Southampton City Council

2016 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management

December 2016

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Executive Summary: Air Quality in Our Area

Background

The City of Southampton is a major coastal port located on the South Coast of England. It is the largest city in Hampshire, covering an area of 5,181 hectares (Southampton City Council, 2011) and has a population of 245,300 (Office for National Statistics mid year estimate 2014). The city centre is located between two rivers, the River Test, which borders the city to the west and the River Itchen, which bisects central Southampton from the eastern wards. Both rivers converge into Southampton Water, a deep water estuary with a double tide that results in prolonged periods of high water. Southampton's excellent strategic position and channel characteristics have made it particularly good at facilitating the movements of large ships and has resulted in the city developing into a thriving cargo and cruise passenger port.

The Port of Southampton is run by Associated British Ports (ABP) and it is one of Southampton's biggest employers. The port handles around 820,000 vehicles per annum, 41.0 million tonnes of goods per year (ABP) making it the 16th busiest port in Europe. A total of 1.57 million cruise ship passengers (includes arrivals & departures) passed through the port in 2014, (source ABP). In 2014, just over 1 million shipping containers were handled, 625,000 were moved by Road, and 317,000 by Rail. Containers moved by Road represents 66%, and by Rail 34% of inland container movements. In addition, 125,000 containers were moved by feeder ship to other UK ports such as Liverpool and Belfast. (source DP World)

Other significant employers include; the University of Southampton, NHS, Ikea, Carnival UK. Southampton's West Quay Shopping Centre, which opened in September 2000, is also a major retail hub for the region, ranked 14th in the UK for retail space (Southampton City Council, 2011).

The city has very good transport infrastructure links, served by a regional airport just outside the city's northern boundary, the M3 and M27 Motorways and a main line railway to London and along the south coast.

Southampton lies at the western end of the South Hampshire sub-region. The wider urban South Hampshire area, consisting of Southampton, Eastleigh, Fareham, Gosport, Portsmouth and Havant, together with parts of the New Forest, Test Valley, Winchester and East Hampshire has a combined population of over a million people and is the largest urban area in the South East region outside of London. As a consequence, the area is also one of the South East's major economic centres and whilst other successful areas in the region depend upon linkages to London, South Hampshire operates in a distinct and largely separate manner, relying instead on connections with other regions and with Europe as a result of the presence of two major ports (Southampton and Portsmouth).

Southampton has a wealth of award winning parks, including Grade II listed parks within the city centre, making it is one of the greenest cities in Southern England. Of particular note is Southampton Common, a 362 acre wooded and grassy open recreational area just minutes from the city centre, which is designated a Site of Special Scientific Interest (SSSI).

Road transport emissions are the major source of air pollution in Southampton. Domestic gas boilers, industrial emissions, particularly from the waterside, and shipping emissions also significantly contribute towards the total.

The pollutants of concern in Southampton are nitrogen dioxide ($NO_{2)}$ and particulates, PM_{10} and $PM_{2.5}$. As a result of identified local air quality issues, Southampton has declared 10 Air Quality Management Areas (AQMAs) to date.

Air Quality in Southampton

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with

equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

Southampton, like many other urban areas, has elevated levels of Nitrogen Dioxide (NO2) due mainly to road transport emissions. Emissions from the port contribute significantly in key locations.

Southampton City Council (SCC) has designated 10 Air Quality Management Areas (AQMA) across the City where concentrations of NO_2 breach Government, health-based Objectives and has undertaken reviews of current and predicted levels in the future, including assessments of measures to reduce pollution levels.

Please see below a link to the SCC website which has maps of the AQMAs and descriptions.

http://www.southampton.gov.uk/planning/air-quality-planning/air-quality-management-areas.aspx

Summary of previous air quality reports and AQMA declaration history

Report Date	Report Type	Report Outcome
June 2003	Updating & Screening Assessment 1	Detailed Assessment required for SO_2 and NO_2
December 2004	Detailed Assessment	Six AQMAs required for NO_2 (annual mean)
July 2005	Declaration of six AQMAs	AQMAs declared along Bitterne Road, Town Quay, Bevois Valley Road, Redbridge Road, Romsey Road / Winchester Road Junction and Hill lane / Winchester Road Junction
July 2005	Progress Report (2004)	No recommendations

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

March 2006	Climate Change and Air Quality Strategy	Published Climate Change & Air Quality Strategy
September 2006	Further Assessment	Recommended that one AQMA increased in size (Town Quay) and one AQMA decreased in size (Hill Lane / Winchester Road)
September 2007	Air Quality Action Plan (and subsequent annual progress reports)	Air Quality Action Plan published and incorporated into the Local Transport Plan
August 2006	Updating & Screening Assessment 2	Detailed Assessment required for NO_2 at six locations and PM_{10} at one location
December 2007	Detailed Assessment	Two additional AQMAs required
July 2008	Declaration of two AQMAs	AQMAs declared for Commercial Road and Millbrook Road
November 2008	2007 Progress Report	No recommendations
July 2009	Further Assessment	Confirmed the two AQMAs declared in 2008 as valid
November 2009	Updating and Screening Assessment 3	Identified five roads outside the existing AQMAs which are at risk of exceeding the NO2 annual mean. Proceeded to a Detailed Assessment
December 2011	2010 Progress Report	Identified three more areas that were at risk of exceeding the NO_2 annual mean
April 2012	Detailed Assessment	Recommended the declaration of 3 new AQMAs at New Road, Victoria Road and Burgess Road. Also recommended the extension of the existing Bitterne Road and Romsey Road / Winchester Road AQMAs and the merging of

		Redbridge Road and Millbrook Road AQMAs to form one larger AQMA
December 2012	Updating and Screening Assessment 4	Portswood Road and Millbrook Point Road were identified as areas requiring further investigation with NOx tube monitoring. Proceed to Detailed Assessment for Nitrogen Dioxide
December 2013	Progress Report	The southern end of Romsey Road was identified at risk of exceedance, 2 more NOx tubes to be deployed. Queens Terrace and Orchard Place adjacent to the Platform Road AQMA were identified at risk of exceedance
May 2015	2013 Progress Report and Detailed Assessment combined Report	The Report gave consideration to extending the existing AQMAs on Romsey Road and Bevois Valley Road to include receptor locations that were exceeding in 2013,
November 2015	Updating and Screening Assessment 5	Shirley High Street was identified as being at risk of exceedance, 3 NOx tubes were deployed in July 2015 to monitor. The AQMA amendments recommended in the May 2015 Report have been delayed pending the outcome of the Clean Air Zone consultation.

SCC work closely with our partners, which include neighbouring local authorities, Highways England, Hampshire County Council (HCC), bus and train companies, Southampton Universities and the Environment Agency. The SCC transport department meets regularly to coordinate sustainable transport measures in south Hampshire with neighbouring authorities and businesses, such as the Port and major employers in the city. The new Clean Air Partnership will bring all interested groups together to discuss measures to improve air quality in the city.

In general NO_2 levels are reducing in the city over the last 5 years, but not as fast as was expected. NO_2 monitoring shows a reduction at most of the automatic monitoring stations and 60 NO_2 diffusion tubes in the city.

Actions to Improve Air Quality

In 2015, SCC commenced the development of a Low Emission Strategy (LES) aimed at reducing road transport emissions of Oxides of Nitrogen (NOx, a precursor of NO_2) and other key vehicle pollutants, including particulate matter (PM) and Carbon Dioxide (CO_2).

Southampton has massively boosted cycling to school by 320% (LTP 3).

Journeys to work by bike have risen by a quarter from 2001-2011.

Projects worth a total of £96.4million has been invested in the transport network in Southampton since 2011. Including £2.3 million Clean Bus/Vehicle Technology, £38.5 million Local Sustainable Transport Fund (LSTF). This included £3.96 million for its “Southampton Sustainable Travel City”. A package of targeted measures to encourage sustainable travel. £980,000 of funding has been allocated for electric vehicle charging points in the city from the £2.3 million Clean Bus/Vehicle Technology Grant.

Photo examples of recently built cycle infrastructure improvements in the city below

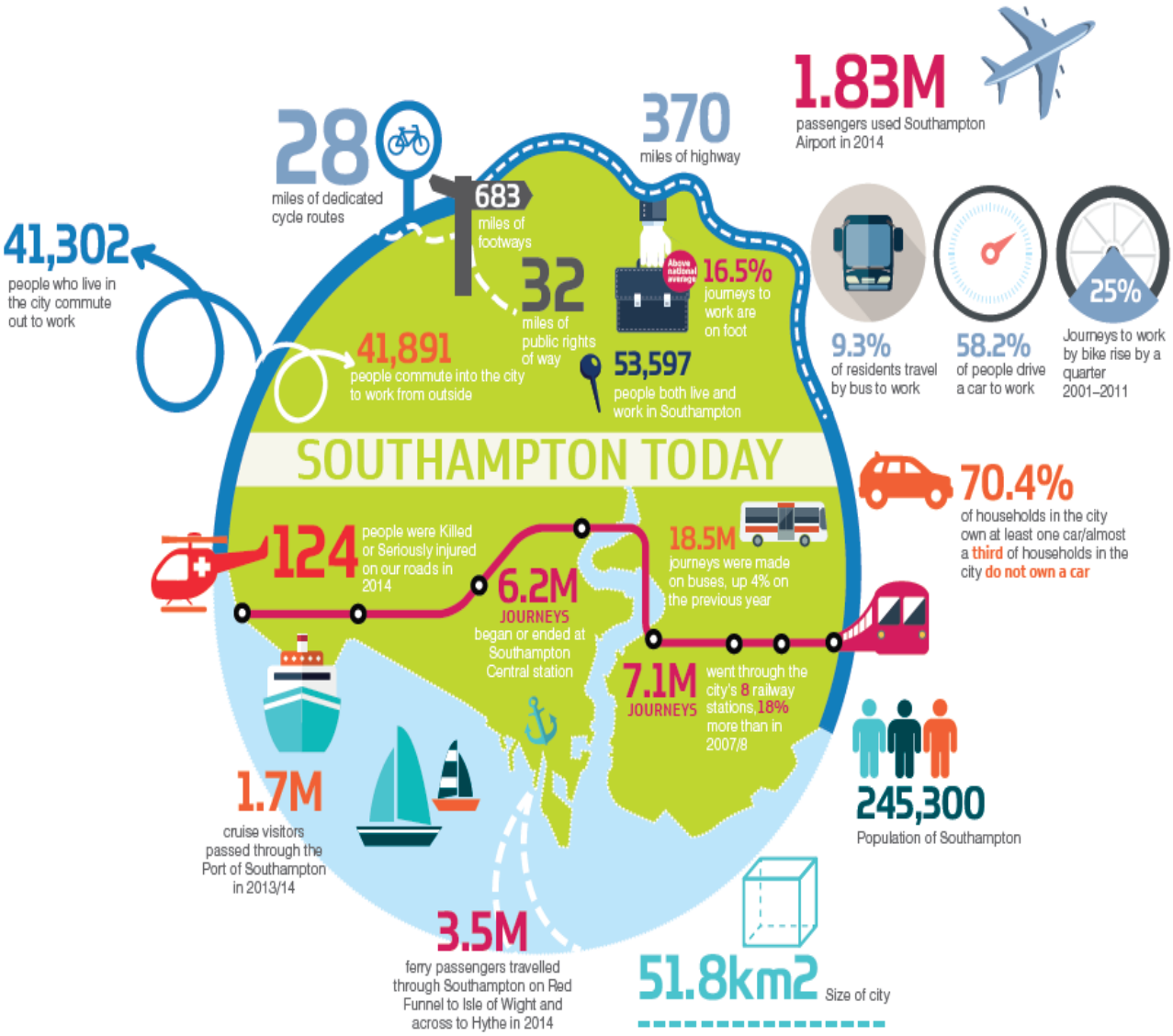
Figure 1 cycle lane on the Itchen Bridge

Figure 2 new cycle lane at Central Bridge Junction

The Southampton Sustainable Travel City LSTF programme has delivered:

- Multiple projects implemented at businesses, schools, hospitals and in residential neighbourhoods to promote sustainable travel choices, which exceeded the target number of people engaged and led towards changes in travel behaviour.
- A Sustrans BikeIt programme that has engaged with 32 primary and secondary schools over three years with over 350 activities and events held (9,000 children plus over 1000 parents and 600 staff). After the first three years of engagement hands-up surveys at 15 schools has seen a 3.2% reduction in car use and that levels of cycling to school have increased by 19.4% and walking by almost 7%.
- Over 18,000 pupils a year in the city took part in the Walk to School Weeks.
- At primary school level 73% of journeys are made by sustainable modes, walking, cycling, scooting, bus and park & stride; at secondary school this rises to 79% with walking, bus, cycling and scooting popular
- Station Travel Plans for Southampton Central Station and one covering the seven local stations completed, and a Brompton Dock cycle hire facility was opened at Southampton Central.
- High awareness of the My Journey brand with an estimated 53% of the public aware of the brand.
- 35,000 people a year receive some level of sustainable travel information and incentives through the workplace, with over 1,600 adults receiving detailed personal travel information via events held at workplaces in Southampton. A further 3,600 received information and incentives through the annual Commuter Challenges.
- 104 business were engaged with through the LSTF programme, with 28 of those having active Travel Plans. From staff surveys, while the car remains the primary way of getting to work (45%), other modes such as walking (16%) and public transport (24%) are popular.
- Community engagement programmes have been well received by the public and engagement targets continue to be exceeded with over 15,000 residents interacted with through sustainable travel roadshows, over 11,000 attending the annual SkyRide events, 1,900 through Bikeability, 2,215 via cycle training and 1,900 who received information on active travel.
- The annual Commuter Challenge engages with over 100 businesses and 2,000 employees competing to log their walking, cycling, public transport and car sharing journeys. So far over 264,000 miles were logged with almost 34,000kg of CO^2 saved and an estimated £71,000 saved.
- This intensive programme has seen car use decline, between 2010 and 2014, on all six key corridors entering the city centre, with the percentage of journeys made by car down by 3%, with cycle use almost doubling across all corridors. All traffic entering the city centre on primary corridors has decreased by 6%.
- The Sustainable Distribution Centre (SDC) scheme was launched with storage and consolidated delivery options made available to organisations.

Southampton Statistics



The infographic above shows some interesting transport related statistics for Southampton which have an impact on local air quality.

Monitoring - Key Successes

Monitoring data has shown a steady reduction in nitrogen dioxide within all of the AQMAs.

Implementation of the Victoria Road AQMA one way system has reduced air pollution. All 5 of the diffusion tubes in the AQMA were below the nitrogen dioxide annual mean standard in 2015 for the first time.

All 6 of the diffusion tubes in the Bitterne Road AQMA were below the nitrogen dioxide annual mean standard in 2015.

The Platform Road scheme has reduced air pollution. In 2015 all the diffusion tubes were below the nitrogen dioxide annual mean standard for the first time since monitoring began.

The Romsey Road AQMA which has 7 diffusion tubes, showed a reduction in nitrogen dioxide. In 2014, 5 diffusion tubes were above the standard,

but in 2015 only 1 was.

The Redbridge/Millbrook Road AQMA which has 12 diffusion tubes showed a reduction in nitrogen dioxide. In 2014, 6 diffusion tubes were above the standard, but in 2015 only 3 were.

Both Burgess Road and New Road AQMAs also monitored reductions in nitrogen dioxide in 2015, although there were still some exceedances.

Grant funded projects update

The £60,000 DEFRA air quality grant project for a Low Emission Strategy was completed by Ricardo in 2015.

The £20,000 DEFRA air quality grant project for a Clean Air Partnership will commence in 2017.

The £17,000 DEFRA air quality grant project Assessing the NO_2 compliance and health impacts of Clean Air Zone options has been completed.

The £50,000 DEFRA air quality grant project to undertake a full scale pilot study to assess the feasibility of reducing NOx emissions from diesel straddle carriers within the container port is ongoing. The Council is working with DP World and Ricardo.

Local Priorities and Challenges

In December 2015, DEFRA published Plans to improve air quality in the UK. The Plans identify 5 cities outside Greater London that are not expected to meet the binding EU Limit Value for NO_2. The cities include Southampton, Birmingham, Derby, Leeds and Nottingham. The Plans state that each of the cities identified will be legally required to introduce a Clean Air Zone (CAZ) for specified classes of vehicles and European Vehicle Emission Standards (Euro Standards) by 2020 or sooner.

SCC is committed to improving air quality and health in the City and, in light of the DEFRA Plans, will undertake the following:

- Re-designate the 10 AQMAs into one Clean Air Zone (CAZ) covering all main, radial roads and key pollution hotspots in the City.
- Introduce a voluntary CAZ in 2017 promoting interim standards that can be achieved quickly and wider measures aimed at changing vehicle purchase and use behaviour.
- Introduce a mandated CAZ in 2019 with enforced emission standards for buses, coaches, heavy goods vehicles (HGVs) and taxis in line with a National Clean Air Zone Framework
- Develop a Clean Air Partnership (CAP) in conjunction with neighbouring authorities and key stakeholders. The CAP will seek to develop common emission reduction policies and measures across the region to ensure that pollution problems are not displaced and the benefits of the CAZ are accrued over a wider area. The CAP will introduce a Clean Air Recognition Scheme (CARS) to promote the early uptake of cleaner fuels and technologies
- The LES will be re-named as the Clean Air Strategy and will include high level messaging, health impact awareness and a comprehensive programme of measures to support the CAZ through behaviour change and sustainable transport modal shift . The CAZ, CAP and CAS will be supported and promoted through an effective communication strategy, which is central to achieving emission reduction aims in Southampton. This will include the development of the MyJourney portal as a one-stop-shop for information and advice

- SCC will work with project partners to introduce mechanisms, including incentives, that will encourage all key stakeholders to aim higher than the mandated CAZ requirements and transition to the use of ultra-low emission vehicles (ULEVs)
- SCC, through the CAP, will develop a database of potential funding opportunities to be pursued in order to support the CAZ and CAS. It is believed that the CAZ plans will provide a significant platform for inward investment
- SCC will continue ongoing discussions with DEFRA and DfT regarding the final scope and funding for the CAZ. This Implementation Plan outlines in detail the next steps that SCC will take in introducing a CAZ in the City.

How to Get Involved

Everybody can “do their bit” to improve local air quality and improve their health.

Road Transport

- For short journeys, walking, cycling and public transport can be the best and cheapest option.
- Find out about car sharing and car club schemes http://myjourneysouthampton.com/drive/city-car-club
- Find out about local bus services that may suit your travel needs in Southampton. http://myjourneysouthampton.com/
- Find out about the city cycle routes and use the cycle route map

  http://www.myjourneysouthampton.com/sites/default/files/Southampton%20Cycle%20Map%202012-13.pdf?_ga=1.214224145.72651337.1475835148
- Turn off your car engine when waiting at traffic lights, traffic jams and closed level crossings
- Become an eco-driver by anticipating traffic flow, keeping in the highest gear possible and maintaining a steady speed at a low revs per minute (RPM). This will help to reduce pollution from your car, and save on fuel consumption.

- Consider purchasing a cleaner electric, hybrid vehicle or one that meets the euro 6 emission standard.
- Maintain your vehicle regularly, if a diesel, make sure the oil and filters are changed frequently. If you notice sooty emissions from the exhaust, take your vehicle to a servicing garage as soon as possible. Ensure your tyres are maintained at the optimum pressure to achieve the best fuel consumption and save you money.

Get Active

- Leave your car at home and try walking/cycling to the local shops, even if it is only once or twice a week. If you can make it part of your normal routine, not only will you be reducing air pollution, you will be more active and healthy.

Plan ahead

- Take some time to plan ahead and consider the small steps you can take to reduce pollution, for example planning journeys that you can leave your car at home or car share.
- When taking a walk, consider the route. It may be possible to take footpaths and streets away from busy roads or areas of local traffic congestion therefore avoiding areas of higher air pollution.

Raising air quality concerns

Southampton City Council residents and businesses can raise concerns about air pollution directly with the Regulatory Services department or their local Councillor, details and links listed below. Officers may be able to offer advice or investigate your concerns further.

Contacts

- Local Councillors

  Your local councilor details can be found on this link:
  http://www.southampton.gov.uk/council-democracy/councillors/default.aspx

- Southampton City Council

  Your contact with regard to local air quality issues at the Council is:

  Simon Hartill or Steve Guppy
  Regulatory Services
  Civic Centre
  Southampton
  SO14 7FP

  E mail: environmental.health@southampton.gov.uk

  Telephone: 023 80832531

Southampton Local Residents Air Quality Campaign Groups

- Western Docks Consultative Forum http://www.wdcf.org/
- Clean Air Southampton https://www.facebook.com/cleanairsouthampton/

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1 Local Air Quality Management

This report provides an overview of air quality in Southampton during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Southampton City Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

Figure 3 showing the locations of the 10 AQMAs in Southampton

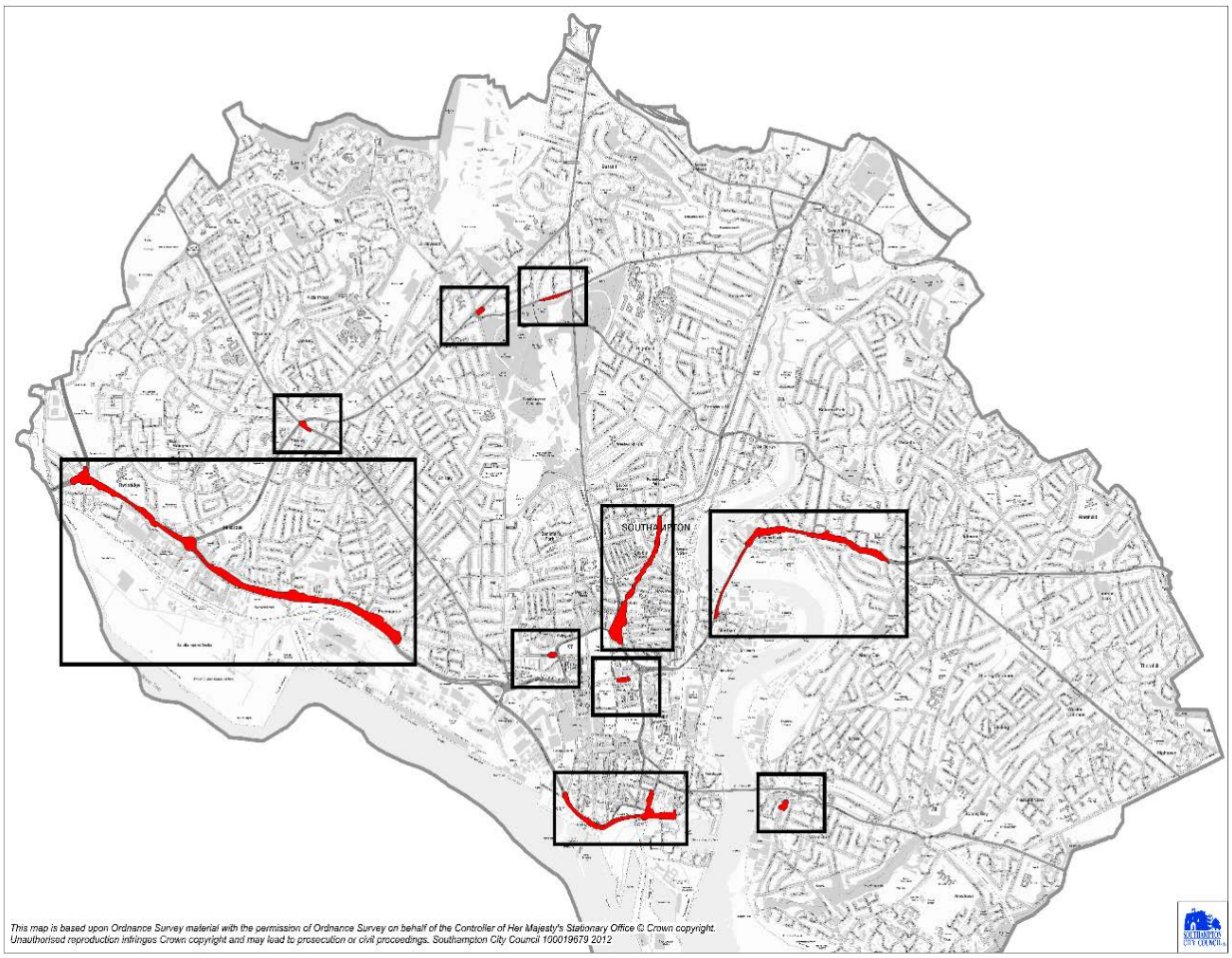
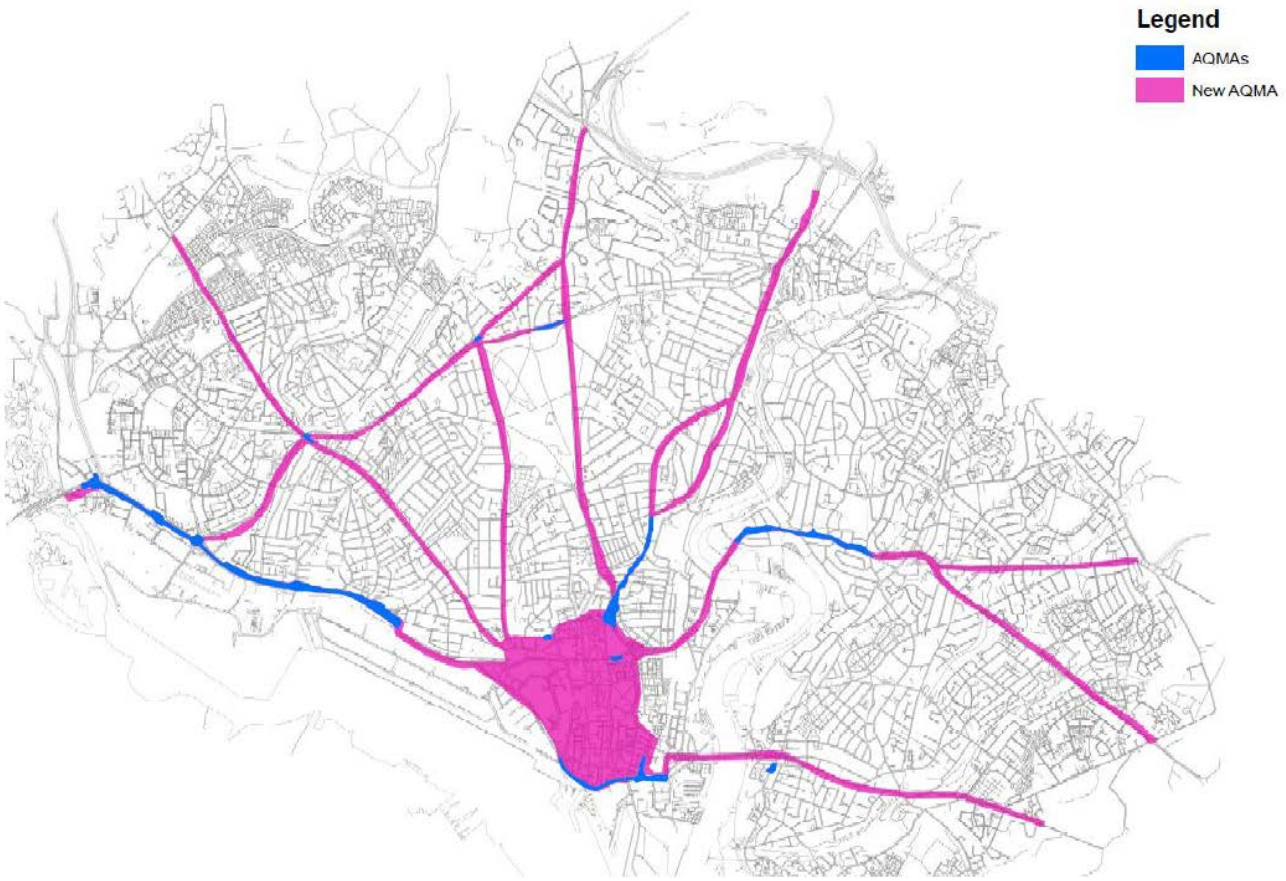


Figure 4 showing the boundary of the proposed Southampton Clean Air Zone coloured in pink



It is proposed to join up all the existing 10 AQMAs (blue areas on map) into a single Clean Air Zone (pink) in 2017.

Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at http://www.southampton.gov.uk/planning/air-quality-planning/air-quality-management-areas.aspx

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	One Line Description	Action Plan
AQMA Bevois Valley	NO_2 annual mean	An area encompassing a number of properties from Charlotte Place Roundabout to Bevois Valley Road	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Bitterne Road West	NO_2 annual mean	An area encompassing a number of properties from Northam Road and along Bitterne Road West	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Winchester Road	NO_2 annual mean	An area encompassing residential properties at the Winchester Road/Hill Lane Junction	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Town Quay to Platform Road	NO_2 annual mean	An area encompassing a number of properties from Town Quay to Platform Road	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Redbridge to Millbrook Road	NO_2 annual mean	An area encompassing a number of properties along Redbridge/Millbook Road	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Romsey Road	NO_2 annual mean	An area encompassing a number of properties along Romsey Road from Teboura Way to Shirley High Street	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Commercial Road	NO_2 annual mean	An area encompassing a number of properties along Commercial Road at the junction with Cumberland	htAQMAtp://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Burgess Road	NO_2 annual mean	An area encompassing a number of properties along Burgess Road at	http://www.southampton.gov.uk/environmental-issues/pollution/air-

AQMA Name	Pollutants and Air Quality Objectives	One Line Description	Action Plan
		the junction with The Avenue	quality/air-quality-reports.aspx
AQMA New Road	NO_2 annual mean	An area encompassing a number of properties along New Road	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx
AQMA Victoria Road	NO_2 annual mean	An area encompassing a number of properties along Victoria Road at the junction with Portsmouth Road	http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx

2.2 Progress and Impact of Measures to address Air Quality in Southampton

Southampton City Council has taken forward a number of measures in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in table 2.2

Key completed measures are:

- 100% of all schools in Southampton have a travel plan.
- City-wide My Journey LSTF funded sustainable travel campaign has achieved significant success in promoting active travel. Over 100 events were delivered in 2015. More than 25% of the city's adult population have engaged with the promotional activities. Over the programme period car journeys have reduced by 3% and cycling has almost doubled.
- Freight Consolidation Centre up and running to reduce the number of freight deliveries into the City.
- Air alert service, 90% of the customers recommend the service to help manage their respiratory symptoms.
- Implementation of the Victoria Road AQMA one way system has reduced air pollution, revocation may be possible within a year or so.
- The Platform Road and Dock Gate 4 removal of gyratory to enable 2 lanes of traffic in each direction between Town Quay and Dock Gate has reduced air pollution on Orchard Place and Queen Anne Terrace.

- Our air monitoring network has been able to demonstrate a steady statistical improvement in the city's air quality.

Progress on the following measures has been slower than expected:

- Shore side electric supply to ships at berth, enabling ship's engine to be turned off. Technical infrastructure issues, lack of mandatory international standard and cost.
- Unsuccessful bid for £5 million Go Ultra Low City Status.
- Unsuccessful Trial of innovative retrofit Flywheel Technology for buses. Funded by a DEFRA grant, after the initial trials on retrofitted buses it proved too technically challenging. The remaining £980,000 funding was reallocated to electric vehicle charging infrastructure, with DEFRA's permission.
- The age limit of the taxi fleet has been raised from 10 to 12 years after a Taxi Licensing Panel Decision. The Taxi Drivers Association lobbied hard for this change. The Clean Air Zone euro 6 standard will reverse this decision in 2019.
- DEFRA Grant and DP World funded gas trial for Straddle Carriers in the Port. DP World decided not to go ahead with this trial. As an alternative, a trial is being undertaken on emission reduction technologies for retrofitting diesel straddle carriers using portable emission testing with DEFRA's permission.

Southampton City Council's priorities for the coming year are:

- Establish the Southampton Clean Air Zone (CAZ) on a voluntary basis, with no charging, by end of 2017 and deliver an associated package of measures.
- Fulfil our statutory requirements and introduce penalty charges in 2019/20 for the most polluting commercial vehicles entering the CAZ.
- Ensure future revisions of our Local Transport Plan, Local Development Plan and all other Council and city plans and strategies provide suitable and adequate policies to reduce emissions and deliver cleaner air.
- Improve transport and freight delivery systems through efficient infrastructure, uptake of new and innovative technologies and increased uptake of public transport, cycling and walking.
- Encourage the uptake of low emission technologies and vehicles.

Identify where alternative fuels and innovative solutions might deliver positive outcomes and support their assessment and introduction.

- Develop a Clean Air Partnership with key stakeholders in the city and region.
- Work with the Port of Southampton to identify and support initiatives that will reduce their emissions.
- Continue to promote sustainable travel through maintaining the “My Journey” campaign and explore options for further development.
- Empower businesses to take responsibility for their contributions to air pollution and implement improvements.
- Implement schemes to support taxi operators, other businesses and public services in reducing the emissions relating to their activities.
- Develop a role for residents and community groups in our Clean Air Partnership.
- Support the education sector to raise awareness of air pollution and how to reduce emissions.
- Incentivise the use of public transport, cycling and walking.
- Empower communities and individuals to take responsibility for their contributions to air pollution.
- Provide good quality, timely information and data on local levels of pollution to enable residents to adopt behaviours to maintain their own health.

The Council will:

- Lead by example, ensuring our plans, policies and working practices support and promote an improvement in local air quality whilst delivering wider environmental and economic benefits locally, regionally and nationally.
- Introduce a programme of measures to reduce its emissions and act as a key partner, sharing best practice on reducing emissions and promoting sustainable working methods whenever it can.

Use its influence on the local supply chain to ensure impacts on air quality are considered when making procurement decisions, including in the procurement and operation of its own fleet.

Figure 5 Photo of new off road cycle lane at Second Avenue, alongside Redbridge Road AQMA

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	Eu Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Local planning policies (citywide)	Policy Guidance and Development	Air Quality Planning and Policy Guidance	SCC	August 2016 –March 2017	April –May 2017	implement policy by May 2017	< 1µgm^3	There is a requirement in the Core Strategy transport policy (CS18) to 'Require new developments to consider impact on air quality, particularly in Air Quality Management Areas (AQMAs) through the promotion of access by sustainable modes of travel'. The Core Strategy sets out the general principles and the CCAP and Southampton Development Plan will show how this affects individual sites.	implement policy by May 2017	Implementation of existing Local Plan policy and work towards strengthening policy in new Local Development Framework. This should include ensuring that the cumulative adverse effect of smaller developments on local air quality is avoided.
2	Targeted planning guidance to address air quality impacts of development	Policy Guidance and Development	Air Quality Planning and Policy Guidance	SCC	December 2016-April 2017	June 2017	implement policy by June 2017	< 1µgm^3	There is regular and ongoing close working between Planning Policy and Development Control. Both the Masterplan and CCAP set out a strategic approach to tall buildings.	2018	Ongoing involvement with Planning Policy and Development Control to avoid the canyon effect (created by tall buildings on both sides of a road) and cumulative air quality effects of development through the planning process
3	Draft Air Quality supplementary planning guidance / work with planning policy	Policy Guidance and Development	Air Quality Planning and Policy Guidance	SCC	August-September 2016	October 2016 – March 2017	Implement policy by May/June 2017	< 1µgm^3	Procuring an air quality consultant to draft the policy	Jun-17	delayed

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4	Mandatory Clean Air Zone	Promoting Low Emission Transport	Low Emission Zone (LEZ)	SCC	2017-2018	2019	enforcement cameras operational, recorded HGVs/buses/ taxis compliant with CAZ euro 6 emission standard	2-4µgm3	regular liason with DEFRA/DfT, CAZ Feasibility modelling,determine boundary of CAZ, funding secured £85k, for ANPR survey to understand fleet composition (survey undertaken December 2016 and £20k modelling needs assessment	2020	Southampton was identified as one of five cities which is required to implement a mandatory CAZ no later than 2020. Euro 6 standard for HGVs, buses and taxis. Resources will need to be secured for the delivery of the CAZ infrastructure
5	School Travel Plan	Promoting Travel Alternatives	School Travel Plans	SCC	2012-13	ongoing	100% of schools have travel plans in place	< 1µgm^3	0.6 FTE School Travel Plan Coordinator in post developing, monitoring and evaluating school travel plans using the STARS accreditation online toolkit.	ongoing	27 schools have signed up to the STARS school travel plan programme (a national accreditation scheme). Through this programme over 1000 bikes have been fixed, 192 Bike-it events have been staged, and 25,000 positive cycling and scooting experiences have been delivered. The scheme has seen 18,000 pupils walk to school at least once a week and an 8% increase in cycling to school rates for those schools participating in 'Bike-it'. A pilot project was staged in Sholing where a road was closed off to simulate what it would be like without traffic.

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6	SCC Staff Travel Plan	Promoting Travel Alternatives	Workplace Travel Planning	SCC	2013-2014	2015-17	more staff cycling/using sustainable transport for work visits	< 1µgm^3	Road safety assessments are now undertaken, the number of secure cycle storage locations have been expanded throughout the city (additional cycle storage is being added to the Civic Centre), a salary sacrifice scheme for bike lease to staff has been put in place and pool bikes are now provided to staff. An online journey planner has been developed and is operated via the 'My Journey Southampton' website. Staff in workplaces in the city, including SCC employees are provided with personal journey planning surgeries as part of the 'My Journey' workplace engagement programme.	Mostly completed	SCC staff travel plan currently being updated anticipated to be completed by end of March 2017. Improvements to facilities when budgets allow
7	Review of Corporate Courier Transport Service	Vehicle Fleet Efficiency	other	SCC	2014	2015-2016	improve emissions from council vehicles	na	1 Electric Renault Kangoo in use since 2012. Business case being developed to convert courier service to wholly electric by April 2017	c2018	Review of service included in wider fleet review
8	SCC Fleet Review	Vehicle Fleet Efficiency	other	SCC	2014-2015	2016-17	Improve emissions from council vehicles	< 1µgm^3	University of Southampton have been appointed to undertake a review of the fleet, including a feasibility of electric vehicle integration	2018	Review and recommendations to be made to Senior Management in April 2017. The review will identify specific vehicles suitable for switch over to electric. An investment plan will then

Measure No.	Measure	EU Category	Eu Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
											be drawn up with vehicles replaced at the earliest viable opportunity.
9	Eco Driver Training and telematics for Council Fleet	Vehicle Fleet Efficiency	Driver training and ECO driving aids	SCC	2016	2017-19	reduce fuel usage by 10%	< 1µgm^3	£99k grant applied for November 2016	2019	Grant funding awarded by Defra 31.1.17. Scheme to be rolled out for the next 3 financial years.
10	My Journey	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	SCC	2012	2013-2016	Reduction in car journeys in the city	< 1µgm^3	The 'My Journey' active travel behaviour change programme has run for 5 years. It has achieved a 52% awareness of the MyJourney brand based upon 2500 survey responses. The campaign has won 2 national communications awards. 40 events roadshows have been staged. The My Journey website continues to offer a multi-modal journey planning tool and live bus and train travel information with over 1,000,000 site visits to date. Other notable achievements are referenced on p8.		SCC have been awarded £2.1 million from the DfT Access Fund to deliver the My Journey sustainable travel behaviour change programme for the next 3 financial years.
11	workplace travel planning	Promoting Travel Alternatives	Workplace Travel Planning	SCC	2013	2014-2016	No of travel plans implemented	< 1µgm^3	Voluntary Retail Travel Plans for Major Shopping Destinations including West Quay have been developed to encourage more shoppers to travel by public transport and reduce reliance on the car. Items such as cycle parking, shower facilities, electric vehicle charging		SCC has been, and is continuing to, work with major retailers and businesses in the city including: Skandia, Mayflower Theatre, the National Oceanography Centre, Town Quay, IKEA, Lloyds Register, Station Quarter, Solent University, the University of Southampton and the General and Royal

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									points at workplaces, PT information points and establishing a framework for collective delivery and evaluation of the travel plan will be taken forward.		South Hants Hospitals. All are members of the city's Travel Plan Network (over 50 registered organisations). Achievements include: 1. Travel Plans have been set up at both Universities. 2. Approx 240 cycle parking bays at the General Hospital have been installed.. 3. Real Time Information screens and enhancements to cycle facilities at the Royal South Hants Hospital have been installed. 4. Specialist advice including PJP and staff travel surveys have been conducted at IKEA, Maritime and Coastguard Agency, Lloyds Register, Adams Morey, John Lewis, ABP, the Police Headquarters, Debenhams, Spire Hospital and the BBC studios. 5. The travel planner's forum continues to meet with over 50 registered participating businesses.

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12	Freight consolidation and efficiency	Freight and Delivery Management	Freight Consolidation Centre	SCC	2012	2014-2017	Reduction in HGV movements in the city. Increased sq/m of storage at SDC with increased No. of consolidated load deliveries in the city on an annual basis	< 1µgm^3	Meachers have been operating the SDC with public sector support for over 3 years with 6 consistent public sector delivery contracts utilising storage space and consolidated load deliveries into and out of the city centre. The facility is the first in the UK to operate independent of subsidy as a stand alone and profitable venture. SCC are committed to the ongoing promotion of the SDC and the roll-out of Delivery Service Plans, identifying sustainable freight strategies for individual organisations in the citiy. All companies within or adjacent to an AQMA will be engaged with to develop a DSP to identify logistics efficiencies.	continuous	Work is ongoing to increase uptake of the service. University is continuing to roll out delivery servicing plans for major organisations in the city
13	Railway Station Travel Plans	Promoting Travel Alternatives	Promote use of rail and inland waterways	SCC	2014	2015-2016	Travel survey	< 1µgm^3	A travel plan has been completed for the Southampton Central Station with £180k of funding invested in measures to promote more sustainable modes of transport in the area. Real time information is now available at the station providing travellers with up-to-date info on buses and trains.	continuous	Rail station travel plans have been formulated for all the district stations in the city. Work will be undertaken with local rail users, transition towns, rail operators and ATOC to implement the mesures identified in the station travel plans at all local stations.

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14	Solent Go Smart ticketing and media	Promoting Travel Alternatives	other	SCC	2013	2014-17	Travel survey	< 1µgm^3	The Solent Go smartcard was launched in July 2014. The smartcard is available for bus and ferry users across South Hampshire.	completed	Monitor useage
15	Brompton Bike Hire Scheme	Promoting Travel Alternatives	Promotion of cycling	SCC	2012	2013	Travel Survey	< 1µgm^3	Installed in March 2013 and launched in April 2013. The scheme has 60 members signed up to use the bikes with 10% of bikes used every day of the year. Corporate members include the University Hospital, the University of Southampton, Solent University, Skandia, CooperVision, Ordance Survey and the Mayflower Theatre	Completed in 2013	Monitor usage
16	Legible Bus Network	Promoting Travel Alternatives	Other	SCC	2013	2013-2016	Bus user survey	< 1µgm^3	Over 400 bus stops across the city have now been upgraded to align with the legible bus stop branding including new timetables installed at 181 bus stops and RTI at others.	completed	Improving road-side publicity for services along key networks. The city has high levels of bus use and is seeking to double bus use over the next 20 years.

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17	Community Engagement Programme	Public Information	Other	Sustrans	2011	2012-2016	Number of active travel events held, people engaged	< 1µgm^3	On an annual basis the community engagement element of the My Journey programme worked with a minimum of 12 community groups, 5 SureStart Centres, delivered regular Health Walks, roadshow events, cycle training, bike doctors, and walking activities with over 2000 participants a year, and over 20 new active travel champions a year acting as advocates for the programme.	ongoing	The promotion of active travel in the community has been a long standing element of the MY Journey sustainable travel behaviour change programme. Alongside School Travel Plans and workplace engagement, community engagement work has sought to encourage more active life styles through walking and cycling.
18	Intelligent Transport systems	Traffic Management	UTC, Congestion management, traffic reduction	SCC	2016-2017	2018		na	SCC has successfully bidded for funding from the DfT's Challenge Fund, securing £100k for investment in Bluetooth technology to enhance the city's ITS traffic management system.		£100k has been secured to implement a citywide demonstration of Cooperative Intelligent Transport Systems – in this case harvesting Bluetooth enabled mobile phone data to collective live traffic data from vehicles – their locations, movements and on the road environment. This will enable us to deliver real time travel information to better manage our local road network and to the motorways with ability to influence people's travel choices, respond to incidents and events and effective and safe

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											traffic demand management.
19	Development and promotion of a bus time smartphone app	Public Information	Via the internet	SCC	2013	2014-16	App working	na	An online journey planner has been developed and implemented as part of the MyJourney website and marketing campaign. Access to this tool and information on bus times is available from multiple devices		SCC is working with academic partners to develop a framework of traveller types to help identify opportunities for bespoke mobile phone apps providing public transport smart ticketing and information
20	Cycle Training	Promoting Travel Alternatives	Promotion of cycling	SCC	2012	2013-2017	Number of cyclists trained	< 1µgm^3	Over 150 individual cycle training sessions have been held per year for adults for the past 5 years under the My Journey programme. Bikeability training has been delivered for school years 5 and 6 across the city for the past 4 years reaching thousands of young people.	ongoing	Bikeability cycle training and adult cycle training continue to be offered to local residents and pupils.
21	City Car Club	Alternatives to private vehicle use	Car Clubs	SCC	2014	2015-2018	usage of car club	< 1µgm^3	Over the course of the My Journey programme 3 separate direct mail promotional campaigns advertising the Car Club and offering discounted membership have been run.	ongoing	Enterprise Car Rentals have taken over ownership of the city car club with work being undertaken to expand the number of cars available throughout the city, and the number of registered users.
22	Real time information provision	Alternatives to private vehicle use	other	SCC	2012	2013-16	Number of systems fitted	< 1µgm^3	Real time information systems have been fitted along all core bus routes in the city.	completed	SCC has delivered public transport with real time information through display screens at key transport hubs, core bus corridors and highly visible locations and through mobile phones by utilising current and future proof media. RTPI screens have been

Measure No.	Measure	EU Category	Eu Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
											installed at 13 x locations including Ferry terminal, Southampton cruise ship terminals, Bus Corridor RTPI on key routes and multi-modal real time information at interchanges.
23	Bus Priority measures	Traffic Management	Bus route improvements	SCC	2014	2015-2017	tbc	< 1µgm^3	Bus priority programme in progress with 42 junction improvements identified continue to be delivered	ongoing	Investment in measures on high frequency city corridors that reduce journey times for buses and design out delays including bus lanes, bus gates, changes to traffic signals and "virtual" priority measures.
24	Improving Bus Journey Time Reliability	Traffic Management	Bus route improvements	SCC	2014	2015-2017	tbc	< 1µgm^3	Bus lane enforcement cameras installed in 2016	ongoing	Alongside targeted interventions to deliver journey time savings of 9.5 seconds per bus per junction, cameras have been installed to penalise motorists using dedicated bus lanes in the city, slowing up buses along key routes. This will deliver an economic benefit, improve punctuality and journey times, whilst reducing emissions.
25	Bus stop improvements	Traffic Management	Bus route improvements	SCC	2011	2012-2015	tbc	na	Installation of new bus shelters completed in 2012/13. The legible bus network was completed in 2015.	ongoing	Additional bus stop improvements planned
26	Cycle Lane/Routes Provision.	Transport Planning and Infrastructure	Cycle network	SCC	2012	2013-2018	tbc	< 1µgm^3	Phase 1 of the eastern cycle route has been completed 2014. University cycle corridor targeted for development with funding bids submitted. A draft 10	Ongoing as and when funding allows	A draft 10 year cycle strategy has been produced which is due to be adopted by the end of March 2017.

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									year cycle strategy has been produced identifying the investment required along the key cycle commuter routes into the city centre		
27	Legible Cities	Public Information	Other	SCC	2012	2013-14	tbc	na	Phases 1 through to 5 have been completed.	completed	Delivery of the on street way finding maps and signage in the city centre for pedestrians. Additional sites have been identified for further signage in the city dtistricts and will be delivered subject to resource availability.
28	Air alert	Public Information	other	SCC	2009	2010-2016	customer satisfaction survey	na	363 users subscribed to the service October 2016, 174 air alerts issued since 2010	completed	Eastleigh council joined air alert in November 2016, high customer satisfaction with the service
29	Straddle Carrier to Trial and monitor hybrid power	Promoting Low Emission Plant	Other measure for low emission fuels for stationary and mobile sources	SCC	2015	2016-17	1 Straddle Carrier fitted with hybrid technology, report produced	tbc	funding secured, Ricardo appointed	ongoing	Funding for the pilot secured. Trial timeframe to be agree with DP World Project review meetings to be convened.
30	Detector and traffic management pilot Town Quay	Traffic Management	UTC, Congestion management, traffic reduction	SCC	2016	2017	Successful trial	tbc	funding secured, Ricardo appointed	2018	
31	Shore Side electricity supply feasibility study and alternative fuels	Promoting Low Emission Plant	Shift to installations using low emission fuels for stationary and mobile sources	SCC	2016	?	feasibility study completed	tbc	Several meetings held with ABP to discuss, significant costs and barriers identified	No formal timeframe agreed yet	Convene meeting of key stakeholders, partner with ABP, procure a feasibility study identifying infrastructure requirements, identify a business case and funding stream
32	Gas / alternative fuels for the Port / City	Promoting Low Emission Plant	Shift to installations using low emission fuels for stationary	SCC	2016	2017-2020	feasibility study completed	tbc	no formal timeframe agreed yet, need to identify funding stream and develop a business case	tbc	Establish gas refuelling for commercial vehicles entering the docks

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			and mobile sources								
33	Voluntary Cleaner Air Zone implementation	Promoting Low Emission Transport	Low Emission Zone (LEZ)	SCC	2016	2017/18	Signs erected, high public awareness in the city	< 1µgm3	CAZ boundary in process of being scoped. Measures for implementation prior to access restrictions as part of the CAZ in 2019 are being devised.	Q4 2017	Opt-in scheme in advance of the mandatory CAZ in 2019, incentivising early movers
34	City-wide fleet composition survey	Vehicle Fleet Efficiency	Other	SCC	Q1-3 2016	December 2016	Report produced	na	ANPR camera survey completed in December 2016 to calculate emission standard of current vehicles using main roads	Q1 2017	Preparatory survey for implementation of CAZ
35	Cleaner Air Strategy development / publication	Policy Guidance and Development Control	Low Emissions Strategy	SCC	2016	2016	Strategy authored, designed, published and available for public consumption on the My Journey website.	< 1µgm3	Clean Air Strategy adopted in November 2016 and published on the council website.	Sep-16	The strategy outlines the councils commitment to addressing poor air quality.
36	Website and communications	Public Information	Via the Internet	SCC	2016	2017	Comms plan published	na	Webpages updated with CAZ information	ongoing	A communications and marketing strategy for Clean Air to be developed. 2 AQ Communications Strategy workshops held with key stakeholders to begin to shape this strategy.

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37	Establish Cleaner Air Partnership	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	SCC	Oct-dec 2016	Apr-17	First partnership meeting of LA stakeholders held. Wider stakeholder agreement published and members signed-up to pledge.	tbc	The governance arrangements for the Clean Air Partnership are in the process of being pieced together. A third party, the Environment Centre, has been commissioned to deliver the CAP. Draft terms of reference have been provided.	2017	Partnership of LAs, private sector companies pledging to deliver improvements and demonsrate progress by achieving agreed targets
38	Integrated Air Quality awareness raising into the existing My Journey sustainable travel behaviour change programme.	Public Information	Via the Internet	SCC	Sep-16	2017	Campaign delivered. Evaluation reflects increased awareness of Air Quality amongst residents.	< 1µgm^3	An Air Quality roadshow will be staged in Southampton schools as part of the My Journey programme for 2017-18 through to 2019-20.	2017-18	Access Fund monies secured to resource the My Journey programme for the next 3 years.
39	Procurement of low emission vehicles in Council and	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	SCC	Oct-Dec 2016	2017-20	No of LEV in council Fleet	< 1µgm^3	CVTF funding re-deployed for investment in the council fleet for the conversion of vehicles to electric where appropriate. A fleet	tbc	Fleet Review due in April 2017.

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	partner fleets								review is currently underway to identify the vehicles suitable for replacement.		
40	Low emission vehicle lease / salary sacrifice scheme	Promoting Low Emission Transport	Other	SCC	Feb-17	tbc	at least 1 member of staff has taken up use of the lease scheme to purchase an EV	tbc	on hold	tbc	
41	24 hr delivery for low emission trucks to encourage fewer peak time HGVs	Promoting Low Emission Transport	Other	SCC	August-December 2016	tbc	24 hour delivery arrangements in place. Case study to be produced as evidence	tbc	tbc	tbc	revise delivery restrictions to enable 24 hour delivery
42	Anti-idling campaign / enforcement for HGVs	Traffic Management	Anti-idling enforcement	SCC	2017	tbc	tbc	tbc	on hold	tbc	campaign to be planned, subject to funding being secured via the DEFRA National Air Quality Grant fund for the National Clean Air Day
43	Retrofit for buses: SCRT for older buses. Thermal management for Euro 5	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	SCC	2015-16	tbc	trial result published, commitment from bus operators to retrofit	tbc	Trial commenced with Southampton University using horiba PEMS on effectiveness of thermal management, City Red Route 7 buses	tbc	assess effectiveness of technlogies using PEMS, thermal management and micro hybrid for reducing tailpipe emissions
44	Anti-idling campaign / enforcement for buses and taxis	Traffic Management	Anti-idling enforcement	SCC	2017	2017	reduction in complaints	tbc	campaign to be planned, subject to funding being secured via the DEFRA National Air Quality Grant fund for the National Clean Air Day	tbc	campaign to be planned, subject to funding being secured via the DEFRA National Air Quality Grant fund for the National Clean Air Day
45	Low emission parking areas	Promoting Low Emission Transport	Priority parking for LEV's	SCC	2016	2017	increased number of EV in city	tbc	Traffic order being revised to make provision for discounts for low emission	tbc	Traffic order to be signed off by the end of the financial year

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									vehicles parking in the city.		
46	Electric Vehicle Action Plan (EVAP) Develop EV charging infrastructure, with common approach to EV recharging payment systems	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	SCC	2016	2017	Map produced with locations of recharge points on the My Journey website. Increased no. of recharge points on an annual basis.	tbc	£980k funding secured for recharge infrastructure, council fleet upgrades and promotional activity around EV's in the city.	tbc	£980k reallocated from CBTF Grant to fund electricvehicle recharge points in the city at council owned car parks, taxi ranks and SDC.
47	EV car clubs	Alternatives to private vehicle use	Car Clubs	SCC	2016	2017-18	Usage of cars	tbc	Discussion with Enterprise Car Rentals over the deployment of EV's as part of the existing car club fleet		On street infrastructure will need to be provided
48	Low emission vehicles encouraged in DSP work	Freight and Delivery Management	Delivery and Service plans	SCC	2016	2017	Electric delivery vehicle in use	< 1µgm^3	DSPs conducted for major organisations in the city identify and advocate electric vehicles where appropriate as a means of achieving commercial efficiencies	tbc	Delivery and Servicing Plans to continue to be on offer to local organisations
49	Port booking scheme used to encourage/ incentivise low emission trucks	Promoting Low Emission Transport	Priority parking for LEV's	ABP/DP World	2017	2018-2020	N° of low emission trucks using the parking	tbc	Discussion ongoing with Port	tbc	
50	M271 Redbridge Roundabout-junction capacity design	Traffic Management	Strategic highway improvements	HA	2016	2018	Traffic flow improved	< 1µgm3	Plan produced, NO_2 diffusion survey in progress. Liasing with Highways England. Green Wall likely to be	2019	Multi million pound Highways England infrastructure improvement project to be undertaken with

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	improvement								installed near houses by the roundabout		changes modelled to improve traffic flows

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases. The impact of public exposure to particulate matter alone has been estimated to reduce life expectancy in the UK by around six months and imposes a cost to public health of c£16 billion per annum.

Annual Mean

$PM_{2.5}$ is monitored in Southampton at the Brintons Road, AURN Urban Centre station. $PM_{2.5}$ decreased substantially in 2015 compared to previous years. In 2011 it was 16 ug/m^3 but it has decreased steadily to 10 ug/m^3 by 2015. Although annual variations due to weather conditions may have played a part in the decrease.

$PM_{2.5}$ and Health

Based on national estimates, exposure to particulate matter in Southampton is estimated to contribute to 110 early deaths each year. Public Health England provide a Public health Indicator for $PM_{2.5}$ at a local authority level as a fraction of the mortality attributable to particulate air pollution. This enables local authorities to assess their local figure and take appropriate action to try to reduce it.

In Southampton Public Health England estimated the fraction of mortality at 6.2% attributable to particulate air pollution. This was slightly higher than the South East England figure of 5.2% and Hampshire at 5%. As a regional city the slightly higher figure is to be expected, compared to rural Hampshire.

Local hot-spots

Background pollutant maps provided electronically by Defra (Defra,2016(c)) also give a basic local background concentration for $PM_{2.5}$. This information may show areas of higher $PM_{2.5}$ concentrations which Southampton City Council could assess to determine if there are local particulate issues where specific measures could be implemented to reduce particulate emissions.

The above noted methods will be used to establish local $PM_{2.5}$ annual mean concentrations, identify the local health burden of particulate matter and identify any local hot spot areas for particulate matter that have not been identified to date. This will enable Southampton City Council to establish baseline figures for $PM_{2.5}$ with the aim to improve on the established baseline, including the possibility of setting targets for a measured reduction in the near future, and to target resources to assess and improve any identified hot spot areas for $PM_{2.5}$. This data will be updated on an annual basis, and therefore provide some guidance of whether implemented measures are reducing local $PM_{2.5}$ concentrations.

Southampton City Council is taking the following measures to address $PM_{2.5}$:

Current Measures

A number of schemes that are being progressed through the Air Quality Action Plan to reduce nitrogen dioxide will also have a positive impact on reducing $PM_{2.5}$. These measures are shown in Table 2.2.

New Measures

The proposed Clean Air Zone with a Euro 6 emission standard for HGVs, buses and taxis will help to reduce $PM_{2.5}$ along the main road corridors and city centre. The likely reduction impact is currently being modelled.

The Clean Air Strategy has a target to reduce the fraction of mortality attributable to particulate pollution, see next page for more details.

A Clean Air Strategy for Southampton 2016-2025

Clean air is essential for good quality of life, yet every day people living in our urban centres can be exposed to potentially harmful levels of pollutants.

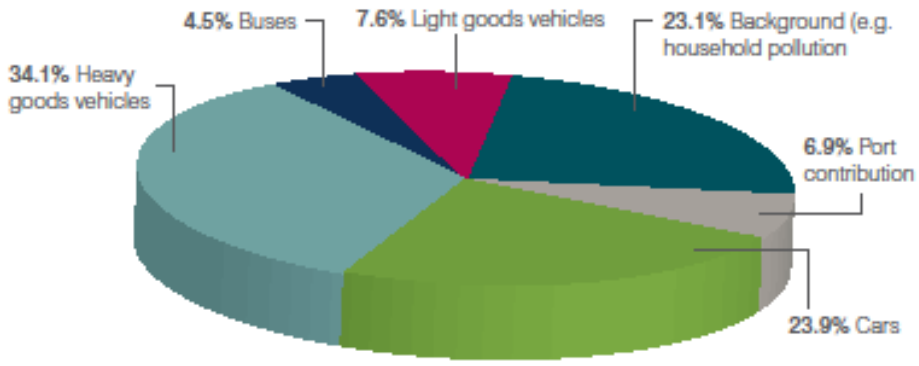
Southampton City Council is committed to improving the city's air quality. Reducing emissions and air pollution now will have lifelong, lasting benefits for the city's population, remove barriers to further economic development and make the city a more attractive place to work, live and visit. Improvements in air quality can deliver ongoing improvements in public health and wellbeing. To protect our residents' health we want to make the city's air as clean as we can.

The Council cannot improve air quality on its own. This strategy details the key ways in which we will work together with our partners to make improvements to air quality across the city.

AIR QUALITY IN SOUTHAMPTON

- There are many different pollutants that can affect the quality of the air we breathe. Nitrogen dioxide and Particulate Matter are the main concern in the UK.
- The negative effects of exposure to air pollutants occur at every stage of life, from early stages of development through to old age. Those with existing cardiovascular and respiratory disease are most at risk, but a wide range of health effects have been linked to the wider population including stroke, heart disease, obesity, lung cancer and asthma. Reducing the health impacts of local air pollution is identified as a priority by Public Health England in its Strategic Plan (2016 to 2020).
- The Council has a statutory duty to assess and review air quality in its area and make reasonable efforts achieve statutory thresholds. DEFRA have set limits for key pollutants. Monitoring and modelling in Southampton suggests levels of nitrogen dioxide could exceed that level beyond 2020, unless additional efforts are made.
- In the UK, up to 50,000 early deaths each year can be attributed to Particulate Matter and Nitrogen Dioxide exposure. Costs to society, businesses and NHS services due to poor air quality exceed £30 billion a year.
- Exposure to Particulate Matter alone is estimated to contribute to 110 early deaths in Southampton each year.
- Road transport is the biggest contributor to pollution across the city followed by industry. Port operations are also significant in certain areas of the city.
- Diesel cars have been encouraged by national policy to reduce carbon dioxide emissions. However, they generate significantly higher emissions of Particulate Matter and Nitrogen Dioxide than petrol cars. In 2001, 18% of all new cars registered were diesel. By 2012, this increased to 50%.
- Air quality is a consideration for the Planning Authority and the Council is obliged to ensure that impacts on air quality are taken into account when approving developments.

Causes of pollution in Southampton



Source apportionment (% of modelled nitrogen dioxide) at M271 and A33 junction, Redbridge

WHAT ARE WE GOING TO DO?

- The Council is committed to improving Southampton's air quality, reducing health impacts, and fulfilling our legal obligations. The national Air Quality Plan for Nitrogen Dioxide in UK (2015) sets out targeted local, regional and national measures to meet these goals.
- This includes implementing a new programme of Clean Air Zones in Southampton, Birmingham, Leeds, Nottingham and Derby. Under this Plan, by 2020 the most polluting vehicles - older buses, coaches, taxis and lorries - will be discouraged in Southampton through the levying of a penalty charge. Newer vehicles that meet the latest emission standards, and private cars will not be subject to the statutory penalty charges.
- The Council will develop a package of measures as part of the city's Air Quality Action Plan and Clean Air Zone implementation plan to encourage behaviours which support improvements in air quality.

We have identified four priorities for improving air quality in the city:

PRIORITY	WHY THIS IS IMPORTANT
Improve air quality in the city	• Air pollution has an adverse effect on people's health. Reducing levels of pollutants below statutory levels and beyond is key to improving the health and wellbeing of Southampton's residents of all ages. • The threshold level for nitrogen dioxide (annual average) is exceeded in a number of key locations across the city and the Council has a statutory duty to make reasonable efforts to reduce levels below this. • If air quality does not improve it could become a significant barrier to further economic growth.
Supporting businesses and organisations	• The Council cannot deliver improvements in air quality on its own - we will need to work with our local businesses and organisations to promote the benefits of change in term of both health and prosperity. • The Council will need to engage with residents, visitors, businesses and other organisations to encourage the use of low emission technologies, public transport and the take up of active travel such as cycling and walking.
Collaborating with communities and residents	• Cleaner air in Southampton can only be achieved if individuals and organisations take responsibility and change their current behaviours. • These measures can provide direct benefits to the health and wellbeing of everyone in the city. If our residents and visitors embrace this positive message we can expect to see improvements sustained for future generations. • Our communities and residents will need support to ensure they are able to deliver the changes they want.
Promoting sustainability	• It is important that measures to improve air quality in Southampton are sustainable and do not create a negative impact elsewhere. This might happen if the most polluting vehicles are displaced from the city or alternative fuels are not from a sustainable source. • The Council will promote sustainable change – as well as making sure that, when providing advice and promoting change to others, it can demonstrate its own efforts and the positive differences it is making.

WHAT DO OUR RESIDENTS SAY ABOUT AIR QUALITY IN SOUTHAMPTON?

In 2014, a survey of residents' views on air quality was undertaken:

- Of the 291 responses, 36% felt that air quality in the city was a "significant issue". Only 7% felt it was not an issue.
- Cars and HGVs were felt to be the main contributors to pollution, with buses, industry, shipping and other port-based activities also selected.
- Residents suggested a wide range of measures that would be needed to help improve the city's air quality including promoting public transport, cycling and walking, traffic improvements, low emission vehicles, penalty charging and port improvements.

OUR CHALLENGES

- Air pollution is linked to many major health problems facing cities like Southampton. Estimates suggest that 6.2% of early deaths in Southampton in 2010 were attributable to long term Particulate pollution alone.
- Those who live in deprived areas or have existing medical conditions are disproportionately affected by poor air quality.
- Between 2008/9 and 2012/13, Southampton has become relatively more deprived – of the 326 Local Authorities in England, Southampton is now ranked 54th (previously 72nd) most deprived.
- Southampton's port is the busiest cruise terminal and second largest container port in the UK. Its continued success is vital to the city's economy
- As a regional retail and economic centre, Southampton's economy is heavily reliant upon its transport links.

OUR SUCCESSES

- The Council introduced its first Air Quality Action Plan in 2007. At its last review, it identified 48 individual activities delivering improvements in local air quality.
- The city has a long established air monitoring network that provides robust data on current and historical pollution levels. Four continuous monitoring stations and 60+ passive sampling sites currently provide data on current levels and ongoing trends.
- Our air monitoring network has been able to demonstrate a steady statistical improvement in the city's air quality since 2007.
- Both the existing Local Transport Plan and Local Development Plan recognise the health impact of air quality and identify how improvements can be achieved.
- The Council was amongst the first authorities to offer an Air Alert service. This is free to anyone but is particularly valued by those with respiratory illnesses who can be more sensitive to air pollution.
- The My Journey campaign has achieved significant success in promoting public transport and active travel choices across the city. Over 100 events were delivered in 2015. More than 25% of the city's adult population have been engaged via one or more of the promotional activities. Over the programme period car journeys have reduced by 3% and cycling has almost doubled.
- The Council is working closely with key partners and has assisted and supported local bus operators, port operators and the University of Southampton in seeking and acquiring funding for activities to assess and improve air quality.

PRIORITY	OUTCOME	WHAT ARE WE GOING TO DO?
Improve air quality in the city	Adopt an effective programme of measures to reduce emissions of nitrogen dioxide, particulates and other pollutants in Southampton	• Establish the Southampton Clean Air Zone (CAZ) on a voluntary basis, with no charging, by 2017 and deliver an associated package of measures. • Fulfil our statutory requirements and introduce penalty charges in 2019/20 for the most polluting commercial vehicles entering the CAZ. • Ensure future revisions of our Local Transport Plan, Local Development Plan and all other Council and city plans and strategies provide suitable and adequate policies to reduce emissions and deliver cleaner air. • Improve transport and freight delivery systems through efficient infrastructure, uptake of new and innovative technologies and increased uptake of public transport, cycling and walking. • Encourage the uptake of low emission technologies and vehicles. • Identify where alternative fuels and innovative solutions might deliver positive outcomes and support their assessment and introduction.
Supporting businesses and organisations	Work with businesses and organisations to promote the uptake of low emission technology and change travel behaviours	• Develop a Clean Air Partnership with key stakeholders in the city and region. • Work with the Port of Southampton to identify and support initiatives that will reduce their emissions. • Continue to promote sustainable travel through maintaining the "My Journey" campaign and explore options for further development. • Empower businesses to take responsibility for their contributions to air pollution and implement improvements. • Implement schemes to support taxi operators, other businesses and public services in reducing the emissions relating to their activities. • Strengthen shared learning via networks including representatives from academia, community groups and expert groups.
Collaborating with communities and residents	Work with and support the education of communities and individuals to identify and support behaviours which improve air quality	• Develop a role for residents and community groups in our Clean Air Partnership. • Support the education sector to rais awareness of air polution and how to reduce emissions. • Incentivise the use of public transport, cycling and walking. • Empower communities and individuals to take responsibility for their contributions to air pollution. • Provide good quality, timely information and data on local levels of pollution to enable residents to adopt behaviours to maintain their own health.
Promoting sustainability	Southampton City Council will be an exemplar of sustainable working practices in relation to reducing emissions and improving local air quality	The Council will: • Lead by example, ensuring our plans, policies and working practices support and promote an improvement in local air quality whilst delivering wider environmental and economic benefits locally, regionally and nationally. • Introduce a programme of measures to reduce its emissions and act as a key partner, sharing best practice on reducing emissions and promoting sustainable working methods whenever it can. • Use its influence on the local supply chain to ensure impacts on air quality are considered when making procurement decisions, including in the procurement and operation of its own fleet.

HOW WILL WE MEASURE SUCCESS?

We will:

- Achieve all statutory air quality standards by 2020.
- Deliver an ongoing reduction in Nitrogen Dioxide and Particulate Matter levels, to include those arising from Southampton City Council activities.
- Reduce the fraction of mortality attributable to particulate air pollution.
- Implement the Southampton Clean Air Zone by April 2017, and penalty charging for the most polluting commercial vehicles by 2019/20.
- Increase the proportion of journeys to work and school made by public transport or active methods.
- Increase the uptake and use of ultra-low and zero emission vehicles in the city.

This Clean Air Strategy will also contribute to wider improvements in the health of the Southampton population and we anticipate improvements in key indicators for public health in the city.

More detail about how we intend to achieve our targets or monitor progress is included in our Air Quality Action Plan which will be reviewed and updated annually for the duration of this strategy.

LINKS TO OTHER STRATEGIES AND PLANS

Working with Public Health colleagues

- Environmental Health have regular meetings with our public health colleagues within Southampton City Council. The Health and Wellbeing Board that oversees the Strategy is attended by both Environmental Health and Public Health. Air quality and particulate pollution is regularly discussed by the Board and measures to reduce particulates is progressed. Recent work has included a collaboration with Southampton University to use particulate NASA satellite maps. A grant application will be made by the University to the ESRC funding body for this project named SPHERE (Satellite-based Pollution Health and Exposure) It is anticipated to use the smart phone technology of Google location history to track Southampton residents exposure to particulate pollution throughout the day. This project is being supported by Public Health England.
- The air alert service that warns registered users of predicted moderate/high air pollution alerts helps Southampton residents with respiratory disease to reduce their exposure to particulates. The service was developed with Sussex Air and Kings College London, with the support of our public health colleagues and the NHS.

Working with other partners

- Neighbouring Authorities, New Forest District Council, Eastleigh Borough Council. Southampton works with our neighbouring authorities to improve air quality at a regional level. An air quality regional meeting takes place every year and we have regular contact by e mail and phone to discuss issues of mutual concern. A recent example being planning applications for short term operating reserve diesel generators with cross boundary air pollution issues. We will need to liase very closely over the mandatory Clean Air Zone designation to ensure it runs smoothly.
- The Port of Southampton, Associated British Ports (ABP), DP World, the container terminal operator, Cruise Ship companies, Carnival and Royal Caribbean. Southampton works closely with the Port operator and its customers to identify and support initiatives that will reduce their

emissions. The Clean Air Partnership will develop over the coming years to engage with the key stakeholders in the city, including the port.

- The Council engages with community pressure groups such as Clean Air Southampton and the Western Docks Consultative Forum. They will be invited to participate in the Clean Air Partnership.

In Summary

The following actions are proposed:

- Determine local concentrations of PM2.5 using current monitoring data, and data from Public Health England (health indicators) and Defra (background maps).
- Identify potential local hot spots areas for PM2.5
- Raise awareness of air quality (including particulate emissions) with partners (Public Health, Health and Well-being Board, Clean Air Partnership.
- Work with partners to identify and forward feasible schemes to reduce particulate emissions, through the Clean Air Partnership to produce a structured work plan.
- Consider the setting of a target for reductions in particulate emissions for Southampton. To be monitored using the $PM_{2.5}$ monitor at the AURN station in Brintons Road.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

Since 1994, real-time monitoring of nitrogen dioxide and other pollutants has been undertaken at 7 sites across the city. Details regarding these sites have been previously documented in previous air quality reports on the council website. Details of current monitoring are provided in Appendix A.

In addition to real-time monitoring, SCC has undertaken nitrogen dioxide diffusion tube monitoring at over 100 sites across the city. The details can be found on the Council website http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-monitoring/nitrogen-dioxide-diffusion-tubes.aspx

There have been a few changes to the nitrogen dioxide diffusion tube monitoring in 2015. Some sites have closed and some new sites have started in response to the ongoing review and assessment process. There are currently 65 operational tubes deployed throughout the city, mostly at residential facades, close to busy roads.

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Southampton City Council undertook automatic (continuous) monitoring at 3 sites during 2015. Table A.1 in Appendix A shows the details of the sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at http://uk-air.defra.gov.uk/data/

Maps showing the location of the monitoring sites are provided online at. http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-monitoring/

Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Southampton City Council undertook non- automatic (passive) monitoring of NO_2 at 65 sites during 2015. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided online at http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-monitoring/nitrogen-dioxide-diffusion-tubes.aspx

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for "annualisation" and bias. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B.

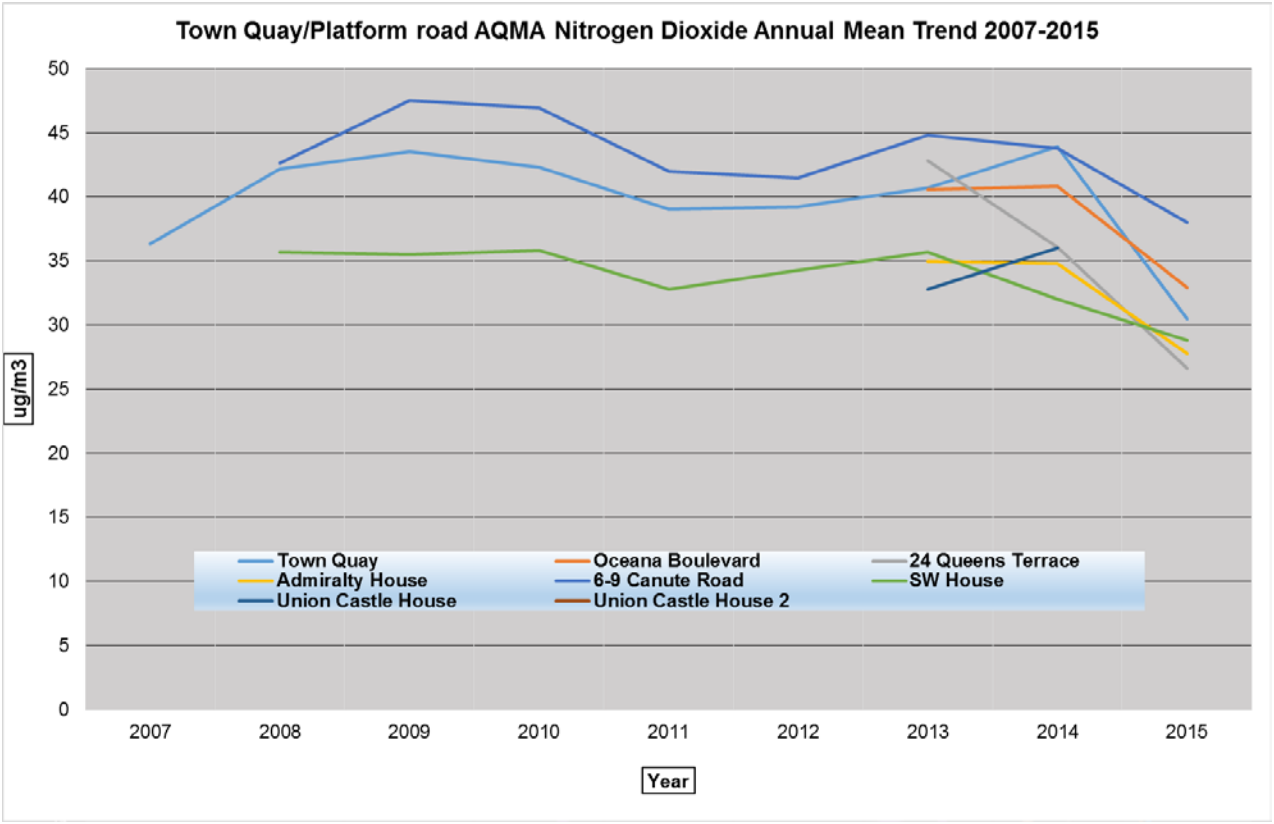
Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

There was no exceedance of the NO_2 hourly mean concentration air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. There were no monitored annual means greater than 60µg/m^3 at any site, which could indicate the hourly meran objective could be breached.

Nitrogen dioxide concentrations reduced at 2 of the 3 automatic stations in 2015. A slight increase of 1 microgramme was recorded at Onslow Road, although the data capture was only 68%, due to the station cabin being replaced with a new one.

Figures 6-12 NO_2 trends in AQMAs using diffusion tube monitoring

Figure 6



Most sites have decreased from 2013 -2015. This AQMA and Orchard Place was subject to a detailed assessment in May 2015, following major road layout changes in 2014. The road layout changes appear to have been beneficial for air quality, especially 24 Queens Terrace which has seen a substantial reduction in traffic.
All tubes were below the 40 ug/m^3 annual mean standard in 2015 for the first time. The highest sites were Union Castle House 2 at 38.7 ug/m^3 and 6-9 Canute Road at 38.0 ug/m^3 .

Figure 7

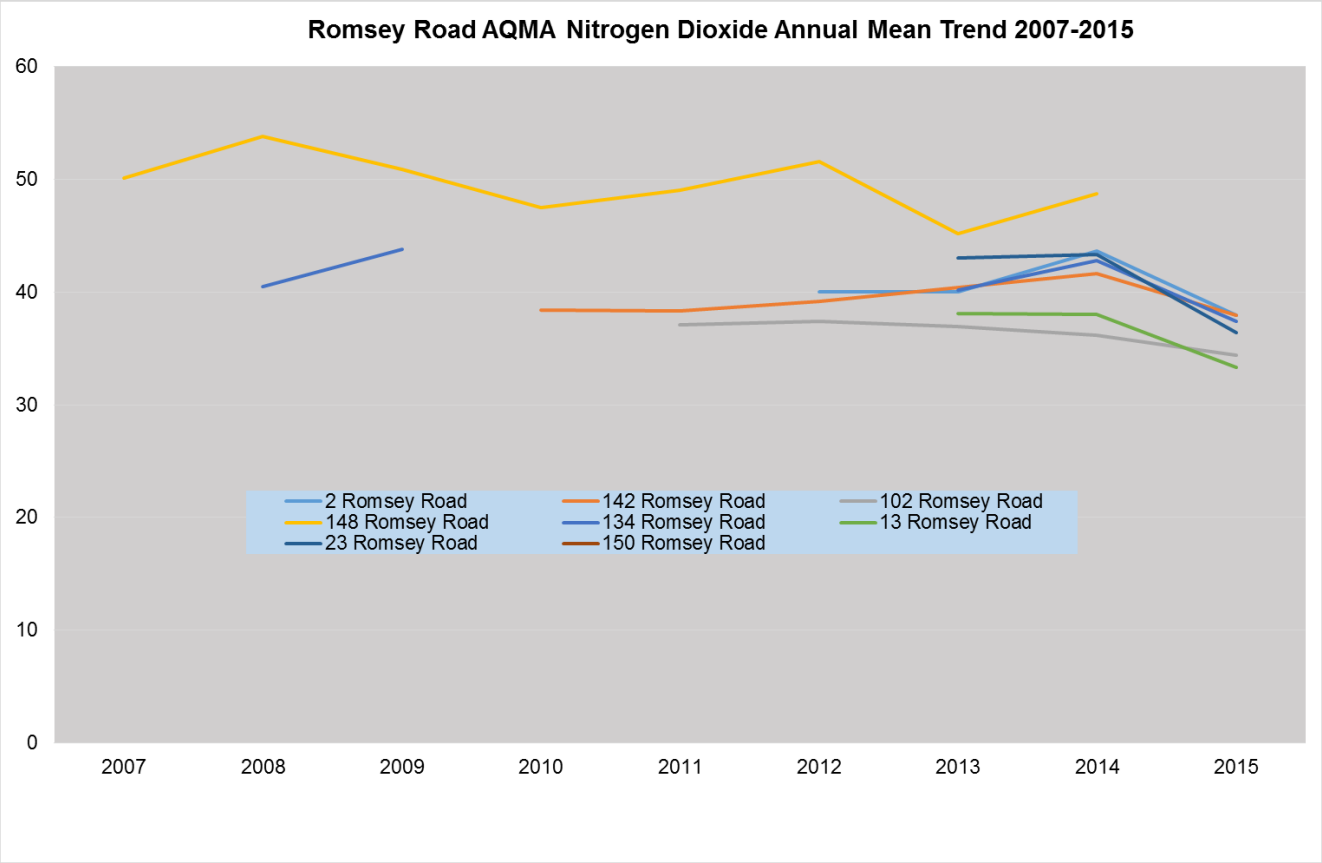
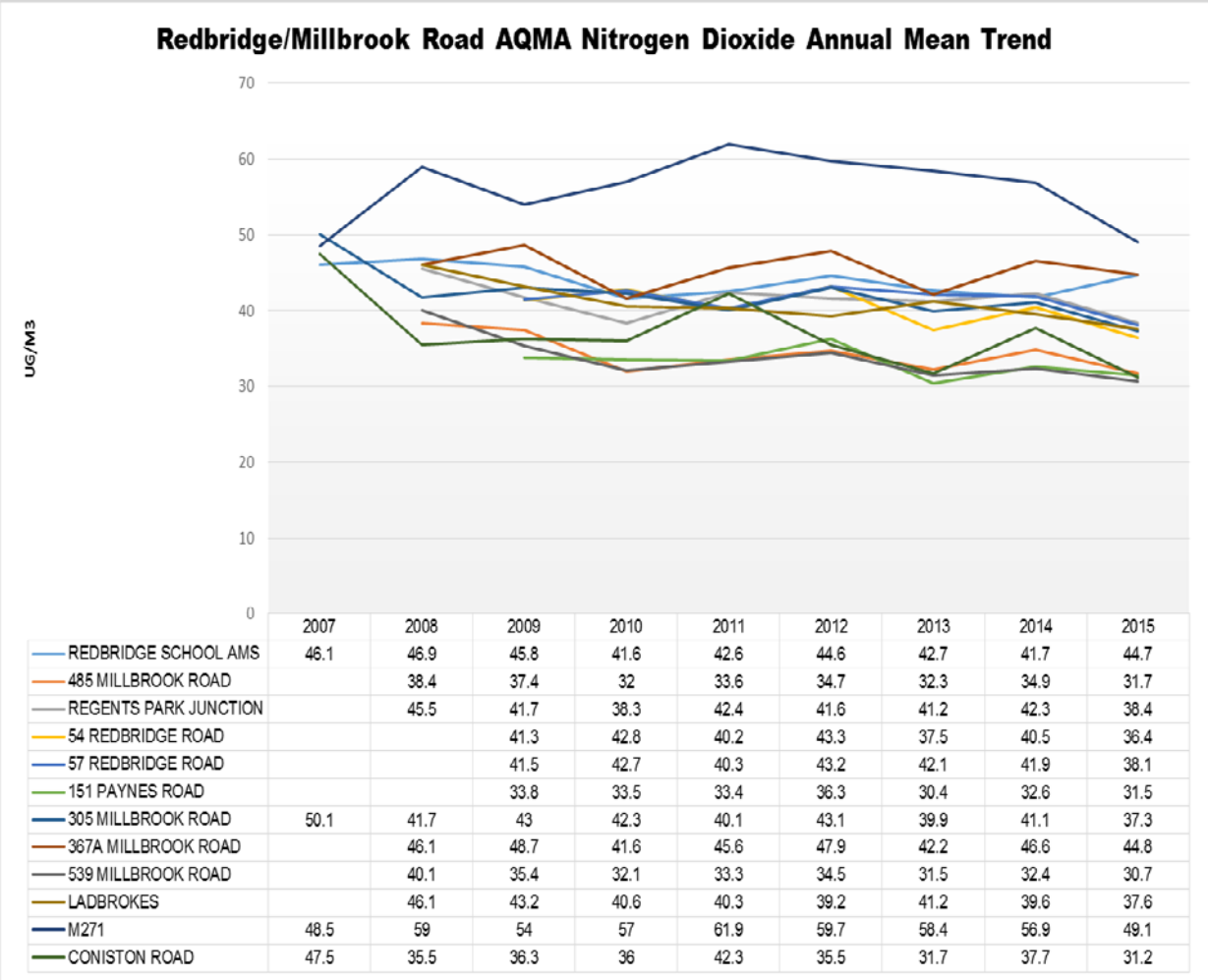


Figure 7 above shows a reduction in nitrogen dioxide annual mean in 2015 at all of the sites monitored. In 2014, 5 sites monitored levels above the annual mean standard. In 2015 only 1 site, 150 Romsey Road was above the standard. This tube is on the façade of a terraced house close to the junction with Teboura Way. The tube at 150, replaced the nearby tube on a lamp post on the pavement outside 148. The lamp post had been removed, so it was decided to relocate it onto the façade of 150 which is representative of residential exposure. The tube at 148 always had to be scaled for distance to the receptor, increasing the uncertainty in the measurement.

Figure 8



	2007	2008	2009	2010	2011	2012	2013	2014	2015
REDBRIDGE SCHOOL AMS	46.1	46.9	45.8	41.6	42.6	44.6	42.7	41.7	44.7
485 MILLBROOK ROAD		38.4	37.4	32	33.6	34.7	32.3	34.9	31.7
REGENTS PARK JUNCTION		45.5	41.7	38.3	42.4	41.6	41.2	42.3	38.4
54 REDBRIDGE ROAD			41.3	42.8	40.2	43.3	37.5	40.5	36.4
57 REDBRIDGE ROAD			41.5	42.7	40.3	43.2	42.1	41.9	38.1
151 PAYNES ROAD			33.8	33.5	33.4	36.3	30.4	32.6	31.5
305 MILLBROOK ROAD	50.1	41.7	43	42.3	40.1	43.1	39.9	41.1	37.3
367A MILLBROOK ROAD		46.1	48.7	41.6	45.6	47.9	42.2	46.6	44.8
539 MILLBROOK ROAD		40.1	35.4	32.1	33.3	34.5	31.5	32.4	30.7
LADBROKES		46.1	43.2	40.6	40.3	39.2	41.2	39.6	37.6
M271	48.5	59	54	57	61.9	59.7	58.4	56.9	49.1
CONISTON ROAD	47.5	35.5	36.3	36	42.3	35.5	31.7	37.7	31.2

All of the tubes showed a reduction in nitrogen dioxide annual mean in 2015, except for the Redbridge School site. However this can be explained as the NOx tube was relocated 4 metres closer to the road onto the boundary fence of the School in 2015.

It was previously on the roof inlet of the closed air monitoring station. The M271 trend line above shows uncorrected annual means, not scaled for distance to the nearest receptor. Once scaled for the 14metre distance to the nearest receptor, the 2015 annual mean reduces to 36.9 ug/m^3 , below the standard. Only 2 sites exceeded the annual mean standard in 2015, the Redbridge School boundary fence and 367A Millbrook Road, on a residential façade.

Figure 9

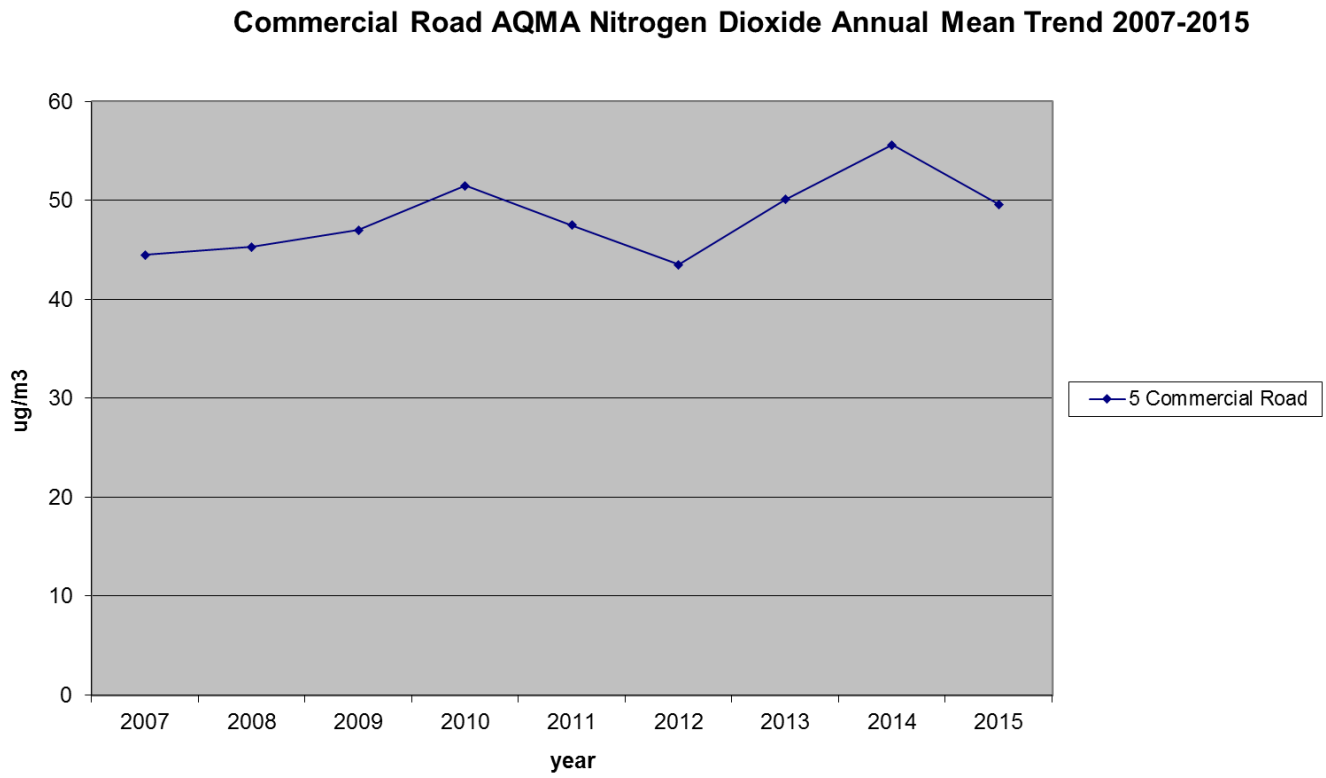
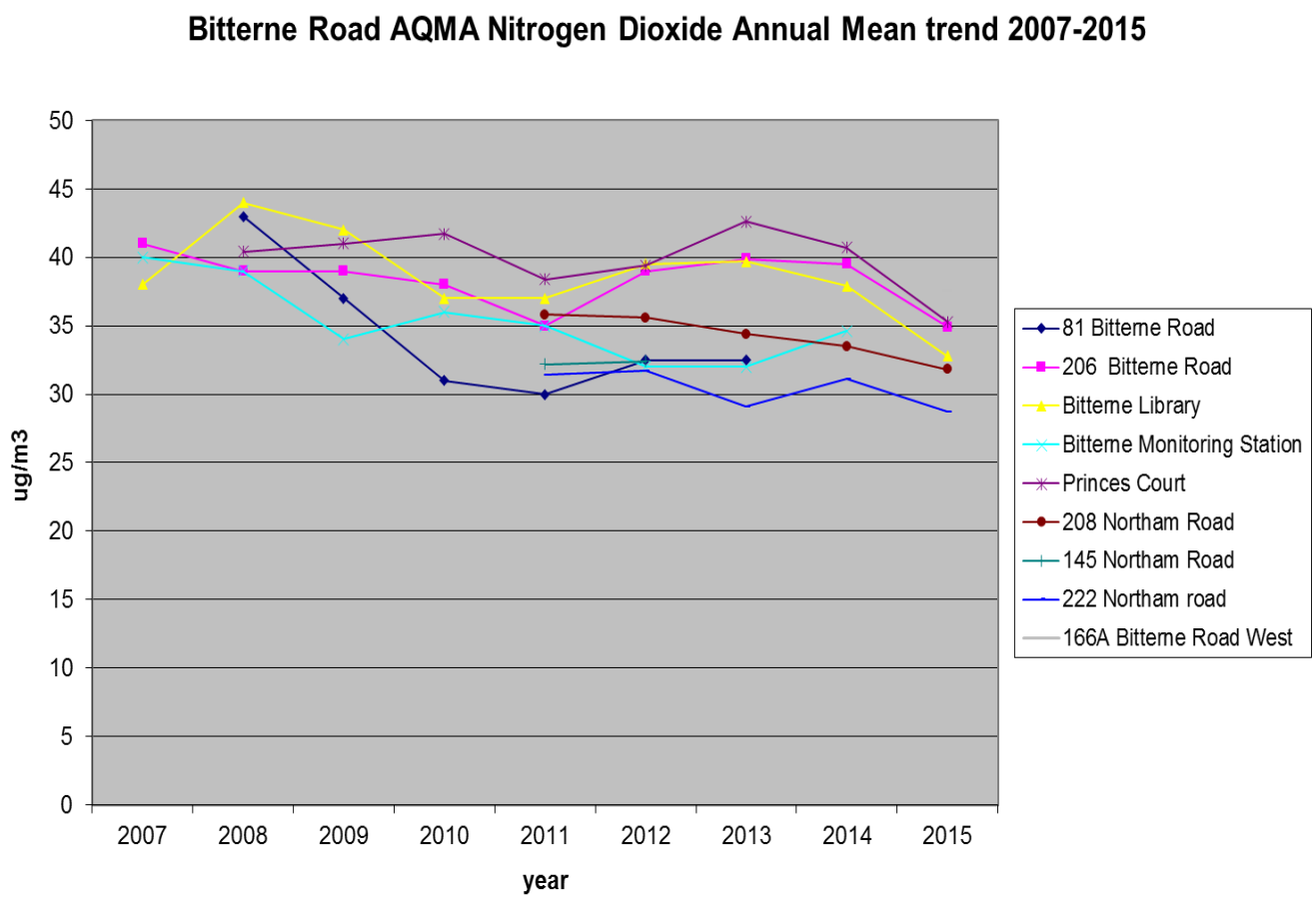


Figure 9 above, shows the annual mean trendline for the NOx tube on the pavement lamp post directly outside 5 Commercial Road, near the Mayflower Theatre in the city centre. The data in this graph has not been adjusted for distance to the residential receptor. In 2015, once scaled for the 2 metre distance to the nearest terraced house façade it reduced from 49.6 μg/m^3 to 44.8 μg/m^3, still well above the annual mean standard.

From 2013-2014, the graph above shows a marked increase in nitrogen dioxide annual mean from 43.5 μg/m^3 to 55.6 μg/m^3. This increase is highly likely to have been caused by the recent construction of the 12 Storey Mayflower Student Halls of residence. It is likely that the tall building has created a “street canyon effect” and reduced dispersion of tail pipe emissions from the queuing traffic on Commercial Road waiting to turn onto Havelock Road. The temporary construction activity is also likely to have increased congestion, as there was a contraflow in operation and a narrowing of the road, with high hoardings protecting the construction site. There is very little parking associated with the student halls. The Halls are well served by the Unilink bus service to enable students to travel to the various University campuses. The developer contributed £10,000 towards the City Council Air Quality Action Plan to help mitigate the adverse impact. The ground floor level of the student halls are commercial with residential above.

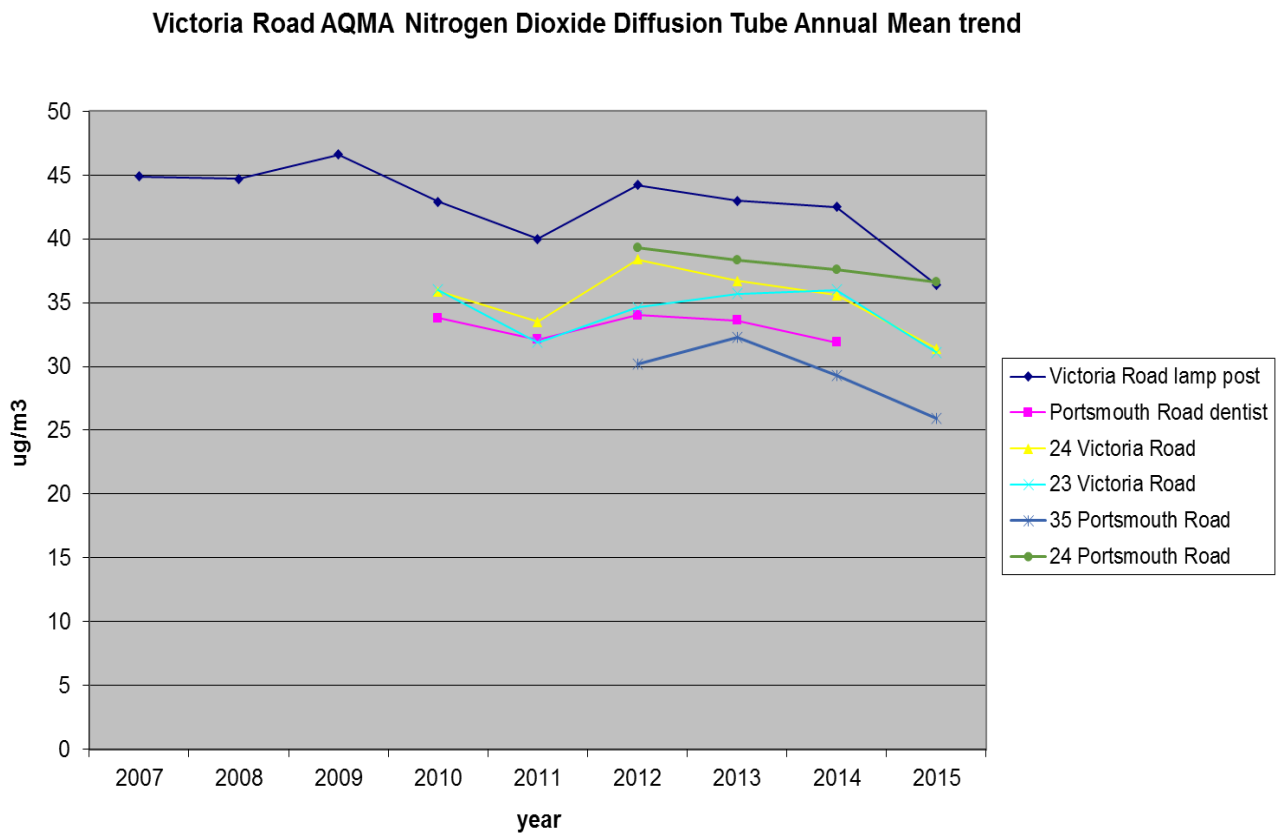
In 2015, this upward trend reversed, probably as a result of the construction work completing and traffic returning to normal.

Figure 10



The long term trend is downwards, all NOx tubes in 2015 were below the nitrogen dioxide annual mean standard for the first time. Although a new NOx tube for 2015 on the façade of 166A Bitterne Road West monitored the highest annual mean at 37.6 ug/m^3 of all the 6 sites. This may be partially attributable to the 7% decrease in traffic count on the Northam Bridge. (ref LTP3)

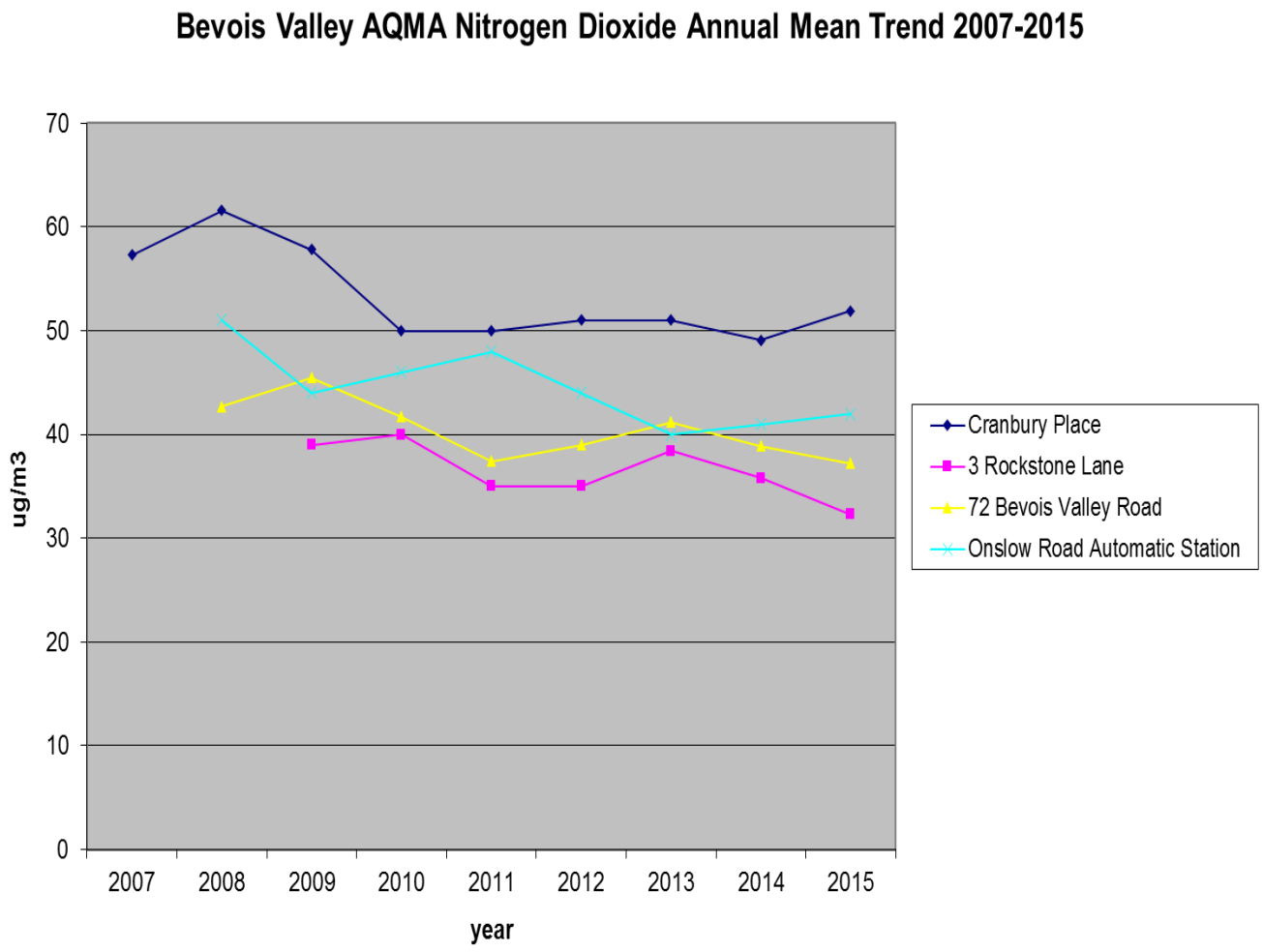
Figure 11



The long term trend is downwards, all NOx tubes in 2015 were below the nitrogen dioxide annual mean standard for the first time. The creation of a one way system on Victoria Road in 2014 and improvements to the street scene has reduced the traffic flow, benefitting local air quality. However, the automatic station at the same location as the Victoria Road lamp post NOx tube was still above in 2015 at 41.6 ug/m^3 .

The sampling inlet is much lower at 1metre, than the NOx tube height on the lamp post of 2.3metres. Height does affect the level of pollution monitored. NOx tubes usually have to be located higher on downpipes/lamp posts to reduce the risk of vandalism.

Figure 12



The overall trend since 2007 is downwards, but in 2015, both Cranbury Place NOx tube and the automatic station monitored a small increase compared with 2014, both locations were above the annual mean standard.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

There were no exceedances of the PM_{10} annual mean or hourly mean objective standard in 2015. There were 4 days above the PM_{10} 24-hour mean objective of 50µg/m^3, however it was well below the 35 days per year allowed.

There has been significant reductions in PM_{10} since monitoring began in Southampton in 1994 as shown by Figure 13 . No AQMAs have been declared with regards to PM_{10} in Southampton, however monitoring will continue at the existing stations, including the new Redbridge AURN station that commenced monitoring in 2016.

Figure 13

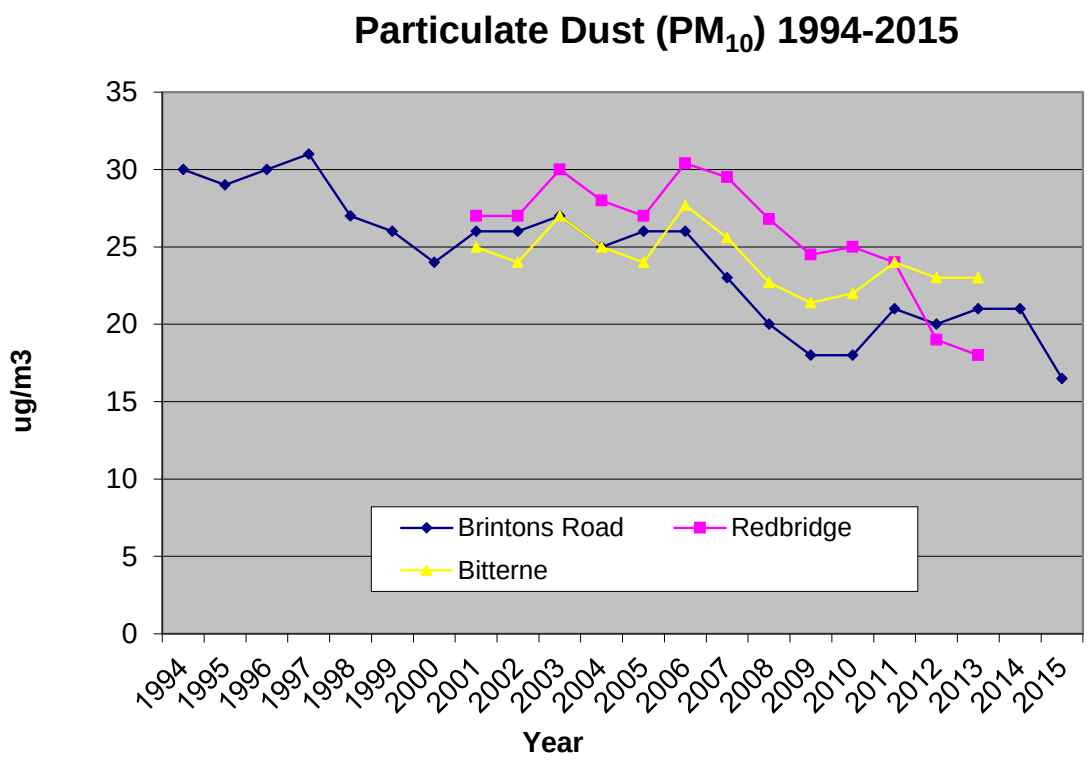


Figure 13 shows PM_{10} annual mean from 1994-2015. The graph shows a steady reduction. In 2015 the Brintons Road station showed a significant reduction from 21 in 2014 to 16.5 ug/m^3 . Monitoring ceased at the Redbridge and Bitterne Stations at the end of 2013. However a new AURN station commenced monitoring very close to the old Redbridge station at the start of 2016. The new station monitors NO_2 and PM_{10} .

3.2.3 Particulate Matter ($PM_{2.5}$)

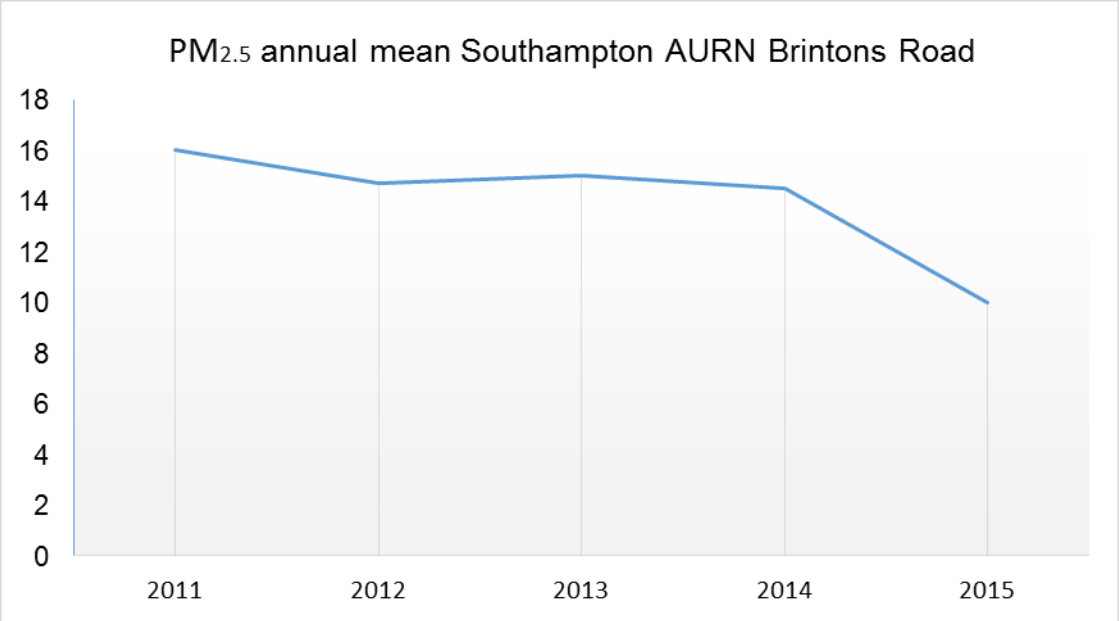
Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

$PM_{2.5}$ decreased substantially in 2015 compared to previous years.

In 2011 it was 16 ug/m^3 but in 2015 it decreased to 10 ug/m^3

Figure 14 shows the reduction in $PM_{2.5}$ although the 2015 significant reduction could have been caused by annual variation due to weather conditions.

Figure 14



3.2.4 Sulphur Dioxide (SO_2)

Table A.8 in Appendix A compares the ratified continuous monitored SO_2 concentrations for year 2015 with the air quality objectives for SO_2.

SO_2 is monitored at the automatic AURN station at Brintons Road.

No exceedance of the SO_2 15 minute mean, hourly mean or 24 hour mean objective was monitored in 2015. Monitoring will continue at Brintons Road as part of the national monitoring network into the future.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Inlet Height	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Does this Location Represent Worst-Case Exposure
CM1	AURN Brintons Road	Urban Centre	442583	112248	2.5m	NO2, PM10 (FDMS), PM2.5 (FDMS), SO2, CO, benzene, O3	N	Chemiluminescence (NO2), FDMS (PM10 and PM2.5), ultra-violet fluorescence (SO2), infra-red absorption (CO), pumped diffusion tube sampler (benzene)	Y (18 m)	8m	N
CM2	Redbridge School Closed January 2014	Roadside	437549	113721	2.5m	NO2, PM10 (TEOM)	Y	Chemiluminescence (NO2), TEOM (corrected using VCM) (PM10)	Y adjacent to school football pitch 0m	8m	Y
CM3	Bitterne Road Closed end of 2013	Roadside	443987	113340	2.5	NO2, PM10 (TEOM)	Y	Chemiluminescence (NO2), TEOM (corrected using VCM) (PM10)	Y (some houses are closer to the road than the station 10m)	8m	N

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Inlet Height	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Does this Location Represent Worst-Case Exposure
CM4	Onslow Road	Roadside	442304	112771	1.3	NO2	Y	Chemiluminescence (NO2),	Y (houses similar distance to the road as station 10m)	2m	Y
CM5	Millbrook road Closed end of 2014	Roadside	439702	112248	1.3	NO2 O3	Y	Chemiluminescence	Y (houses similar distance to the road as station 20m)	6m	Y
CM6	Victoria Road	Roadside	443751	111121	1.3	NO2	Y	Chemiluminescence (NO2)	Y (1m)	3m	Y

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N100	6 Sandringham Road	Background	444386	114450	NO_2	N	0	NA	N	1
N101	Redbridge School AMS	Roadside	437543	113726	NO_2	Y	0	8	Y	1.8
N102	64 Burgess Road	Roadside	441678	115278	NO_2	Y	0	6	N	1.6
N103	485 Millbrook Road	Roadside	438807	112908	NO_2	Y	0	13	N	1.2
N104	Regents Park Junction	Roadside	439218	112850	NO_2	Y	2	24	N	2.3
N105	32 Burgess Road	Roadside	441210	115124	NO_2	N	0	5	N	1.2
N106	2 Romsey Road, Oakhill	Roadside	439754	113982	NO_2	N	0	5	N	1.6
N107	Cranbury Place	Roadside	442367	112896	NO_2	Y	0.5	2	N	2.5
N108	81 Bitterne Road (closed)	Roadside	443581	113359	NO_2	Y	0	5	N	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N109	72 Bevois Valley	Roadside	442585	113251	NO_2	Y	0.5	5	N	2.5
N110	Brinton's Road 1	Urban	442591	112240	NO_2	N	18	10	Y	3.2
N111	Brinton's Road 2	Urban	442591	112240	NO_2	N	18	10	Y	3.2
N112	Brinton's Road 3	Urban	442591	112240	NO_2	N	18	10	Y	3.2
N113	206 Bitterne Road	Roadside	444124	113290	NO_2	Y	0	5	N	1.8
N114	Bitterne Library	Roadside	444131	113326	NO_2	Y	1	3.5	N	2.5
N115	54 Redbridge Road	Roadside	437939	113473	NO_2	Y	0	11	N	1.4
N116	57 Redbridge Road	Roadside	437951	113407	NO_2	Y	0	11	N	1.2
N117	Victoria Road (lamp post)	Roadside	443751	111122	NO_2	Y	0.3	3	Y	2.3
N118	3 Rockstone Lane	Roadside	442472	113068	NO_2	Y	2.5	2.5	N	2.3

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N120	6-9 Canute Road	Roadside	442555	111021	NO_2	Y	0	4	N	2.5
N121	Hill Lane (closed)	Kerbside	440958	115068	NO_2	N	7	1	N	2.3
N122	151 Paynes Road	Roadside	439998	112634	NO_2	N	0	12	N	1.5
N123	102 St. Andrews Road	Roadside	442351	112302	NO_2	N	0	4	N	1.5
N124	305 Millbrook Road	Roadside	439741	112746	NO_2	Y	0	10	N	1.5
N125	Princes Court	Roadside	443126	112645	NO_2	Y	0	5.5	N	2.5
N126	107 St Andrew's Road	Roadside	442369	112283	NO_2	N	2	2	N	1.5
N127	Western Esplanade (closed)	Roadside	441656	112065	NO_2	N	2	2.8	N	2
N128	290 Bursledon Road (closed)	Roadside	446283	112145	NO_2	N	0	4.8	N	2.2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N129	SW House	Roadside	442554	111022	NO_2	Y	0	3.1	N	2.5
N130	367A Millbrook Road	Roadside	439346	112821	NO_2	Y	0	9	N	2
N131	142 Romsey Road	Roadside	439378	114185	NO_2	Y	0	5	N	1.6
N132	347A Winchester Road (closed)	Kerbside	440950	115138	NO_2	Y	3	1	N	2.5
N133	539 Millbrook Road	Roadside	438608	113018	NO_2	Y	0	33	N	1.6
N134	Ladbrokes	Roadside	438953	112866	NO_2	Y	0	12	N	2.8
N135	24 Victoria Road	Roadside	443714	111052	NO_2	N	0	4	N	2.5
N136	23 Victoria Road	Roadside	443731	111053	NO_2	N	0	3.2	N	2.5
N137	Bitterne AMS	Roadside	443990	113340	NO_2	Y	5	10	Y	2.8

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N138	66 Burgess Road	Roadside	441694	115288	NO_2	Y	0	3	N	2
N139	Wyndham Court (Closed)	Urban	441506	112223	NO_2	N	0	8	N	2.5
N140	5 Commercial Road	Roadside	441629	112332	NO_2	Y	2	2	N	2.8
N141	Town Quay Road	Kerbside	441915	110993	NO_2	Y	1	0.8	N	2.2
N142	10 New Road	Roadside	442225	112127	NO_2	Y	0	2	N	2.5
N143	102 Romsey Road	Roadside	439468	114146	NO_2	N	0	6	N	1.5
N144	208 Northam Road	Roadside	443147	112709	NO_2	N	0	5	N	3.0
N145	145 Northam Road (closed)	Roadside	443076	112579	NO_2	N	0	12	N	2.3
N146	222 Northam Road	Roadside	443164	112741	NO_2	N	0	10	N	3

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N147	123 Burgess Road (closed)	Roadside	441548	115266	NO_2	N	0	7	N	1.8
N148	143 Burgess Road (closed)	Roadside	441669	115300	NO_2	N	0	10	N	1.8
N149	44B Burgess Road	Roadside	441552	115247	NO_2	Y	0	2	N	1.8
N150	148 Romsey Road	Roadside	439368	114193	NO_2	Y	3	2	N	2.6
N151	134 Romsey Road	Roadside	439396	114176	NO_2	Y	0	5	N	1.4
N152	M271	Roadside	437353	112645	NO_2	Y	14	4	N	2.5
N153	Coniston Road	Roadside	437325	113860	NO_2	Y	3	14	N	2.2
N154	Oceana Boulevard DG5	Roadside	442234	111081	NO_2	N	0	1	N	2.4
N155	24 Queens Terrace	Roadside	442405	111083	NO_2	N	0	1	N	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N156	Union Castle House (Relocated)	Roadside	442461	110996	NO_2	Y	0	8	N	2.5
N157	Admiralty House	Roadside	442375	110970	NO_2	N	0	1, (To dock gate), 35 (To Platform Road)	N	2.3
N158	24 Portsmouth Road	Roadside	443801	111111	NO_2	N	0	2	N	2.3
N159	35 Portsmouth Road	Roadside	443745	111151	NO_2	N	0	2	N	2.3
N160	2 Dorset Street	Roadside	442218	112890	NO_2	N	0	3	N	2.6
N161	30 Addis Square	Roadside	442703	114127	NO_2	N	0	4	N	3
N162	263A Portswood Road	Roadside	442877	114342	NO_2	N	0	4	N	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N163	285 Portswood Road	Roadside	442950	114381	NO_2	N	0	9	N	2
N164	164-166 Portswood Road	Roadside	442796	114258	NO_2	N	0	4	N	2
N165	8 The Broadway	Roadside	442767	114184	NO_2	N	0	4	N	2.6
N166	14 New Road	Roadside	442210	112140	NO_2	Y	0	1	N	3
N167	13 Romsey Road	Roadside	439757	114013	NO_2	N	0	6	N	2.6
N168	23 Romsey Road	Roadside	439736	114025	NO_2	N	0	5	N	4
N169	150 Romsey Road	Roadside	439368	114193	NO_2	Y	0	5	N	2
N170	Union Castle House (2)	Roadside	442461	110996	NO_2	Y	6	2.5	N	2
N171	132 Newton Road	Background	444211	114669	NO_2	N	0	12	N	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N172	4 New Road	Roadside	442203	112125	NO_2	Y	0	2.5	N	2.4
N173	19A Burgess Road	Roadside	440962	115112	NO_2	Y	0	6	N	2.4
N174	166A Bitterne Road West	Roadside	443955	113315	NO_2	Y	0	5	N	2
N175	38 Shirley High Street	Roadside	439957	113739	NO_2	N	0	6	N	2.4
N176	Salisbury Arms, Shirley High Street	Roadside	439773	113954	NO_2	N	0	12	N	2.4
N177	95 Shirley high Street	Roadside	439845	113906	NO_2	N	0	5	N	2.4
N178	2 Gover Road	Roadside	437266	113685	NO_2	N	0	10	N	1.4
N179	38 Old Redbridge Road	Roadside	437152	113685	NO_2	N	0	24	N	1.6

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
B1	Brintons Road AURN	Urban Centre	442591	112240	Benzene	N	10	10	N	3

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
					2011	2012	2013	2014	2015
CM1 (AURN)	Urban Centre	Automatic	93	93	35	32	30	32	32
CM2 (Redbridge School)	Roadside	Automatic	NA	NA	**48**	-	**45**	Ceased Operation	Ceased Operation
CM3 (Bitterne)	Roadside	Automatic	NA	NA	35	32	32	Ceased Operation	Ceased Operation
CM4 (Onslow Road)	Roadside	Automatic	92%	68	**46**	**44**	**40**	**41**	**42**
CM5 (Millbrook Road)	Roadside	Automatic	NA	NA	**50**	**43**	**41**	**42**	Ceased Operation
CM6 (Victoria Road)	Roadside	Automatic	93	93	**47**	**44**	**43**	**44**	**42**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
N100	Background	DT	91	91	**19.8**	**19.0**	**20.4**	20.5	17.2
N101	Roadside	DT	100	100	**42.6**	**44.6**	**42.7**	**41.7**	**44.7**
N102	Roadside	DT	83	83		32.0	33.3	33.3	29.8
N103	Roadside	DT	100	100	33.6	34.7	32.3	34.9	31.7
N104	Roadside	DT	100	100	**42.4**	**41.6**	**41.2**	**42.3**	38.4
N106	Roadside	DT	91	91	37.5	**40.0**	39.9	**43.6**	37.9
N107	Roadside	DT	83	83	**50.4 estimate**	**51.2 estimate**	**49.4 estimate**	**49.1 estimate**	**51.9 estimate**
N109	Roadside	DT	100	100	37.4	38.7	**41.2**	38.9	37.2
N110	Urban Centre	DT	100	100	27.2	29.1	29.5	29.2	25.4
N111	Urban Centre	DT	100	100	28.1	29.1	29.4	29.2	25.9
N112	Urban Centre	DT	100	100	28.2	29.6	28.6	29.2	26.1
N113	Roadside	DT	100	100	34.9	38.9	39.9	37.9	34.9
N114	Roadside	DT	100	100	37.2	39.5	39.7	39.5	32.8
N115	Roadside	DT	100	100	**40.2**	**43.3**	37.5	37.9	36.4

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
N116	Roadside	DT	100	100	**40.3**	**43.2**	**42.1**	**41.9**	38.1
N117	Roadside	DT	91	91	**40.0 estimate**	**44.2 estimate**	**42.5 estimate**	**42.0 estimate**	35.9 estimate
N118	Roadside	DT	100	100	34.8	35.2	35.3 estimate	35.8 estimate	32.3 estimate
N119	Roadside	DT	91		32.1	34.0	33.6	31.9	
N120	Roadside	DT	91	91	**42**	**41.5**	**44.8**	**43.8**	38.0
N122	Roadside	DT	100	100	33.4	36.3	30.4	326	31.5
N123	Roadside	DT	91	91		34.1	38.1	36.2	32.8
N124	Roadside	DT	100	100	**40.1**	43.1	39.9	**41.1**	37.3
N125	Roadside	DT	100	100	38.4	39.4	**42.6**	**40.7**	35.3
N126	Roadside	DT	100	100	37.4	35.2	36.3	36.9	32.8
N129	Roadside	DT	100	100	32.8	34.3	37.7	32.0	28.8
N130	Roadside	DT	100	100	**45.6**	**47.9**	**42.2**	**46.6**	**44.8**
N131	Roadside	DT	100	100	38.3	39.2	**40.4**	**41.6**	37.9
N132	Roadside	DT	NA	NA	**40.8**	39.6	**40.7 estimate**	**40.0 estimate**	**Relocated to facade**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
N133	Roadside	DT	100	100	33.3	34.5	31.5	32.4	30.7
N134	Roadside	DT	100	100	**40.3**	39.2	**41.2**	39.6	37.6
N135	Roadside	DT	100	100	33.5	38.4	36.7	35.6	31.4
N136	Roadside	DT	100	100	31.9	34.6	35.7	35.6	31.1
N137	Roadside	DT	100	**41**	32.5	32.8	32.7	36.0	25.5 estimate
N138	Roadside	DT	83	83	**41.9**	**45.5**	**44.5**	**49.8**	**43.8**
N140	Roadside	DT	100	100	**47.5**	**43.5**	**45.3** estimate	**50.5** estimate	**44.8** estimate
N141	Roadside	DT	91	91	39.0	39.2	**40.7**	**43.9**	30.5
N142	Roadside	DT			**40.0**	39.7	**42.6**	38.3	
N143	Roadside	DT	100	100	37.1	34.1	36.9	**40.1**	34.4
N144	Roadside	DT	91	91	35.8	35.6	34.4	33.5	31.8
N146	Roadside	DT	100	100	31.4	31.7	29.1	31.1	28.7
N149	Roadside	DT	91	91	28.9	33.1	34.3	36.1	32.5

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
N150	Roadside	DT	100	100	49.0	51.6	**45.2** estimate	**51.3** estimate	Relocated to facade of 150 romsey road
N151	Roadside	DT	100	100	**44.5**	38.8	**40.2**	**40.9**	37.4
N152	Roadside	DT	100	100	**47.1** estimate	**44.0** estimate	**40.9** estimate	**40.9** estimate	36.9 estimate
N153	Roadside	DT	100	100	**42.3**	35.5	31.7	37.7	31.2
N154	Roadside	DT	100	100		**44.2**	**40.6**	**40.8**	32.9
N155	Roadside	DT	83	83		**43.8**	**42.8**	36.1	26.6
N156	Roadside	DT				32.8	32.8	36.0	
N157	Roadside	DT	100	100		34.6	35.0	34.8	27.8
N158	Roadside	DT	91	91		39.3	28.3	37.6	36.6
N159	Roadside	DT	100	100		30.2	32.3	29.3	25.9
N160	Roadside	DT	91	91			33.7	32.0	32.6
N161	Roadside	DT	100	100			37.0	35.2	32.5
N162	Roadside	DT	91	91			**44.3**	**41.9**	37.7

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
N163	Roadside	DT	83	83			31.6	32.6	27.8
N164	Roadside	DT	100	**66**			**40.8**	39.0	32.3
N165	Roadside	DT	91	91			**49.3**	**57.2**	32.3
N166	Roadside	DT	91	91		**46.2**	**40.7**		38.1
N167	Roadside	DT	100	100		34.0	38.1	38.0	33.5
N168	Roadside	DT	100	100		35.9	**43.0**	**43.3**	36.4
N169	Roadside	DT	83	83				36.6	**40.6**
N170	Roadside	DT	100	100				37.5 estimate	38.7 estimate
N171	background	DT	91	91				23.1	17.2
N172	Roadside	DT	91	91					**42.9**
N173	Roadside	DT	100	58					27.3 estimate
N174	Roadside	DT	100	50					37.6 estimate
N175	Roadside	DT	100	50					38.0 estimate
N176	Roadside	DT	83	50					38.0 estimate

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
					2011	2012	2013	2014	2015
N177	Roadside	DT	100	50					36.7 estimate
N178	Roadside	DT	100	33					25.9 estimate

Notes: Exceedances of the NO_2 annual mean objective of 40µg/m³ are shown in **bold**.

NO_2 annual means exceeding 60µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200µg/m³ (3)				
					2011	2012	2013	2014	2015
CM1 (AURN)	Urban Centre	Automatic	93	93	0	0	0	0	**3**
CM2 (Redbridge School)	Roadside	Automatic		NA	3	-	0	Ceased Operation	Ceased Operation
CM3 (Bitterne)	Roadside	Automatic		NA	0	0	0	Ceased Operation	Ceased Operation
CM4 (Onslow Road)	Roadside	Automatic	89	68	1	1	2	1	

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2011	2012	2013	2014	2015
CM5 (Millbrook Road)	Roadside	Automatic			0	0	0	0	
CM6 (Victoria Road)	Roadside	Automatic	93	93	0 (124)	0 (146)	1	5	5

Notes: Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
				2011	2012	2013	2014	2015
CM1 (AURN)	Urban Centre		90	21	19.8	21	20.9	16.5

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2011	2012	2013	2014	2015
CM2 (Redbridge School)	Roadside			24.5	18.8	17.6		
CM3 (Bitterne)	Roadside			24	21.6	22.8		
CM4 (Onslow Road)	Roadside							
CM5 (Millbrook Road)	Roadside							
CM6 (Victoria Road)	Roadside							

Notes: Exceedances of the PM_{10} annual mean objective of $40\mu g/m^3$ are shown in **bold.**

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2011	2012	2013	2014	2015
CM1 (AURN)	Urban Centre		90	9	11	4	5	4
CM2 (Redbridge School)	Roadside			15	6	0	Ceased Operation	Ceased Operation
CM3 (Bitterne)	Roadside			13	9	6	Ceased Operation	Ceased Operation

Notes: Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 90%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2011	2012	2013	2014	2015
CM1 (AURN)	Urban Centre		89	16	14.7	15	14.5	10

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.8 – SO_2 Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	Number of Exceedances (percentile in bracket) (3)		
				15-minute Objective (266 $\mu g/m^3$)	1-hour Objective (350 $\mu g/m^3$)	24-hour Objective (125 $\mu g/m^3$)
CM1	Roadside	98	98	0	0	0

Notes: Exceedances of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%)

(3) If the period of valid data is less than 90%, the relevant percentiles are provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2015

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
N100	26	24.8	18.7	17.5	14.8	12.5	-	14.8	19.7	21.5	18.5	19	18.9	17.2
N101	43.2	48.2	38.5	43.5	39.7	50.5	51.9	50.2	53.8	57.1	56.1	56.5	49.1	44.7
N102	34	40.8	-	34.8	25.3	-	29.9	30.2	35.7	31.5	33.6	32	32.8	29.8
N103	34.2	39	35	35.4	28.4	31	31	39.5	33.6	35.1	38.3	38	34.9	31.7
N104	38.6	49.7	39.8	42.5	32.6	36.2	36.7	44.1	38.9	38.5	47.7	61.2	42.2	38.4
N105														
N106	37.4	51.2	43	43.1	38.3	-	39.8	41.7	37.5	37.3	45.3	43.8	41.7	37.9
N107	58.1	66.8	57.8	65.7	-	-	53.1	57.8	54.3	55.6	56.7	63.8	59	53.7
N108														
N109	48.9	47.2	47.9	45.1	36.2	33.1	32.3	41.3	42.6	41.3	35.9	39.1	40.9	37.2
N110	30.4	36.5	27.1	32.5	21.1	23.2	25.2	24.4	29.2	31.1	27.3	26.9	27.9	25.4
N111	36.4	32.9	30.55	28.4	22.8	24.8	26.1	25.2	28.7	30.5	28.2	27.5	28.5	25.9
N112	33.7	37.9	25.7	29.2	25.3	23.8	24.7	25.1	30.3	32.3	28.3	27.6	28.7	26.1
N113	41.2	45.3	36.6	32.1	35	36.8	35.9	37.2	41.2	34.3	35.6	49.5	38.4	34.9

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
N114	36.3	41.6	33.4	35	31.6	36.8	35.8	34.3	36.5	39.5	33.6	37.7	36	32.8
N115	32.3	50.3	42.4	39.1	36.4	37.5	39.5	38.7	44	40.9	49.3	29.2	40	36.4
N116	52.5	50	43.3	39.9	38.1	36.5	32.7	42.7	44.9	43	36.5	41.8	41.8	38.1
N117	47	54.9	51.9	43.5	36.8		29.9	34.2	30.6	38	35.9	36.8	40	36.4
N118	44.5	45.8	46.8	43.1	31.8	31.8	29.9	36.3	41.3	41.2	27.1	39.2	38.2	34.8
N120	40.1	51.8	47	41.2	38	42.7	38.8	44	-	43.3	39.7	32.2	41.7	38
N121														
N122	37	38.6	29.2	36.6	28.2	32	32.4	35.7	28	37.5	44	36.1	34.6	31.5
N123	38.4	45.9	34.2	40.2	26.8	31.8	31.6	34.8	35.3	43	-	34.7	36.1	32.8
N124	39.2	49.3	36.5	41.8	33	37.8	36.8	39.4	47.3	42.2	48.3	39.9	41	37.3
N125	33.4	41.4	39.7	43.2	35	36.6	34.1	42.3	47.2	44.6	33.2	34.2	38.7	35.3
N126	39.9	43.5	34.8	42.5	31	32.7	32.4	34.2	41.1	37.2	30.7	32.8	36.1	32.8
N127														
N128														
N129	33.6	36.8	32.9	33.3	28.3	31.1	28.8	29	35	37.4	26.6	27.2	31.7	28.8
N130	46.9	54.7	42.4	48.9	45.3	49.1	48.2	51.6	47.8	48.6	50.5	56.3	49.2	44.8
N131	42	52	43	46.3	38.4	41	38.8	46.6	38.8	40	35	37.8	41.6	37.9

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
N132	40.9	53.7	43.3	-	-	-	-	-	-	-	-	-	46	41.8
N133	33.3	41.3	37.8	31.8	29	28.3	31.4	29.9	32.5	34.2	38.2	37	33.7	30.7
N134	44.1	48.5	39.7	42.5	32.8	35.1	40.1	42.4	49.7	44.9	35.9	39.9	41.3	37.6
N135	35.5	50.1	34.8	35.9	33	33.9	31.7	30	33.7	33.6	33.7	27.9	34.5	31.4
N136	28.1	43.8	38.7	38.5	29.1	43	27.8	31.7	32.6	41.3	26.7	28.3	34.1	31.1
N137	31.8	36.8	32.2	34	28	-	-	-	-	-	-	-	32.6	29.6
N138	42.8	51.3	47.9	59.1	40.6	-	41.1	54	-	55	39.8	50	48.2	43.8
N139														
N140	79.4	53.8	52	49.8	48.9	47.3	50.5	61.4	56.2	60.8	46	47.5	54.5	49.6
N141	35.3	-	35.6	34.5	29.1	36.3	28.7	38.4	45.5	40.7	23.4	21	33.5	30.5
N142														
N143	37.4	45.1	40.2	35.2	33	35.5	38.3	39.3	40.5	38.5	31.9	38.3	37.8	34.4
N144	33.6	38.6	33.3	35	33	33.5	31.9	-	36.1	34.3	38.8	36.8	35	31.8
N145														
N146	33.2	36.7	28.2	31.5	29	27.5	31	31.7	33.5	29.7	34.8	31.6	31.5	28.7
N147														
N148														

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
N149	48.7	44.2	33.1	-	55.2	28.8	29.4	28.2	34.9	32.8	21	36.2	35.7	32.5
N150														
N151	42.2	44	40	42.9	36.5	42.5	39.7	40.7	44.3	42	38.2	40	41.1	37.4
N152	52	66	48.7	51.3	44.7	47	55.3	46.7	55.9	60.4	58.7	60.6	53.9	49.1
N153	30.5	36.3	39	36.1	28.3	30	32.3	38.3	32.6	40.4	25.4	41.6	34.2	31.2
N154	39.3	44.7	36.6	39.4	37.6	38.5	32.8	34.6	37.7	32.8	29.2	30.6	36.2	32.9
N155	33.8	34	26	27.7	20.6	26.6	-	27	39.6	31.5	25.7	-	29.3	26.6
N156														
N157	33.5	35.1	30.8	31.1	28.9	28.6	28.1	30.2	30.4	37.3	27.9	25	30.6	27.8
N158	41	47	42.5	41.1	-	40.7	39.2	37.8	39.6	41.7	36.7	35.2	40.2	36.6
N159	30.8	36	31.35	33.5	19.8	30.2	27	27	24.4	32.3	25.4	23.7	28.5	25.9
N160	42.8	42.3	-	35.5	-	28.3	29.3	31.4	35.3	44.1	-	33.1	35.8	32.6
N161	36.8	43.7	34.7	38.6	33.3	29.7	39.6	32	39	40.7	30.7	29.7	35.7	32.5
N162	-	54.9	42.8	39.5	33.4	39	41	43.4	44.6	43	31.8	42.6	41.5	37.7
N163	34.1	33.8	27	31.5	-	27.7	27.5	-	-	31.2	29.2	32.7	30.5	27.8
N164	35	42	34.1	34.4	-	30.8	30.1	-	39.6	38	-	-	35.5	32.3
N165	38.9	42.6	37.2	-	30.8	33.6	30.3	36.7	37.1	39.2	27.6	36.9	35.5	32.3

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
N166	47.7	46	45.9	37.1	31	49	36.2	38.3	44.9	46.5	-	38	41.9	38.1
N167	37.2	40.4	46.3	-	28.9	30	31.9	40	42.3	48.7	30.5	29.1	36.8	33.5
N168	37.1	53.7	40.35	46.1	32.7	43	34.3	42.4	44.6	44.3	33.5	28.6	40.1	36.4
N169	43	53	42.3	47.9	40.7	43.7	47.6	46.4	41.2	41.7	39.7	48.5	44.6	40.6
N170	-	47.3	44.9	46.7	43	41.3	36.6	-	52.8	43.1	36.3	33.8	42.6	38.7
N171	23.2	26.2	19.1	19.3	14.6	14	14	16.8	19.1	21.5	19.6	19	18.9	17.2
N172	-	52.8	39.12	53.7	39.8	41	49	50.2	46.6	45.4	46.9	53.8	47.1	42.9
N173	-	-	-	-	-	28.5	25.8	30.2	35.3	33.2	24	29.5	29.5	26.8
N174	-	-	-	-	-	43.3	40.8	46.5	42	40	38.3	32.9	40.5	36.9
N175	-	-	-	-	-	-	45.5	47.2	39	40.1	43.8	44.5	43.4	39.4
N176	-	-	-	-	-	-	38.6	46.7	43.1	45	37.5	-	42.2	38.4
N177	-	-	-	-	-	-	36.7	43.7	40.6	47.8	36.7	38.8	40.7	37.1
N178	-	-	-	-	-	-	-	-	30.5	36.3	25.5	30.5	30.7	27.9

(1) See Appendix C for details on bias adjustment

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

Significant Planning Applications

Several air quality assessments have been undertaken during 2015 by air quality consultants on behalf of developers for the planning applications listed below:

- Test Lane, B2 industrial and B8 warehousing and distribution, 21,400m2
- Royal Pier, reclamation of 5.85 ha of land for the extension of Mayflower Park and its use by the annual boat show, and the creation of a development platform. 730 new homes, 47,000m2 offices, 250 bed hotel, new marine basin, casino, conference accommodation. Underground car park, combined heat and power plant. The residential part of the development is estimated to be completed in 2023.

Larger residential developments approved

- 536 Portswood Road 199 unit student accommodation block
- 224 Portswood Road 252 student flats
- 106-113 St.Marys Street 74 residential flats above shops, 4 additional storeys added.
- 18-22 Cumberland Place 11 and 12 storey building with retail at ground floor and 507 bed residential student accommodation above.

Industrial Sources

During 2015 there have been no significant changes to pollutant sources.
A Sulphur Pastillation Plant is being built in the western docks of Southampton for converting liquid sulphur waste from Fawley Oil Refinery into solid pellets by cooling. This plant does not require a permit, as there are virtually no emissions from the process. There is a minor risk of odour nuisance from the process in the event of a breakdown. However the operator will stop the process immediately if the odour control measures fail.

Additional Monitoring to assess potential AQMAs.

Diffusion tube monitoring has continued on Portswood Road, Romsey Road and began on Shirley High Street to assess whether the existing AQMAs need to be

extended to incorporate the residential receptors on these roads. It is likely they will be extended and form part of the proposed mandatory Clean Air Zone.

Changes to Monitoring Regime

In December 2015 a new AURN station was installed on Redbridge Road, monitoring PM_{10} and NO_2 . It commenced monitoring in January 2016. Additional diffusion tubes were installed in June 2015 residential receptors at 19A Burgess Road and 166 Bitterne Road West. This new monitoring will assist the Council to assess NO_2 pollution along these busy roads.

QA/QC of Automatic Monitoring

SCC undertakes manual calibrations and LSO duties at the continuous monitoring stations at Brintons Road AURN, Onslow Road and Victoria Road. SCC are the designated Local Site Operator (LSO) for the AURN. The Millbrook Road monitoring station which closed at the end of 2014 was owned by Marchwood Power Station. The LSO duties at the Millbrook Station were undertaken by Enviro Technology (ET).
Data ratification is undertaken by Kings College London (KCL) for Onslow Road, Victoria Road. KCL download data twice a day and notify SCC by email of any issues that may require a call out to check the equipment. ESU1 service and maintain the SCC owned stations. The Brinton's road AURN is ratified by Ricardo.
Calibrations are undertaken on a fortnightly basis for Onslow Road and Victoria Road. Victoria road has overnight permeation tube internal calibrations every 3 days. The filters are changed every fortnight as well.
The AURN Station has a scheduled calibration and filter change every 4 weeks.
Annual audits are undertaken by the National Physical Laboratory (NPL). This process ensures quality assurance at the stations.

QA/QC of Diffusion Tube Monitoring

The determination of NO_2 diffusion tube precision is obtained from the triplicate site on the sample inlet roof of the Brintons Road AURN Station. Tube precision was deemed good and the bias was -3.5% giving a bias adjustment factor of 1.04.

The automatic monitor recorded 29 ug/m^3 whereas the triplicate tubes recorded 28 ug/m^3 . The automatic station is classified as an urban centre location, not roadside.Southampton use Gradko International Ltd for the supply and analysis of

diffusion tubes. They are a UKAS accredited laboratory and has been rated 'good' through the Workplace Analysis Scheme for Proficiency (WASP) as determined by the health and safety laboratory. Gradko International Ltd. also follows procedures set out in the Technical Guidance LAQM.TG16 (Defra, 2016).

Diffusion Tube Bias Adjustment Factors

The nitrogen dioxide diffusion tubes were supplied and analysed by Gradko International Ltd. The preparation method used for the diffusion tubes was 20% TEA (triethanolamine) in water.

The national bias adjustment factor for Gradko using the preparation method of 20% TEA in water (2015) was 0.91. This was obtained from the Local Air Quality Management website (Defra, 2016) from database version 03/16. This factor included the co-location study in Southampton. One of 29 studies for gradko 20% TEA in water.

Factor from Local Co-location Study

The automatic Brintons Road AURN monitor recorded 29 ug/m^3,whereas the triplicate tubes recorded 28 ug/m^3 as an annual mean. The automatic station is classified as an urban centre location, not roadside. This gave a bias correction factor of 1.04.

Table C.1 below shows the Brintons Road AURN bias correction calculation spreadsheet

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean
1	06/01/2015	2.2.15	30.40	36.40	33.70	33.5	3.00	8.97	7.46
2	02/02/2015	04/03/2015	36.5	32.9	37.9	35.8	2.58	7.21	6.41
3	04/03/2015	01/04/2015	27.1	30.55	25.7	27.8	2.50	8.98	6.20
4	01/04/2015	05/05/2015	32.5	28.4	29.2	30.0	2.17	7.24	5.40
5	05/05/2015	03/06/2015	21.10	22.80	25.30	23.1	2.11	9.16	5.25
6	03/06/2015	02/07/2015	23.20	24.80	23.80	23.9	0.81	3.38	2.01
7	02/07/2015	03/08/2015	25.20	26.10	24.70	25.3	0.71	2.80	1.76
8	03/08/2015	03/09/2015	24.40	25.20	25.10	24.9	0.44	1.75	1.08
9	03/09/2015	05/10/2015	29.20	28.70	30.30	29.4	0.82	2.78	2.03
10	05/10/2015	04/11/2015	31.10	30.50	32.30	31.3	0.92	2.93	2.28
11	04/11/2015	01/12/2015	27.30	28.20	28.30	27.9	0.55	1.97	1.37
12	01/12/2015	06/01/2016	26.90	27.50	27.60	27.3	0.38	1.39	0.94
13									

Data Quality Check
Diffusion Tubes Precision Check
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa, for AEA

Version 04 - February 2011

Site Name/ ID:

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 5 Automatic DC: 96%
Bias factor A: 1.04 (0.98 - 1.1)
Bias B: -4% (-9% - 2%)
Information about tubes to be adjusted
Diffusion Tube average: 28 µgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 29 +/- 2 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 5 Automatic DC: 96%
Bias factor A: 1.04 (0.98 - 1.1)
Bias B: -4% (-9% - 2%)
Information about tubes to be adjusted
Diffusion Tube average: 28 µgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 29 +/- 2 µgm^{-3}

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	06/01/2015	02/02/2015	30.40	36.40	33.70	34	3.0	9	7.5
2	02/02/2015	04/03/2015	36.5	32.9	37.9	36	2.6	7	6.4
3	04/03/2015	01/04/2015	27.1	30.55	25.7	28	2.5	9	6.2
4	01/04/2015	05/05/2015	32.5	28.4	29.2	30	2.2	7	5.4
5	05/05/2015	03/06/2015	21.10	22.80	25.30	23	2.1	9	5.2
6	03/06/2015	02/07/2015	23.20	24.80	23.80	24	0.8	3	2.0
7	02/07/2015	03/08/2015	25.20	26.10	24.70	25	0.7	3	1.8
8	03/08/2015	03/09/2015	24.40	25.20	25.10	25	0.4	2	1.1
9	03/09/2015	05/10/2015	29.20	28.70	30.30	29	0.8	3	2.0
10	05/10/2015	04/11/2015	31.10	30.50	32.30	31	0.9	3	2.3
11	04/11/2015	01/12/2015	27.30	28.20	28.30	28	0.6	2	1.4
12	01/12/2015	06/01/2016	26.90	27.50	27.60	27	0.4	1	0.9
13									

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
36.4	95	Good	Good
35.7	95	Good	Good
29.1	87	Good	Good
30.8	96	Good	Good
24.9	96	Good	Good
23.4	96	Good	Good
26.3	100	Good	Good
24.3	91	Good	Good
28.6	100	Good	Good
32.6	100	Good	Good
36.1	98	Good	Good
24.5	99	Good	Good
Overall survey -->		Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

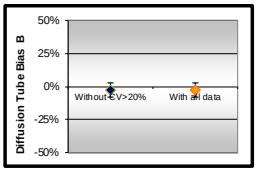
Site Name/ ID:

Precision 12 out of 12 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 1.04 (0.98 - 1.1)
Bias B -4% (-9% - 2%)
Diffusion Tubes Mean: 28 µgm^{-3}
Mean CV (**Precision**): **5**
Automatic Mean: 29 µgm^{-3}
Data Capture for periods used: **96%**
Adjusted Tubes Mean: 29 (28 - 31) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 1.04 (0.98 - 1.1)
Bias B -4% (-9% - 2%)
Diffusion Tubes Mean: 28 µgm^{-3}
Mean CV (**Precision**): **5**
Automatic Mean: 29 µgm^{-3}
Data Capture for periods used: **96%**
Adjusted Tubes Mean: 29 (28 - 31) µgm^{-3}



Jaume Targa, for AEA

Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

Discussion of Choice of Factor to Use

It was decided to use the national factor of 0.91 to ensure consistency with previous review and assessments that have used the national factor. The local factor is more conservative, but the national factor, based on 29 studies, including Southampton, has more robust data. The local co-location study is at an urban centre location, whereas most of Southampton's NO_x tubes are located at roadside locations with residential exposure. The vast majority of co-location studies incorporated into the national factor are from roadside locations. It could be argued that roadside co-location studies will be more representative of the likely NOx tube bias, compared with an urban centre study that is further away from the roadside. If the local factor was used in the bias adjustment of the raw data, it would increase the measured nitrogen dioxide annual means at the NOx tube locations.

Southampton is confident that the correct methods have been followed using the NO_x tube data. The choice of correction factor is very important to the conclusions reached.

Short-term to Long-term data adjustment (annualised data)

During 2015, 7 diffusion tubes reported data over the calendar year of less than 75% data capture. Therefore in accordance with Technical Guidance LAQM.TG16 (Defra, 2016) Box 7.10, the data collated from these sites was annualised, as detailed below. Some of the tubes were newly established sites that started monitoring halfway through the calendar year.The long term automatic stations utilised in the calculations were Southampton AURN and Victoria Road.

Estimation of annual mean concentration from short – term monitoring June 2015 – December 2105 19A Burgess Road N173

Automatic station	Annual Mean 2015 (Am)	Period Mean (Pm)	Ratio (Am/Pm)
AURN Southampton (3 miles from site)	29	31.7	0.91
Victoria Road (7 miles from site)	42	37.1	1.13
		Average Ratio	**1.02**

26.8 *1.02 = 27.3 $\mu g/m^3$ equivalent 2015 annual mean.

Estimation of annual mean concentration from short – term monitoring June 2015 – December 2105 166A Bitterne Road West Road N174

Automatic station	Annual Mean 2015 (Am)	Period Mean (Pm)	Ratio (Am/Pm)
AURN Southampton (2 miles from site)	29	31.7	0.91
Victoria Road (5 miles from site)	42	37.1	1.13
		Average Ratio	**1.02**

36.9 *1.02 = 37.6 μg/m^3 equivalent 2015 annual mean.

Estimation of annual mean concentration from short – term monitoring July 2015 – December 2105 38 Shirley High Street N175

Automatic station	Annual Mean 2015 (Am)	Period Mean (Pm)	Ratio (Am/Pm)
AURN Southampton (3 miles from site)	29	33.2	0.87
Victoria Road (6 miles from site)	42	37.7	1.11
		Average Ratio	**0.99**

39.4 *0.99 = 39.0 μg/m^3 equivalent 2015 annual mean.

Estimation of annual mean concentration from short – term monitoring July 2015 – December 2015 126 Shirley High Street (Salisbury Arms Pub) N176

Automatic station	Annual Mean 2015 (Am)	Period Mean (Pm)	Ratio (Am/Pm)
AURN Southampton (3 miles from site)	29	33.2	0.87
Victoria Road (6 miles from site)	42	37.7	1.11
		Average Ratio	**0.99**

38.4 *0.99 = 38.0 μg/m^3 equivalent 2015 annual mean.

Estimation of annual mean concentration from short – term monitoring July 2015 – December 2105 95 Shirley High Street (Windsor Castle Pub) N177

Automatic station	Annual Mean 2015 (Am)	Period Mean (Pm)	Ratio (Am/Pm)
AURN Southampton (3 miles from site)	29	33.2	0.87
Victoria Road (6 miles from site)	42	37.7	1.11
		Average Ratio	**0.99**

37.1 *0.99 = 36.7 μg/m^3 equivalent 2015 annual mean.

Estimation of annual mean concentration from short – term monitoring September 2015 – December 2105 2 Gover Road N178

Automatic station	Annual Mean 2015 (Am)	Period Mean (Pm)	Ratio (Am/Pm)
AURN Southampton (3 miles from site)	29	36.1	0.80
Victoria Road (6 miles from site)	42	39.3	1.06
		Average Ratio	**0.93**

27.9 *0.93 = 25.9 μg/m^3 equivalent 2015 annual mean.

Estimation of annual mean concentration from short – term monitoring January 2015 – May 2015 Bitterne AMS N137

Automatic station	Annual Mean 2015 (Am)	Period Mean (Pm)	Ratio (Am/Pm)
AURN Southampton (3 miles from site)	29	32.7	0.88
Victoria Road (6 miles from site)	42	49.4	0.85
		Average Ratio	**0.86**

29.6 *0.86 = 25.5 μg/m^3 equivalent 2015 annual mean.

Appendix D: Map(s) of Monitoring Locations

Figure D1: Map of Automatic Monitoring Sites (in blue) across the city

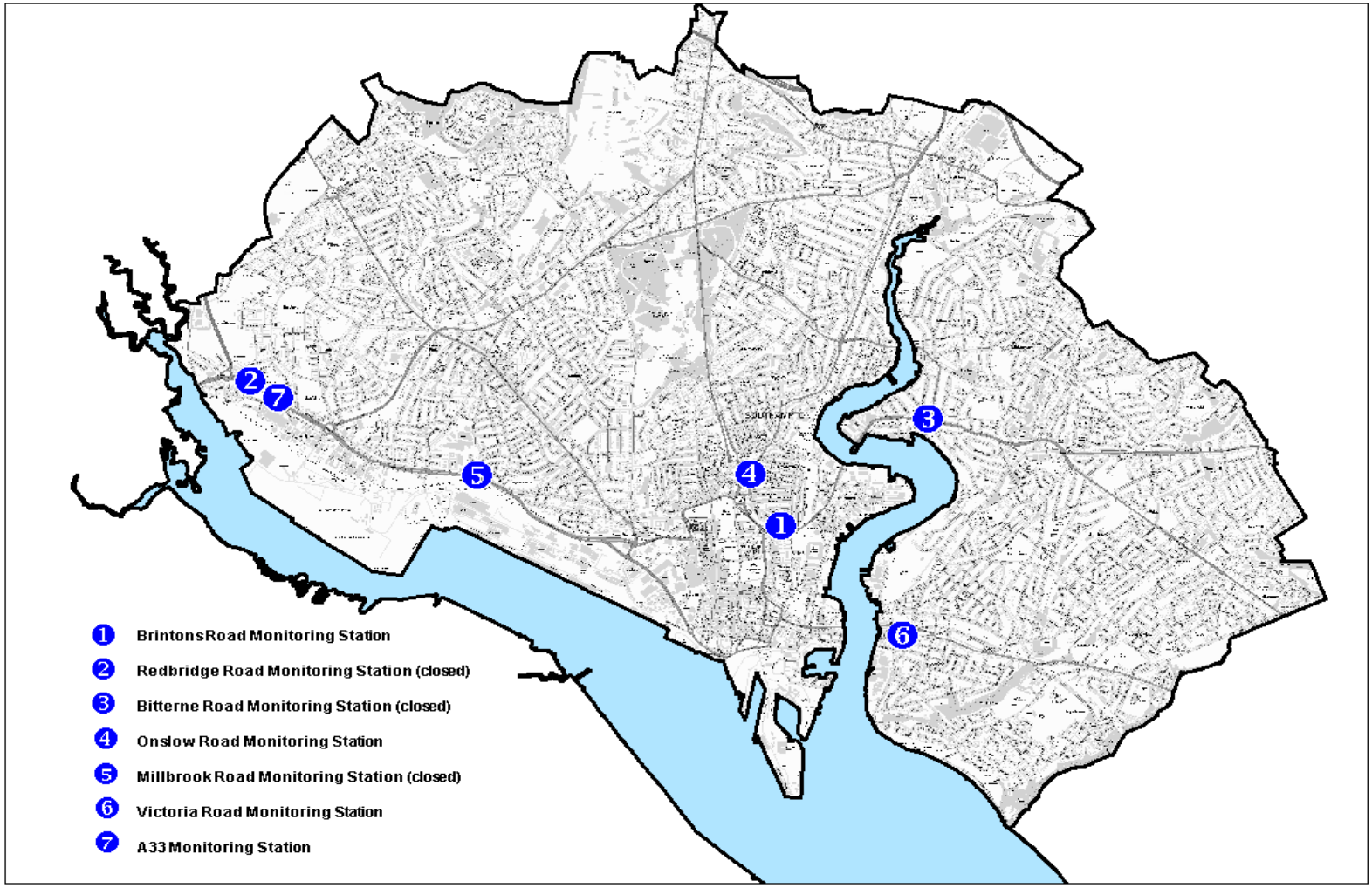


Figure D2: Map of diffusion tube locations on A33 Redbridge/Millbrook Road

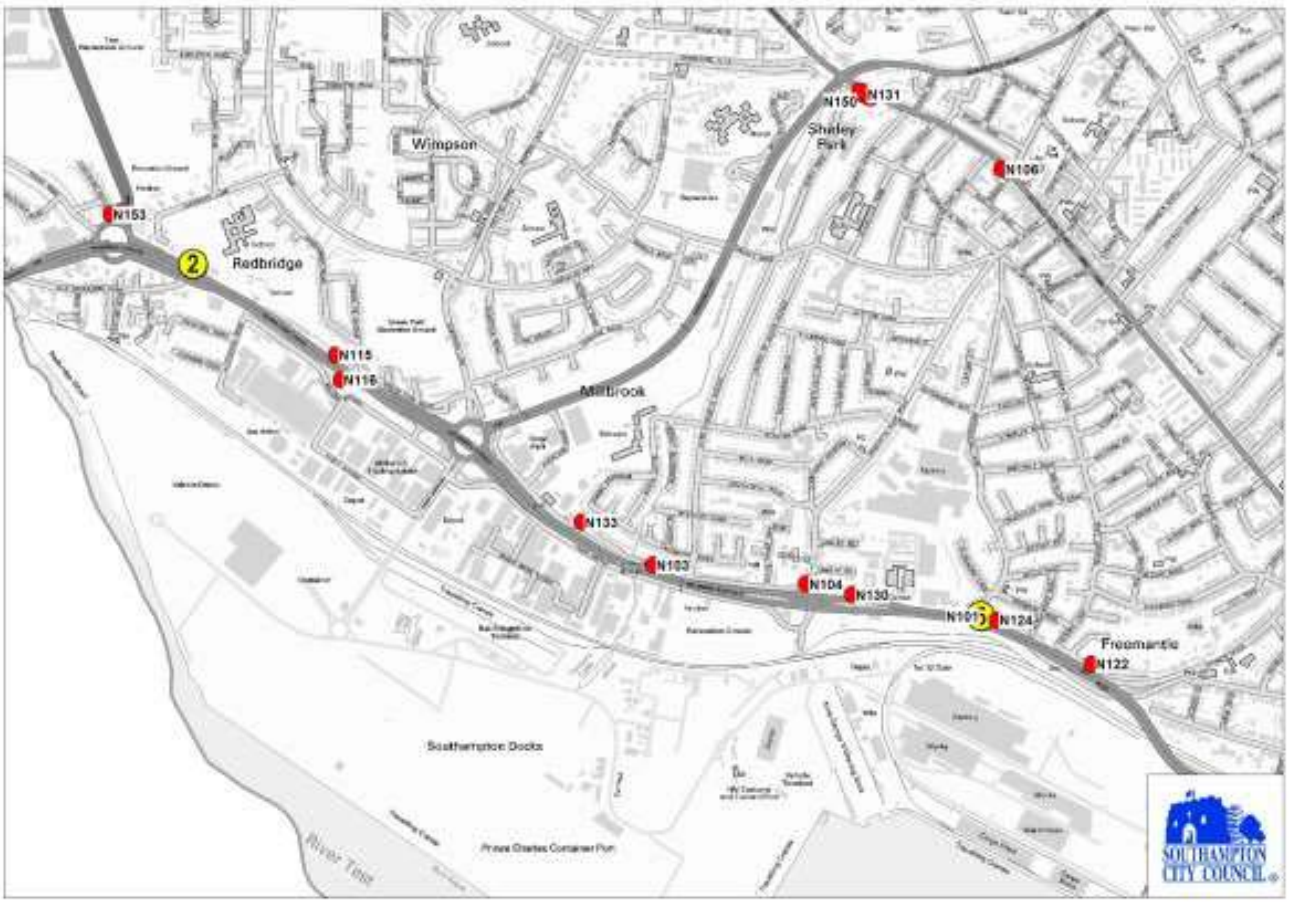


Figure D3: Map of diffusion tube locations on Burgess Road

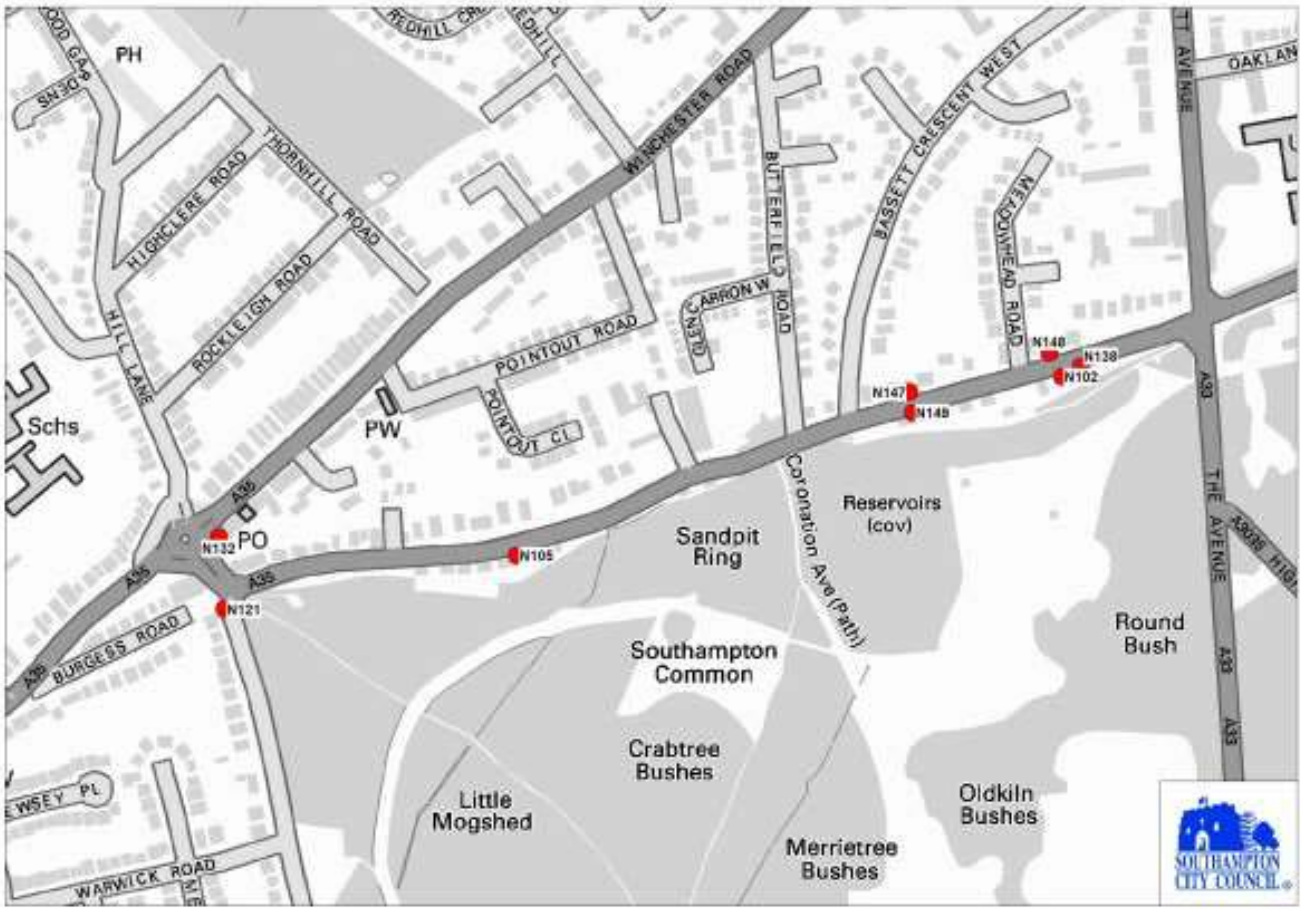


Figure D4: Map of diffusion tube locations in central Southampton, Bevois Valley and Northam

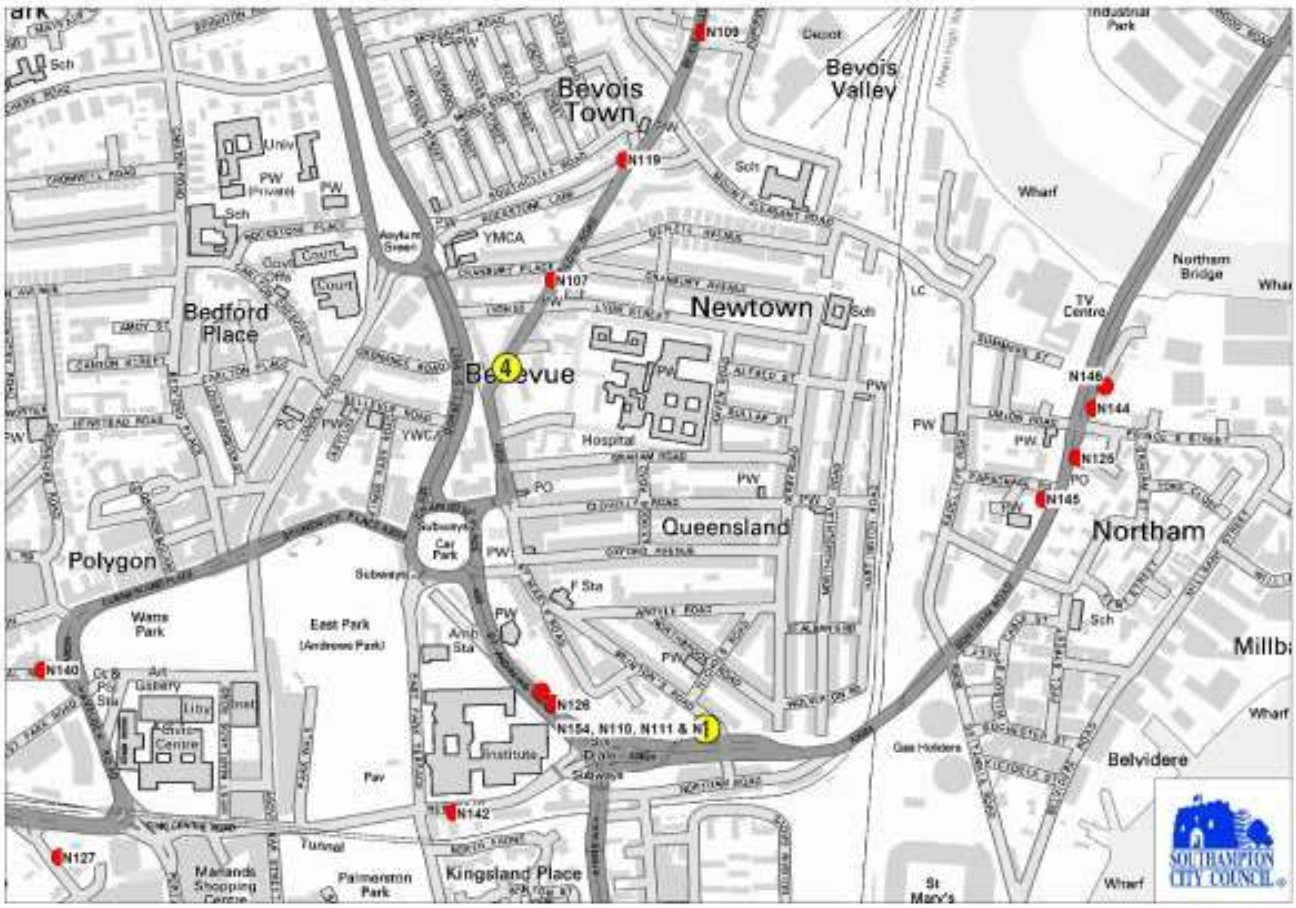


Table D1 Estimated Nitrogen Dioxide at receptor façade, scaled for distance calculation 2015 data

Most of Southampton City Council's diffusion tubes are located at residential facades, however the 5 sites listed in table 2.7 below, are located on posts closer to the kerb than the relevant receptor. The "NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html was used to calculate the estimated concentration at the receptor as detailed in box 3.2 of the Technical Guidance. All the predicted exceedences above 40 are already within existing AQMAs.

Site ID	Location	Tube	Distance between receptor and tube	Estimated mean at receptor
N140	5 Commercial Road	**49.6**	2m	**44.8**
N152	M271	**49.1**	14m	36.9
N107	Cranbury Place	**53.7**	0.5m	**51.9**
N118	3 Rockstone Place	34.8	2.5m	32.3
N117	Victoria Road	36.4	0.3m	35.9

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[4] The units are in micrograms of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
CAZ	Clean Air Zone

References

Defra (2016(a)). *Part IV of the Environment Act 1995. Local Air Quality Management. Policy Guidance LAQM.PG(16).*

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http://www.southampton.gov.uk/roads-parking/transport-policy/default.aspx

Previous SCC review and assessment reports. Available from:

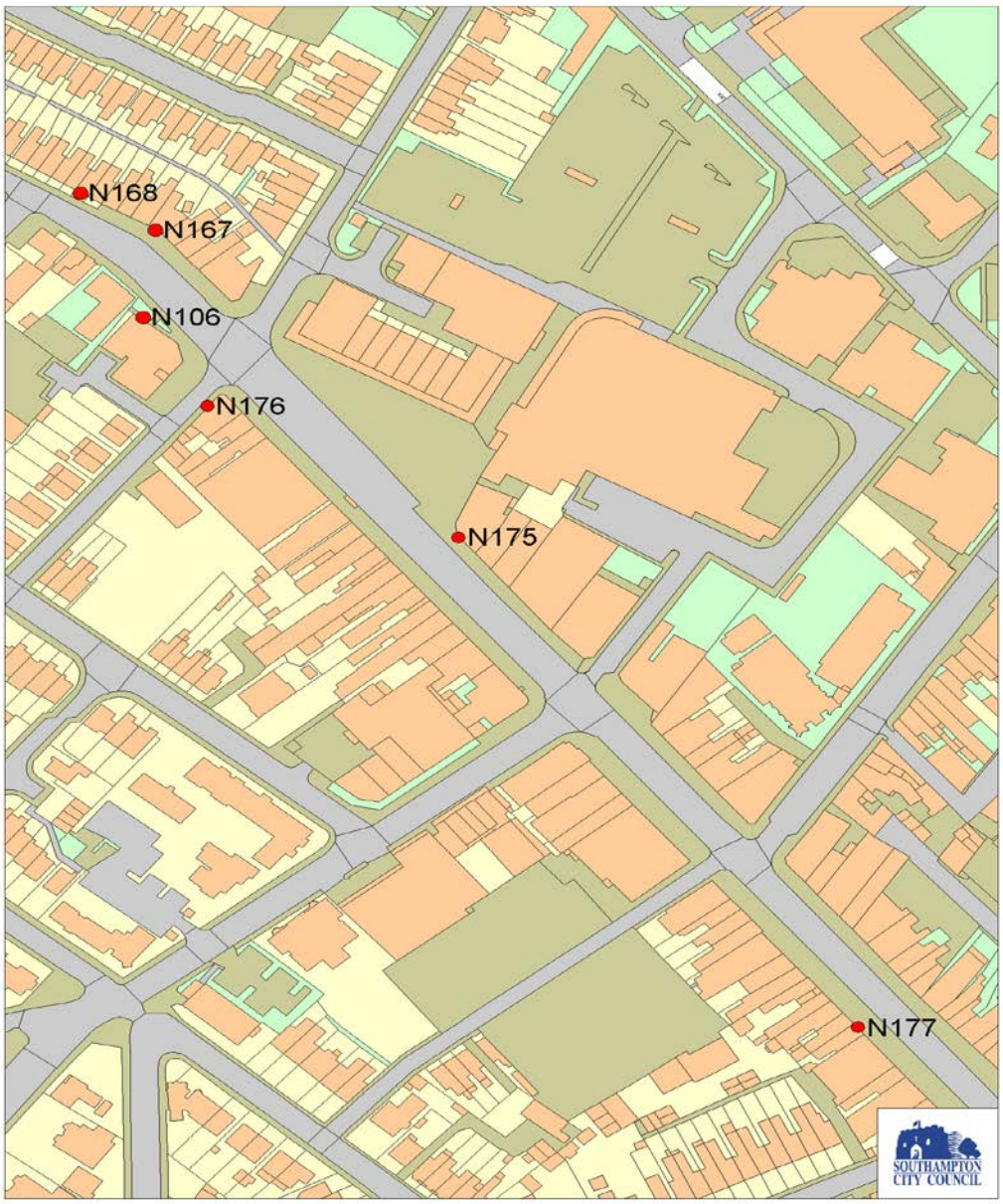
http://www.southampton.gov.uk/environmental-issues/pollution/air-quality/air-quality-reports.aspx

Detailed Assessment Shirley High Street

The 2015 Updating and Screening Assessment (USA) recommended a detailed assessment to be incorporated into the ASR in 2016 for Shirley High Street.

3 new nitrogen dioxide diffusion tubes were installed in July 2015 on the facades of residential receptors, including 2 pubs with accommodation at 1st floor level at a busy junction and a flat above a shop with slow moving traffic outside.

Figure 1 showing the 6 NOx tube locations, southern section of Romsey Road and Shirley High Street, outside of the existing Romsey Road AQMA



Monitoring Results

Table 1 Shirley High Street 2015 Nitrogen Dioxide Tube Survey July – December 6 months and southern section of Romsey Road, outside of the existing Romsey Road AQMA

Tube Number	Location	National Bias Adjusted annual mean	Data Capture	Annual Mean equivalent short term adjustment
N175	Windsor Castle Pub	37.1	50%	36.7
N176	Salisburys Arm Pub	38.4	50%	38.0
N177	38 Shirley high Street	39.4	50%	39.0
N106	2 Romsey Road	37.9	91%	-
N167	13 Romsey Road	33.5	91%	-
N168	23 Romsey Road	36.4	100%	-

The results in the table above show all 3 locations in Shirley High Street were below the nitrogen dioxide annual mean standard, although only just. With only 6 months of monitoring data, there is more uncertainty in the result.

Monitoring has continued in 2016 at all 3 locations, to hopefully achieve good data capture over the 2016 calendar year. Initial results up to October 2016 indicate the locations will be close to the annual mean objective, dependent upon the national 2016 bias adjustment factor.

Conclusion

A decision will be taken whether to declare Shirley High Street an AQMA in the 2017 ASR, when a full year results are available.

It is very likely Shirley High Street and Romsey Road will be part of the new Clean Air Zone with a euro 6 emission standard in 2019.

All 3 NOx tube receptor locations at the southern section of Romsey Road were below the nitrogen dioxide annual mean standard in 2015, negating the requirement to extend the existing Romsey Road AQMA to include these locations.

Portswood Road 2015 monitoring data update to detailed assessment

There is a high flow of buses along Portswood Road. 624 buses per day. 7am-7pm. 6 bus routes use Portswood Road. The 12 hour traffic count is about 8000 vehicles per day. There are residential flats above shops at first floor level on Portswood High Street. The traffic flow is congested, with traffic queues forming at the major traffic light controlled junctions. It is a busy shopping district with a new large Sainsburys Store.

Figure 1 showing the 5 NOx tube locations on Portswood Road

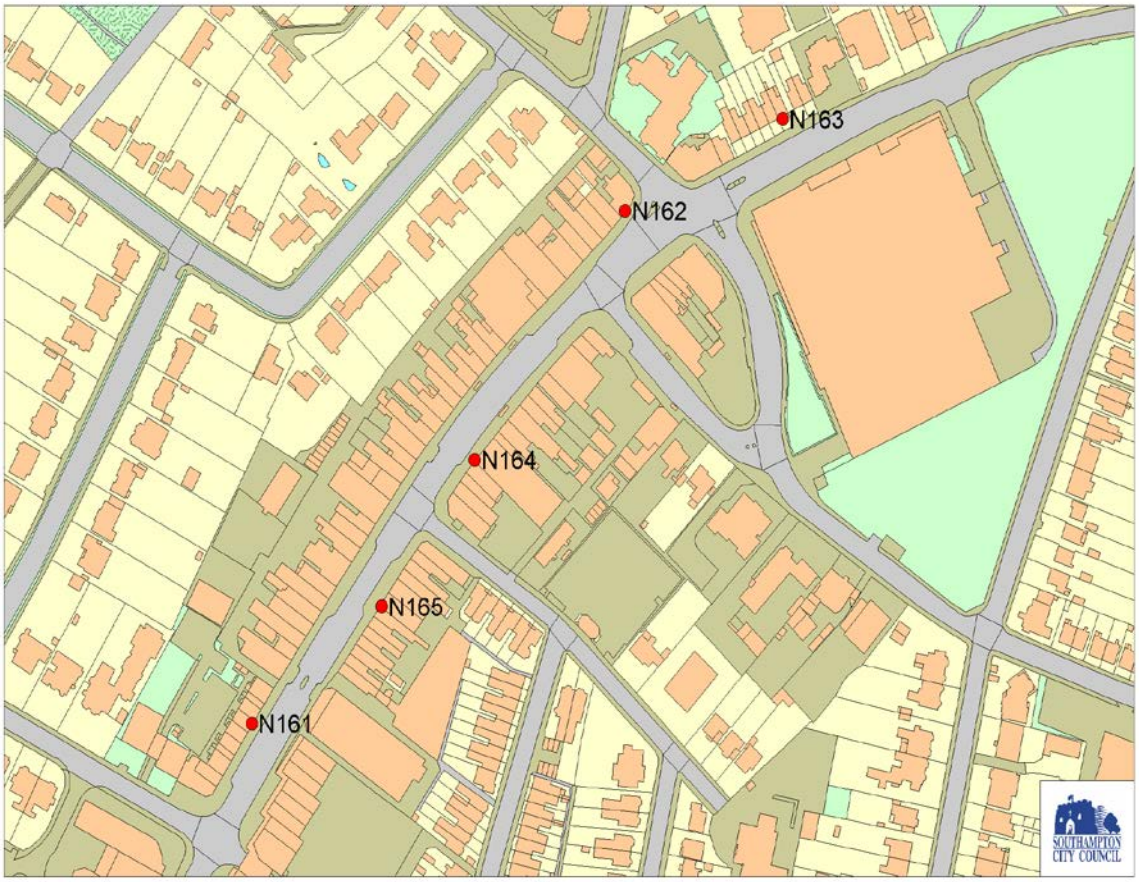


Table 1 2015 Nitrogen Dioxide Annual Average at residential facades outside of the Bevois Valley AQMA

Tube Nº	Location	Data Capture	National Bias Adjusted Annual Average (0.91)	Distance from kerb to tube on receptor facade
N162	263A Portswood Road	91%	37.7 ug/m^3	4m
N163	285 Portswood Road	83%	27.8ug/m^3	9m
N164	229 Portswood Road	66%	32.3 ug/m^3	4m
N165	8 The Broadway	91%	32.3 ug/m^3	4m
N161	30 Addis Square	92%	32.5 ug/m^3	4m

Discussion of Results

The annual mean results in the table above show all 5 locations on Portswood Road were below the nitrogen dioxide annual mean standard.

The conclusion in the 2014 combined Progress and Detailed Assessment Report was to extend the existing Onslow Road/Bevois Valley AQMA to include Portswood Road. 2014 annual mean data indicated a small exceedance of the nitrogen dioxide annual mean at some of the NOx tube locations.

However the 2015 monitoring data shows all 5 monitoring locations were compliant with the nitrogen dioxide annual mean standard. All the NOx tube locations were maintained in 2016. Ths 2016 data will be reviewed in the next ASR to ascertain if 2015 was not unusually low. A decision whether to extend the formal AQMA to include Portswood Road will be made in April 2017 when the 2016 data has been bias adjusted and analysed.

The Clean Air Zone (CAZ) with a euro 6 emission standard is very likely to include Portswood Road, as indicated in on the map (figure 4, page 3) . The CAZ will be the main mechanism to improve air quality in the city.