, one of the largest contributors after road transport. A snapshot of the data showed that the greatest contribution to NOx pollution was from excavators which emitted 46% of all NRMM emissions followed by dumpers at 11%. The compliance levels from these machines are far below those of motor vehicles (cars and lorries.) The current compliance limit for excavators in the GLA is likely to produce the same level of emissions as 15 Euro 1V trucks or buses.

This means that whilst measures are being taken to clean up the most polluting vehicles using the roads, NRMM used on sites will continue to have lower emission standards and will continue to add high levels of pollution to London's air. It is important to note that NRMM is often left idling on site, increasing the exposure to emissions for the local community and the operators of these machines are often exposed to high levels of pollution.

The GLA's Supplementary Planning Guidance (SPG) requires registration of all developments in the Central Activity Zone and all major developments within Greater London and this register allows local planning authorities to check what NRMM is being used in their boroughs for compliance purposes and for the industry to self-regulate the use of NRMM.

This register has been available online since September 2015 and is administered by the London Low Emission Construction Partnership (LLECP) and the purpose of the website is to:

- Register the development
- Upload details of all NRMM
- Apply for exemptions where applicable (exemptions can only be applied for if the site is registered.)

Exemptions fall into three categories: Block, Viability and Short-term, determined to take account of current availability of compliant plant or suitable retrofit technology to reduce emissions. These all have time limits due the rapid improvements in developing technology.

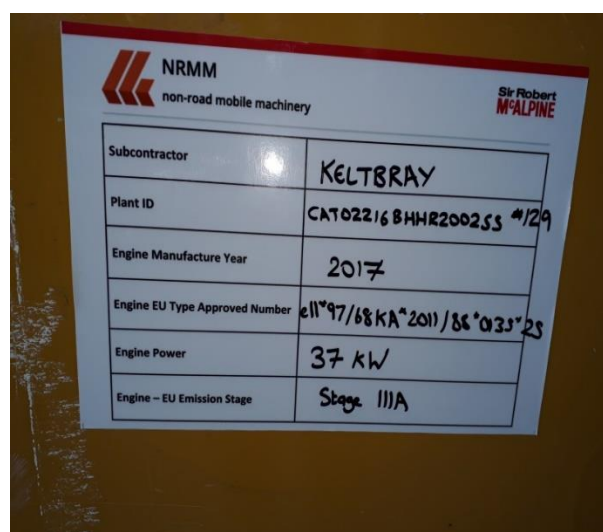
Despite this compulsory registration being in place enforcement has been difficult across the construction sites and is largely reliant on the self-regulation aspects. Earlier this year Sir Robert McAlpine carried out a survey of 10 selected construction sites for the City of London and recorded that only seven out of the ten sites had registered on the website and of the seven sites, two had registered but did not log the NRMM on site – all sites involved demolition which traditionally relies heavily on excavators.

The overriding fact is that until all sites are registered as common practice and comply with the requirements there will not be any significant improvements in NRMM emissions.

We have taken on board these requirements at Broadgate and have listed out some of the best practice initiatives that should be incorporated when considering NRMM:

- The overriding drive for all construction projects should be to set standards that ensure only compliant plant is used on sites and that it is well maintained and serviced regularly.
- The first consideration is to ensure that where specialist plant is required, especially if it falls into the exempt categories, that a full review is carried out to seek alternative construction methods or to design out the need for the plant in the first place.
- Diesel plant to be retrofitted with Diesel Particulate Filters (DPFs) where appropriate – but this should only be considered a short term solution.
- Individual plant stickers to record information and registration details to facilitate compliance audits (see below photographs in use at 100 Liverpool Street at Broadgate.)

- NRMM inventory kept on site in addition to registering on website to ensure full compliance including photographic reference of plant. Signs very often already incorporate this as part of their safety records so this is a small additional requirement.
- No plant idling policies on site for NRMM in addition to no idling for delivering road transport vehicles.
- NRMM and associated air quality requirements included in site induction.
- Tool box talks given to plant operators about air quality requirements and benefits of efficient driver operation and to reinforce no idling policy.
- All machinery to be regularly serviced and service logs kept on site for inspection.
- Use of generators on construction sites limited and/or excluded by early engagement with UK Power Networks to ensure that temporary power available for the construction phase. This has been successfully achieved at Broadgate and is already being addressed for future phases. If generators are the only option then these should be appropriately sized and/or hybrid technology should be considered especially with the improvements in battery technology.
- All block exemption plant should be registered for monitoring purposes.
- Consider the use of hybrid fuel source NRMM such as propane or ethanol. We have used an electric powered concrete pump at Broadgate as the pump can only be located in a confined space in the gyratory system.
- Use of site manufacturing where appropriate.



Figures 2, 3 and 4: Individual plant stickers to record information and registration details to facilitate NRMM compliance audits