Sefton Council

2017 Air Quality Annual Status Report (ASR)

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

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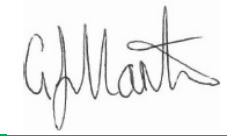
Prepared by	Greg Martin	Principal Environmental Health Officer		03.11.17
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Foreword by
Sefton Council Director of Public Health

Sefton Council strives to ensure the Borough is a place where improved health and wellbeing is experienced by all. Poor air quality has a negative impact on public health, with potentially serious consequences for individuals, families and communities.

The majority of Sefton's air quality is of a good standard, however a number of small locations have been identified where targeted actions are being implemented to improve air pollution.

Tackling air quality in these areas is often a complex issue requiring a partnership approach. In acknowledgement of this the Council has re-introduced a multi Departmental Strategic Air Quality Steering Group which directs and focuses the Council's work on reducing air pollution in the Borough.

As Director of Public Health for Sefton I endorse this Annual Status Report which sets out the current position in Sefton and which will support an ongoing work programme to address air quality issues.

Matthew Ashton
Director of Public Health Sefton Council

Executive Summary: Air Quality in Our Area

Air Quality in Sefton

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].

Sefton Council recognises the serious health impacts poor air quality can have on residents and has invested significant time, effort and financial resources to identify where the pollution hotspot areas are in the Borough. Through improving air quality, the short term and long term effects on people's health can be reduced and will have particular benefits to those who may find their conditions are made worse through exposure to air pollution, for example people with heart or lung conditions or breathing problems. Ways to improve air quality in Sefton have been developed through a number of actions and innovative measures and introduced through Air Quality Action plans (AQAPs).

The Council undertakes detailed monitoring using both sophisticated real time, air quality monitoring equipment and an extensive network of passive diffusion tube monitoring devices to determine the levels of certain harmful pollutants that the Council is required to monitor by Central Government. Through this monitoring, the Council has identified a number of small areas, all in the south of the Borough, where air quality has or is currently exceeding national standards.

The two pollutants for which air quality objectives have been exceeded in Sefton are nitrogen dioxide (NO_2) and fine particulate matter (PM_{10}). The areas where objectives have not been met are all located around busy road junctions or near busy roads and residents living closest to these junctions and roads are most affected.

[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

The locations where air quality has been identified as a current concern are shown below. The pollutant(s) that have shown exceedance are shown in brackets:

- Lathom Close, Princess Way, Seaforth (NO_2).
- Millers Bridge/ Derby Road junction, Bootle (PM_{10} & NO_2).
- South Road/Crosby Road North junction, Waterloo (NO_2).
- Hawthorne Road/ Church Road junction, Litherland (NO_2).

Areas of high pollution where air quality objectives have been exceeded (or likely to be exceeded) have been designated as Air Quality Management Areas (AQMAs) and maps have been produced showing the extent and boundaries of the AQMA, see Appendix D and also link:

https://uk-air.defra.gov.uk/aqma/list?la=S&country=all&pollutant=alllist

Sefton Council is not unique in having declared AQMAs. Currently over 700 AQMAs have been designated by UK local authorities, mostly for NO_2.

In Sefton, road traffic is the main source of NO_2 and PM_{10} , particularly emissions from heavy goods vehicles (HGVs) in some areas along port access routes. Emissions from industrial activities within the Port of Liverpool have also been identified as a source contributing to high PM_{10} levels on occasions.

Detailed AQAPs have been developed and are in place to address the areas where pollutant levels are high. The Action Plans contain a number of measures to improve air quality within the AQMAs.

Sefton Council air quality officers work closely with a number of internal and external partners to improve air quality in the Borough. These partners include, the Highways Department, Strategic Transport Planning Unit, Local Planning Authority and Public Health Team internally within Sefton Council. Air quality officers also work with external partners outside of the Council including the Environment Agency, Highways England, Public Health England, Merseytravel and Peel Ports (who operate the Port of Liverpool). Sefton Council air quality officers attend regular scheduled meetings with air quality officers from other local authorities within the Merseyside & Cheshire region, through the Merseyside and Cheshire Air Quality Management Group, to discuss air quality issues and how to improve air quality within the wider Liverpool

City Region and Cheshire. This group includes Liverpool City Region air quality officers from Sefton Council, Liverpool City Council, St Helens Council, Knowsley Council, Wirral Council, Halton Borough Council, and also officers from Cheshire East, and Cheshire West and Chester Council's.

The latest air quality monitoring in Sefton shows that, in general, NO_2 levels have increased slightly from those recorded in 2015, however it was considered 2015 was a particularly low pollution year in Sefton and over the last 5 years the overall trend shows NO_2 levels reducing. Compliance with PM_{10} air quality objectives was achieved at all monitoring sites is Sefton in 2016 with levels lower than 2015 at all locations. Exceedances of the NO_2 annual mean objective were recorded in 2016, however these were in areas already declared as AQMAs at Millers Bridge and Princess Way, where Action Plans are already in place. No new exceedances have been found and no further AQMA's are required. Members of the public can view current and past pollutant levels from all the monitoring locations on Sefton Council's breathing space air quality website at:

http://breathingspace.sefton.gov.uk/Default.aspx?bsPage=air_pollution

Actions to Improve Air Quality

Sefton Council has developed and implemented Action Plans for all of its AQMAs. The plans include two categories of Action Plan measures that are called **site specific measures** and **general measures**.

Site specific measures are targeted measures to address particular site specific air quality issues within an individual AQMA. These measures provide the greatest benefits in terms of air pollutant emissions reductions for an identified source of pollution at each particular AQMA.

General measures are measures that will benefit **all** AQMAs. Individually they may not have the same extent of emissions reduction as site specific measures, but collectively they will bring significant benefits to all AQMAs.

The AQAPs for Sefton can be viewed at:

http://breathingspace.sefton.gov.uk/AssessRepDocs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

Examples of site specific measures that have been included in the Action Plans include:

- A package of measures contained within the A565 Route Management Strategy and Action Plan, which includes junction improvements to the South Road/Crosby Road North/ Haigh Road, Waterloo junction.
- Increased road sweeping and pavement cleaning to reduce the impact of re-suspended dust on PM_{10} levels.
- Hurry Call traffic management system to allow HGVs through the Millers Bridge/ Derby Road traffic lights without having to stop/start on the incline at Millers Bridge, thus reducing pollution from this vehicle type.
- Effective regulatory control and monitoring of industrial sites within the Port of Liverpool to minimise their impact on PM_{10} levels.
- A study on HGVs using the A5036, to gain information on destination, age of vehicle & Euro emission standard.
- HGV booking system to improve movement of HGVs within the Port of Liverpool.
- ECO Stars fleet recognition scheme to improve emissions from HGV fleet operators using roads in Sefton and Sefton Council's own fleet of vehicles.
- Port expansion mitigation measures. These include a Defra funded study looking at an alternative fuels strategy (AFS) for HGVs and buses in Sefton and the Liverpool City Region, rather than using diesel as a fuel. An HGV parking demand study.

Many of the site specific measures have been successful in reducing pollutant levels within the AQMAs. More recently a Defra funded Sefton ECO Stars Fleet Recognition Scheme has been successful in recruiting 50 operators to the scheme. This free scheme provides a review of an operator's fleet and their operations to award an initial star rating. Advice to operators is given on how to make further improvements to both save fuel & money and on how to improve operator environmental performance to increase their star rating and thus reduce emissions of vehicles travelling through Sefton and improve air quality. **Funding has been secured to continue the ECOSTARS scheme for a further 2 years**.

Junction improvement works have been completed to improve the South Road/Crosby Road North/ Haigh Road junction in Waterloo. Monitoring is currently taking place to assess the effectiveness of these measures in reducing congestion and air pollution.

Sefton Council encourages and promotes the use of low emission vehicles and is currently leading by example by using them within the Council. Sefton Council has also now introduced two Nissan Leaf electric pool cars based at Bootle Town Hall for use by Sefton Council employees when out on Council business throughout the Borough and an electric vehicle pool car for use by Cleansing Services.

Seftons AQ officers using Nissan Leaf to undertake AQ duties.

Sefton Council also use five Nissan NVe200 electric vans (two postal vans, two Leisure Services vans and one Coastal Management van) for delivering Council services. Cleansing Services also now use seven small electric tipping trucks (under 3.5t) for picking up street cleansing. The tipper trucks average around 10,500 miles per annum each and the vans have an average mileage of 12,500 per annum each. The pool car mileage has still to be assessed. However, the total mileage using Council electric vehicles that would otherwise have been driven using Council trucks/vans or private cars running on diesel or petrol is in excess of 150,000 miles per annum, thus reducing air pollution in the Borough.

Strategic AQ Steering Group

Sefton has recently re introduced a Strategic AQ steering group which acts as the main strategic forum for Air Quality Matters in the Borough, its purpose is summarised below:

- To develop a Sefton One Council approach to air quality that includes an air quality strategy/position statement and overarching action plan.
- To act as the main forum for strategic discussions about air quality, including receiving and responding to consultations, approaches to work jointly with other organisations, and ideas for local action.
- To contribute to and develop the Local Air Quality Management Policy including ongoing oversight of:
    - The content of the Annual Status Report
    - Declaration, action plans and revocations of Air Quality Management Areas
- To commission pieces of work in line with the action plan, as appropriate.
- To assign responsibility for operational issues and delivery of elements of the action plan, with the formation of task and finish groups as appropriate.
- To develop an appropriate communications strategy that will engage with the public and communicate accurate and effective messages in relation to local air quality.

Clean Air Zone Feasibility Study

Through the steering group Sefton has recognised that there are still challenges ahead with regard to reducing levels of NO_2 in some of Seftons AQMAs particularly those impacted by traffic entering and leaving the Port of Liverpool. Sefton is in the process of commissioning environmental consultants to undertake a Clean Air Zone (CAZ) feasibility study to assess the feasibility of implementing CAZs in Sefton to reduce traffic related emissions. The study is likely to take up to 12 months to complete with findings released in late 2018. The results from this will be used to develop further action plans.

$PM_{2.5}$ Monitoring

Although Sefton Council monitors PM_{10} at a number of locations in the Borough, there is now clear evidence that even smaller particles with an aerodynamic diameter of 2.5µm or less, known as $PM_{2.5}$, have a significant impact on human health. A new dual PM_{10} / $PM_{2.5}$ monitor has been installed at the Millers Bridge monitoring site with data being used to provide accurate levels of $PM_{2.5}$ in the area to assist in providing data of the Councils new role in reducing levels of $PM_{2.5}$

New dual PM_{10} / $PM_{2.5}$ Monitor at Millers Bridge AQ Station

Schools Air Quality Project

Sefton is currently developing a Schools Air Quality action programme targeting 10 schools in close proximity to Sefton's AQMAs. The programme will encourage pupils to consider air quality and how their and families actions impact on air quality in their neighbourhood. The programme will also utilise diffusion tube monitoring as part of Sefton's community air watch diffusion tube scheme. Should the scheme be considered successful it will be expanded to further schools.

Conclusions and Priorities

The main on-going priority in Sefton for the coming years is to fully understand the effects that the predicted increase in HGVs due to port expansion will have on air quality and how this can be mitigated. This is undoubtedly the most significant challenge for the Council in terms of air quality impact in the Borough at the present time, due to the scale of the expansion and the potential for this to impact on air quality in existing AQMAs and also impact on public exposure receptor residential locations on port access routes.

The Port of Liverpool has undergone a £300 million expansion, known as L2, which included the building of a new deep water berth. This allows large post panamax container ships to berth there.

Although port expansion will bring significant economic benefits to the region, it is also predicted to lead to a significant increase in HGVs using the A5036, the main port access route, and to a lesser extent the A565, and will pass through three of Sefton's AQMAs, potentially leading to a worsening of air quality in areas that are already identified as having poor air quality and congestion, particularly on the A5036.

Work is being carried out by the Council and partner agency Highways England to better understand the potential effects of port expansion on air quality in Sefton and to produce measures to address any negative impacts on air quality and the road network resulting from port expansion. A site specific AQAP port expansion mitigation measure has been included for the AQMAs most affected.

The route improvement option currently being considered by Highways England is the offline option which entails Building a new road through the Rimrose Valley, linking to Brooms Cross Road (Thornton to Switch Island Link).

The next stages in the process are

- **Development phase**. Focus at this stage is on the design and environmental assessment of the selected option, taking it through all statutory processes to where the decision to build can be made. This includes preliminary design, community consultation, statutory procedures and powers, construction preparation and commitment to construct.
- **Construction phase**. This stage involves construction of the chosen option, commissioning, handover for operation and opening of the road to traffic.

Highways England has been producing newsletters to keep local Sefton residents updated on progress on this project. Further information on the A5036 road improvements and the latest published newsletters can be viewed at the following link:

http://www.highways.gov.uk/roads/road-projects/a5036-port-of-liverpool-access/

Local Engagement and How to get Involved

Sefton engages with local groups through officers undertaking presentations on Air Quality and Health. Officers also attend local Health and Wellbeing forums.

Sefton is currently developing a schools air quality project where it will engage with primary school children at 10 local schools in close proximity to Seftons AQMA's.

Local ward Councillors have attended a number of residents meetings regarding the issues surrounding the port expansion and the proposed road improvement scheme. AQ officers have briefed Councillors on the AQ issues related to these meetings.

Sefton maintains the public Breathing Space website where you can get more information on air quality in Sefton. On Breathing Space you can gain access to the latest results from all the electronic monitoring stations in the Borough, which are updated hourly, and also all historic air quality data that has been carried out using the following link: http://breathingspace.sefton.gov.uk/

The website also contains every Local Air Quality Management (LAQM) report that has been submitted to Defra. These include Air Quality Progress reports, Updating and Screening Assessment reports, Detailed and Further Assessment reports, Air Quality Action Plans and Action Plan Progress reports and will include all future Annual Status Reports. Various air quality Technical reports that have been completed are also included in this section of the website.

Further information on air quality is also available on Defra's air quality website:

https://uk-air.defra.gov.uk/

There are a number of things the public can do to help improve air quality in their area. These include:

- Reducing the use of your car and consider cycling, walking or using public transport more. 55% of car journeys are less than five miles. Many of these trips could be walked, or made by bike or public transport.

- Consider car sharing. When two or more people share a car and travel together, it allows people to benefit from the convenience of the car, sharing travel costs, whilst helping to reduce congestion and air pollution.

- When using your car consider taking an ‘eco-driving’ approach. This can not only save you money in reduced fuel costs but also reduce emissions of air pollutants and impact on climate change. This includes:
    - Regular maintenance and servicing of your vehicle according to the manufacturers schedule to maintain the engine’s efficiency.
    - Making sure your tyres are inflated to the manufacturer’s recommended pressures. Under-inflated tyres create more rolling resistance and so use more fuel.
    - Removing unused roof racks or roof boxes to reduce wind resistance and not overloading your vehicle or carrying unnecessary weight.
    - Reducing your use of air conditioning which increases fuel consumption at low speeds.
    - Avoiding unnecessary idling of your car engine.
    - Driving smoothly and avoiding sharp acceleration and harsh braking.
    - Shifting into a higher gear as soon as possible; Maintaining a steady speed, using the highest gear possible as soon as possible between 2000rpm and 2500rpm to keep your engine working most efficiently.
    - The faster you go, the greater the fuel consumption and pollution. For example, driving at 70mph uses up to 9% more fuel than at 60mph and up to 15% more than at 50mph.
- Consider purchasing a lower emissions, hybrid or electric vehicle.

Other things you can do:

- Don’t burn garden waste. This not only releases pollutants into the atmosphere, it can also cause a nuisance to your neighbours.
- Should I burn wood? Solid fuels such as wood, wood chips and pellets (sometimes referred to as biomass) are renewable fuels with lower carbon dioxide emissions than gas, coal or electricity; however they still have a

negative impact on air quality and public health. This is through the emissions of NO_2 and particulates even when burnt in an 'exempt appliance'. The increasing popularity of the installation of wood burning stoves / biomass boilers etc. may actually lead to a deterioration in Sefton's air quality, which is something you should think about if you are considering burning wood/ biomass.

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1 Local Air Quality Management

This report provides an overview of air quality in Sefton during 2016. 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 Sefton 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 compliance with the objectives.

A summary of AQMAs declared by Sefton can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=226.

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMAs.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
AQMA2 Princess Way	2009	NO2 Annual Mean	Seaforth	An area encompassing a number of residential properties from the Ewart Road flyover, Princess Way (A5036) up to and including the roundabout and flyover at the junction with Crosby Road South (A565).	Yes	45.8 µg/m^3	41.6 µg/m^3	Name: Draft Air Quality Action Plan for Sefton Council for Air Quality Management Areas 1-5.Link to Action Plan: http://breathingspace.sefton.gov.uk/AssessRepDocs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf
AQMA3 Millers Bridge	2009	NO2 Annual mean	Bootle	An area encompassing a number of residential properties around the junction of Millers Bridge (A5058) and Derby Road (A565)	Yes	60 µg/m^3	46 µg/m^3	Name: Draft Air Quality Action Plan for Sefton Council for Air Quality Management Areas 1-5.Link to Action Plan: http://breathingspace.sefton.gov.uk/AssessRepDocs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

AQMA3 Millers Bridge	2009	PM10 24 Hour Mean	Bootle	An area encompassing a number of residential properties around the junction of Millers Bridge (A5058) and Derby Road (A565)	YES	46 exceedances	5 exceedances	Name: Draft Air Quality Action Plan for Sefton Council for Air Quality Management Areas 1-5.Link to Action Plan: http://breathingspace.sefton.gov.uk/AssessRepDocs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf
AQMA4 South Road	2012	NO2 Annual Mean	Waterloo	An area encompassing the Liver Hotel and a number of residential properties around the junction of Crosby Road North (A565) and South Road.	No	48 µg/m^3	38 µg/m^3	Name: Draft Air Quality Action Plan for Sefton Council for Air Quality Management Areas 1-5.Link to Action Plan: http://breathingspace.sefton.gov.uk/AssessRepDocs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf
AQMA5 Hawthorne road	2012	NO2 Annual mean	Litherland	An area encompassing a number of residential properties around the junction of Hawthorne Road (B5058) and Church Road (A5036).	yes	42.6 µg/m^3	37.1 µg/m^3	Name: Draft Air Quality Action Plan for Sefton Council for Air Quality Management Areas 1-5.Link to Action Plan: http://breathingspace.sefton.gov.uk/AssessRepDocs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

☒ **Sefton MBC confirm the information on UK-Air regarding their AQMA(s) is up to date**

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

Defra's appraisal of last year's ASR concluded :

1. The report was well structured and provided most of the information specified in the Guidance.
2. The location of monitoring sites was reviewed and relocated where appropriate, and monitoring results have been distance corrected where necessary. The introduction of SO_2 monitoring during 2015 and the planned addition of $PM_{2.5}$ monitoring is commended.
3. The monitoring data for 2015 indicates that there are still some measured exceedances of the AQ objectives within the existing AQMAs but the authority has also identified two sites outside the AQMAs which are close to exceeding the NO_2 annual mean objective. The decision to keep these sites under review is supported.
4. One point for clarification relates to Table A2. The column titled 'Tube co-located with continuous analyser?' has been ticked as 'yes' for all diffusion tube sites. This suggests that all diffusion tubes are physically mounted close to an analyser inlet which, based on the monitoring site maps, is not the case. It is recommended that this point is clarified for future reports.
5. Monitoring data for 2015 indicates a continued downward trend in NO_2 and PM_{10} concentrations over the past 5 – 10 years. It is noted that AQMA1 is being revoked and AQMA4 is also likely to achieve compliance with the AQ objectives following completion of road junction improvements at the South Road/Crosby Road, North/Haigh Road junction. This indicates that the site–specific measures incorporated into the AQAP have been effective at targeting identified 'hot-spots'. This approach is supported.

6. The Port of Liverpool expansion has been well documented in the ASR and the ongoing assessment in terms of the potential impact on AQ is noted. The Council's strategic approach to dealing with the AQ implications associated with the expansion of the port and the continued partnership working with Highways England and the port operator is supported. The council have identified that ensuring full understanding of the impact of the port expansion is a key priority and the decision to reconvene the AQ steering group to review the effectiveness of the current draft AQAP in light of the expansion is supported. It would be useful if the council could confirm whether the current draft AQAP will be finalised once the re-evaluation of measures has been completed.

Following last years ASR Sefton has taken forward a number of direct measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in their respective Action Plans http://breathingspace.sefton.gov.uk/AssessRepDocs/Progress_Reports/AQAP_Progress_Report_2015.pdf

http://breathingspace.sefton.gov.uk/AssessRepDocs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

Sefton Council Draft Action Plan measures consist of 11 general measures that are applicable to all AQMA's and a number of site specific measures that are applicable to each individual AQMA. General measures GM1 - GM11 have all been implemented.

Key site specific measures that have been completed are as follows:

AQMA 2 Princess Way, Seaforth

- Port of Liverpool booking system introduced.

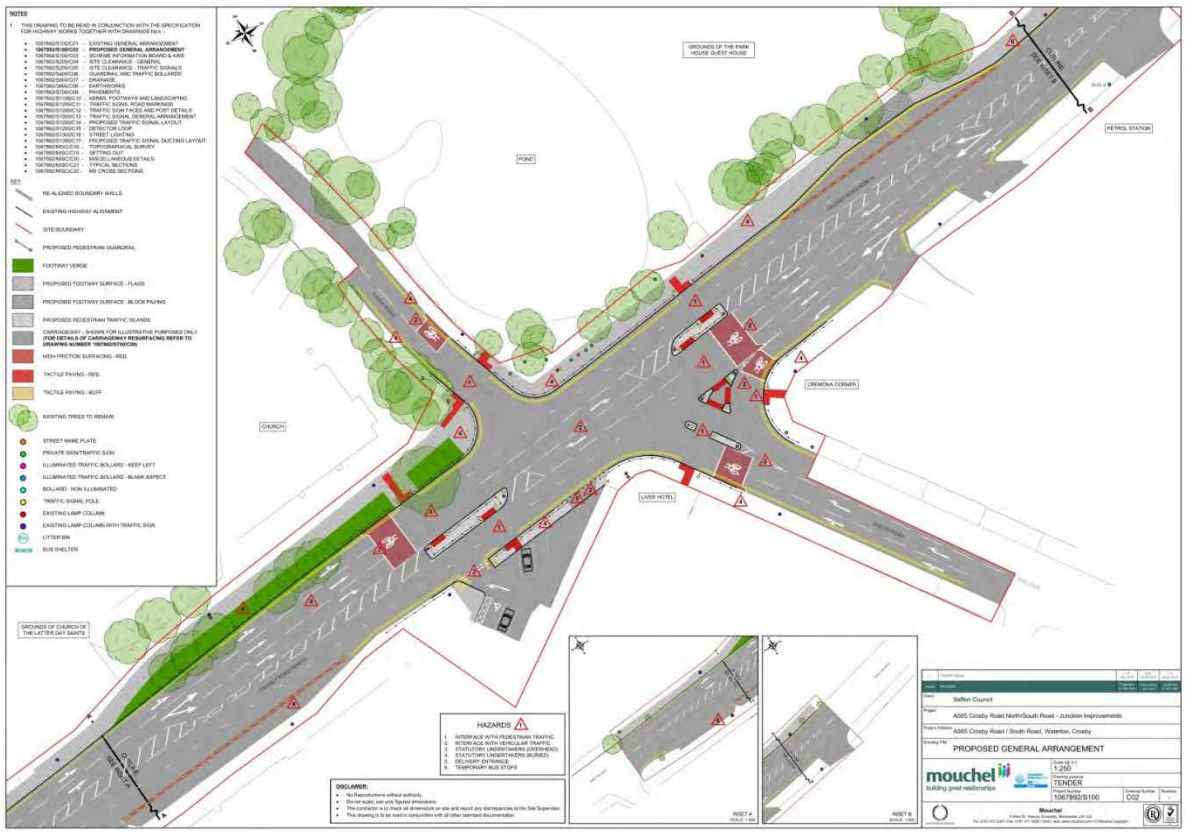
- Specialised goods vehicle count to gain information on HGVs travelling to and from the port of Liverpool on the A5036 & A565 completed. Information gained is being used to support further port expansion mitigation measures.
- Port expansion mitigation measures: (i) Highways England port access A5036 road options study - stage 1 completed. (ii) HGV parking demand study stage 2 report completed. (iii) Defra funded alternative fuels strategy (AFS) for HGVs & buses for the Liverpool City Region project completed.
- ECOSTARS fleet recognition scheme funding secured to continue for a further 2 years.
- Port expansion mitigation measures: (i) Highways England port access A5036 road options stage 1 study completed. Offline route option chosen. Further detailed assessment of this option now underway by Highways England and their consultant.

AQMA 3 Millers Bridge, Bootle

- Hurry Call traffic light management system to allow HGVs passage through traffic lights at Millers Bridge during non-peak hours without having to stop/start implemented.
- Improved dust control achieved at industrial installations operating within the Port of Liverpool through the environmental permitting regime, resulting in reduced fugitive dust emissions affecting Millers Bridge.
- Intensive regular pavement/ road washing/cleaning to reduce re-suspended dust implemented. However measure now discontinued due to funding. Measure was shown to be successful in reducing PM_{10} levels during the drier summer months.
- ECOSTARS fleet recognition scheme funding secured to continue for a further 2 years.

AQMA 4 South Road, Waterloo

- Work on the South Road/ Crosby Road North/Haigh Road junction improvements has been completed (Spring 2017). A map of the junction improvements is shown below



Monitoring is now taking place to assess the effectiveness on reducing congestion and the improvements in relation to traffic related emissions.

AQMA 5 Hawthorne Road, Litherland

- As AQMA 2

Further action/measures being taken to improve air quality in Sefton

1. A new strategic air quality steering group has been set up with attendees from Planning, Public health , Environmental Health, Highways , Economic Development all in regular attendance. The group considers air quality at a strategic level and focuses and directs the Council priorities in terms of Air quality.

2. Sefton is currently in the process of appointing an environmental consultant to undertake a Clean Air Zone feasibility study to determine whether the creation of a CAZ(s) in Sefton's AQMAs would bring about improvements in air quality

and control any future increases in emissions as a result of traffic increases due to the port expansion. It is envisaged that the report will be completed by summer 2018.

3. $PM_{2.5}$ monitoring at the existing Millers Bridge station has commenced, in light of the clear evidence of the health effects of $PM_{2.5}$ and to monitor this in the context of port expansion. This will also enable a locally derived $PM_{2.5}/PM_{10}$ ratio to be determined to use and apply to PM_{10} monitoring results in Sefton, rather than using the nationally derived ratio, and gain a more accurate assessment of $PM_{2.5}$ levels in the Borough.

4. A Liverpool City region wide CAZ feasibility study is underway which is looking at the feasibility of introducing CAZ across the Liverpool city region with Sefton actively participating in the study.

5. Sefton is currently developing a Schools Air Quality action programme targeting the schools in close proximity to Sefton's AQMAs. The programme will encourage pupils to consider air quality and how their actions impact on air quality. The programme will also utilise diffusion tube monitoring as part of Sefton's community air watch diffusion tube scheme.

Sefton anticipates that the measures stated above and in Table 2.2 will achieve compliance in AQMA 3 Millers Bridge declared for PM_{10} 24hour mean and AQMA4 Waterloo declared for NO_2 Annual Mean.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Sefton anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of AQMA2 Princess way (NO_2 Annual Mean), AQMA3 Millers Bridge (NO_2 Annual Mean) and AQMA5 Hawthorne Road (NO_2 Annual Mean).

Seftons Draft Action Plan for AQMAs 1-5 will be updated following the findings of the recently commissioned CAZ feasibility study.

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
AQMA 2 Princess Way SS1	Port booking system	Freight and Delivery Management	Delivery & Service plans	Peel Ports Liverpool	2009	2009-2015	Feedback on effectiveness of booking system via Port liaison meetings.	No target pollution reduction set - difficult to quantify.	Vehicle booking system introduced and completed in 2009. New L2 terminal operating system and autogate technology introduced in 2015.	Completed	Reduced HGV waiting times on the port will reduce pollutant emissions from the port estate affecting AQMA.
AQMA 2 Princess Way SS2	ANPR/ Specialised Goods Vehicle Count (SGVC) study	Traffic Management	Other	Sefton Council	2011	2012	Analysis of information and interpretation of data to further inform Action Plan.	Not applicable.	Specialised goods vehicle count (in preference to ANPR study) completed and report issued in 2012.	Measure completed and served its purpose, but now no longer applies. Replaced by new SS2 measure 'port expansion mitigation' measures.	Measure was used to gain information on HGVs travelling to and from the port on the A5036 and A565. Information used to support new port expansion mitigation and ECO Stars Measures.
AQMA 2 Princess Way SS2	Port expansion mitigation measure No 1 Highways England A5036 Road options study	Traffic Management	Strategic highway improvements	Highways England (and consultant Atkins)	2013	2013-2022	Compliance with the NO_2 air quality objectives. New road built to timescale.	No target pollution reduction set - difficult to quantify at this stage.	Stage 1 offline option chosen. Detailed assessment underway by HE consultants	Potentially not until 2022 when new road is built.	Awaiting detail assessments from consultant

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
AQMA 2 Princess Way SS2	Port expansion mitigation measure No 2 A5036 AQ dispersion Modelling study	Traffic Management	Other	Sefton Council	2013	2013-2018	Results of modelling to inform decision making process.	Not applicable	Baseline model incorporating all sources including port sources completed. Various model run scenarios being carried out.	End of 2018	This will establish how port expansion will affect AQMAs and relevant public exposure along the A5036 and inform decision making process.
AQMA 2 Princess Way SS2	Port expansion mitigation measure No 3 Alternative Fuels Strategy for HGVs & buses	Vehicle Fleet Efficiency	Other	Sefton Council	2014	2015-2016	Results of study to inform decision making process.	Not applicable	Defra AQ grant for HGV alternative fuels refuelling infrastructure & strategy awarded 2014. Consultant appointed in 2015. Report issued 2016.	Completed	Main recommendation to undertake further CAZ study being undertaken
AQMA 2 Princess Way SS2	Port expansion mitigation measure No 4 HGV parking demand study	Transport Planning and Infrastructure	Other	Sefton Council (and consultant Atkins)	2014	2015-2016	Robust assessment of HGV parking.	No target pollution reduction set - difficult to quantify at this stage.	Stage 2 report completed. Detailed phase 2 study on preferred HGV parking site option underway.	End of 2016	Council to take forward report recommendations.

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
AQMA 2 Princess Way SS3	ECO Stars fleet recognition scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Sefton Council/ Transport Research Laboratory (TRL)	2013	2013-2015	Compliance with target to recruit 25 operators in the 2 years of scheme operation.	No target pollution reduction set - difficult to quantify.	ECO Stars commenced 2013, funded by Defra AQ grant, to run initially for two years. Formal launch in 2014. 50 operators recruited.	Completed/on going	Mainly 4 & 5 star operators recruited. AQ benefits in context of port expansion low. Scheme now funded for a further 2 years with aim of recruiting a further 15 members.
AQMA 3 Millers Bridge SS1	Hurry Call system	Traffic Management	UTC, Congestion management, traffic reduction	Sefton Council	2010-2011	2011	Number of activations of Hurry Call system.	No target pollution reduction set - difficult to quantify.	Implemented July 2011. Number of activations of the system per hour reviewed and system continues to show that the system is working well.	Completed	Difficult to quantify emissions reduction, but number of activations outside of peak hours indicate successful in facilitating HGV passage through traffic lights and reducing NO_x and PM_{10} emissions.

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
AQMA 3 Millers Bridge SS2	Control of dust from Industry	Environmental Permits	Other	Sefton Council / Environment Agency (EA)	2010-2011	2011	Compliance results from Local Authority and Environment Agency site inspection visits to permitted industrial sites within the Port of Liverpool and the number of exceedances of the PM_{10} daily mean standard when predominantly north westerly winds.	No target pollution reduction set - difficult to quantify.	Meetings with EMR and EA. New EMR dust management plan produced 2010. Number of exceedances of PM_{10} 24-hour mean when wind direction from the direction of the port continues to remain low.	Completed	Compliance with PM10 AQOs achieved. Improved dust control at EMR & relocation of JMD Haulage has significantly contributed to reducing PM10 levels at Millers Bridge.
AQMA 3 Millers Bridge SS2	Pavement cleaning	other	other	Sefton Council	2010	April 2010 – March 2013	Comparison of ratio of PM_{10} levels at site within AQMA to background site	No target pollution reduction set - difficult to quantify.	Implemented in 2010 and operated until 2013.	Completed	Successful in reducing PM_{10} at this location during drier Summer months. Measure now discontinued due to lack of funding.
AQMA 4 South Road SS1	A565 Route Management Strategy RMS action plan	Traffic Management	Strategic highway improvements	Sefton Council	2009	2009-2016	Compliance with the NO_2 air quality objectives. RMS actions implemented to timescale	No target pollution reduction set - difficult to quantify	SouthRoad/ Crosby Road North/Haigh Road junction improvement elements of RMS to benefit AQMA 4 now completed	completed	NO_2 monitoring underway to assess improvements and compliance with NAQS objective.

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
AQMA 5 Hawthorne Road SS1	Port expansion mitigation measure No 1 Highways England A5036 Road options study	Traffic Management	Strategic highway improvements	Highways England	2013	2013-2022	Compliance with the NO_2 air quality Objectives... New road built to timescale.	No target pollution reduction set - difficult to quantify at this stage	Stage 1 offline option chosen. Detailed assessment underway by HE consultants	Potentially not until 2022 when new road built	Awaiting consultant report on options.
AQMA 5 Hawthorne Road SS1	Port expansion mitigation measure No 2 A5036 AQ dispersion Modelling study	Traffic Management	Other	Sefton Council	2013	2013-2018	Results of modelling to inform decision making process	Not applicable	Baseline model incorporating all sources including port sources completed. Various model run scenarios being carried out.	End of 2018	This will establish how port expansion will affect AQMAs and relevant public exposure along the A5036 and inform decision making process.
AQMA 5 Hawthorne Road SS1	Port expansion mitigation measure No 3 Alternative Fuels Strategy for HGVs & buses	Vehicle Fleet Efficiency	Other	Sefton Council	2014	2015-2016	Results of study to inform decision making process	Not applicable	Defra AQ grant for HGV alternative fuels refuelling infrastructure & strategy awarded 2014. Consultant appointed in 2015. Report issued2016.	Completed	. Main recommendation to undertake further CAZ study being undertaken

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
AQMA 5 Hawthorne Road SS1	Port expansion mitigation measure No 4 HGV parking demand study	Transport Planning and Infrastructure	Other	Sefton Council	2014	2015-2016	Robust assessment of HGV parking	No target pollution reduction set - difficult to quantify at this stage	Consultant appointed in 2015 to carryout .project Report issued March 2016.	Completed	Council to take forward report recommendations .
AQMA 5 Hawthorne Road SS2	ECO Stars fleet recognition scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Sefton Council/ Transport Research Laboratory (TRL)	2013	2013-2015	Compliance with target to recruit 25 operators in the 2 years of scheme operation	No target pollution reduction set - difficult to quantify	ECO Stars commenced 2013, funded by Defra AQ grant, to run initially for two years. Formal launch in 2014. 50 operators recruited.	Completed	Mainly 4 & 5 star operators recruited. AQ benefits in context of port expansion low. Scheme now funded for a further 2 years with aim of recruiting a further 15 members.
General Measure GM1	SCOOT	Traffic Management	UTC, Congestion management, traffic reduction	Sefton Council	2010	2010	Liaison with Sefton Council Highways Maintenance Manager on optimisation of the SCOOT system	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	SCOOT system is optimised and operating successfully.
General Measure GM2	Variable Message Signs (VMS)	Public Information	Via other mechanisms	Sefton Council	2010	2010-2013	Ensure system operating effectively	No target pollution reduction set - difficult to quantify	Implemented 2013	Completed	VMS system operational since July 2013 and linked to Sefton Council breathing space air quality website to display current levels.
General Measure GM3	Work travel plans	Promoting Travel Alternatives	Workplace Travel Planning	Sefton Council	2010	2010	Number of work place travel plans implemented	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	

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
General Measure GM4	School travel plans	Promoting Travel Alternatives	School Travel Plans	Sefton Council	2010	2010	Percentage of schools in Sefton with a travel plan	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
General Measure GM5	Cycling & walking	Promoting Travel Alternatives	Promotion of cycling and walking	Sefton Council	2010	2010	Increase in participation	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
General Measure GM6	Land use planning	Policy Guidance and Development	Air Quality Planning and Policy Guidance	Sefton Council	2010	2010	Percentage of planning permissions granted where the submitted air quality assessment shows no action was required or the air quality impact of a development was mitigated	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	100% of planning permissions either required no action or the air quality impact of the Development was mitigated.
General Measure GM7	Low emissions strategies	Policy Guidance and Development	Low emissions Strategy	Sefton Council	2010	2010	Number of LES measures implemented	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	Increasing number of EV charging points installed.
General Measure GM8	Tree planting	other	other	Sefton Council	2010	2010	Number of trees planted within AQMA. Compliance with the PM_{10} air quality Objectives	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
General Measure GM9	AQ awareness	Public Information	Via other mechanisms priorities	Sefton Council	2010	2010	Maintenance of Sefton Council air quality website. Number of AQ awareness events	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	

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
General Measure GM10	Freight Quality Partnership (FQP)	Freight and Delivery Management	Other	Merseytravel	2010	2010-ongoing	Number of meetings held. Number of AQ initiatives undertaken	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
General Measure GM11	Taxi Quality Partnership (TQP)	Promoting Low Emission Transport	Taxi emission incentives	Merseytravel	2011-2012	2013-ongoing	Number of operators participating	No target pollution reduction set - difficult to quantify	Implemented 2013 Potential bid to encourage the take up of ULEV taxis (Hackney carriages)	Completed	

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.

Sefton takes its role in reducing $PM_{2.5}$ seriously and has recently purchased and installed a FIDAS Dual $PM_{2.5}/PM_{10}$ monitor at the Millers Bridge monitoring site to allow accurate data to be gathered to assist in this role. Monitoring started in June 2017 and will be used in future ASR's.

Sefton Council has initially made use of the nationally derived $PM_{2.5}/PM_{10}$ ratio correction to estimate annual $PM_{2.5}$ concentrations in the parts of Borough where PM_{10} monitoring has taken place. Indicative $PM_{2.5}$ annual mean concentrations have been estimated from Sefton Council measured PM_{10} annual mean concentrations using the nationally derived ratio of 0.7 in line with Defra technical guidance LAQM. TG16 box 7.7 example B. This shows compliance with the $PM_{2.5}$ annual mean limit value of 25µg/m^3 at all sites in Sefton, see **Table 2.3**. The results in table 2.3 also show that the recent trend in $PM_{2.5}$ levels is downwards which indicates that measures in Sefton are mutually successful in reducing this pollutant.

Table 2.3 Estimation of PM $_{2.5}$

Site ID	Site Type	PM Metric	Annual Mean Concentration µg/m^3					
			2011	2012	2013	2014	2015	2016
CM1 Former St Joan of Arc School Bootle	Urban background	Measured PM_{10}	24.6 (22.2)	27.1 (23.6)	28.5 (26.1)	22.9 (21.0)	Monitor relocated	Monitor relocated
		Estimated $PM_{2.5}$	15.5	16.5	18.3	14.7	n/a	n/a
CM2 Crosby Road North Waterloo	Roadside	Measured PM_{10}	31.3	25.4	28.3	23.6	23.7	17.0
		Estimated $PM_{2.5}$	21.9	17.8	19.8	16.5	16.6	11.9
CM3 Millers Bridge Bootle	Roadside	Measured PM_{10}	29.8	26.1	28.1	28.8	28.7	25.4
		Estimated $PM_{2.5}$	20.9	18.3	19.7	20.2	20.1	17.8
CM4 Princess Way Seaforth	Roadside	Measured PM_{10}	27.8	24.9	26.5	26.5	26.7	23.8
		Estimated $PM_{2.5}$	19.5	17.4	18.6	18.6	18.7	16.7
CM6 Crosby Road South	Urban Background	Measured PM_{10}	n/a	n/a	n/a	n/a	n/a	22.4
		Estimated $PM_{2.5}$	n/a	n/a	n/a	n/a	n/a	16.7

Table 2.3 Estimation of $PM_{2.5}$ Concentrations from PM_{10} Monitoring

Sefton Council is already taking a number of measures to address $PM_{2.5}$, as many of the existing measures in the current Air Quality Action Plans to reduce PM_{10} also serve in reducing $PM_{2.5}$, see **Table 2.2**. These include:

- Traffic Management measures - SCOOT and Hurry Call systems.
- Promoting Alternative Travel through school and workplace travel plans and encouraging walking and cycling.
- Reducing dust emissions from industry through the Environmental Permitting system.

- Reducing emissions from the freight transport sector through the ECO Stars Fleet Recognitions Scheme.
- Strategic highway and junction improvements to reduce congestion pollutant emissions.
- Addressing particulate matter through the land use planning and development control system.

As a greater understanding of the areas and $PM_{2.5}$ emission sources that need to be targeted in Sefton is developed through actual monitoring, further measures to reduce $PM_{2.5}$ will be implemented as necessary in consultation with colleagues in Public Health. A CAZ feasibility study is being commissioned by Sefton to look at further ways of reducing traffic related pollution in Sefton. $PM_{2.5}$ is to be specifically considered within the study and any findings used to target further action to reduce $PM_{2.5}$ levels.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Sefton undertook automatic (continuous) monitoring at 5 sites during 2016. Table A.1 in Appendix A shows the details of the sites. The pollutants monitored in Sefton include nitrogen dioxide (NO_2) at all five sites, particulate matter (PM_{10}) at four of the sites and sulphur dioxide (SO_2) at one location. Local authorities no longer have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. Previous assessment of these pollutants indicated compliance with the air quality objectives, consequently no monitoring for 1,3 butadiene, benzene, carbon monoxide and lead is carried out in Sefton and the pollutants are therefore not considered further in this report. National monitoring results are available at https://uk-air.defra.gov.uk/data/

Maps showing the location of the monitoring sites are provided in Appendix D1. 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

Sefton undertook non-automatic (passive) monitoring of NO_2 at 92 sites during 2016. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D2. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. 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 2016 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.

Discussion of NO_2 Objective Compliance/Exceedance

One of the five automatic monitoring sites where NO_2 is monitored, showed exceedance of the NO_2 annual mean objective in 2016. This was at the Lathom Close, Princess Way, Seaforth site ID: CM4 where a NO_2 annual mean of 41.6µg/m^3 was recorded. This site is located within AQMA 2 at Lathom Close Princess Way. The monitor is located 8.5 m from relevent exposure and as such the DEFRA fall off with distance calculator has been used to calculate the public exposure giving an estimated level of 36.7µg/m^3

There were no exceedances of 1-hour mean objective at any of the automatic monitoring sites.

Three non-automatic (passive) diffusion tube monitoring sites showed exceedance of the NO_2 annual mean objective in 2016. These were at Site ID: NBM Derby Road, Bootle where a NO_2 annual mean of 41µg/m^3 was recorded and at Site ID: NBR Derby Road, Bootle where a NO_2 annual mean of 46µg/m^3 was recorded and site ID: MEM Millers Bridge Bootle where a NO_2 annual mean of 41µg/m^3 was recorded. All three sites are located within existing AQMA 3 Millers Bridge. As these sites recorded a 2016 NO_2 annual mean concentration in exceedance of the air quality objective at a monitoring site which is not representative of public exposure, the concentration at the nearest receptor for these locations was estimated using the

Defra NO_2 fall off with distance calculator. This showed the estimated concentrations at receptor locations to be 34.2µg/m^3,44.9µg/m^3 and 31.2µg/m^3 for NBM,NBR and NEM respectively. Thus Site ID: NBR, within AQMA 3, was the only diffusion tube location that showed exceedance of the NO_2 annual mean objective at a relevant public exposure location in 2016.

Seven diffusion tube monitoring sites had annual mean NO_2 concentrations that were close to the objective (between 38-40µg/m^3) in 2016. These were at Site ID: NBS Derby Road Bootle (within AQMA3), NCI Hawthorne Rd (within AQMA5),NCJ South Road Waterloo (within AQMA4), NDD Hawthorne Road Litherland (within AQMA5) and will continue to be closley monitored as part of the AQMAs. NDO Hawthorne Road/ Linacre Lane junction Bootle, NEL Breeze Hill Bootle, NFI Hemans street Boolte and NEY Lathom Avenue Seaforth will remain under close observation also to monitor future annual mean concentrations.

None of the non-automatic (passive) diffusion tube monitoring sites recorded a NO_2 annual mean greater than 60µg/m^3 in 2016. This indicates that an exceedance of the 1-hour mean objective is unlikely at any of the diffusion tube monitoring sites in Sefton.

NO_2 annual mean concentrations from passive monitoring were broadly similar across the Borough in 2016 compared with those recorded in 2015. The overall trend does appear to be a gradual decline in levels of NO_2 across the Borough.

It can be concluded that no new AQMAs need to be declared as a result of any 2016 NO_2 monitoring. Due to uncertanties in the impact of the port expansion no AQMA's are due to be revoked .

A summary of each AQMA with regards to NO_2 objective exceedance/compliance is discussed below.

- **AQMA 2 Princess Way, Seaforth**. Exceedance of the NO_2 annual mean objective at the automatic monitoring location occurred in 2016 and has done so over the previous 4 years. The general trend in NO_2 levels is declining however. The most recent result when corrected for fall off with distance indicates the public exposure in this AQMA is below the NAQS objective.

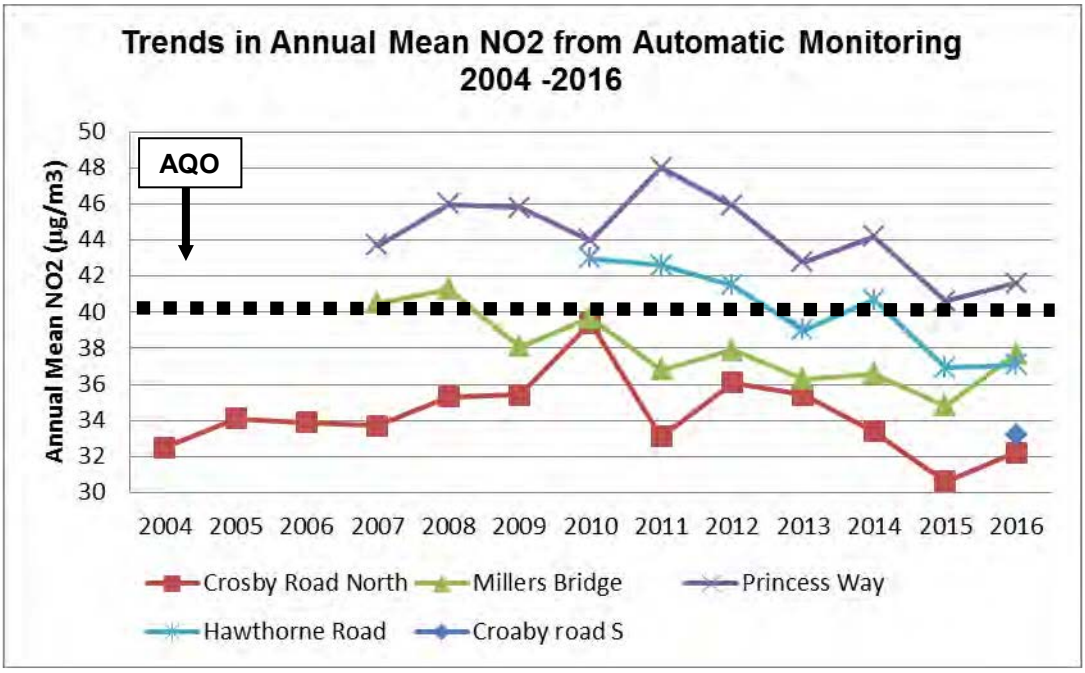
- **AQMA 3 Millers Bridge, Bootle**. Compliance with the NO_2 annual mean objective and 1-hour mean objective at the automatic monitoring location was achieved in 2016. Compliance has now been achieved in every year at the automatic monitoring location since 2009, having previously exceeded the annual mean objective in 2007 & 2008. However diffusion tube monitoring in 2016 still shows exceedance of the annual mean objective at 1 location but to a reduced extent.

- **AQMA4 Waterloo**. No automatic NO_2 monitoring is carried out within AQMA 4. Diffusion tube monitoring showed compliance with the objectives in 2016 and 2015. It is hoped that following the completion of the junction improvements in spring 2017 further reductions in NO_2 will be achieved and revocation of this AQMA can be considered.

- **AQMA 5 Hawthorne Road, Litherland**. It is pleasing to observe compliance with the NO_2 annual mean objective and 1-hour mean objective at the automatic monitoring location was achieved in 2015 and 2016. Due to the uncertanties surrounding the impact the port expansion will have on pollution levels in this area it is unlikely that this AQMA will be considered for revocation in the immediate future.

AQMA 2 and AQMA 5 are most likely to be affected by port expansion, and to a lesser extent AQMA 3, therefore there is the potential for NO_2 concentration to increase within these AQMAs until port expansion mitigation measures are fully implemented.

Figure F.1 – Trends in Annual Mean NO_2 from Automatic Monitoring



Princess Way (CM4) which is located within AQMA 2 continues to be consistently above the NO_2 annual mean objective of 40µg/m^3 as indicated by the purple line in **Figure F.1**. There has been a downward trend in the years following a peak of 48.0µg/m^3 in 2011, however the annual mean at this location rose slightly in 2014 to 44.2µg/m^3 from 42.8µg/m^3 the previous year. 2015 saw the lowest annual mean recorded since monitoring began of 40.6µg/m^3, with 2016 levels slightly higher than 2015.

Hawthorne Road (CM5) which is located within AQMA 5 had shown a downward trend since monitoring commenced in 2010 as indicated by the light blue line in **Figure F.1** and showed borderline compliance with the objective in 2013, having shown non-compliance in the previous three years (2010-2012). The annual mean rose in 2014 to 40.7µg/m^3 but showed compliance in 2015 and again in 2016. Due to the port expansion this monitor is ideally placed to assess any future increases.

The trend from automatic monitoring at Millers Bridge (CM3) which is located within AQMA 3 has been one of compliance with the annual mean objective from 2009 –

2016, following a period of non-compliance in 2007 and 2008, although compliance in 2010 was borderline as indicated by the green line in **Figure F.1**. The annual mean concentration in the past 3 years has been in the 38-35μg/m^3 range and would indicate that the "Hurry Call" Action Plan measure is having an effect in achieving objective compliance, however relevant public exposure diffusion tube monitoring within this AQMA still shows exceedance of the annual mean objective. AQMA 3 will be affected by port expansion, but to a lesser extent than AQMA's 2 & 5, nevertheless annual mean concentrations at CM3 and within the AQMA generally could potentially rise in future years due to increased HGV traffic due to port expansion.

Following an unexpected rise in the NO_2 annual mean in 2010 at Crosby Road North automatic monitoring site (CM2), when compliance in that year was borderline as indicated by the red line in **Figure F.1**, annual mean concentrations have fallen back to pre-2010 compliance levels and continued compliance with the annual mean objective in 2016. This location is not within an AQMA for NO_2.

Levels at Crosby Road South CM6 were well within the NAQS objective.

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.

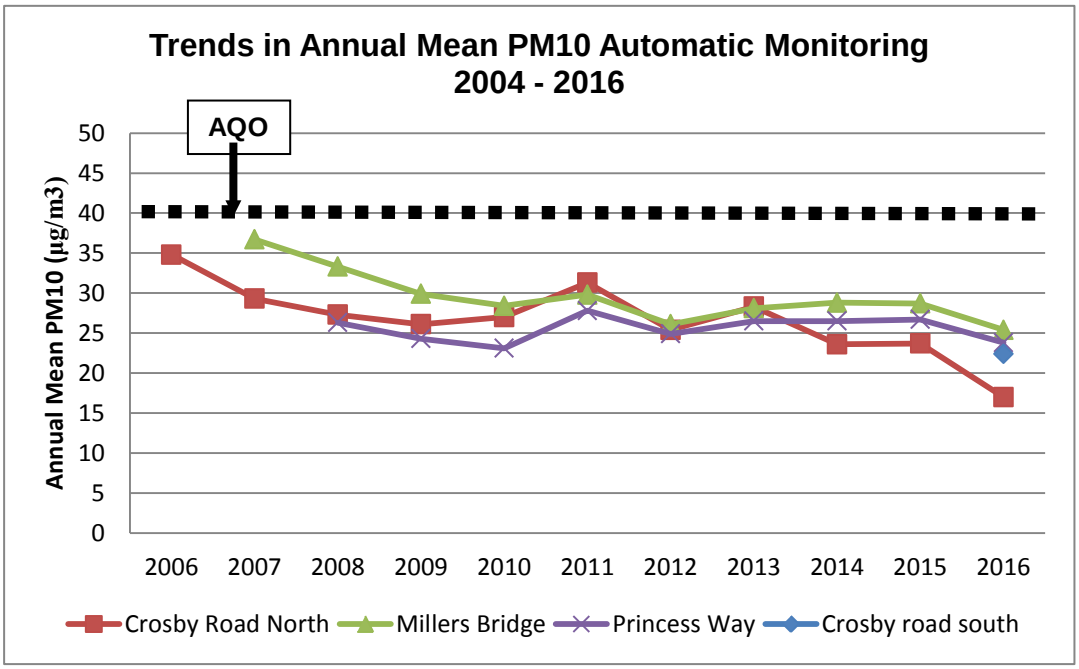
Discussion of PM_{10} Objective Compliance/Exceedance

No exceedances of either the PM_{10} annual mean objective or the 24-hour mean objective at any of the four sites where PM_{10} is monitored were recorded in 2016. It is also positive to see that the downward trend in both the annual mean and the exceedces of the 24 hour mean continue in 2016.

AQMA 3 Millers Bridge is the only current AQMA that has been declared for PM_{10}. This was was due to exceedance of the 24- hour mean objective. Compliance with the objective at Millers Bridge has now been met since 2008 (with 2008 showing borderline compliance) and athough a Detailed Assessment in 2014 concluded that the PM_{10} declaration could be revoked, the 2015 Air Quality Action Plan Progress Report concluded that the declaration for PM_{10} should remain in place due to the potential future impacts of port expansion on PM_{10} levels at Millers Bridge. **This is currently being reviewed due to continued reduction in PM $_{10}$ levels.**

Trends in PM_{10} from Automatic Monitoring

Figure F.2 – Trends in Annual Mean PM_{10} from Automatic Monitoring



Trend analysis shows compliance with the PM_{10} annual mean objective at all sites since 2006 and since 2012 the annual mean PM_{10} concentration has been below 30ug/m3 at all sites, well within the objective, with 2016 annual means being further reduced to those in 2015 for each individual site, as indicated in Figure F.2.

3.2.3 Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ was not monitored in 2016. However to obtain indicative $PM_{2.5}$ annual mean concentrations, these have been estimated from measured PM_{10} annual mean concentrations recorded in Sefton using the nationally derived ratio of 0.7. This shows compliance with the $PM_{2.5}$ annual mean limit value of 25μg/m^3 at all sites in Sefton, as shown in **Table 2.3**. A Dual $PM_{2.5}$/PM_{10} monitor has been installed at the Millers Bridge monitor in June 2017. Levels of $PM_{2.5}$ are now being continuously monitored and can be used to derive a local adjustment factor. The PM_{10} monitor that was previously located at the Millers Bridge site has been relocated to the Hawthorne road monitoring site.

3.2.4 Sulphur Dioxide (SO_2)

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Table A.7 in **Appendix A** compares the ratified continuous monitored SO_2 concentrations for year 2016 with the air quality objectives for SO_2.

Sefton Council recommenced automatic monitoring for SO_2 at one location near to the Port of Liverpool at Crosby Road South, Seaforth (Site ID:CM6) in April 2015, due to concerns that SO_2 concentrations from shipping may increase as a result of port expansion. The aim was to establish baseline SO_2 concentrations prior to the new deep water berth becoming operational towards the end of 2016 and to then monitor any increase in SO_2 concentrations that may occur and determine any potential non-compliance with SO_2 air quality objectives.

Discussion of SO_2 Objective Compliance/Exceedance

No exceedances of the 15-minute, 1-hour or 24-hour SO_2 objectives were recorded in 2016.

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	Pollutants Monitored	In AQMA ?	Monitoring Technique	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Inlet Height (m)
CM2	Crosby Road North, Waterloo, (outside Waterloo Primary School).	Roadside	332175	398475	NO_2; PM_{10}	No	Chemiluminescence; Beta attenuation monitor (BAM)	3.5	4	1.8
CM3	Millers Bridge, Bootle.	Roadside	333772	394603	NO_2;PM_{10}	**Yes** (for PM_{10} **and** NO_2)	Chemiluminescence; Beta attenuation monitor (BAM)	5.5	9.5	1.8
CM4	Lathom Close, Princess Way, Seaforth.	Roadside	332647	396940	NO_2;PM_{10}	**Yes** (for NO_2 only)	Chemiluminescence; Beta attenuation monitor (BAM)	8.5	6	1.8

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM5	Hawthorne Road, Litherland.	Roadside	333821	397512	NO_2	**Yes** (for NO_2 only)	Chemiluminescence	8	6	1.8
CM6	Crosby Road South, Seaforth.	Urban Background	332871	396550	NO_2; PM_{10}; SO_2	No	Chemiluminescence; TEOM – VMS corrected; UV Fluorescence	0	25	2.8

(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.

Note: Site ID CM1 former St Joan of Arc School site, Rimrose Road, Bootle now discontinued and monitoring enclosure relocated to Crosby Road South, Seaforth Site ID:CM6

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)
NW	Gladstone Road/ Gordon Road, Seaforth	Roadside	332978	397021	NO_2	Yes	3	4	no	2.6
NAG	Lydiate Lane, Thornton	Roadside	334039	400808	NO_2	No	2	1.5	no	2.6
NAN	Strand Road, Bootle	Kerbside	333399	395251	NO_2	No	1.5	1	no	2.6
NAW	Balliol House, Bootle	Roadside	334459	394781	NO_2	No	4	3	no	2.8
NBB	Eaton Avenue, Seaforth	Roadside	333510	397184	NO_2	No	2	2	no	2.7
NBL	Litherland Road/Marsh Lane, Bootle	Kerbside	334432	395820	NO_2	No	0	1.5	no	2.5
NBM	Millers Bridge, Bootle	Roadside	333785	394594	NO_2	Yes	10	2.5	no	2.6

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)
NBO	Douglas Place, Bootle	Roadside	333828	394457	NO_2	Yes	3	1.5	no	2.7
NBQ	Douglas Place/Millers Bridge, Bootle	Roadside	333834	394570	NO_2	Yes	1.5	1.5	no	2.8
NBR	Derby Road, Bootle	Roadside	333751	394553	NO_2	Yes	0.5	2.2	no	2.6
NBS	Derby Road, Bootle	Roadside	333757	394622	NO_2	Yes	5	3	no	2.5
NBU	Hougoumont Avenue/South Road, Waterloo	Kerbside	332083	398113	NO_2	No	N/A	0.5	no	2.7
NBV	Quarry Road, Thornton	Roadside	333386	400851	NO_2	No	7	2	no	2.5
NBW	Crosby Road South/ Riversdale Road, Seaforth	Kerbside	332599	397021	NO_2	No	2	1	no	2.6
NCI	Hawthorne Road, Litherland	Roadside	333821	397512	NO_2	Yes	10	4	no	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)
NCJ	South Road, Waterloo	Roadside	332204	398230	NO_2	Yes	0	1.5	no	2.6
NCR	Parker Avenue, Seaforth	Roadside	332507	397330	NO_2	No	2	1.5	no	2.7
NCS	Willoughby Road, Waterloo	Kerbside	332142	398186	NO_2	No	3	0.5	no	2.5
NCU	Sefton Street, Litherland	Roadside	333711	397422	NO_2	No	2	6	no	2.7
NCV	South Road, Waterloo	Roadside	332188	398218	NO_2	Yes	0	15	no	2.2
NCY	Lytton Grove, Seaforth	Roadside	332976	396977	NO_2	Yes	3	1.5	no	2.6
NCZ	Pleasant Street, Bootle	Kerbside	333674	394904	NO_2	No	1.5	1	no	2.0
NDC	Marsh Lane, Bootle	Kerbside	334328	395797	NO_2	No	2	0.5	no	2.5
NDD	Hawthorne Road, Litherland	Roadside	333773	397535	NO_2	Yes	4	2.5	no	2.6

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)
NDE	Wilson's Lane, Litherland	Roadside	333913	397574	NO_2	No	3	2	no	2.6
NDF	Church Road, Litherland	Roadside	333909	397497	NO_2	No	1	15	no	2.6
NDG	Marina Avenue, Litherland	Roadside	333759	397460	NO_2	No	0	20	no	2.1
NDH	South Road, Waterloo	Roadside	332191	398194	NO_2	Yes	0	4	no	2.8
NDI	Crosby Road Waterloo	Roadside	332205	398190	NO_2	Yes	0	4	no	2.5
NDM	Chapel Terrace, Bootle	Roadside	333656	395005	NO_2	No	3	2	no	2.7
NDN	Queens Road, Bootle	Roadside	334225	394710	NO_2	No	4	2	no	2.6
NDO	Hawthorne Road,Bootle	Kerbside	334647	396388	NO_2	No	4.5	1	no	2.6
NDP	Gordon Road, Seaforth	Kerbside	332786	396975	NO_2	Yes	5	0.5	no	2.7

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)
NDQ	Rawson Road, Seaforth	Roadside	332788	396932	NO_2	Yes	4	2	no	2.6
NDR	Crosby Road North, Waterloo	Roadside	332216	398236	NO_2	Yes	15	2.5	no	2.5
NDS	South Road, Waterloo	Kerbside	332142	398176	NO_2	Yes	2	1	no	2.6
NDT	Glendower Road, Waterloo	Kerbside	332115	398241	NO_2	No	2	0.5	no	2.4
NDU	Liverpool Road, Waterloo	Roadside	332196	398788	NO_2	No	7	3	no	2.6
NDV	Moor Lane, Crosby	Kerbside	332327	400168	NO_2	No	5	0.5	no	2.6
NDW	Church Road, Litherland	Roadside	334577	397923	NO_2	No	8	6	no	2.6
NDX	Merton Road, Bootle	Roadside	334734	395138	NO_2	No	10	6	no	2.6
NDY	Hougoumont Avenue, Waterloo	Kerbside	332248	398008	NO_2	No	4	0.5	no	2.4
NDZ	Bailey Drive, Bootle	Roadside	335394	397291	NO_2	No	6	3.5	no	2.6

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)
NEA	Copy Lane, Netherton	Roadside	336635	399491	NO_2	No	4	40	no	2.5
NEB	Copy Lane, Netherton	Kerbside	336607	399446	NO_2	No	15	0.5	no	2.6
NEC	Dunnings Bridge Road, Netherton	Roadside	336539	399477	NO_2	No	25	3	no	2.6
NED	Cumberland Gate, Netherton	Urban background	336492	399455	NO_2	No	6	1.5	no	2.6
NEE	Copy Lane, Netherton	Roadside	336574	399525	NO_2	No	N/A	4	no	2.6
NEF	Copy Lane, Netherton	Roadside	336476	399553	NO_2	No	15	5	no	2.6
NEG	Dooley Drive, Netherton	Roadside	336672	399574	NO_2	No	0	30	no	2.6
NEK	Hawthorne Road, Bootle	Kerbside	334781	395193	NO_2	No	10	1	no	2.3
NEL	Breeze Hill, Bootle	Kerbside	335259	394977	NO_2	No	8	1	no	2.6

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)
NEM	Millers Bridge, Bootle	Roadside	333735	394594	NO_2	Yes	25	3	no	2.6
NEN	Hawthorne Road, Litherland	Roadside	333725	397573	NO_2	No	10	2.5	no	2.5
NEO	Hatton Hill Road, Litherland	Kerbside	333690	397615	NO_2	No	7	0.5	no	2.6
NEP	Ash Road, Seaforth	Roadside	333343	397217	NO_2	No	17	10	no	2.6
NEQ	Crosby Road South, Seaforth	Kerbside	332612	396982	NO_2	Yes	4	1	no	2.6
NER	Green Lane, Seaforth	Kerbside	333174	397112	NO_2	No	2	1	no	2.7
NES	Chatham Close, Seaforth	Kerbside	332712	397000	NO_2	Yes	7	0.5	no	2.6
NET	Moorhey Road, Maghull	Roadside	337547	400475	NO_2	No	8	2.5	no	2.6
NEU	Moorhey Road, Maghull	Roadside	337250	400580	NO_2	No	5	2.5	no	2.7

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)
NEV	Princess Way, port end, Seaforth	Roadside	332650	396919	NO_2	Yes	N/A	1.2	no	2.6
NEW	Elm Drive junction with Crosby Rd Sth, Seaforth	Roadside	332662	396824	NO_2	Yes	1.5	2	no	2.7
NEX	Elm Drive, Seaforth	Kerbside	332725	396840	NO_2	Yes	3	0.7	no	2.7
NEY	Lathom Avenue, Seaforth	Kerbside	332682	396952	NO_2	Yes	4.5	0.7	no	2.7
NEZ	Hicks Road, Seaforth	Kerbside	333199	397058	NO_2	No	5	0.3	no	2.6
NFA	Bridge Road, Red Lion Pub, Seaforth	Kerbside	333711	397368	NO_2	No	1.7	0.6	no	2.5
NFB	Hawthorne Road opposite Tesco, Litherland	Roadside	334017	397317	NO_2	No	N/A	3	no	2.6
NFC	Church Road junction with St Philips Avenue, Litherland	Roadside	334218	397673	NO_2	No	6	2	no	2.6

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)
NFD	Church Road opposite Bellway development, Litherland	Roadside	334280	397737	NO_2	No	8	2.3	no	2.8
NFE	Church Road Kirkstone Road South, Litherland	Roadside	334617	397917	NO_2	No	6	7	no	2.6
NFF	Boundary Road, Netherton	Kerbside	334984	398177	NO_2	No	12	1	no	2.6
NFG	Sandiways Avenue, Netherton	Roadside	335997	398790	NO_2	No	3	2.5	no	2.6
NFH	Church Road Netherton Pub, Netherton	Kerbside	334963	398131	NO_2	No	11.5	0.8	no	2.6
NFI	Hemans Street, Bootle	Roadside	333273	395963	NO_2	No	0	2	no	2.6
NFJ	Our Lady of Walsingham Church, Dunnings Bridge Road, Netherton	Roadside	335815	398723	NO_2	No	0	20	no	2.0

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)
NC10	Sandfield Road. Bootle	Roadside	334855	394959	NO_2	No	0	5	no	2.0
NC11	Sandfield Road. Bootle	Roadside	334796	395034	NO_2	No	0	5	no	2.0
NC14	Viola Street, Bootle	Roadside	334262	394305	NO_2	No	0	5	no	2.0
NC28	Marina Avenue, Litherland	Roadside	333823	397545	NO_2	No	0	5	no	2.0
NC47	Coronation Drive, Crosby	Roadside	332080	399336	NO_2	No	0	5	no	2.0
NC51	Apollo Way, Netherton	Roadside	335928	399882	NO_2	No	0	5	no	2.0
NC52	Green Lane, Thornton	Roadside	333489	400980	NO_2	No	0	5	no	2.0
NC74	Deyes Lane, Maghull	Roadside	338682	402476	NO_2	No	0	5	no	2.0
NC82	Fernhill Way, Bootle	Roadside	335147	395002	NO_2	No	0	5	no	2.0

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)
NC83	Sandiways Avenue, Netherton	Roadside	336067	398710	NO_2	No	0	5	no	2.0
NC86	Crosby Road South, Seaforth	Roadside	332685	396768	NO_2	Yes	0	5	no	2.0
NC107	Norton Street, Bootle	Roadside	333571	396173	NO_2	No	0	5	no	2.0
NC108	Wango Lane, Aintree	Roadside	338567	398342	NO_2	No	0	5	no	2.0
NC112	Poplar Grove, Bootle	Roadside	332889	396811	NO_2	No	0	5	no	2.0
UK2	Church Road, Litherland	Roadside	334781	398054	NO_2	No	6	1.5	no	2.5
UK4	Crosby Road North, Waterloo	Roadside	332170	398538	NO_2	No	N/A	0.5	no	2.6

Notes: (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.

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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 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016
CM2	Roadside	Automatic	Full Year		36.1	35.4	33.4	30.6	32.2
CM3	Roadside	Automatic	Full Year		37.9	36.3	36.6	34.8	37.7
CM4	Roadside	Automatic	Full Year		**45.9**	**42.8**	**44.2**	**40.6**	**41.6**
CM5	Roadside	Automatic	Full Year		**41.5**	39.0	**40.7**	36.9	37.1
CM6	Urban Background	Automatic	Full Year		-	-	-	34.6	33.2
NW	Roadside	Diffusion Tube	Full Year	92	36	33	33	30	31
NAG	Roadside	Diffusion Tube	Full Year	83	24	21	21	18	17
NAN	Kerbside	Diffusion Tube	Full Year	100	34	34	33	30	31
NAW	Roadside	Diffusion Tube	Full Year	100	37	37	35	33	30
NBB	Roadside	Diffusion Tube	Full Year	75	34	33	31	28	29
NBL	Kerbside	Diffusion Tube	Full Year	100	33	31	29	29	29
NBM	Roadside	Diffusion Tube	Full Year	100	**45**	**45**	**44**	**41**	**41**
NBO	Roadside	Diffusion Tube	Full Year	100	34	32	30	29	30
NBQ	Roadside	Diffusion Tube	Full Year	100	35	33	32	30	32
NBR	Roadside	Diffusion Tube	Full Year	92	**58**	**56**	**54**	**53**	**46**
NBS	Roadside	Diffusion Tube	Full Year	100	**48**	**43**	40	39	39
NBU	Kerbside	Diffusion Tube	Full Year	100	31	29	26	25	26
NBV	Roadside	Diffusion Tube	Full Year	100	37	35	33	31	33
NBW	Kerbside	Diffusion Tube	Full Year	100	36	34	33	31	30
NCI	Roadside	Diffusion Tube	Full Year	100	**48**	**42**	**42**	37	38
NCJ	Roadside	Diffusion Tube	Full Year	92	**46**	**42**	**41**	38	38
NCR	Roadside	Diffusion Tube	Full Year	100	36	33	33	30	29
NCS	Kerbside	Diffusion Tube	Full Year	83	25	24	24	20	22
NCU	Roadside	Diffusion Tube	Full Year	83	35	35	33	26	25

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016
NCV	Roadside	Diffusion Tube	Full Year	100	31	26	28	22	22
NCY	Roadside	Diffusion Tube	Full Year	100	31	32	31	26	28
NCZ	Kerbside	Diffusion Tube	Full Year	75	37	37	38	34	32
NDC	Kerbside	Diffusion Tube	Full Year	100	38	38	36	33	33
NDD	Roadside	Diffusion Tube	Full Year	92	**42**	**43**	**44**	38	38
NDE	Roadside	Diffusion Tube	Full Year	83	30	30	29	26	28
NDF	Roadside	Diffusion Tube	Full Year	100	34	31	30	27	28
NDG	Roadside	Diffusion Tube	Full Year	92	31	27	30	24	24
NDH	Roadside	Diffusion Tube	Full Year	100	39	35	36	32	31
NDI	Roadside	Diffusion Tube	Full Year	100	**44**	**41**	**41**	34	33
NDM	Roadside	Diffusion Tube	Full Year	100	31	33	35	31	30
NDN	Roadside	Diffusion Tube	Full Year	100	32	32	34	29	29
NDO	Kerbside	Diffusion Tube	Full Year	100	**42**	**44**	**47**	38	40
NDP	Kerbside	Diffusion Tube	Full Year	92	39	35	39	33	33
NDQ	Roadside	Diffusion Tube	Full Year	75	38	36	34	30	32
NDR	Roadside	Diffusion Tube	Full Year	92	**41**	40	39	35	34
NDS	Kerbside	Diffusion Tube	Full Year	92	36	34	35	30	29
NDT	Kerbside	Diffusion Tube	Full Year	100	23	23	22	20	20
NDU	Roadside	Diffusion Tube	Full Year	100	39	38	38	33	33
NDV	Kerbside	Diffusion Tube	Full Year	100	**44**	**43**	38	36	36
NDW	Roadside	Diffusion Tube	Full Year	92	37	37	39	31	33
NDX	Roadside	Diffusion Tube	Full Year	100	35	37	36	33	33
NDY	Kerbside	Diffusion Tube	Full Year	92	28	26	28	22	23
NDZ	Roadside	Diffusion Tube	Full Year	100	36	39	36	30	33
NEA	Roadside	Diffusion Tube	Full year	100	29	28	29	29	28
NEB	Kerbside	Diffusion Tube	Full Year	100	39	39	35	34	31

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016
NEC	Roadside	Diffusion Tube	Full Year	100	**43**	40	39	32	32
NED	Urban Background	Diffusion Tube	Full Year	83	25	26	25	21	21
NEE	Roadside	Diffusion Tube	Full Year	92	**41**	**41**	39	34	36
NEF	Roadside	Diffusion Tube	Full Year	92	36	32	32	27	28
NEG	Roadside	Diffusion Tube	Full Year	92	33	30	29	26	26
NEK	Kerbside	Diffusion Tube	Full Year	92	-	33	33	30	32
NEL	Kerbside	Diffusion Tube	Full year	92	-	**43**	39	38	40
NEM	Roadside	Diffusion Tube	Full Year	92	-	**41**	40	37	**41**
NEN	Roadside	Diffusion Tube	Full Year	92	-	34	34	31	32
NEO	Kerbside	Diffusion Tube	Full year	92	-	38	36	32	35
NEP	Roadside	Diffusion Tube	Full year	92	-	28	31	27	30
NEQ	Kerbside	Diffusion Tube	Full Year	92	-	35	35	33	32
NER	Kerbside	Diffusion Tube	Full Year	83	-	29	29	27	24
NES	Kerbside	Diffusion Tube	Full year	92	-	30	30	27	29
NET	Roadside	Diffusion Tube	Full Year	92	-	21	22	20	22
NEU	Roadside	Diffusion Tube	Full Year	92	-	24	25	22	24
NEV	Roadside	Diffusion Tube	Full Year	92	-	-	39	36	37
NEW	Roadside	Diffusion Tube	Full Year	92	-	-	38	37	35
NEX	Kerbside	Diffusion Tube	Full Year	92	-	-	33	-	31
NEY	Kerbside	Diffusion Tube	Full Year	92	-	-	**41**	38	37
NEZ	Kerbside	Diffusion Tube	Full year	92	-	-	28	25	26
NFA	Kerbside	Diffusion Tube	Full Year	92	-	-	33	29	26
NFB	Roadside	Diffusion Tube	Full Year	92	-	-	38	32	32
NFC	Roadside	Diffusion Tube	Full Year	92	-	-	29	27	27
NFD	Roadside	Diffusion Tube	Full Year	92	-	-	30	26	26

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016
NFE	Roadside	Diffusion Tube	Full Year	92	-	-	33	31	32
NFF	Kerbside	Diffusion Tube	Full Year	92	-	-	39	32	35
NFG	Roadside	Diffusion Tube	Full Year	92	-	-	28	26	27
NFH	Kerbside	Diffusion Tube	Full Year	83	-	-	45	37	39
NFI	Roadside	Diffusion Tube	Full Year	92	-	-	36	34	35
NFJ	Roadside	Diffusion Tube	Full Year	83	-	-	25	23	24
NC10	Roadside	Diffusion Tube	Full Year	75	24	25	24	21	23
NC11	Roadside	Diffusion Tube	Full Year	58	-	24	25	22	22
NC14	Roadside	Diffusion Tube	Full Year	75	27	23	22	20	21
NC28	Roadside	Diffusion Tube	Full Year	83	29	26	26	23	24
NC47	Roadside	Diffusion Tube	Full Year	75	20	19	18	15	17
NC51	Roadside	Diffusion Tube	Full year	83	19	15	14	14	14
NC52	Roadside	Diffusion Tube	Full Year	92	31	28	25	22	21
NC74	Roadside	Diffusion Tube	Full Year	83	24	21	20	20	21
NC82	Roadside	Diffusion Tube	Full Year	100	32	31	31	28	21
NC83	Roadside	Diffusion Tube	Full Year	92	24	22	23	20	19
NC86	Roadside	Diffusion Tube	Full Year	83	35	34	33	31	29
NC107	Roadside	Diffusion Tube	Full Year	92	28	25	23	23	21
NC108	Roadside	Diffusion Tube	Full Year	92	21	21	20	18	18
NC112	Roadside	Diffusion Tube	Full Year	83	28	27	25	24	21
UK2	Roadside	Diffusion Tube	Full Year	83	33	32	30	27	28
UK4	Roadside	Diffusion Tube	Full Year	83	39	38	35	32	31

☒ **Diffusion tube data has been bias corrected (confirm by selecting in box)**

☒ **Annualisation has been conducted where data capture is <75% (confirm by selecting in box)**

☒ **If applicable, all data has been distance corrected for relevant exposure (confirm by selecting in box)**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, 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 Boxes 7.9 and 7.10 in 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 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2012	2013	2014	2015	2016
CM2	Roadside	Automatic	Full Year	99	1	1	0	0	0
CM3	Roadside	Automatic	Full Year	93	0	0	0	0	0
CM4	Roadside	Automatic	Full Year	99	3	0	0	0	0
CM5	Roadside	Automatic	Full Year	99	0	0	0	0	0
CM6	Urban Background	Automatic	Full year	92	-	-	-	0 (82)	0

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 85%, the 99.8th percentile of 1-hour means is provided in bracket

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016(%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2012	2013	2014	2015	2016
CM2	Roadside	Full Year	96	25.4	28.3	23.6	23.7	17.0
CM3	Roadside	Full Year	99	26.1	28.1	28.8	28.7	25.4
CM4	Roadside	Full Year	99	24.9	26.5	26.5	26.7	23.8
CM6	Urban Background	Full Year	97	-	-	-	25.3(4)	22.4

☒ **Annualisation has been conducted where data capture is <75%** **(confirm by selecting in box)**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/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 Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(4) Note: CM6 uses a TEOM and the Volatile Correction Model (VCM) corrected annual mean would normally be quoted in brackets. However this was unable to be calculated due to poor data capture at nearby FDMS sites in 2015. This resulted in 44 days where the VCM corrected 24 hour mean could not be calculated with any accuracy due to no nearby FDMS site data being available on these days. However it can be assumed given the low VCM uncorrected annual mean recorded, that it is unlikely that the objective would have been exceeded had the correction been able to be fully applied.

Table A.6 – 24-Hour Mean PM10 Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016(%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2012	2013	2014	2015	2016
CM2	Roadside	Full Year	96	18	17	8	4	2
CM3	Roadside	Full Year	99	13	17	14	15	5
CM4	Roadside	Full Year	99	15	12	12	14	6
CM6	Urban Background	Full Year	97	-	-	-	5 (36.0)	2

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 – SO_2 Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	Number of Exceedances 2016 (percentile in bracket) (3)		
				15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
CM6	Urban Background	Full year	99	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 85%, the relevant percentiles are provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2016

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
NW	46.5	48.2	37.4	32.4	27.9	26.9	29.4	-	33.4	45.5	19.2	53.1	36.3	31	29.9
NAG	-	25.5	23.0	-	16.0	15.1	11.6	13.2	18.1	22.4	16.7	33.9	19.6	17.0	16.8
NAN	45.8	44.4	42.5	38.2	32.9	32.2	28.9	27.6	32.2	48.2	22.5	33.9	37.0	31.0	29.7
NAW	44	37.7	38.4	35.7	27.7	27.7	31.9	29.7	36.8	45.4	25.5	47.8	35.7	30.0	28.7
NBB	40.3	36.4	34.3	30.1	-	26.2	24.9	-	-	51.7	20.9	41	34.0	29.0	28.2
NBL	42.7	40.2	36.7	32.8	26.7	26.5	26.8	28	32.7	38.6	21	55.6	34.0	29.0	29.0
NBM	51.5	62.8	51.8	45.2	45	42.5	47.3	45	47.7	51	27.2	63.7	48.4	**41.0**	34.2
NBO	41.8	48.3	38	35.1	23	29.2	27.9	25.4	35.3	38.2	23.8	53.5	35.0	30.0	28.6
NBQ	45.9	40.4	40.2	41.8	34.5	33.4	32.4	33.2	35.9	36.8	22.8	47.1	37.0	32.0	30.8
NBR	51.1	45.1	59.9	48.6	51.5	59.3	-	56.5	59.5	50.8	35.2	80.3	54.3	**46.0**	**44.9**
NBS	53.4	50.2	49.6	45.8	38.1	42.4	36.7	41.2	46	51.2	31.5	64.4	45.9	39.0	35.2
NBU	39	29.3	33.6	29	26.5	25.7	21.8	23.8	27.7	39.5	22.3	50.5	30.7	26.0	26.0
NBV	48.6	45.6	44.2	39	33.8	31	30.1	30.8	35.7	44.6	26.7	58.5	39.1	33.0	29.8
NBW	42.3	43.1	37.8	36.7	28.8	29.7	27.8	32.5	36.7	36.8	26.1	46.2	35.4	30.0	28.7
NCI	68.6	48.9	46.5	45.1	33.4	36.4	35.9	37	40	45.9	26.8	69.8	44.5	38.0	33.1

NCJ	40.7	41.1	53.8	42.6	43.3	-	37.2	37.5	43.9	53.1	28.2	64.5	44.2	38.0	38.0
NCR	40.3	40.8	38.7	32.7	28.6	31.1	28.5	30.9	35.9	32.5	23.4	45.8	34.1	29.0	28.1
NCS	-	30.6	28.7	26.9	19.7	20.7	-	18.9	25.2	28.3	18.7	38.4	25.6	22.0	21.7
NCU	41.3	-	32.5	30.3	27.2	24.4	21.6	23.9	29	-	22.9	44.2	29.7	25.0	24.9
NCV	36	28.4	31.2	22.2	24.7	19.6	14.9	16.5	27	32	18.1	38.7	25.8	22.0	22.0
NCY	38.6	38.8	35.7	31.8	30.4	27.2	26.3	24.8	34.8	37.2	24.8	48.6	33.2	28.0	27.0
NCZ	46.3	37.1	39.5	40	-	34.8	36	-	-	36.3	26.3	46.4	38.1	32.0	30.5
NDC	44	48.4	41.3	40.4	28.9	36.7	33.2	32.5	38.7	45.8	27.7	53.2	39.2	33.0	30.4
NDD	56	52.5	36.1	42.7	36.8	36.4	40.9	43.5	52.2	-	28.7	68.9	45.0	38.0	34.7
NDE	41.8	34.6	41.3	-	-	23.3	24.2	26.9	27	39.8	24.1	45.6	32.9	28.0	27.1
NDF	36.4	39	34.9	30.3	34.1	26.5	26.9	24.7	32.6	37.6	23.4	44.6	32.6	28.0	27.9
NDG	38.7	33.6	32.3	26.3	25	24.2	19.5	21.6	30	-	18.9	41	28.3	24.0	24.0
NDH	38.9	39.5	38.8	38.2	33.4	34.2	29.3	28.2	38	42.3	24.7	52.2	36.5	31.0	31.0
NDI	50	42.8	41.3	40.4	36.5	40.6	36.9	38.9	42.8	45.2	30.6	14	38.3	33.0	33.0
NDM	39.1	41.7	35.2	36.4	30.5	29.8	34.1	33.3	38	35.9	25.7	46.3	35.5	30.0	28.7
NDN	34.7	40	34.5	36.1	29.9	30.9	25.4	26.7	32.3	39.3	26.6	45.7	33.5	29.0	27.7
NDO	51.4	49.6	45.7	50	41.2	42.6	40.5	39.7	50.7	51.2	34.3	64.2	46.8	**40.0**	34.5
NDP	-	43.7	41.6	34.6	33.7	30.4	29.9	35	41	48.9	24.2	57.3	38.2	33.0	29.2
NDQ	40.4	37.6	36.6	37.3	35.6	32.3	-	28.5	-	38.5	-	48.5	37.2	32.0	29.9
NDR	49.9	45.4	43.2	42.9	31.1	-	35.6	36.8	43.1	40.9	24	48.3	40.1	34.0	29.2
NDS	37.2	32.5	38.9	39.1	34.8	32.7	27.7	30.3	36.8	-	26.2	42.2	34.4	29.0	27.9
NDT	30.2	26.3	28.3	21	18.4	18.1	13.9	19.8	23.2	27.2	20	36.1	23.5	20.0	19.7
NDU	39.2	44	43.6	35.4	36	33.8	35.3	30.5	41.3	44	26.7	53.8	38.6	33.0	30.2
NDV	45.2	48.1	49.4	45.3	41.5	34.7	37.4	39.4	43.4	46.6	36	39	42.2	36.0	30.9
NDW	43.3	38	40.2	36.6	33.9	33.4	26.5	32.3	38.5	45.3	-	58	38.7	33.0	30.6
NDX	45.4	43.4	36.9	40.4	31.8	29.1	32.6	38.4	42.2	41.9	28.8	51.6	38.5	33.0	30.2
NDY	32.2	29.2	33.7	27.4	24.1	25.7	15.5	22.6	28.4	34	26	-	27.2	23.0	22.6

NDZ	44.4	39.4	41	39	30.3	32.6	29	31.7	40.2	45.9	34.7	52.4	38.4	33.0	30.6
NEA	38.3	37.7	33.4	34.6	26.8	24.9	20.7	30.8	32.9	36.1	22.8	50.8	32.5	28.0	27.7
NEB	40.6	37.9	41.2	43.6	32.7	36.3	35.8	38.3	18.5	40.3	26.6	48.6	36.7	31.0	26.7
NEC	36.6	39.5	41.6	34.5	31.8	34.1	25	34.9	40.4	48.1	27	56.8	37.5	32.0	27.4
NED	32	-	31.7	23.3	23.9	21.5	14.6	20.4	24.7	-	19.1	37.6	24.9	21.0	20.6
NEE	40.9	48	49.5	-	40.1	35.5	28.4	33.9	35.7	56.1	28.8	67.6	42.2	36.0	36.0
NEF	39.4	39.2	37.3	-	29.1	28	18.2	22.2	29	49	25.7	48.3	33.2	28.0	26.2
NEG	34.5	44.1	34	-	25.7	24.9	25.3	24.1	27.7	31	21.6	26.9	30.9	26.0	26.0
NEK	44.2	40.8	40.9	-	32.8	31.7	24.4	30.5	36.9	46.1	26.4	58.2	37.5	32.0	28.1
NEL	48.8	64	54.3	-	42	43.5	35.9	37.4	41.2	61.5	30.7	53.3	46.6	**40.0**	32.9
NEM	52.3	58.5	49.3	-	37.3	40.6	34.4	37.5	54.1	61.6	32.5	67.4	47.8	**41.0**	31.2
NEN	48.8	45.3	36.5	-	30.5	34.3	28.1	30.2	42.2	41.5	23.4	58	38.1	32.0	28.8
NEO	46.6	49.3	43.2	-	32.8	36.3	30.4	31.5	44.7	48.2	26.1	59.6	40.8	35.0	29.7
NEP	45.1	39.9	33.6	-	29	25.4	24.1	25.9	38.5	44	22.1	53.8	34.7	30.0	27.8
NEQ	47	46.9	40.3	-	30.2	30.5	28.3	30	38.4	42.5	25	56.4	37.8	32.0	29.4
NER	31.6	37	34.9	-	26.3	24.2	21.3	20.3	28.6	38.5	22.5	-	28.5	24.0	23.8
NES	47.3	43.4	33.2	-	25.3	25	23	26	36.5	39	20	51.2	33.6	29.0	26.6
NET	33.6	33.8	29.3	-	21.7	20	15.9	19.1	25.9	29.6	19	37.5	25.9	22.0	21.6
NEU	30.3	32.1	29.6	-	21.5	21.2	-	20.8	25.3	31.7	21.6	42.5	27.7	24.0	23.7
NEV	50.4	52.9	49.8	-	38.6	39.9	35.1	32.2	47.7	39.3	33.5	53.6	43.0	37.0	37.0
NEW	53.9	46.1	39.9	-	35.5	37.1	36.7	35	43.7	44.2	25.2	54.3	41.1	35.0	33.6
NEY	56.6	49.5	47.9	-	40.3	37.3	31.8	34.5	41	53.9	28.4	59.3	43.7	37.0	32.1
NEZ	38.4	40.2	31	-	25.3	23.8	25.5	21.4	26.9	34.5	23	40.6	30.1	26.0	25.1
NFA	41.9	46.9	37.9	-	28.7	29.6	31.1	23.9	31.7	37.9	26.1	-	33.6	29.0	25.5
NFB	43.3	39.5	36.4	-	29.1	32	34.7	31.4	37.9	46.7	26	51.4	37.1	32.0	32.0
NFC	38.1	35.2	34.3	-	27.4	28.8	27	23.1	28	39.9	23	45.1	31.8	27.0	26.0
NFD	-	39.3	31.9	-	24.2	24.8	21.6	23.7	29.8	46.3	22.7	45.5	31.0	26.0	25.3

NFE	42.6	47	37.9	-	34.5	36	28.3	29.7	32.6	41.7	28.8	48.5	37.1	32.0	30.4
NFF	48.1	39.4	42.6	-	40.6	36.2	28.3	31.5	38.1	58.3	28.7	57	40.8	35.0	29.3
NFG	38.5	34.9	34.9	-	27.6	27.6	25.5	26.5	30	35.9	27.9	44.1	32.1	27.0	26.4
NFH	40.8	53.7	47.7	-	44	44.8	31.7	41.3	-	56.7	36.6	61.3	45.8	39.0	31.1
NFI	47.3	52.4	42.8	-	39.9	38.1	36.6	36.6	39.7	35.6	26.2	52.4	40.7	35.0	35.0
NFJ	33.9	23.3	28.4	-	27.3	-	16.4	21.8	28.4	38.8	21	40.5	28.0	24.0	24.0
NC10	31.9	30.5	27.3	-	22.8	22.6	-	-	27.5	25.9	17.7	42	27.6	23.0	23.0
NC11	25.8	31.3	29.3	-	-	20.7	21.4	23.6	-	31.8	-	-	26.3	22.0	22.0
NC14	29.2	30.5	25.3	-	-	-	19.2	18.4	24	26.2	18.1	34.9	25.1	21.0	21.0
NC28	33.8	33.7	28.5	-	23.8	23	20.4	22.7	28.2	31.3	-	34.7	28.0	24.0	24.0
NC47	27.3	24.4	19	-	11.1	12.6	-	19.7	-	21.5	11.3	28.5	19.5	17.0	17.0
NC51	-	17.8	18.5	-	12.2	12.9	8.8	12.7	15.7	20.8	13	29	16.1	14.0	14.0
NC52	27.8	28.9	28.6	-	22.2	21.2	17.4	19.4	23	28.3	18.6	34.6	24.6	21.0	21.0
NC74	48.3	25.9	20.7	-	20.4	19.7	14.5	-	24	23	17.7	36.6	25.1	21.0	21.0
NC82	40	39.3	34.7	31.1	28.7	29.8	26.6	28.9	23.2	39.6	24	40.7	32.2	27.0	21.0
NC83	27.1	28.9	24.7	-	17.2	17.2	17.3	14.5	25.9	27.1	17.7	33.4	22.8	19.0	19.0
NC86	39	-	35.5	-	30.4	34.8	28.7	29.2	45.1	35.6	22.5	44.5	34.5	29.0	29.0
NC107	26.7	34.1	28.5	-	17.8	22.4	21.8	20	33.3	28.3	-	38.9	27.2	23.0	21.0
NC108	24.3	24.3	22.1	-	17.2	19.9	13.5	15.8	21.6	25.9	17.8	33.2	21.4	18.0	18.0
NC112	31	34.9	26	-	21.6	21.5	21.5	19.3	-	23.1	5.6	36.9	24.2	21.0	21.0
UK2	40	34.2	-	-	30.3	28.2	23	25.2	31.7	41.5	20.2	51	32.5	28.0	26.6
UK4	43.2	39.7	37.3	-	32.3	35.7	28.7	30.5	-	35.2	27.6	54.6	36.5	31.0	31.0

☒ **Local bias adjustment factor used (confirm by selecting in box)**

☐ **National bias adjustment factor used (confirm by selecting in box)**

☒ **Annualisation has been conducted where data capture is <75% (confirm by selecting in box)**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

C.1 Supporting Technical Information

There have been no significant changes to existing sources in Sefton and no new sources have been identified that would require a change to the monitoring programme since the last air quality report. However, a review of the current monitoring strategy and air quality monitoring equipment in use is currently being undertaken.

No further areas requiring AQMA declaration have been identified and there is no need at present to revoke or amend any AQMAs.

Nitrogen Dioxide Drop Off With Distance Calculations

Diffusion tubes Site ID: NBM NBR NEM recorded a 2016 NO_2 annual mean concentration in exceedance of the air quality objective at a monitoring site which is not representative of public exposure. The concentration at the nearest receptor was estimated using the Defra NO_2 fall off with distance calculator.

QA/QC for Automatic Monitoring

Sefton Council's monitoring network is operated and run by officers who have been trained in all aspects of air quality monitoring, including routine site maintenance, calibration of analysers and data ratification. The QA/QC procedures used are detailed below.

Horiba 360 and 370 series analysers are used for gaseous pollutants and TEOM (VMS corrected) and BAM analysers used for particulates PM_{10}. FIDAS dual Particulate monitor is used for $PM_{2.5}$ PM_{10}

Sefton Council have in place a rigorous QA/QC programme which incorporates the daily screening, by visual examination of all monitoring and calibration data to ascertain if any immediate action is necessary, fortnightly site visits to carry out routine maintenance and calibration checks, equipment maintenance support including breakdown repair and 6 monthly servicing following the manufacturers

recommendations carried out by trained service engineers, 6 monthly QA/QC audits carried out by an external UKAS accredited (RICARDO) field auditor and data validation and ratification of all datasets.

The QA/QC audit independent organisation used must hold UKAS accreditation to ISO 17025 for the on-site calibration of the NO_x gas analysers and for flow rate checks on particulate (PM_{10}) analysers and for the determination of the spring constant, k0, for conventional and TEOM-FDMS instruments. ISO17025 accreditation provides confidence that the analyser calibration factors produced are traceable to national metrology standards, that the calibration methodology is suitable, and that the uncertainties are appropriate for data reporting purposes and ISO17025 accreditation for laboratory certification of NO, NO2, CO and SO2 gas cylinders is also held.
Horiba gas analysers carry out automatic checks every three days for zero and span calibration and Horiba software scales the data of the three-day calibration checks. Monitoring and calibration data from automatic monitors for the previous day(s) are examined on the morning of each working day by an air quality officer to check for spurious or unusual readings, allowing for the identification of anomalies or instrument faults, so they can be investigated and dealt with promptly. The daily checks and zero and span data are recorded on a spreadsheet to identify trends and for future reference and cross checking purposes.

An air quality officer carries out routine site visits every 14 days in accordance with a documented procedure, during which routine maintenance is carried out including the changing of all sample inlet filters. Zero and span calibration checks and gas cylinder pressures checks are also made. Any faults identified are either rectified at the time of the visit or are reported immediately to the instrument supplier service department to arrange an engineer call out.

Sefton Council has a maintenance contract currently with Horiba UK, which includes six monthly servicing intervals and breakdown cover to ensure optimum performance of the analysers throughout the year. External QA/QC audits are carried out at 6 monthly intervals. This work is presently carried out by Ricardo Energy & Environment, who provide a report with recommendations and comments relating to data management as a result of the audit and any necessary action to correct data for long term drift or any other matters which need to be addressed.

Primary data validation (application of calibration factors, screening of data for spurious and unusual measurements) is followed up with a more detailed process known as data ratification, a more rigorous data management procedure involving a critical review of all information relating to a particular dataset, the purpose being to verify, amend or reject as necessary. These methods are given in more detail in DEFRA technical guidance LAQM.TG (16).

PM_{10} Monitoring Adjustment

In 2016 Sefton Council used 3 different instrument types to measure PM_{10}

- Tapered Element Oscillating Microbalance (TEOM) with heated inlet
- Eberline ESM FH 62 IR Beta Attenuation Monitor (BAM) with heated inlet
- Met-One 1020 Beta Attenuation Monitor (BAM) with unheated inlet

The UK PM_{10} Objectives and European Union (EU) limit values are based upon measurements carried out using the European reference sampler, which is a gravimetric device where the particle mass is collected onto a filter and subsequently weighed. This method has a number of disadvantages in that only 24-hour mean concentrations are recorded and the data cannot be disseminated to the public in real time and the operation is labour intensive. Historically TEOM analysers have been predominantly used in the UK, however other samplers are also used such as BAM's. A significant problem with instruments using heated inlets is the loss of semi-volatile components when heated to drive off excess moisture. A default correction factor of 1.3 was recommended to be applied to the data of analysers using heated inlets in order to generate a nominal 'gravimetric-equivalent' result. However for TEOM data the guidance is now to use the volatile correction model (VCM) which uses the Filter Dynamics Measurement System (FDMS) 'purge measurement' as an indicator of the volatile component of PM_{10} and is based on the assumption that the volatile component of PM_{10} lost during the heated sampling with a standard TEOM is consistent across a defined geographical area, such that the measurements of this component at one location may be used to correct measurements at another. A VCM web portal allows local authorities to download geographically specific correction factors to apply to TEOM PM_{10} results.

The technical guidance also recommends that Met-One BAM (with unheated inlets) measured concentrations reported at standard conditions be divided by a factor of 1.2.

The following PM_{10} adjustment factors were used and have been applied to the measured PM_{10} concentrations contained in this report.

- TEOM data pre 2008 – multiplied by 1.3
- TEOM data 2008 onwards – Volatile Correction Model (VCM) used (and x 1.3 factor also used for comparative purposes)
- Eberline Beta Attenuation Monitor (BAM) data – multiplied by 1.3
- Met-One Beta Attenuation Monitor (BAM) data – divided by 1.2

QA/QC for Non - Automatic Monitoring, Nitrogen Dioxide Diffusion Tubes

Sefton Council use a large number of passive nitrogen dioxide diffusion tubes to monitor NO_2 throughout the Borough, the majority of which form part of its in-house monitoring programme and the remainder are used for the Community Air Watch programme.

The tubes are currently prepared and analysed by Gradko International Limited, St Martins House, 77 Wales Street, Winchester, Hampshire,
SO23 0RH. Gradko are amongst the market leaders in the preparation, supply and analysis of NO_2 diffusion tubes. Gradko representatives participated and provided input into the working group on the harmonisation of diffusion tubes set up to manage the process of harmonisation of NO_2 tube preparation and analysis methods. The diffusion tubes used are prepared by making up a solution of 20% Triethanolamine (TEA) solution and 80% deionised water. The grey caps are loaded with two stainless steel mesh grids onto which is pipetted 50μL of 20%TEA/water. The tube is then fully assembled and stored under refrigerated conditions ready for use. On receipt the unexposed tubes are stored in a refrigerator prior to and following exposure and then returned to Gradko for analysis. A travel blank is also used to identify possible contamination of diffusion tubes while in transport or storage. Analysis is carried out in accordance with Gradko's documented UKAS accredited in-

house laboratory method GLM7 and follows the harmonisation practical guidance for diffusion tube.

Gradko participate in AIR, an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL Workplace Analysis Scheme for Proficiency (WASP) PT scheme.

NO_2 Diffusion Tube Bias Adjustment Factors

Diffusion tubes may exhibit substantial under or over estimation compared with the reference chemiluminescence method, due to factors in the field affecting performance, such as wind induced shortening of the effective diffusive path length, that are not related to the laboratory's preparation or analysis of the tubes.

Sefton carry out their own co-location study to account for this. Prior to 2009 this was carried out at a single site by exposing three diffusion tubes alongside the automatic chemiluminescence analyser at St Joan of Arc School, Bootle and comparing the results of the two techniques to derive a bias adjustment factor which is then applied to all diffusion tube annual means so they may be compared with air quality objectives.

This was extended to also include three roadside automatic monitoring sites, in addition to the St Joan of Arc School site, which is an urban background site, in 2009 and then further extended to five study sites in 2011 with the addition of the roadside site at Hawthorne Road. The St Joan of Arc site was discontinued in 2015 and relocated to Crosby Road South, Seaforth in April 2015. As the latter site did not record a full calendar year of data in 2015 this was not used in deriving the 2015 bias adjustment factor. The automatic monitoring stations that were used to derive the 2016 bias adjustment factor are shown in **Table C.1**.

Table C.1 – Nitrogen Dioxide Diffusion Tube Bias Adjustment Factor derived from Automatic Monitoring Sites in Sefton 2016

Automatic Monitoring Station Site used in Co-Location Study	NO_2 Diffusion Tube Bias Adjustment Factor 2016
CM 2 Crosby Road North, Waterloo (roadside)	0.776
CM 3 Millers Bridge, Bootle (roadside)	0. 853
CM 4 Lathom Close, Princess Way, Seaforth (roadside)	0.894
CM 5Hawthorne Road (roadside)	0. 907
CM6 Crosby road south	0. 828
Overall Bias Adjustment Factor	**0.851**

Appendix D: Map(s) of Monitoring Locations and AQMAs

D.1 Automatic Monitoring Sites

Sefton Council carries out air quality monitoring using continuous automatic monitors for the pollutants nitrogen dioxide (NO_2) and particulate matter PM_{10}. Continuous automatic monitoring for sulphur dioxide (SO_2) recommenced at one new site in 2015, due to concerns about this pollutant in relation to shipping and port expansion.

Sefton has five automatic monitoring stations. In 2016 these were located at:

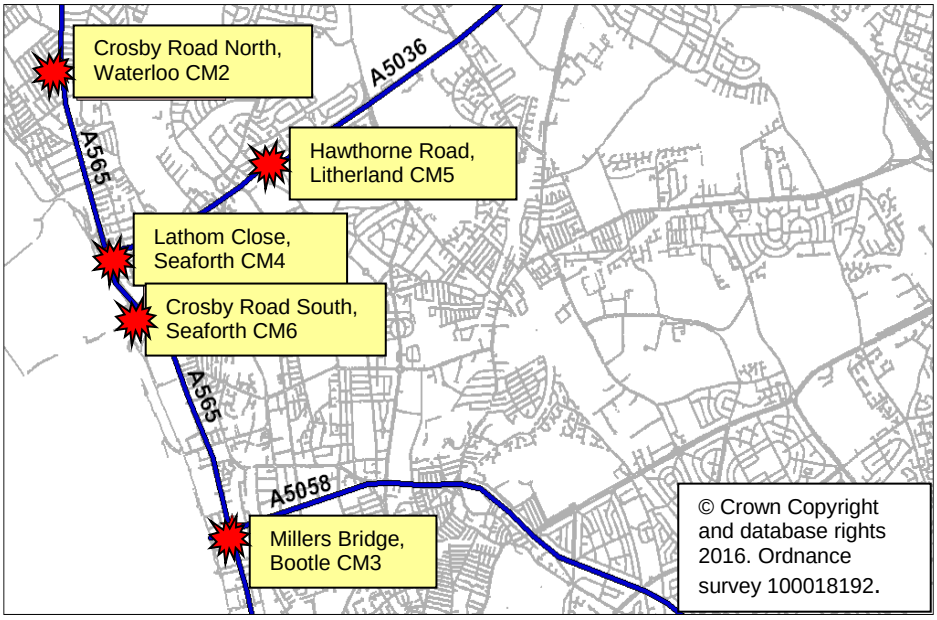
- Waterloo Primary School, Crosby Road North, Waterloo (Site ID: CM2).
- Millers Bridge, Bootle (Site ID: CM3).
- Princess Way, Lathom Close, Seaforth (Site ID: CM4).
- Hawthorne Road, Litherland . (Site ID: CM5).
- Crosby Road South, Seaforth (Site ID: CM6).*

*Note: the former St Joan of Arc, Bootle site (Site ID: CM1) was discontinued early in 2015 due to planning approval for a housing development on this site and the station was consequently moved and relocated to a new site at Crosby Road South, Seaforth (Site ID: CM6) in April 2015.

Data obtained since monitoring commenced in 1996 has shown non-compliance with air quality objectives to be in the south of the Borough and as such the automatic monitors are now concentrated in this area of the Borough in the Bootle/ Seaforth/ Litherland and Waterloo areas near to busy junctions at the A565, A5058 and. A5036. The monitoring location positions relative to each other are shown in **Figure D.1**.

Maps of the monitoring locations are shown in **Figures D.2** to **D.11**.

Figure D.1 – Automatic Monitoring Locations in Sefton in 2016



(Note: Monitoring at Crosby Road South, Seaforth site only commenced in April 2015).

Waterloo Primary School, Crosby Road North, Waterloo

Site Type: Roadside. **Within AQMA?** – No.
Grid Reference: 332175, 398475. **Site ID**: CM2.
Location: Next to the busy A565 Crosby Road North Waterloo situated outside Waterloo Primary School, in a residential and shopping area. This section of the A565 carries commuter traffic to and from Liverpool but also a considerable amount of local traffic to offices and shops in the Waterloo area.
Pollutants monitored: Fine particles (PM_{10}) and oxides of nitrogen.
Date Monitoring Commenced: August 2001 to present.

Figure D.2 – Map showing the Location of the Crosby Road North Monitoring Station

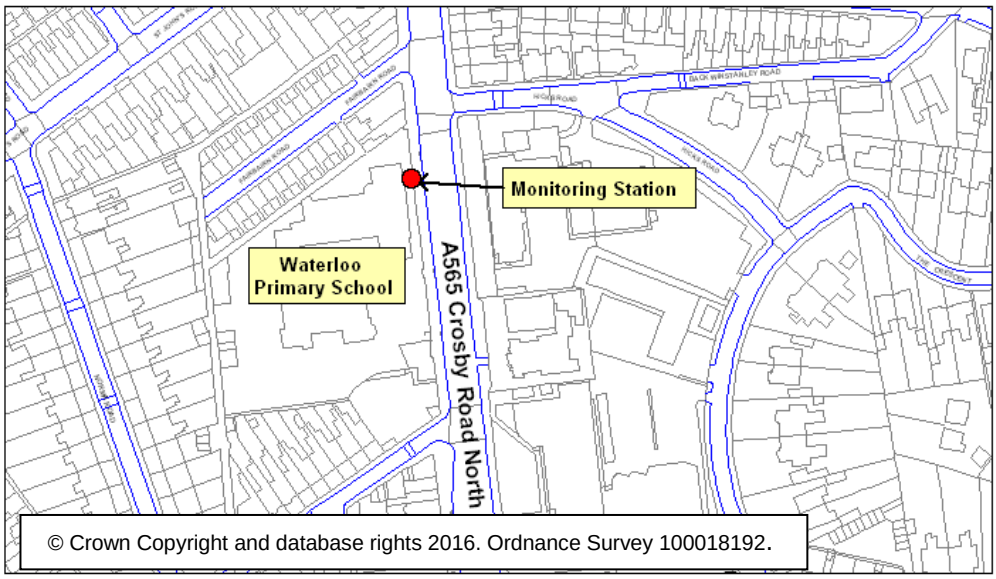
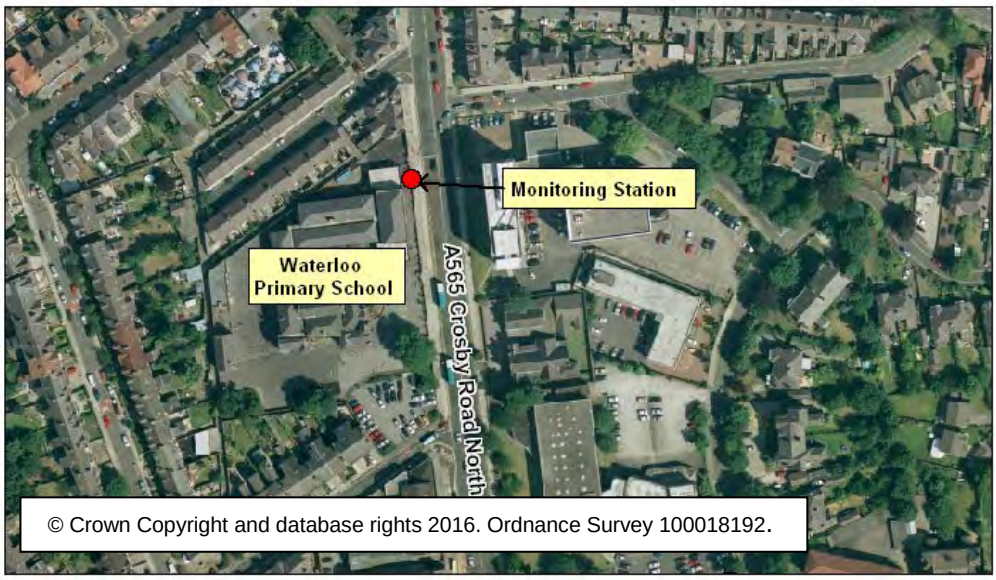


Figure D.3 – Aerial Photograph of the Location of the Crosby Road North Monitoring Station



Millers Bridge, Bootle

Site Type: Roadside. **Within AQMA?** – Yes, declared for both NO_2 **and** PM_{10}.
Grid Reference: 333772, 394603. **Site ID**: CM3.
Location: Situated at the busy junction of Derby Road (A565) and Millers Bridge (A5058) in close proximity to residential property on Derby Road to the north and Douglas Place to the south. The junction is influenced by commuter traffic and high numbers of HGVs. This site is also influenced by fugitive emissions from activities on the Port of Liverpool to the northwest.
Pollutants Monitored: Fine particles (PM_{10}) and oxides of nitrogen.
Date Monitoring Commenced: October 2006 to present.

Figure D.4 – Map showing the Location of the Millers Bridge Monitoring Station

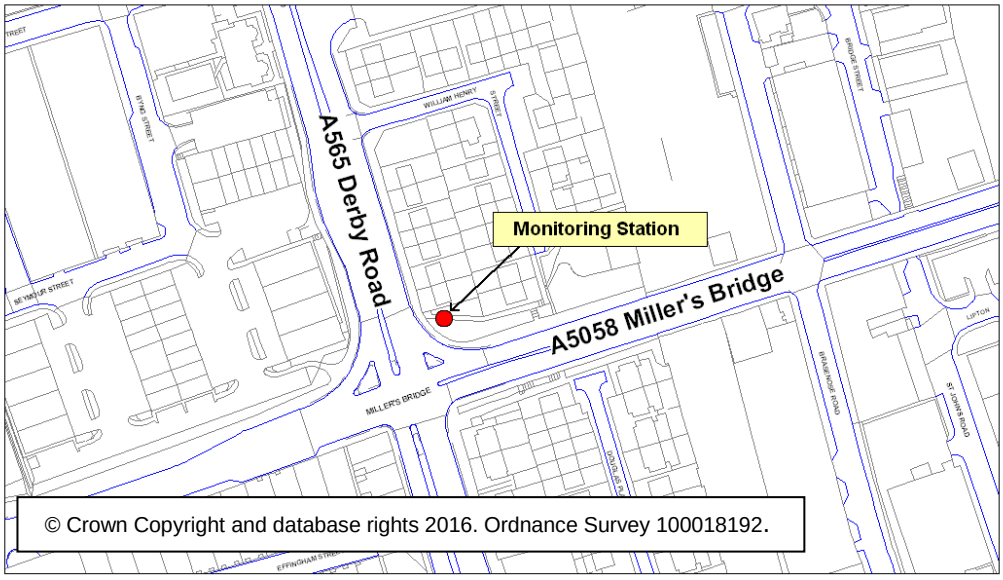


Figure D.5 – Aerial Photograph of the Location of the Millers Bridge Monitoring Station

Lathom Close, Princess Way, Seaforth

Site Type: Roadside. **Within AQMA?** – Yes, declared for NO_2 only.
Grid Reference: 332647, 396940. **Site ID**: CM4.
Location: Situated at Lathom Close, Seaforth next to the roundabout where the A5036 Princess Way meets the A565 Crosby Road South. This site is influenced by the high numbers of HGVs which use the A5036 travelling to and from the Port of Liverpool.
Pollutants monitored: Fine particles (PM_{10}) and oxides of nitrogen.
Date Monitoring Commenced: February 2007 for oxides of nitrogen and February 2008 for PM_{10} to present.

Figure D.6 – Map showing the Location of the Lathom Close, Princess Way, Monitoring Station

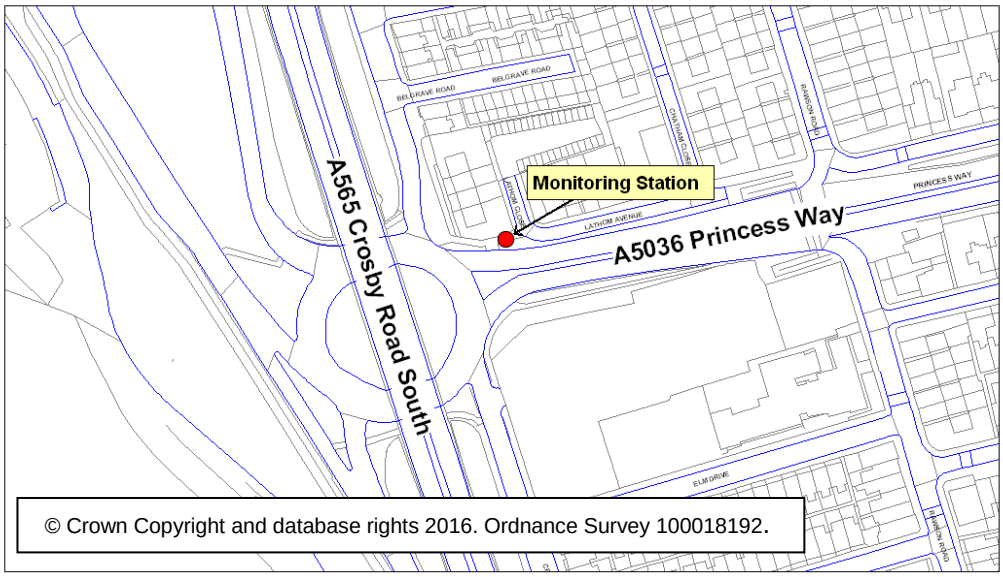


Figure D.7 – Aerial Photograph of the Location of the Lathom Close, Princess Way, Monitoring Station

Hawthorne Road, Litherland

Site Type: Roadside. **Within AQMA?** – Yes, declared for NO_2 only.
Grid Reference: 333821, 397512. **Site ID**: CM5.
Location: Situated at Hawthorne Road, Litherland, at the junction of the A5036 Church Road with the B5422 Hawthorne Road, opposite KFC fast food restaurant and near to a Tesco superstore. The junction is influenced by commuter traffic and high numbers of HGVs.
Pollutants monitored: Oxides of nitrogen only.
Date Monitoring NO_2 Commenced: June 2010 to present.

Figure D.8 – Map showing the Location of the Hawthorne Road, Litherland Monitoring Station

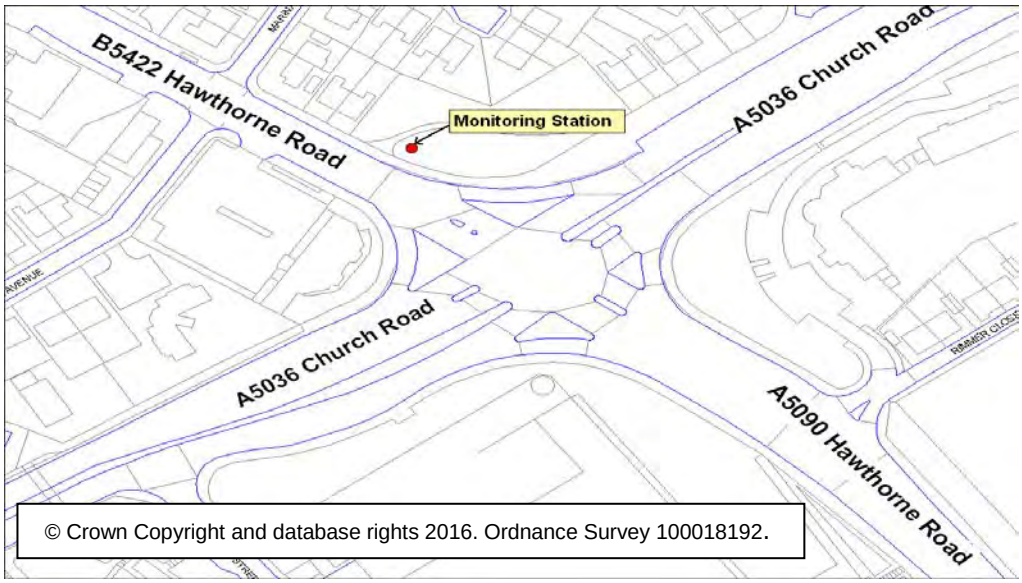
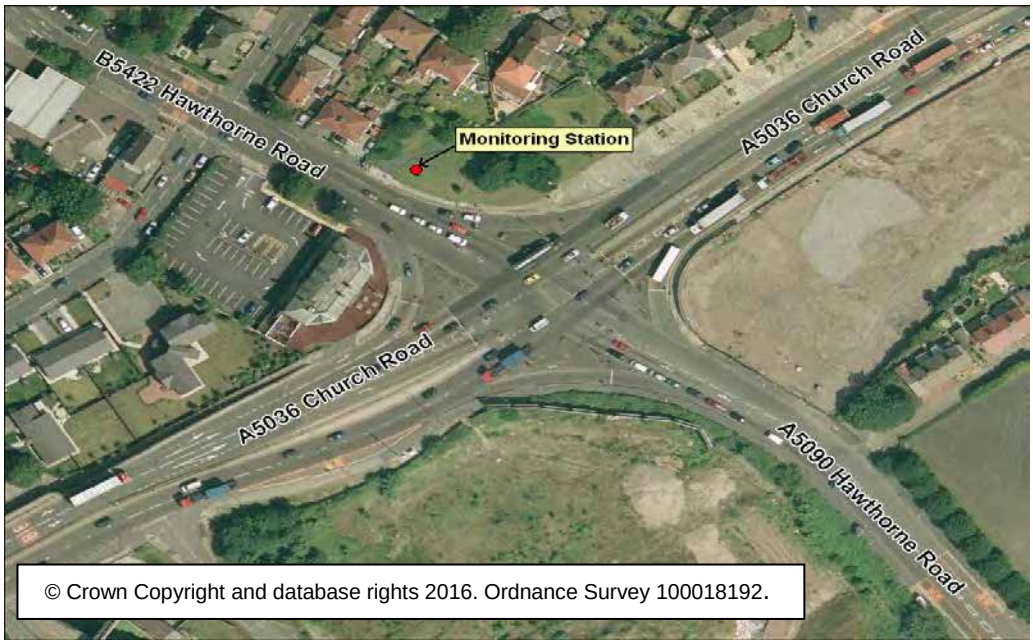


Figure D.9 – Aerial Photograph of the Location of the Hawthorne Road Monitoring Station



Crosby Road South, Seaforth

Site Type: Urban background. **Within AQMA?** – No.
Grid Reference: 332871, 396550. **Site ID**: CM6.
Location: Situated on the A565 Crosby Road South in line with residential property in Verdi Street and opposite the Port of Liverpool with Dacsa Ltd, Seaforth Corn Mills being directly opposite and near the approach to the Seaforth entrance of the port.
Pollutants monitored: Fine particles (PM_{10}), oxides of nitrogen and sulphur dioxide.
Date Monitoring NO_2 Commenced: April 2015 to present.

Figure D.10 – Map showing the Location of the Crosby Road South Monitoring Station

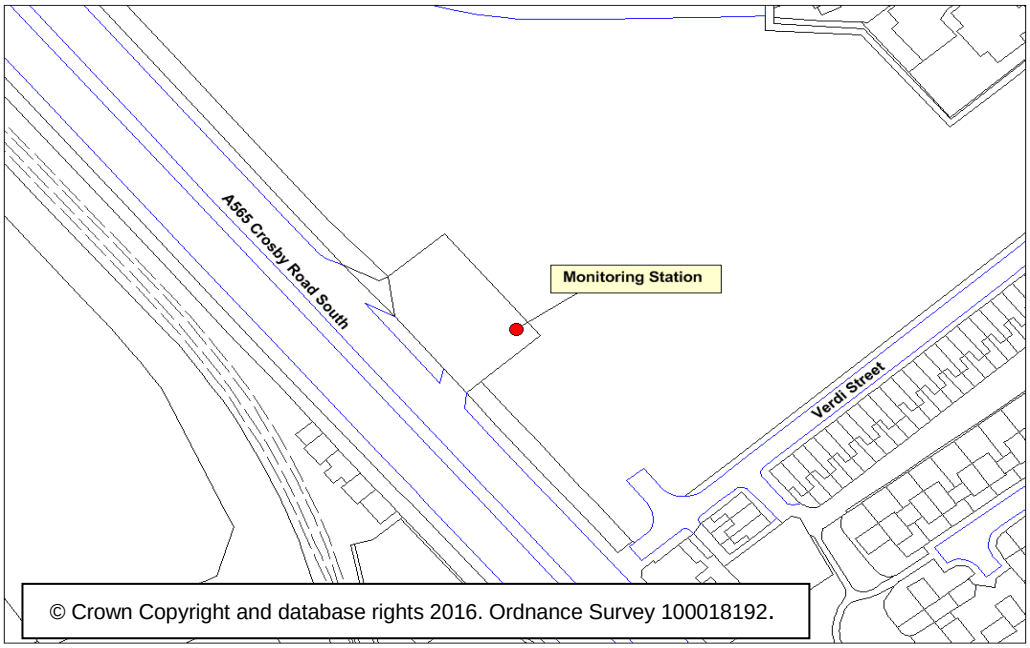
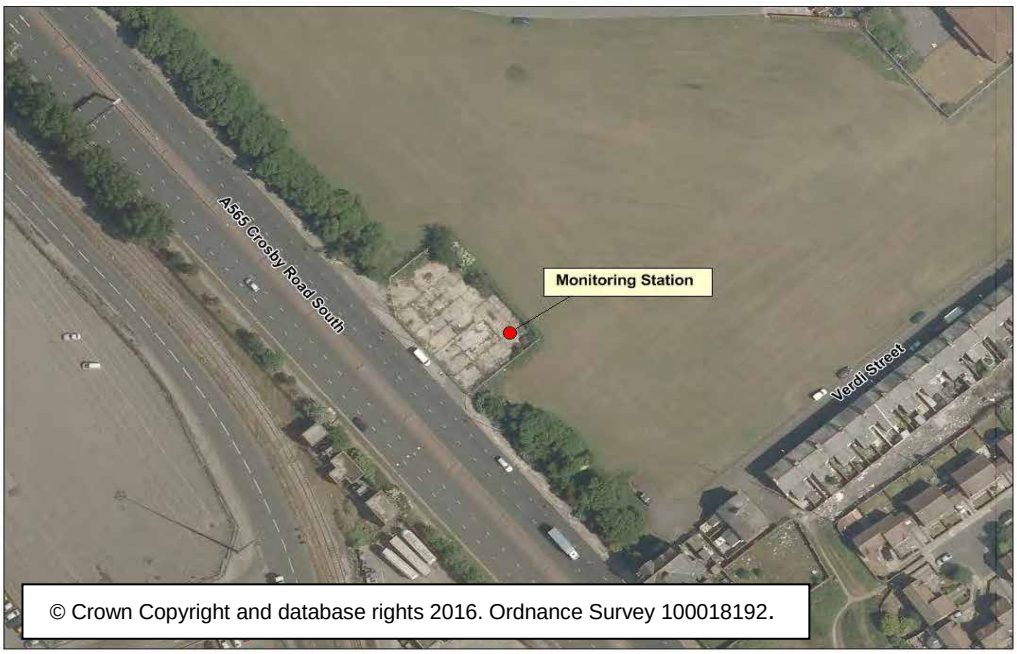


Figure D.11 – Aerial Photograph of the Location of the Crosby Road South Monitoring Station



D.2 Maps of Diffusion Tube Monitoring Locations

Non-automatic monitoring for nitrogen dioxide using nitrogen dioxide diffusion tubes is also carried out. Sefton Council has approximately 100 diffusion tubes deployed throughout the Borough. These are split between an in-house monitoring programme, co-locations studies and the Community Air Watch scheme. Maps showing the locations of diffusion tubes are shown in **Figures D.12** to **D.28**.

Figure D.12 – Diffusion Tube Locations Bootle. SIte ID:NDX, NEK, NEL, NC10, NC11 & NC82

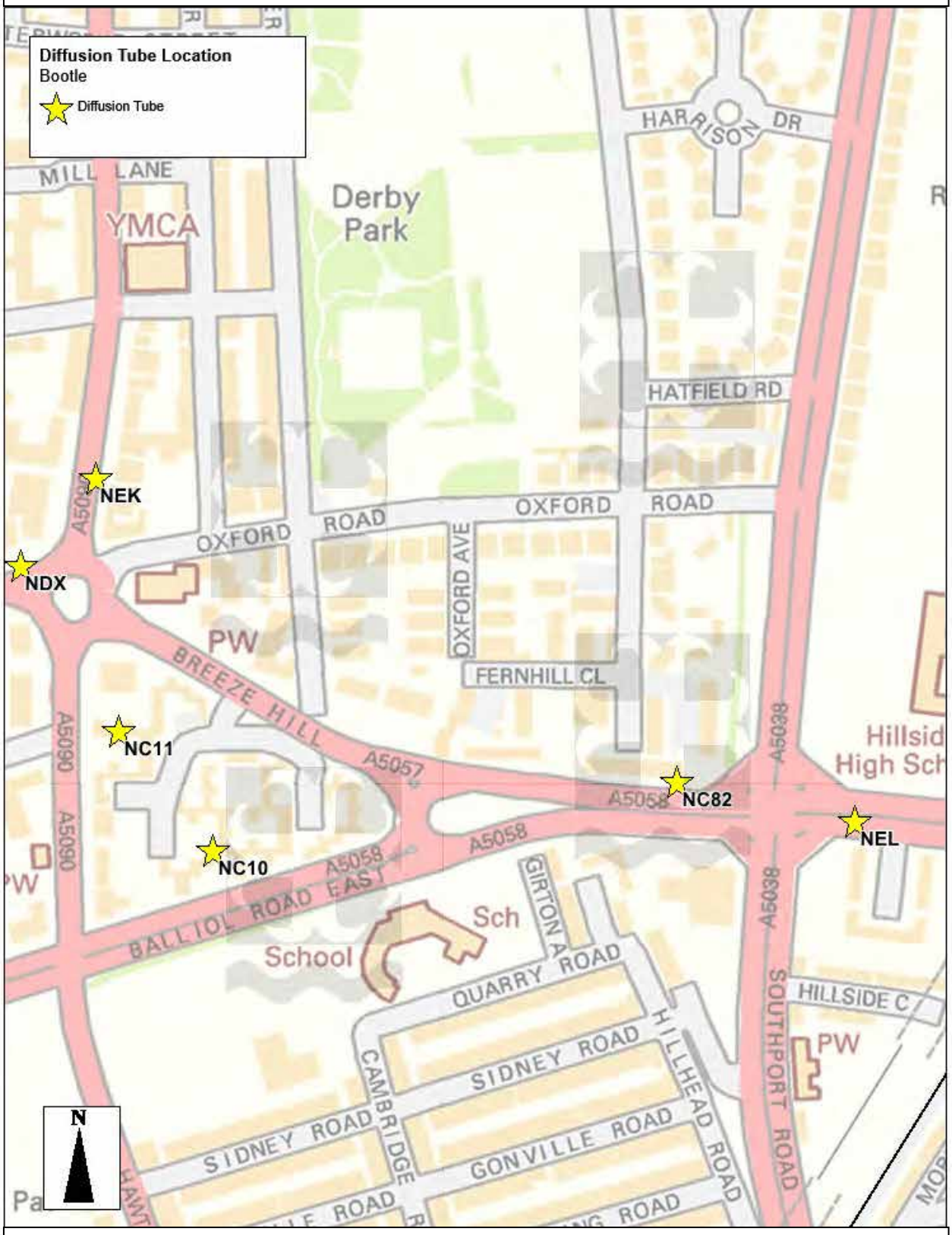


Figure D.13 – Diffusion Tube Locations Bootle. Site ID: NAW, NDN, & NC14

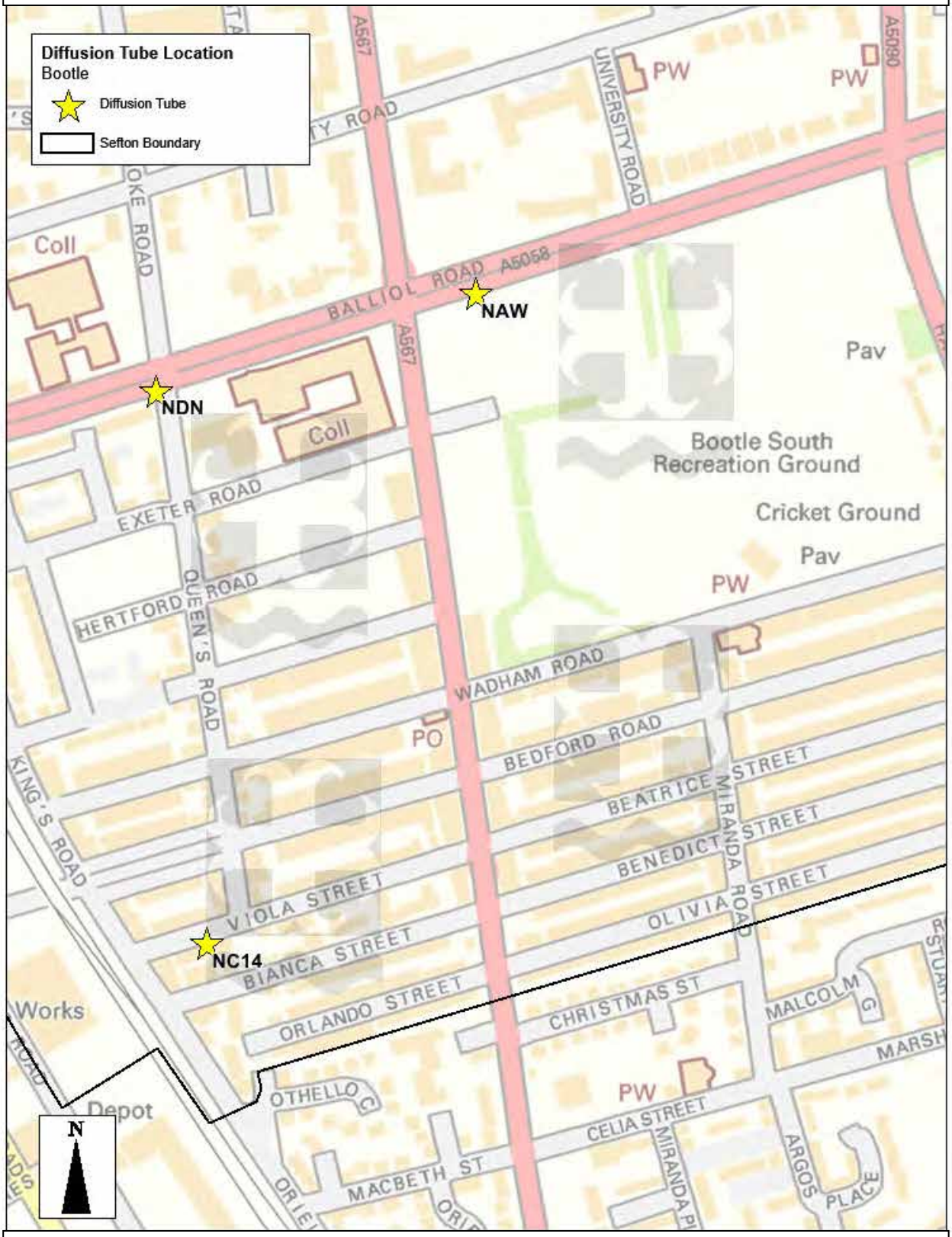


Figure D.14 – Diffusion Tube Locations Bootle. Site ID: NBM, NBO, NBQ, NBR, NBS, NCZ, NDM & NEM

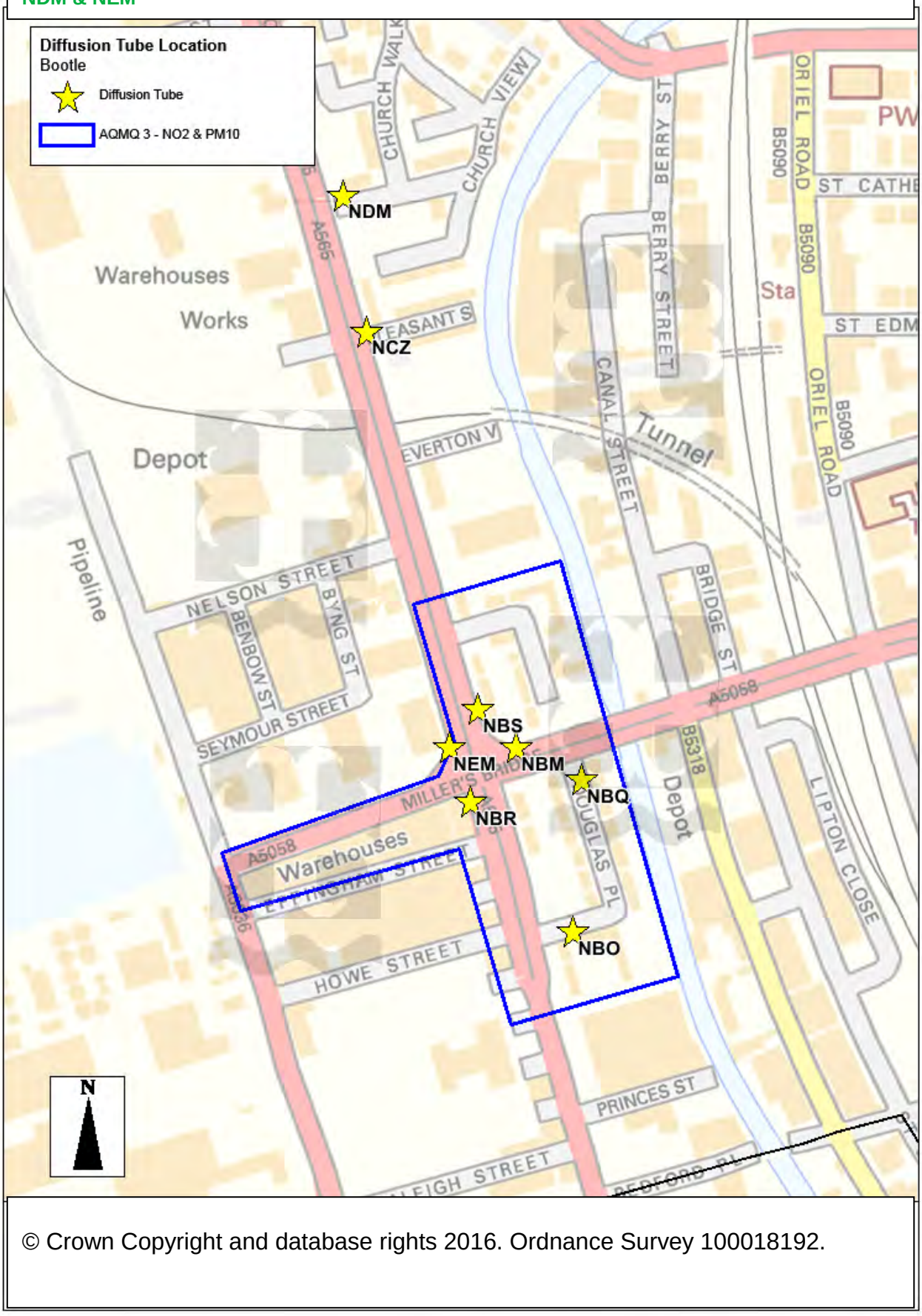


Figure D.15 – Diffusion Tube Locations Bootle. Site ID: NBL & NDC

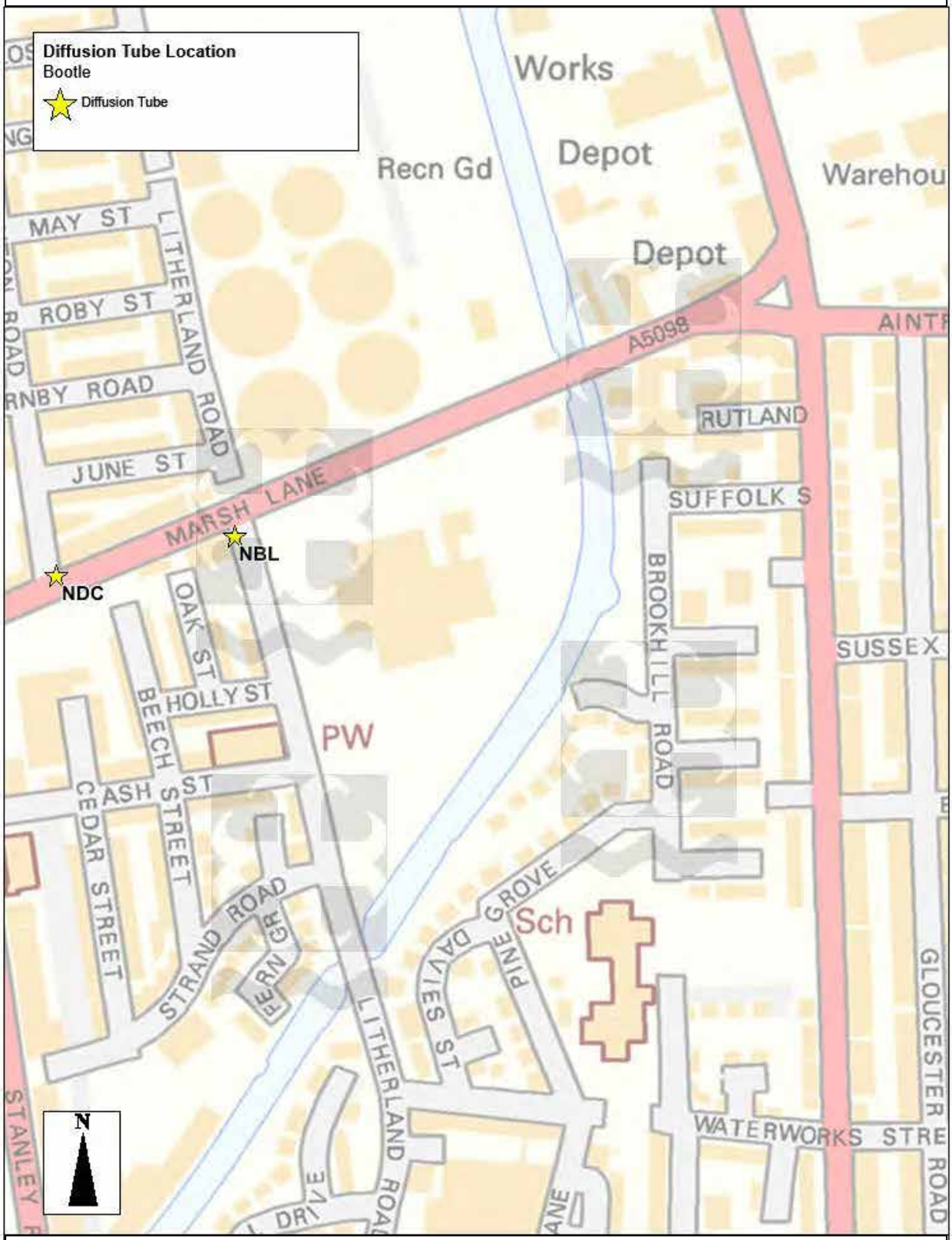


Figure D.16 – Diffusion Tube Locations Bootle. Site ID: NDO

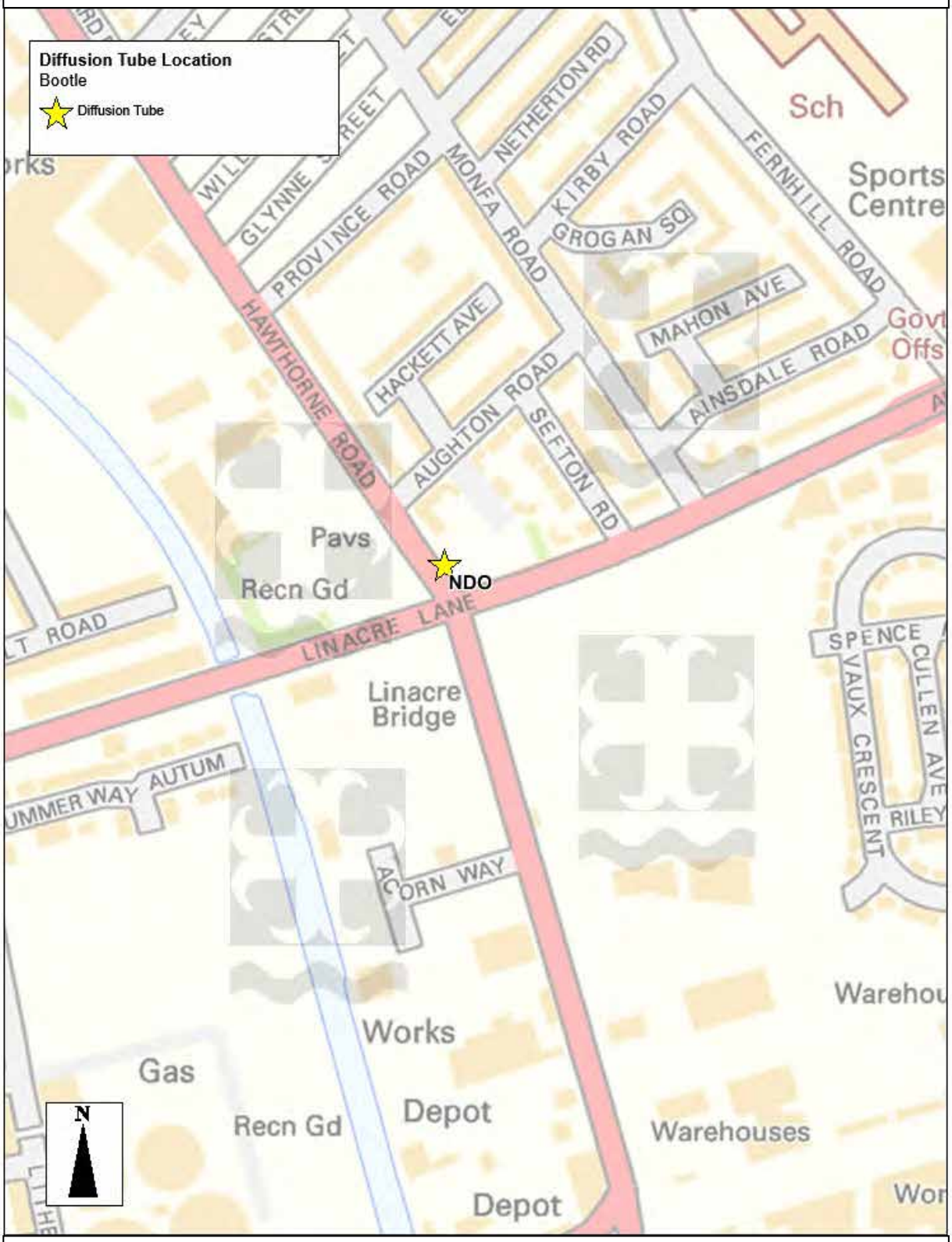


Figure D.17 – Diffusion Tube Locations Seaforth. Site ID: NW, NBW, NCR, NCY, NDP, NDQ, NER, NES, NEV, NEW, NEX, NEY, NEZ, NC 86 & NC112

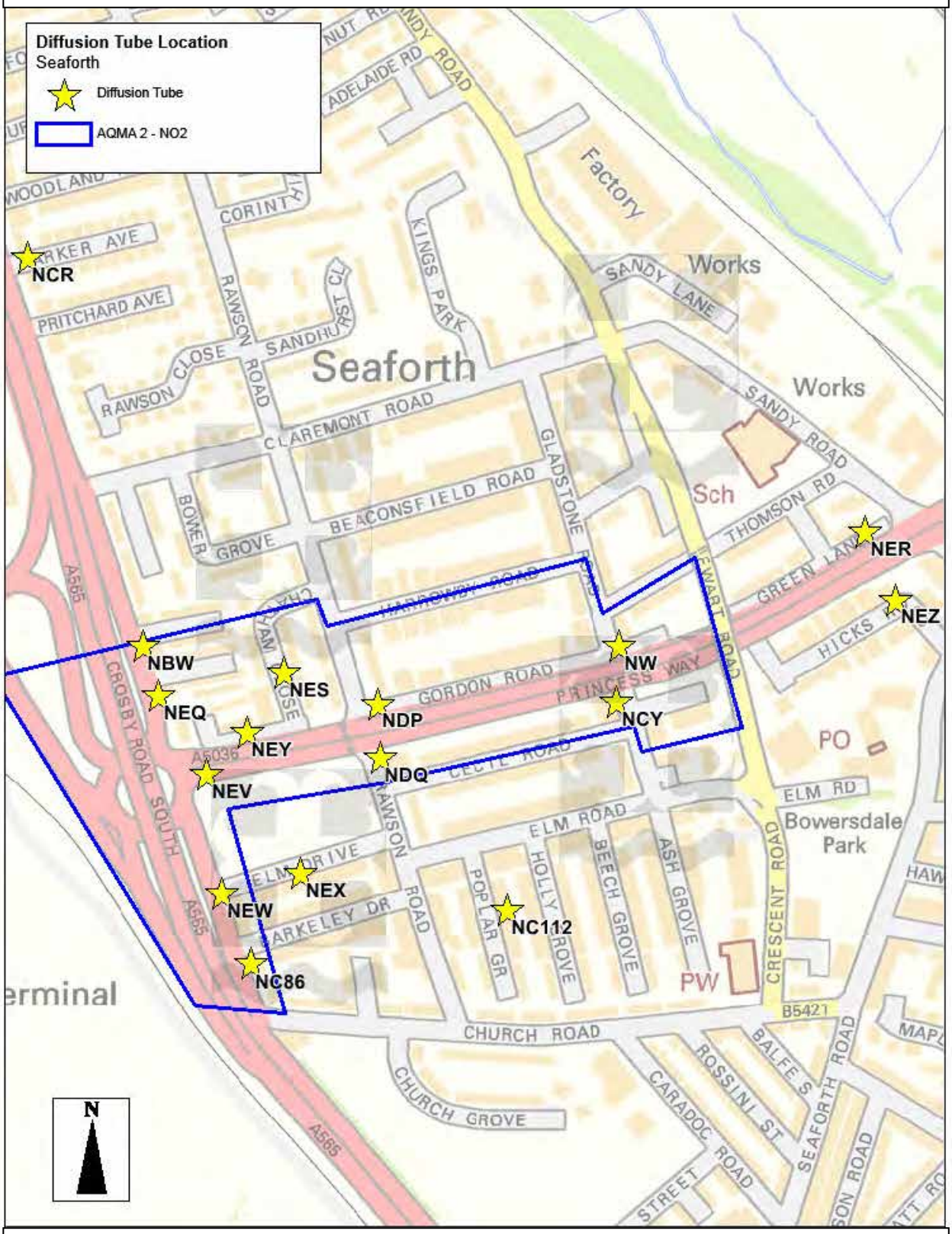


Figure D.18 – Diffusion Tube Locations Litherland. Site ID: NBB, NCI, NCU, NDD, NDE, NDF, NDG, NEN, NEO, NEP, NFA & NC28

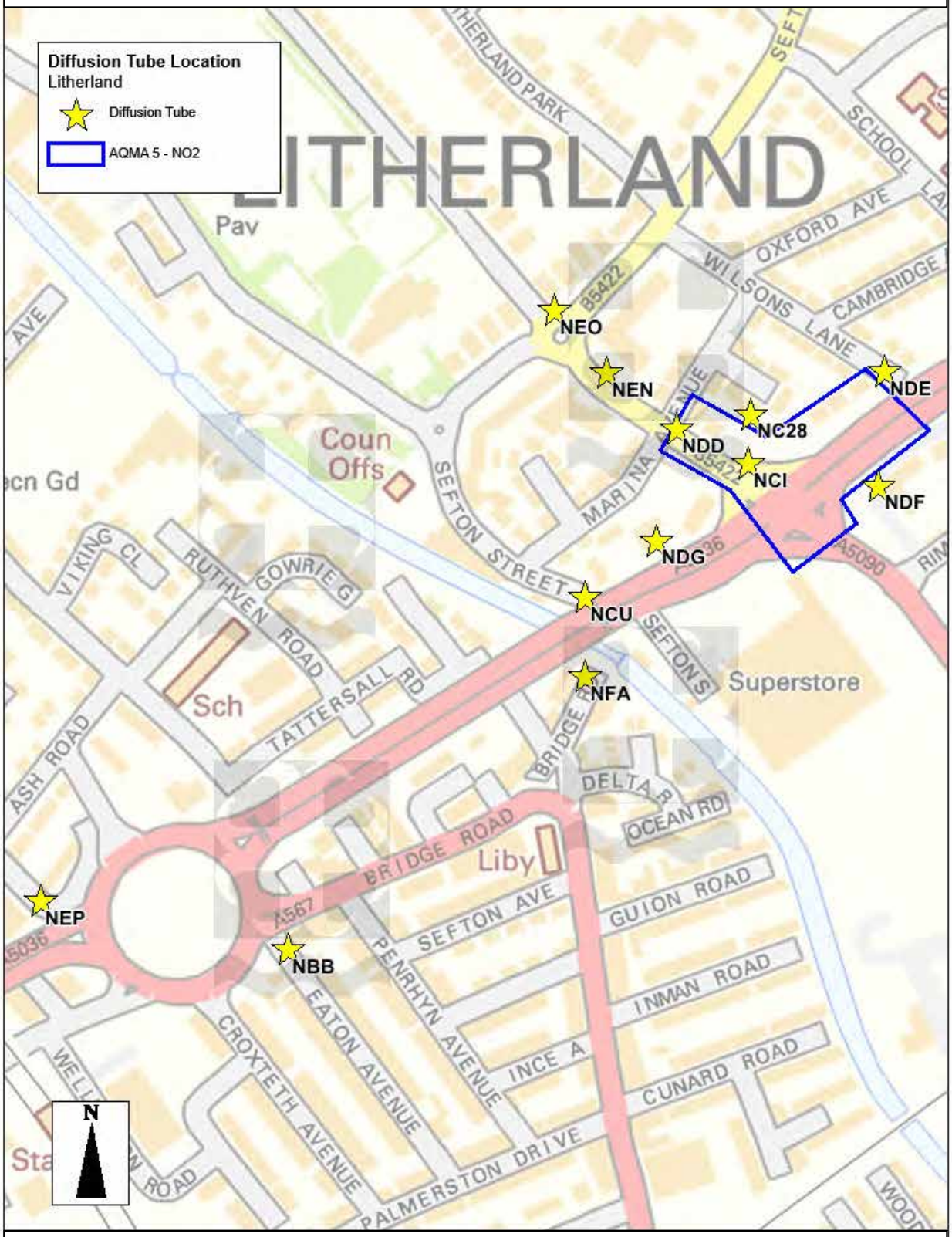


Figure D.19 – Diffusion Tube Locations Litherland/Netherton. Sire ID: NDW, NDX, NFB, NFC, NFD, NFE, NFF, NFH, NFJ & UK2

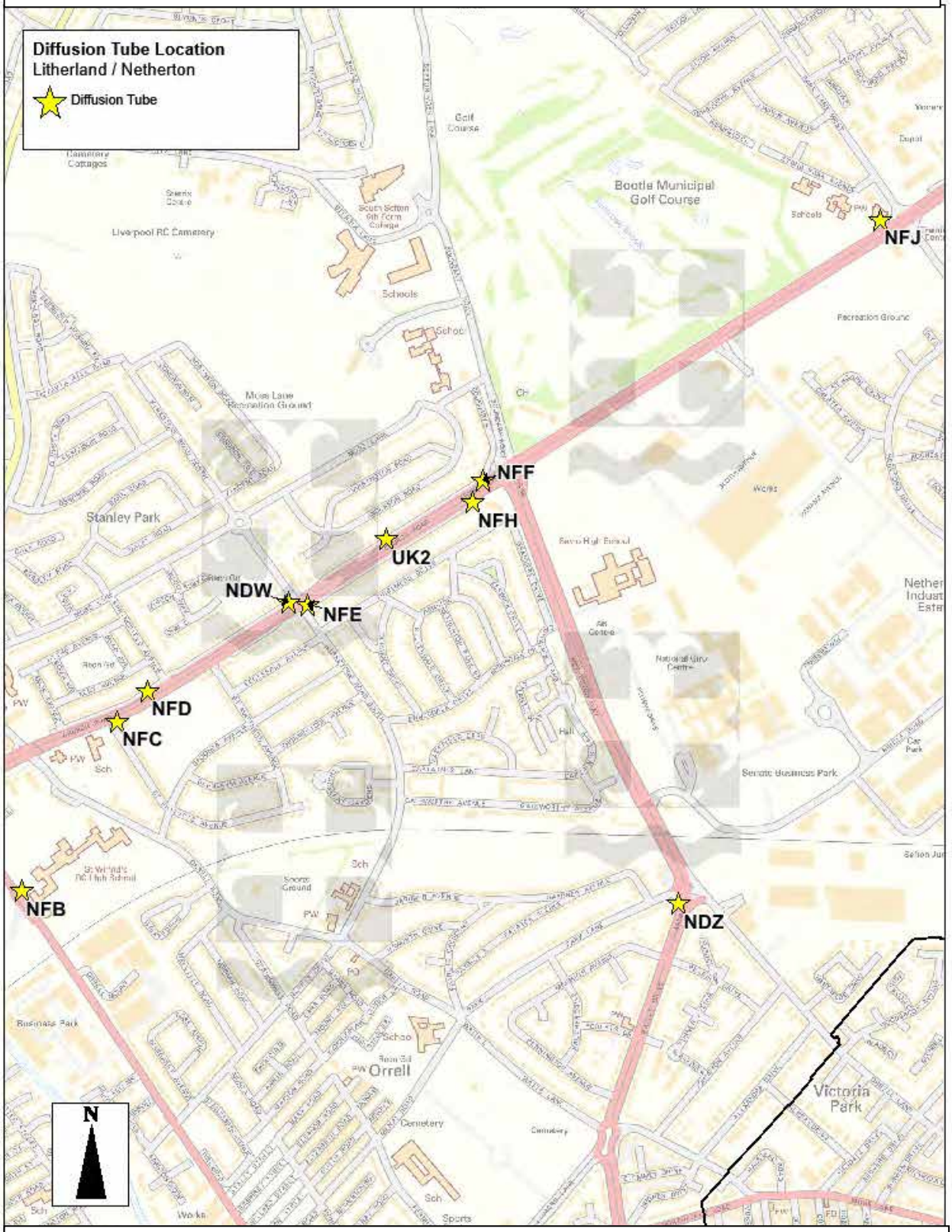


Figure D.20 – Diffusion Tube Locations Netherton. Site ID: NFG, NFJ & NC83

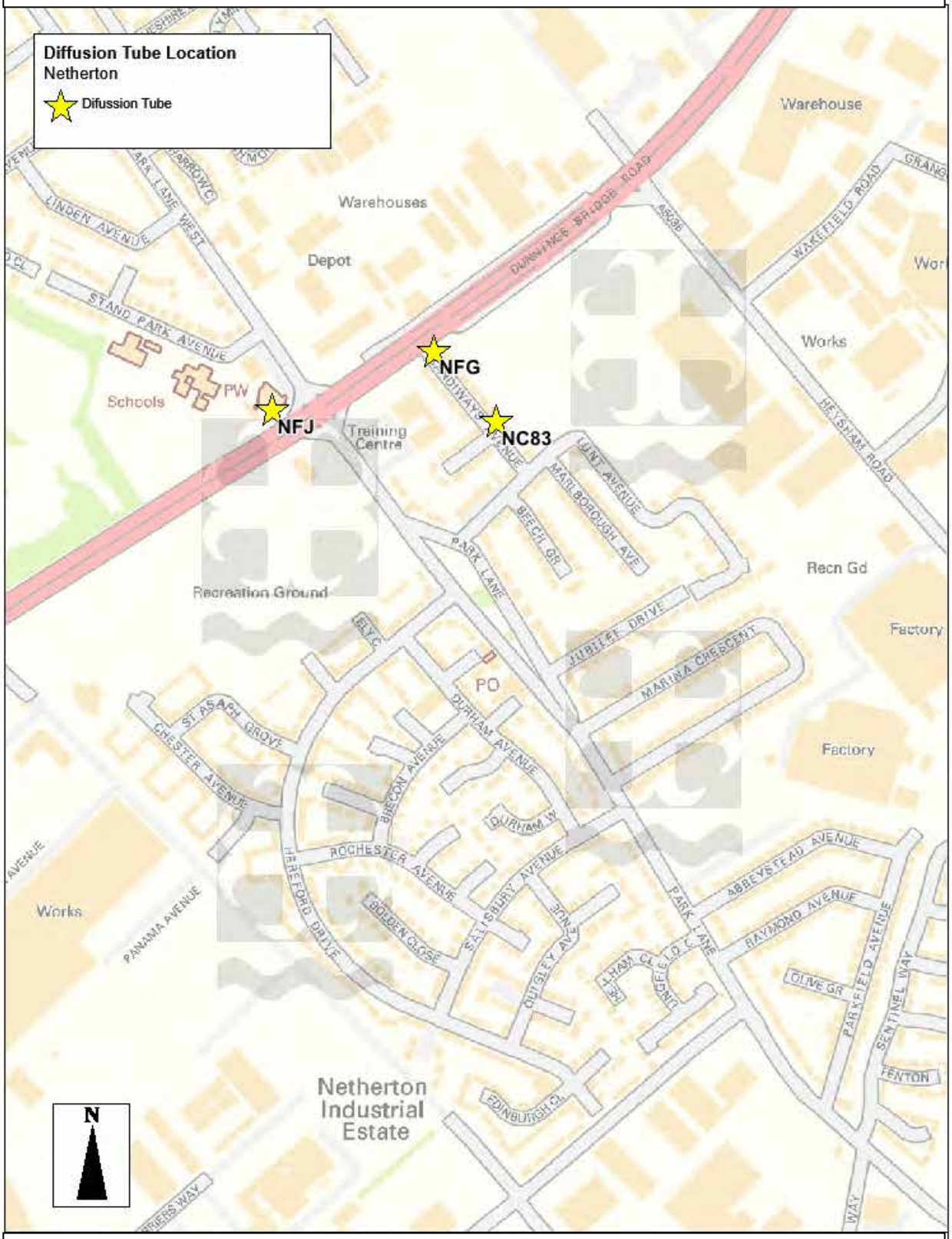


Figure D.21 – Diffusion Tube Locations Netherton/Old Roan. Site ID: NEA, NEB, NEC, NED, NEE. NEF & NEG

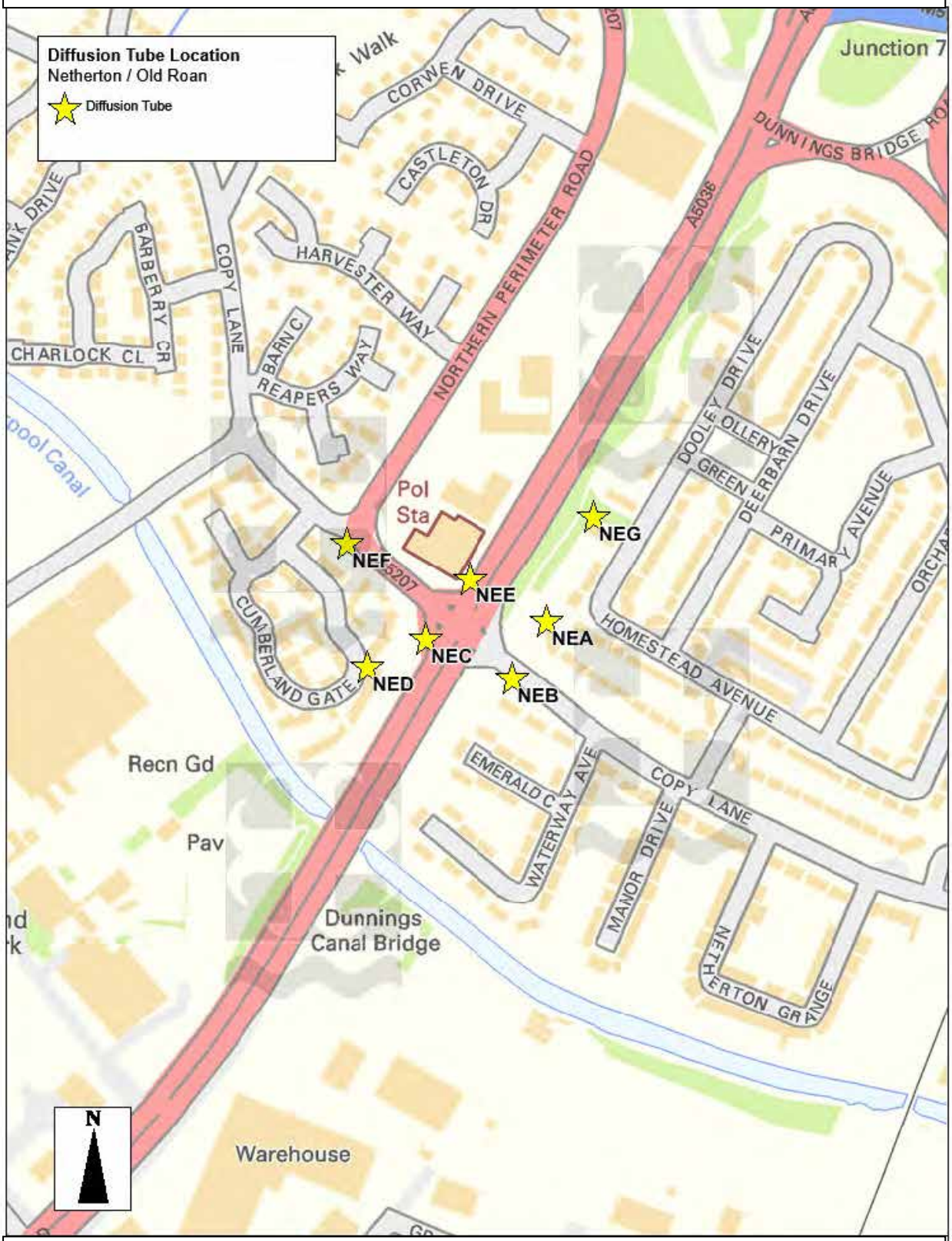


Figure D.22 – Diffusion Tube Locations Netherton. Site ID: NC51

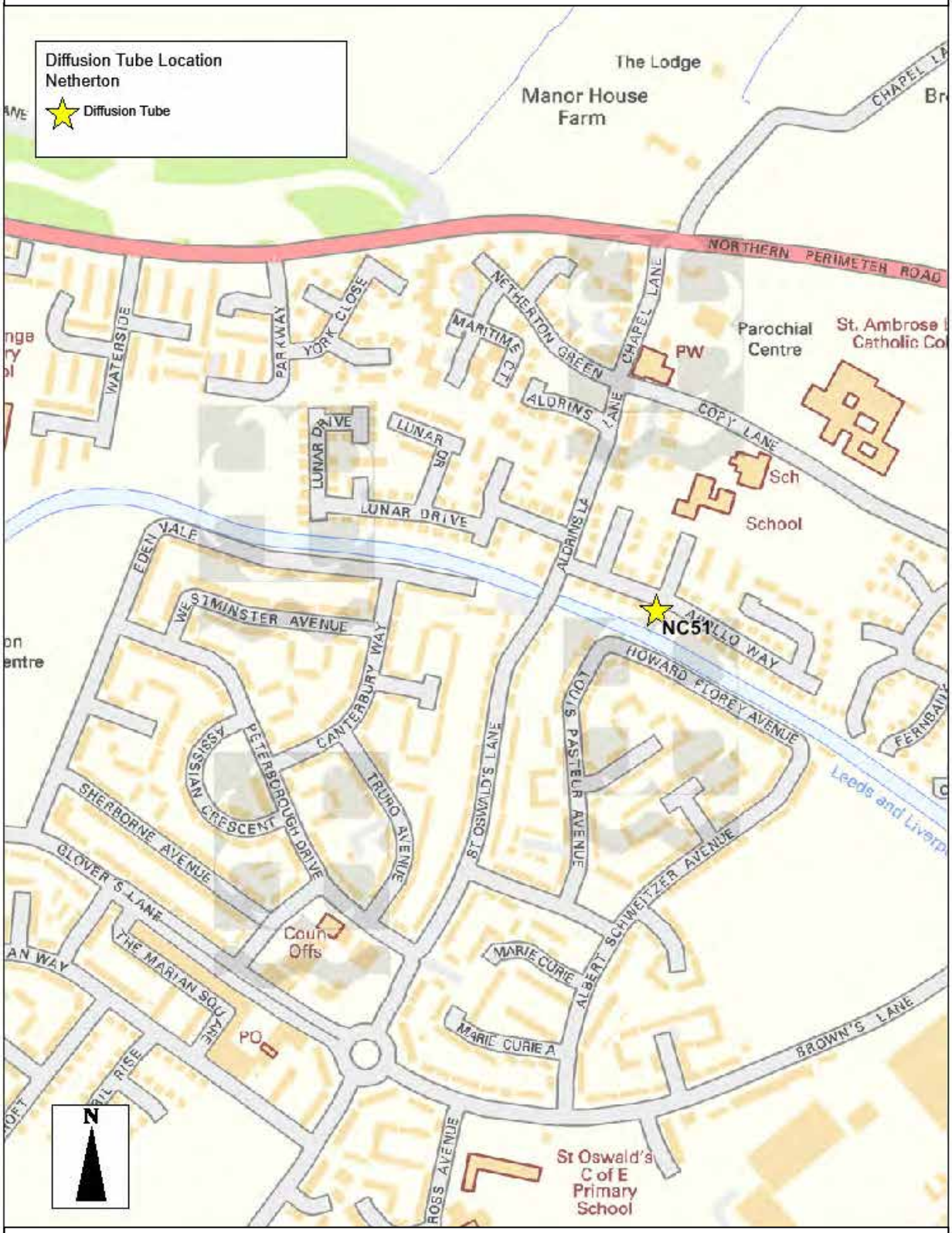


Figure D.23 – Diffusion Tube Locations Crosby. Site ID: NDV

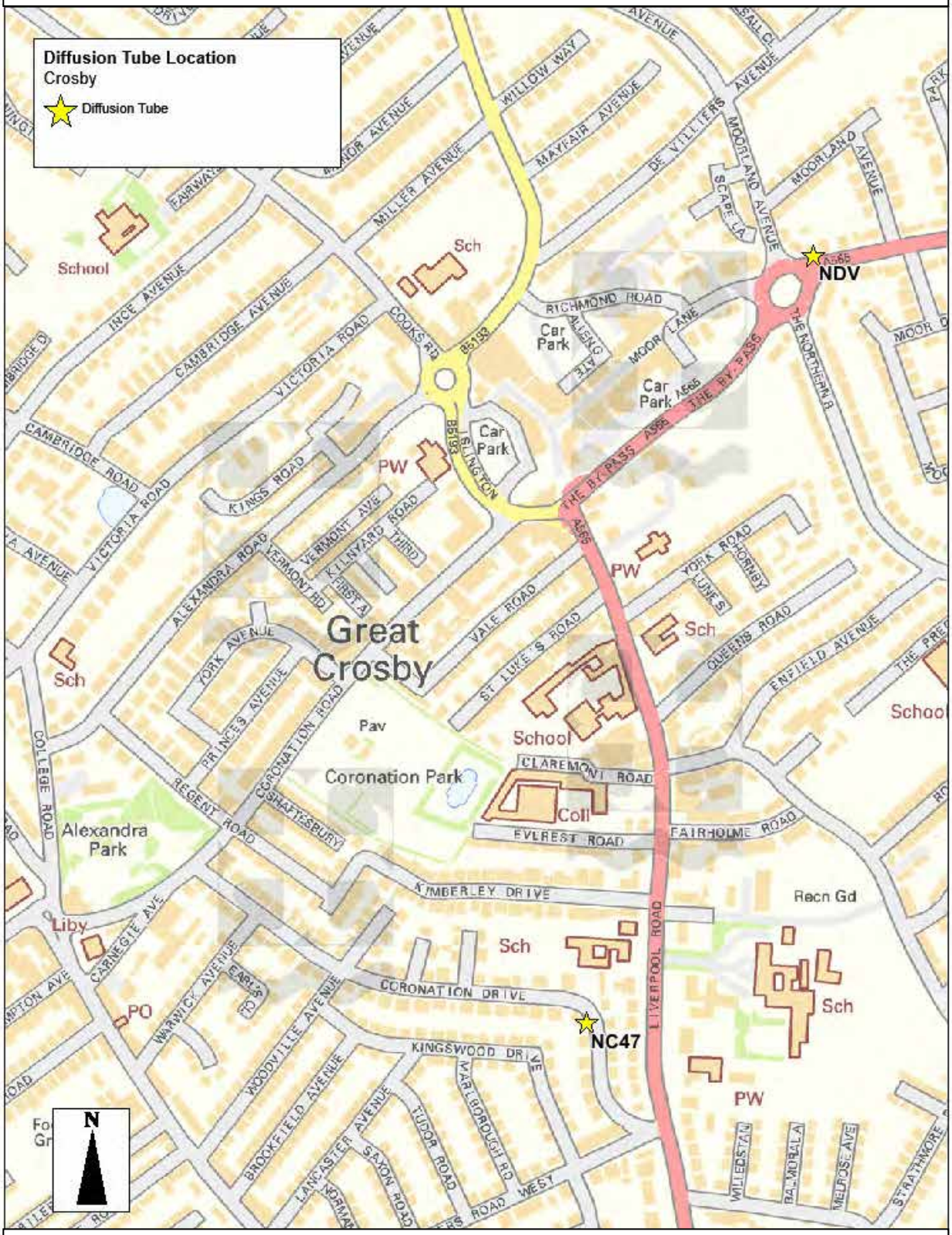


Figure D.24 – Diffusion Tube Locations Waterloo. Site ID: NDR, NDT, NDU & UK4

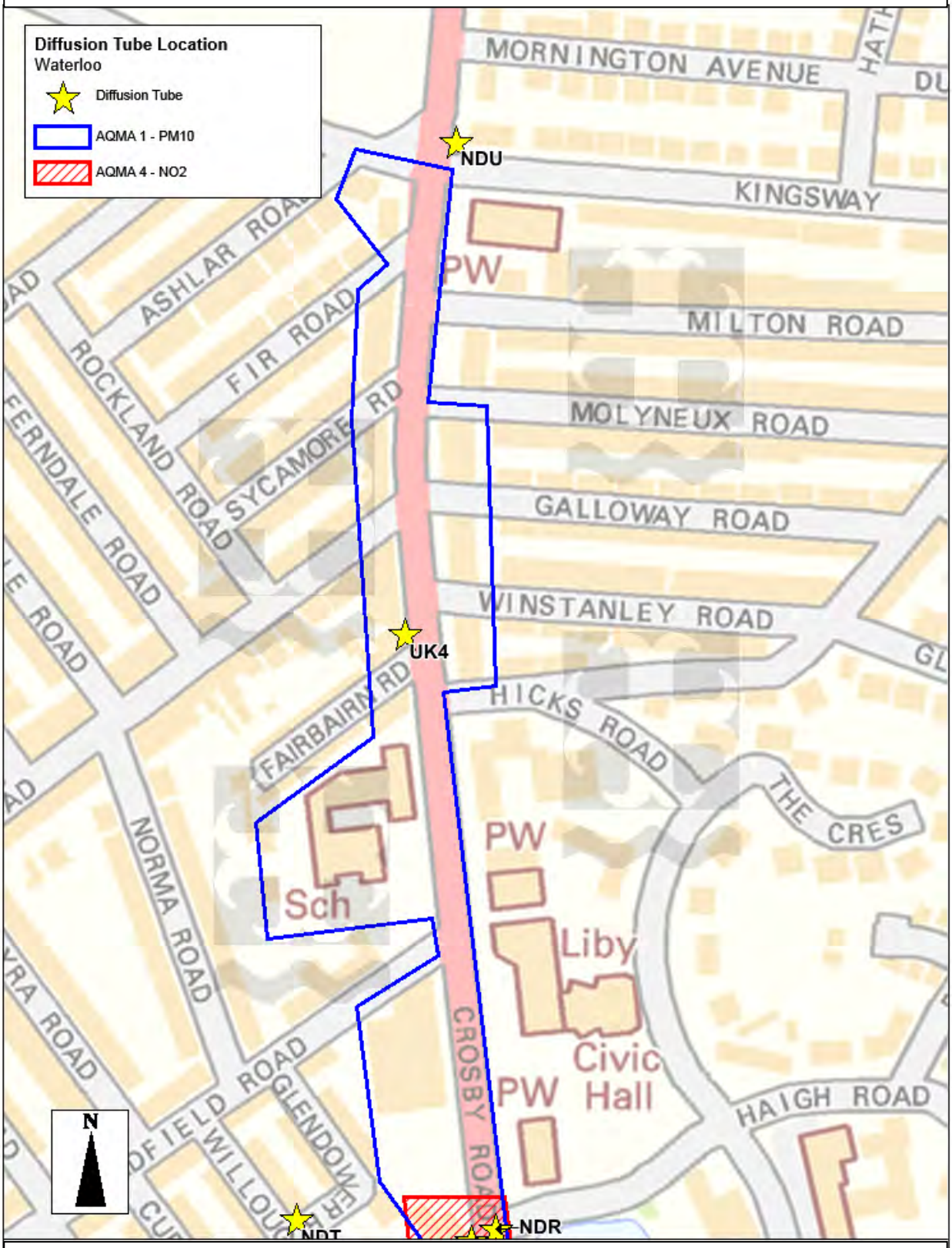


Figure D.25 – Diffusion Tube Locations Waterloo. Site ID: NBU, NCJ, NCS, NCV, NDH, NDI, NDR, NDS, NDT & NDY

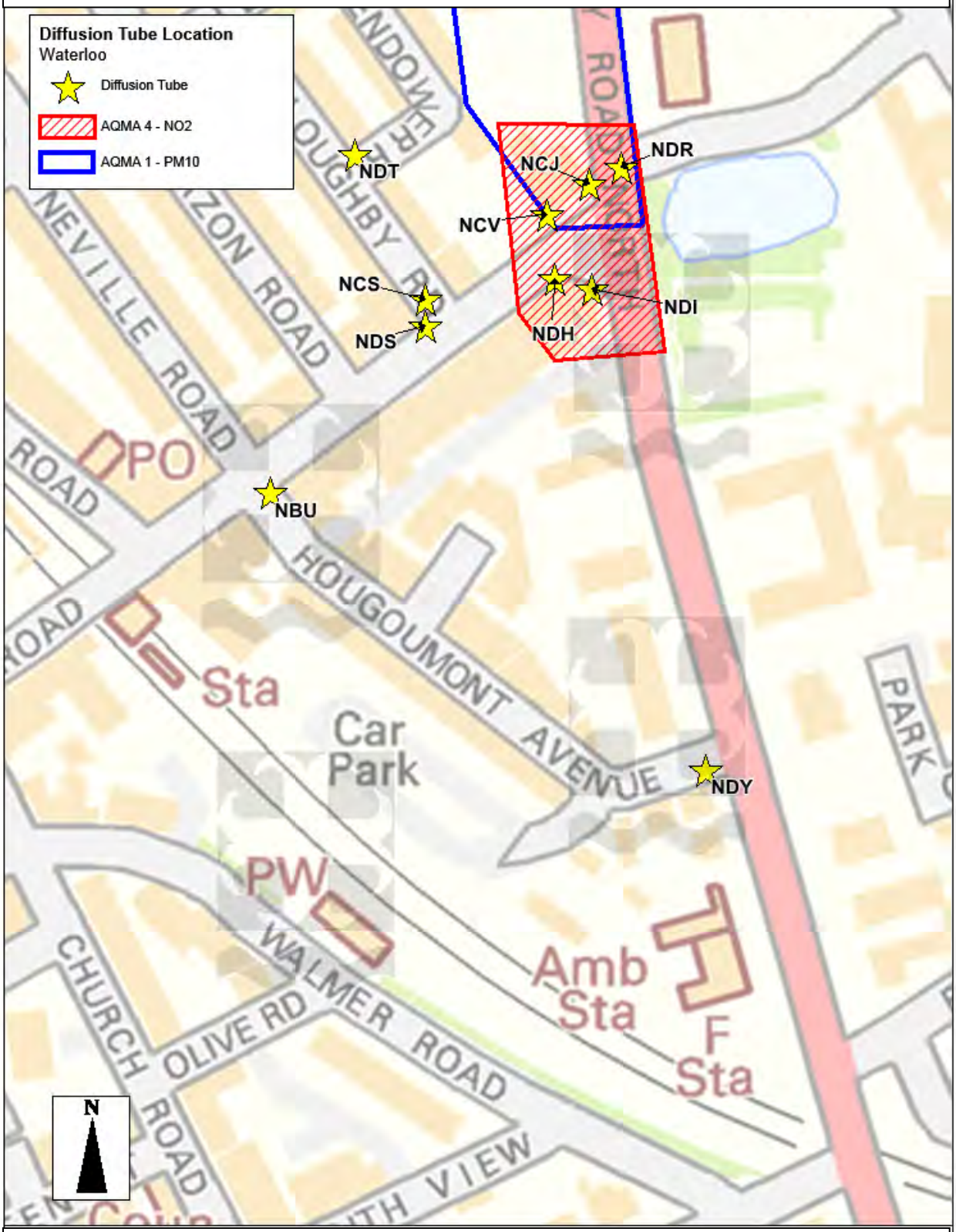


Figure D.26 – Diffusion Tube Locations Thornton. Site ID: NAG, NBV & NC52

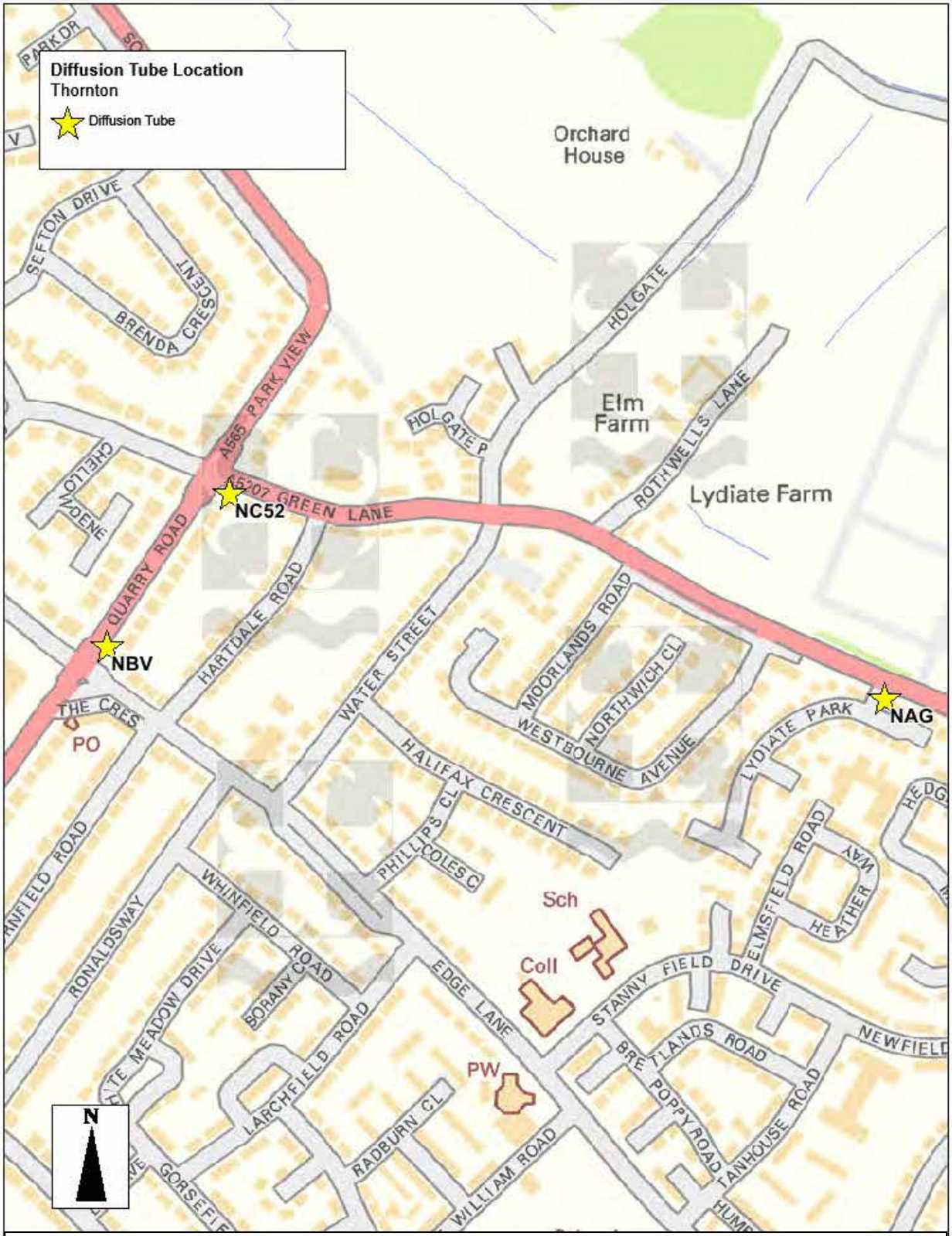


Figure D.27 – Diffusion Tube Locations Aintree. Site ID: NC108

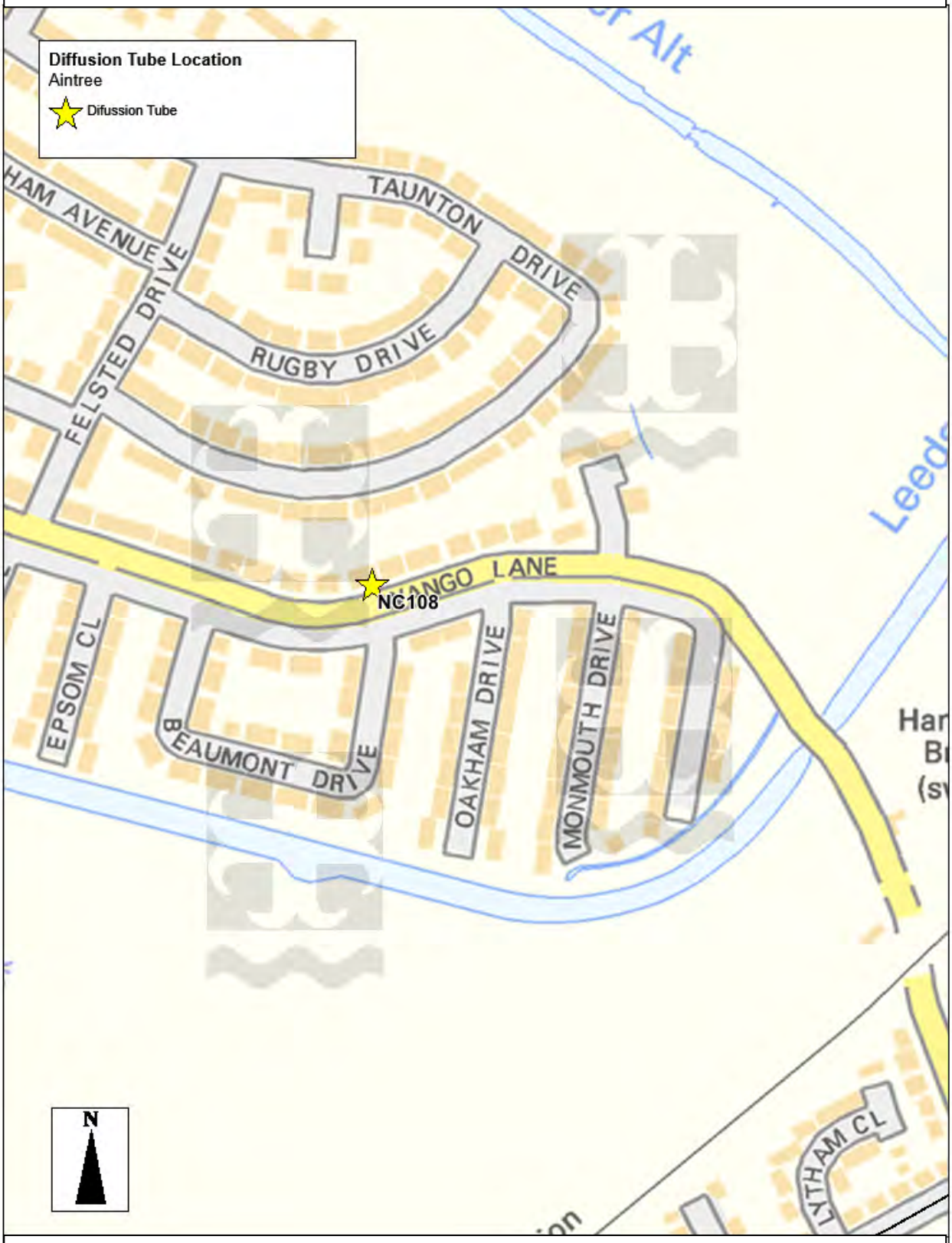
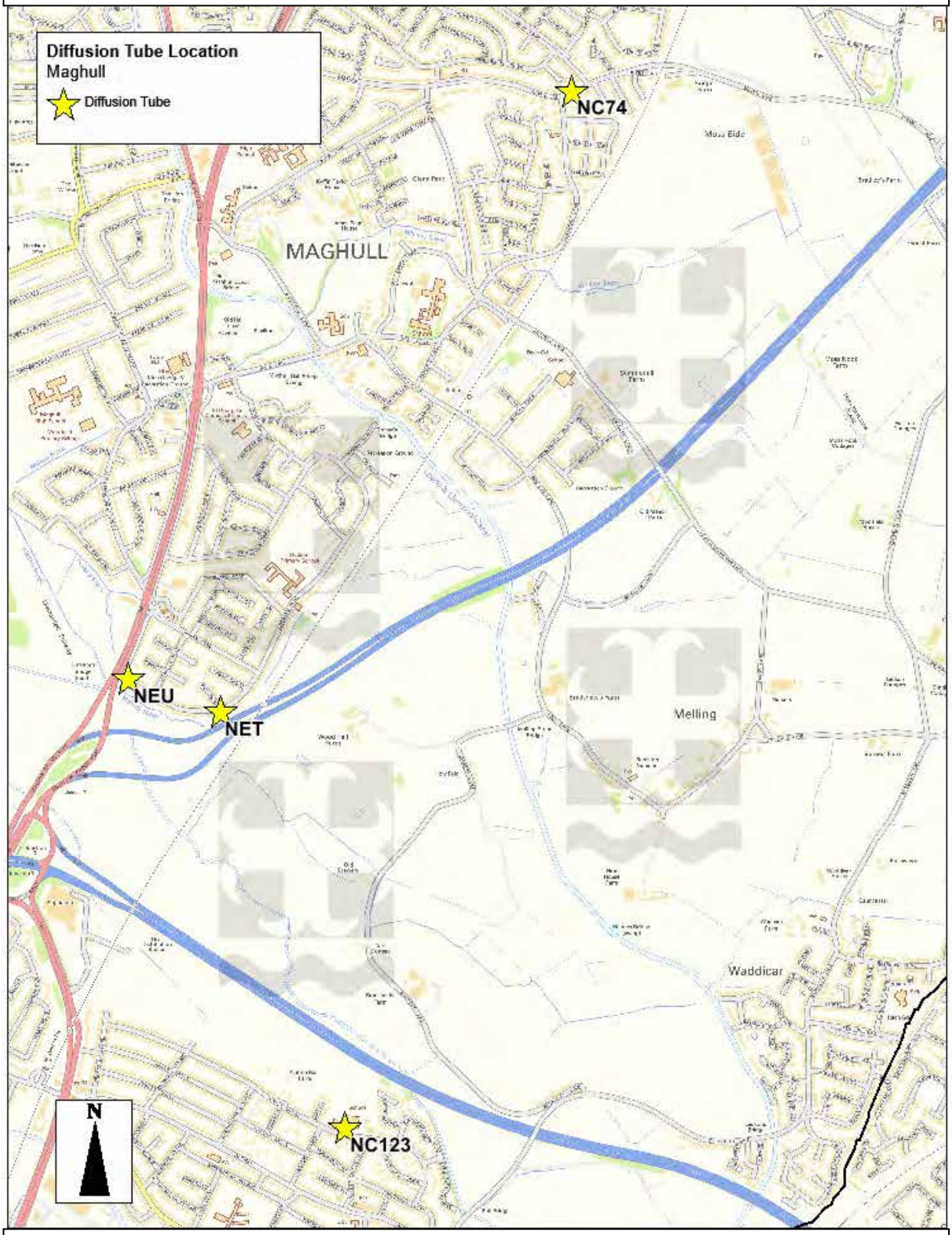


Figure D.28 – Diffusion Tube Locations Maghull. Site ID: NEU, NET, NC74 & NC123



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 microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AFS	Alternative Fuels Strategy
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
AQO	Air Quality Objective
AQS	Air Quality Standard
ANPR	Automatic Number Plate Recognition
ASR	Air Quality Annual Status Report
BAM	Beta Attenuation Monitor
CAZ	Clean Air Zone
CM	Continuous Monitor
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EA	Environment Agency
EMR	European Metal Recycling Limited
EU	European Union
EV	Electric Vehicle
FDMS	Filter Dynamics Measurement System
FQP	Freight Quality Partnership
GM	General Measure in the Air Quality Action Plan
HGV	Heavy Goods Vehicle

JSNA	Joint Strategic Needs Assessment
LAQM	Local Air Quality Management
LCR	Liverpool City Region
LES	Low Emissions Strategy
LEZ	Low Emission Zone
L2	Liverpool 2 (Peel Ports new deep water container terminal)
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PHOF	Public Health Outcomes Framework
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
RIS	Road Investment Strategy
SCOOT	Split Cycle Offset Optimisation Technique
SGVC	Specialised Goods Vehicle Count
SO_2	Sulphur Dioxide
SS	Site Specific Measure in the Air Quality Action Plan
SSNA	Sefton Strategic Needs Assessment
TEOM	Tapered Element Oscillating Microbalance
TQP	Taxi Quality Partnership
TSP	Total Suspended Particulates
VCM	Volatile Correction Model
VMS	Variable Message Sign

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