



8/8a St John Street, Manchester Air Quality Assessment

For Pareto Properties LLP'

Date: 1 September 2020

Doc ref: SJS-HYD-XX-ZZ-RP-AQ-2002-P02

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited 5th Floor Merchants House Wapping Road Bristol	Tel: 0117 945 9225 www.hydrock.com
Client	Pareto Properties LLP'	
Project name	8/8a St John Street, Manchester	
Title	Air Quality Assessment	
Doc ref	SJS-HYD-XX-ZZ-RP-AQ-2002-P02	
Project no.	C-16488-C	
Status	Final	
Date	01/09/2020	

Document Production Record		
Issue Number	01	Name
Prepared by	Blaise Kelly	
Checked by	Mark Nichols	
Approved by	Blaise Kelly	

Document Revision Record			
Issue Number	Status	Date	Revision Details
P01	Preliminary	29/07/2020	First Draft
P02	Final	01/09/2020	Final Version

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1. INTRODUCTION

1.1 Proposed development

Hydrock have been commissioned by Pareto Properties LLP' to undertake an Air Quality Assessment relating to the proposed development of land at 8/8a St John Street, Manchester.

The development lies within the administrative boundary of the Manchester City Council (SCC). The site is situated within the Greater Manchester Air Quality Management Area (AQMA) which has been declared by the council for exceedances of the nitrogen dioxide (NO₂) objective.

The existing site is B1 use and is proposed to be converted to residential use and is expected to lead to a reduction in traffic on surrounding roads.

The location of the site is shown below in Figure 1.

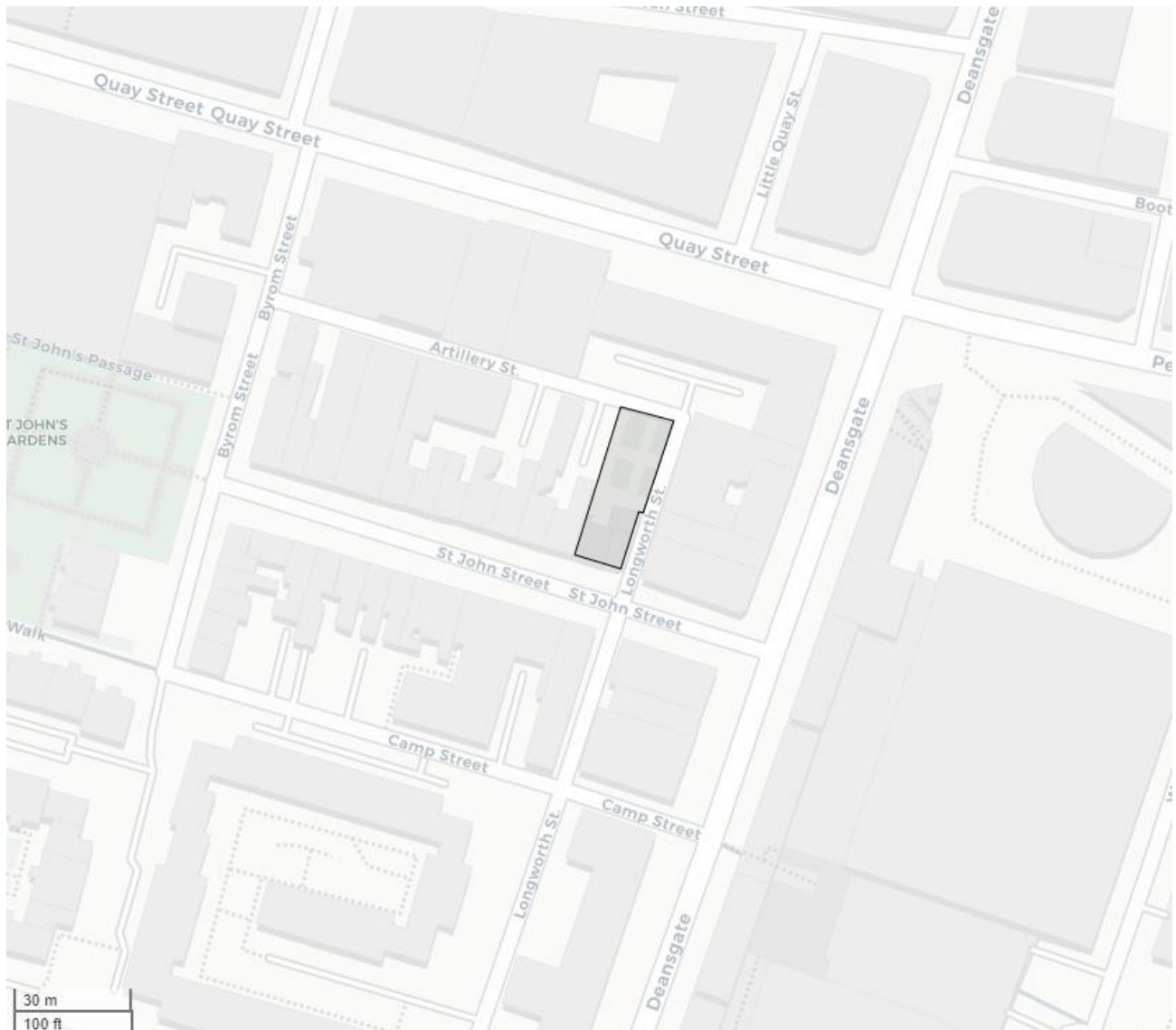


Figure 1 - Proposed site location

2. RELEVANT LEGISLATION

2.1 EU

The overriding policy document is the EU Directive 2008/50/EC¹ which provides statutory guidance on air quality. This shapes the Air Quality criteria for the UK's National Planning Policy Framework which is supported by the Planning Practice Guidelines. In addition, the directive 2004/107/EC² provides guidance on pollutants from point source emissions.

In addition, the Committee on the Medical Effects of Air Pollution (COMEAP)^{3,4}, the World Health Organisation (WHO)⁵ and the United Nations Economic Commission for Europe (UNECE) provide medical and scientific evidence of the health risks to the general public and recommended concentration limits.

2.2 UK

As a result of the 2008 directive the Air Quality Standards Regulations 2010 were released. These set out how the government has interpreted these directives. One of the main additions to these was the addition of regulatory framework on PM_{2.5}.

The Air Quality Strategy 2007 Volume 1⁶ outlines the National Air Quality Objectives that should be achieved. Table 1 summarises where the NAQOs should apply. Whilst central government is ultimately responsible for meeting these objectives, part of the Environment Act 1995⁷ dictates that a local Authority is required to assess and periodically review their compliance with the non-binding objectives and any areas that repeatedly exceed the allowed limits should be designated Air Quality Management Areas (AQMAs).

The National Planning Policy Framework⁸ requires that planning decisions for any new development should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. Furthermore, planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.

¹ EC, "Directive 2008/50/EC of the European Parliament and of the Council," May 21, 2008, 44.

² EC, "Directive 2004/107/EC Relating to Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air," January 26, 2005, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF>.

³ COMEAP, "Long Term Exposure to Air Pollution: Effect on Mortality" (Committee on the Medical Effects of Air Pollutants (COMEAP), November 2009).

⁴ UNECE, "Air Pollution - Air Pollution - Environmental Policy - UNECE," 2016, <http://www.unece.org/env/lrtap/welcome.html>.

⁵ WHO, "WHO | Air Pollution," WHO, 2016, http://www.who.int/topics/air_pollution/en/.

⁶ Defra, "The Air Quality Strategy for England, Scotland, Wales and Northern Ireland - Volume 1" (Department for Food, Environment and Rural Affairs (Defra), July 2007), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf.

⁷ Environment Agency, "Environment Act 1995" (The Environment Agency, 2002), <http://www.legislation.gov.uk/ukpga/1995/25/contents>.

⁸ Ministry of Housing, Communities and Local Government, "National Planning Policy Framework," February 2019, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf.

The Planning Practice Guidance⁹ states that consideration must be given to the potential impact a development could have on an area where air quality is known to be poor.

Greater Manchester Combined Authority (GMCA)¹⁰ has an AQMA which covers the 10 districts of Greater Manchester, declared for breaches of the annual NO₂ and PM₁₀ objectives. The council undertakes annual Air Quality Reports assessing the performance of areas of significant pollution. The most recent Annual Status Report (ASR) was issued in June 2020¹¹, based on data from 2019. A map of the AQMA in relation to the site is shown in Figure 2.

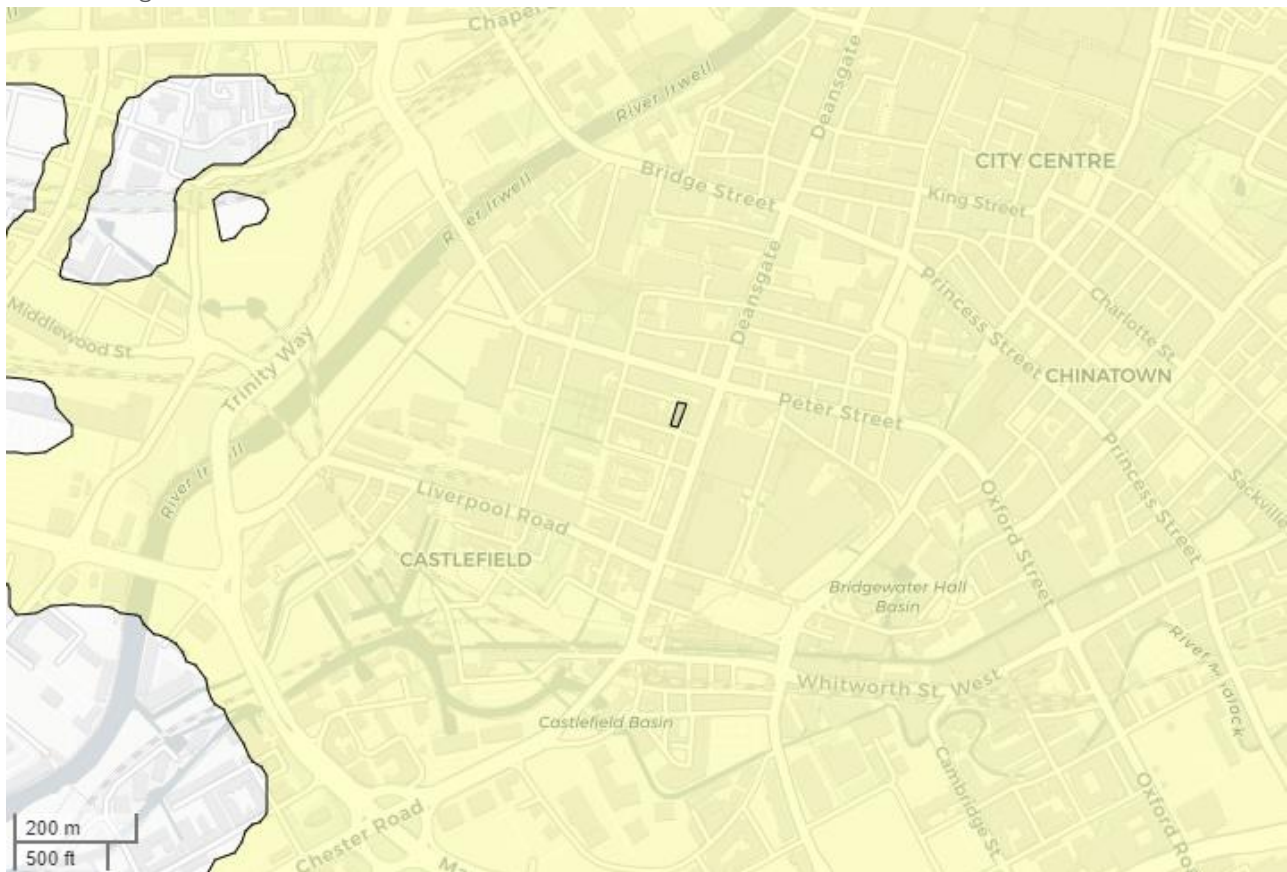


Figure 2 - Boundary of the Manchester AQMA in yellow in relation to the site

⁹ Ministry of Housing, Communities and Local Government, "Air Quality | Planning Practice Guidance," March 2014, <http://planningguidance.communities.gov.uk/blog/guidance/air-quality/>.

¹⁰ GMCA, "2016 Air Quality Annual Status Report (ASR) for Greater Manchester" (Greater Manchester Combined Authority (GMCA), July 31, 2017), http://www.manchester.gov.uk/download/downloads/id/25718/greater_manchester_air_quality_annual_status_report_a_sr_2016.pdf.

¹¹ Lynda Stefek, "Greater Manchester LAQM Annual Status Report (ASR)" (Greater Manchester Combined Authority (GMCA), June 2020), http://www.manchester.gov.uk/download/downloads/id/27583/greater_manchester_air_quality_annual_status_report_a_sr_2019.pdf.

In order to determine if an air quality assessment is required, Defra Local Air Quality management (LAQM) Technical Guidance 2016¹², and the IAQM Land-use Planning & Development Control: Planning for Air Quality¹³ and the Highways Agency Design Manual for Roads and Bridges¹⁴ is used as guidance.

Table 1 - Breakdown of where the NAQO apply taken from Defra TG(16) guidance

Averaging Period	Objectives should apply at:	Objectives should generally NOT apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual Mean and: 24 and 8 hour mean objectives apply. Kerbside site (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railways stations etc. which are not fully enclosed, where members of the public might be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where member of the public might reasonably be exposed for a period of 15 minutes	

2.3 Local planning policy/environmental Policy

Local Policy: Greater Manchester combined authority (including Salford City Council)

Greater Manchester Combined Authority has designated the centre of Manchester, its ring road and arterial road leaving the city as an AQMA. GMCA released their Air Quality Strategy Action Plan 2016- 2021¹⁵ which has the primary objective to improve air quality across Greater Manchester and to embed low-emission behaviours into the culture of our organisations and lifestyles by 2025. In order to help achieve this, GMCA have developed 8 actions for managing new developments, the four applicable actions are presented below:

¹² Defra, "LAQM Technical Guidance LAQM.TG16," April 2016, 16, <http://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf>.

¹³ IAQM, "Land-Use Planning & Development Control: Planning for Air Quality" (Institute for Air Quality Management (IAQM), January 2017), <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>.

¹⁴ DfT, Design Manual for Roads and Bridges, vol. 12.2.1: Traffic Appraisal of Road Schemes. Section 2: Advice (London: Highways Agency, 1996).

¹⁵ Greater Manchester Combined Authority.2016. Greater Manchester Air Quality Action Plan 2016-2021.

- Greater Manchester councils to adopt the most recent IAQM Guidance on the Assessment of Dust from Demolition and Construction as current best practice to assess and mitigate emissions from construction sites.
- GM local authorities will adopt the most recent IAQM/EPUK guidance for air quality assessment as current best practice, to help ensure that planning applications consider potential local air quality impacts and opportunities to improve air quality are realised.
- A centralised database of significant planning applications and air quality assessments will be managed by TfGM, as a record of the cumulative effects of multiple developments and thereby facilitate combined approaches to minimising emissions.
- TfGM will work with the local authorities to encourage travel planning measures in businesses and individuals to affect a significant modal shift.

GMCA also undertakes annual air quality reporting to assessing the performance of areas of significant pollution. GMCA have released the latest diffusion tube monitoring (2018), which is available online¹⁶.

¹⁶ https://secure.manchester.gov.uk/downloads/download/4166/air_quality_reports

3. SCOPE

The assessment has been carried out based on the methodologies and guidance set out in Local Air Quality Management Technical Guidance LAQM TG(16)¹⁷ and the IAQM and Environmental Protection UK (EPUK) Land-Use Planning & Development Control planning for Air Quality guidance¹⁸.

The IAQM layout the recommended two stage criteria for requiring a full air quality assessment.

Table 2 - IAQM stage 1 criteria

Criteria to proceed to Stage 2	
If any of the following apply:	10 or more residential units or a site area of more than 0.5ha More than 1,000m² of floor space for all other uses or a site area greater than 1ha
Coupled with any of the following	The development has more than 10 parking spaces The development will have a centralised energy facility or other centralised combustion process
Note: Consideration should still be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.	

The development is for less than 10 residential units and is expected to have less than 10 parking spaces. Overall trips are expected to be a reduction of 112 AADT per day (Table 3).

Table 3 - Net trip generation at the site

Existing B1 Traffic			Proposed Residential Traffic			Net Impact		
In	Out	Total	In	Out	Total	In	Out	Total
64.0	62.0	126.0	7.0	7.0	14.0	-57.0	-55.0	-112.0

Therefore, the main focus of the assessment is the proximity of the site to sources of pollution.

¹⁷ Defra, "LAQM Technical Guidance LAQM.TG16."

¹⁸ IAQM and EPUK, "Land-Use Planning & Development Control: Planning for Air Quality" (Institute for Air Quality Management (IAQM) Environmental Protection UK (EPUK), January 2017), <https://www.the-ies.org/sites/default/files/reports/air-quality-planning-guidance.pdf>.

Table 4 – IAQM stage 2 criteria

Averaging Period	The development will:	Indicative Criteria to Proceed to an Air Quality Assessment
1	Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV - cars and small vans <3.5t gross vehicle weight)	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2	Cause a significant change in Heavy Duty (HDV) flows on local roads with relevant receptors (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
3	Realign roads, i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA
4	Introduce a new junction or remove an existing junction or change a bus station	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate e.g. traffic lights or roundabouts
5	Introduce or change a bus station	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA more than 100 AADT elsewhere.
6	Have an underground car park with extraction system	The ventilation extract for the car park will be within 20m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7	Have one of more substantial combustion processes, where there is a risk of impacts at relevant receptors. NB. This includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	Typically, any combustion plant where the single or combined NO _x emission rate is less than 5mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situation where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emissions rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

3.1 Baseline Conditions

MCC has investigated air quality within the area as part of its responsibilities under the LAQM guidance. As part of this they have placed diffusion tubes around the city to monitor concentrations of NO₂.

Estimated background concentrations of all EU limit value pollutants from Defra¹⁹, are presented in Table 5 and shown in Figure 3 for NO₂. The background conditions are all within the limits of the National Air Quality Objectives (NAQOs).

Table 5 - Baseline pollutant concentrations and NAQOs

Pollutant		Period	National Air Quality Objectives (NAQO)	Gorton Street
Description	units			383500,397500
				Annual Mean
Particles (PM ₁₀)	µg/m ³	Annual mean	40	12.9
Particles (PM _{2.5})	µg/m ³	Annual mean	20	8.6
Nitrogen Dioxide (NO ₂)	µg/m ³	Annual mean	40	28.3
Nitrogen Dioxide (NO _x as NO ₂)	µg/m ³	Annual mean	-	45.9

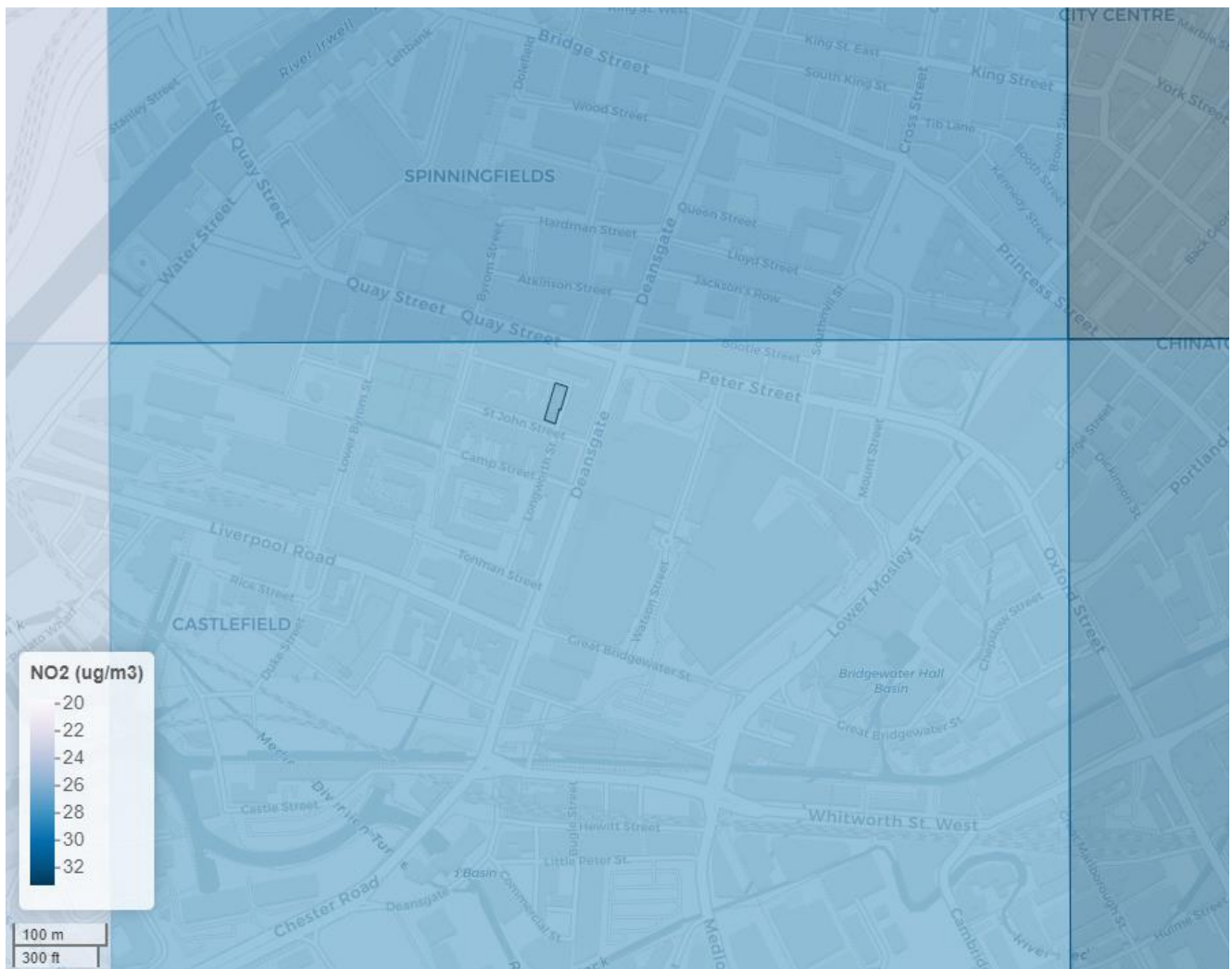
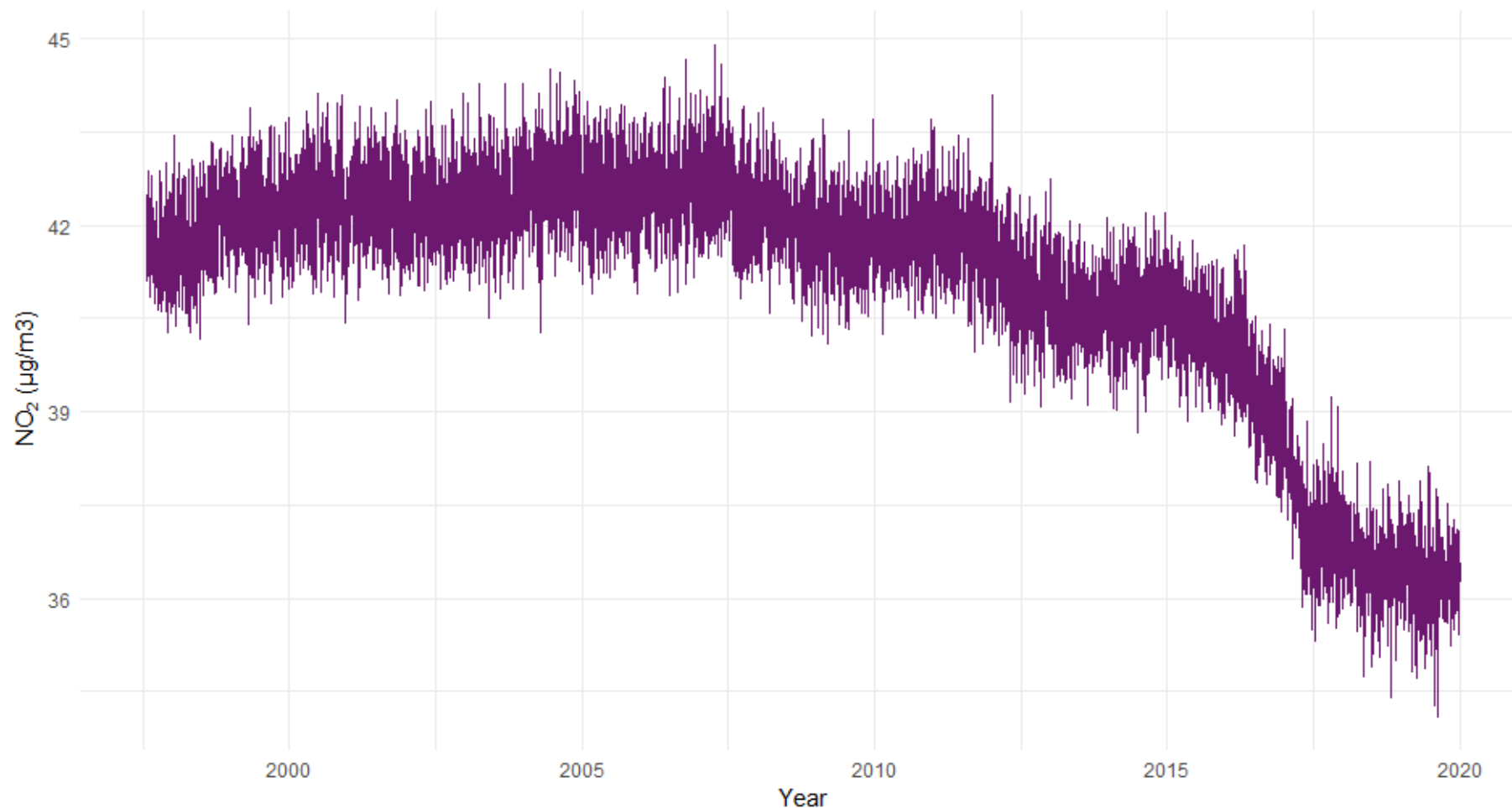


Figure 3 - Background Defra grid squares representing the development site

¹⁹ for a 2km radius surrounding the development site (<https://uk-air.defra.gov.uk/data/gis-mapping>)

Weather normalised NO₂ Concentrations

Monitoring site: MAN3, Manchester Piccadilly



Data source: ARUN network, accessed using the openair R package. Weather normalisation carried out using the RMweather R package

Figure 4 - Meteorologically normalised NO₂ concentrations for the MAN3 Urban Background monitoring site at Piccadilly Gardens.

Table 6 outlines the concentrations of monitored NO₂ for the last seven years at the diffusion tube and automatic monitoring sites shown in Figure 6. Figure 4 plots the urban background data from monitoring site at Piccadilly Gardens since 1999. The data has been corrected for the influence of weather using the RM weather package²⁰. This gives a clearer picture of the true trend due to local pollutants.

Table 6 - Annual NO₂ concentration (µg/m³)

Site ID	X	Y	Distance from site (m)	Site Type	2011 (µg/m ³)	2012 (µg/m ³)	2013 (µg/m ³)	2014 (µg/m ³)	2015 (µg/m ³)	2016 (µg/m ³)	2017 (µg/m ³)	2018 (µg/m ³)
MAN	383851	398003	388	Urban Background	NA	NA	NA	NA	NA	NA	NA	NA
MAN24	383954	398060	502	Urban traffic	53	50.8	46.9	50.3	55.2	45.3	44.7	40.3
SA39	383040	398563	756	Urban traffic	40.9	41.2	37.5	39.7	38.5	46.8	41.6	39.1
MAN59	384310	398337	934	Urban background	43	39.4	37	36.1	35.9	38.5	36.3	32.2
MAN59B	384310	398337	934	Urban background	42	39.2	35.2		35.8	40.8	35.7	31.6
MAN59C	384310	398337	934	Urban background	41	39.6	35.5		34.9	38	36.3	32.1
MAN3	384311	398337	935	Urban Background	44.0	40.8	38.8	40.5	39.4	40.1	35.7	34.6

The measured concentrations at the background monitoring sites are within the NAQO for NO₂ (40µg/m³) at this location and closely represent the expected concentrations at the façade of the development site. Concentrations at roadside sites are around the NAQO. Deansgate does not have any Air Quality monitoring sites, however traffic flows are in a similar order of magnitude to that on Princess Street (Urban Traffic monitoring site MAN24) and the junction with Trinity Way and Chapel Street (Urban Traffic monitoring site SA39). Therefore, it is expected that concentrations at facades along Deansgate would have similar concentrations to MAN24 and SA39.

Table 7 - Estimated AADTs for key roads

DfT ID #	Road	AADT (2018)					
		Two wheeled motor vehicles	Cars and taxis	Buses and coaches	Light goods vehicles	Heavy goods vehicles	All motor vehicles
7950	Deansgate	84	8964	71	1674	182	10975
56487	Princess Street	59	7252	369	1302	160	9142
99519	Trinity Way	217	25415	44	3625	765	30066
70151	Chapel Street	80	7084	1089	974	223	9449

²⁰ Stuart Grange, "Package 'Rmweather,'" July 16, 2018, <https://cran.r-project.org/web/packages/rmweather/rmweather.pdf>.

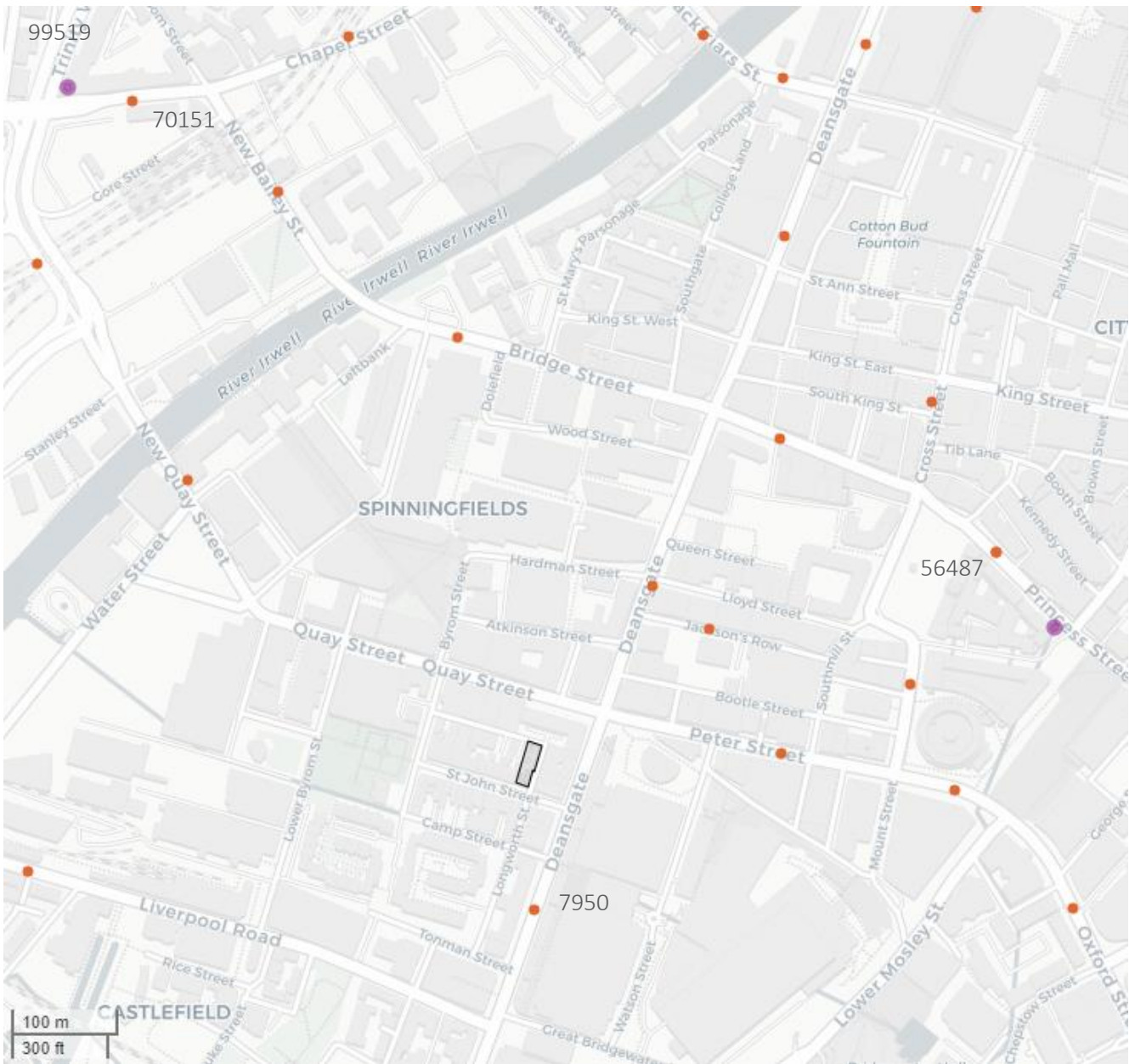


Figure 5 – DfT Count Points used for aggregation

3.2 Monitoring

The site is close to the edge of the Greater Manchester Air Quality Management area, **shown here in yellow**. It is also on the border between Manchester and Salford Local authority, but is officially in Salford.

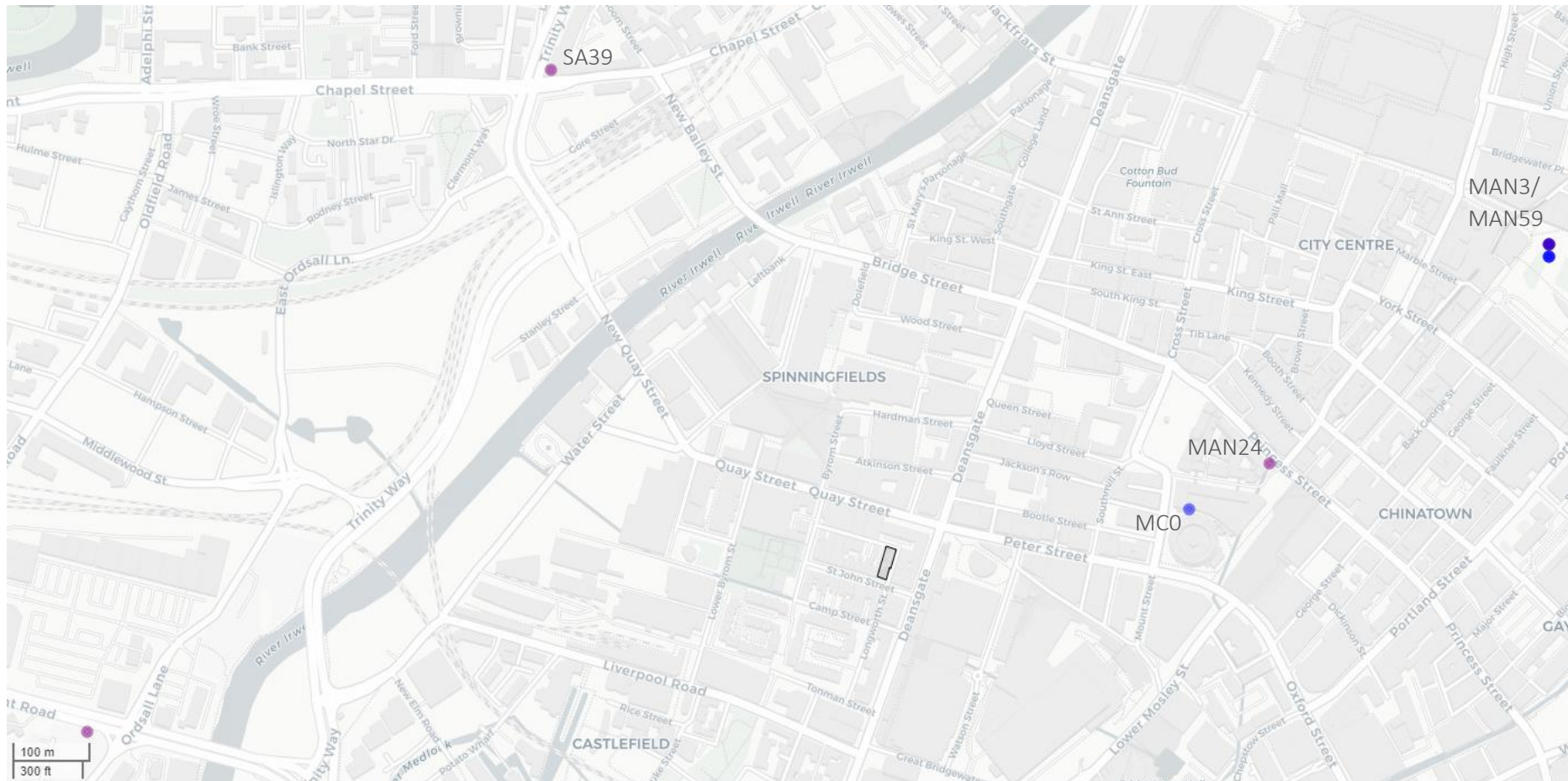


Figure 6 - Proximity of site (grey) to nearby diffusion tube monitoring (purple) and continuous (electronic) analysers (blue).

The site is situated approximately 40m from the nearest main road, which is Deansgate. The wind direction is predominately from the west. This would indicate pollution from Deansgate would have a tendency to disperse in the opposite direction to the development site.

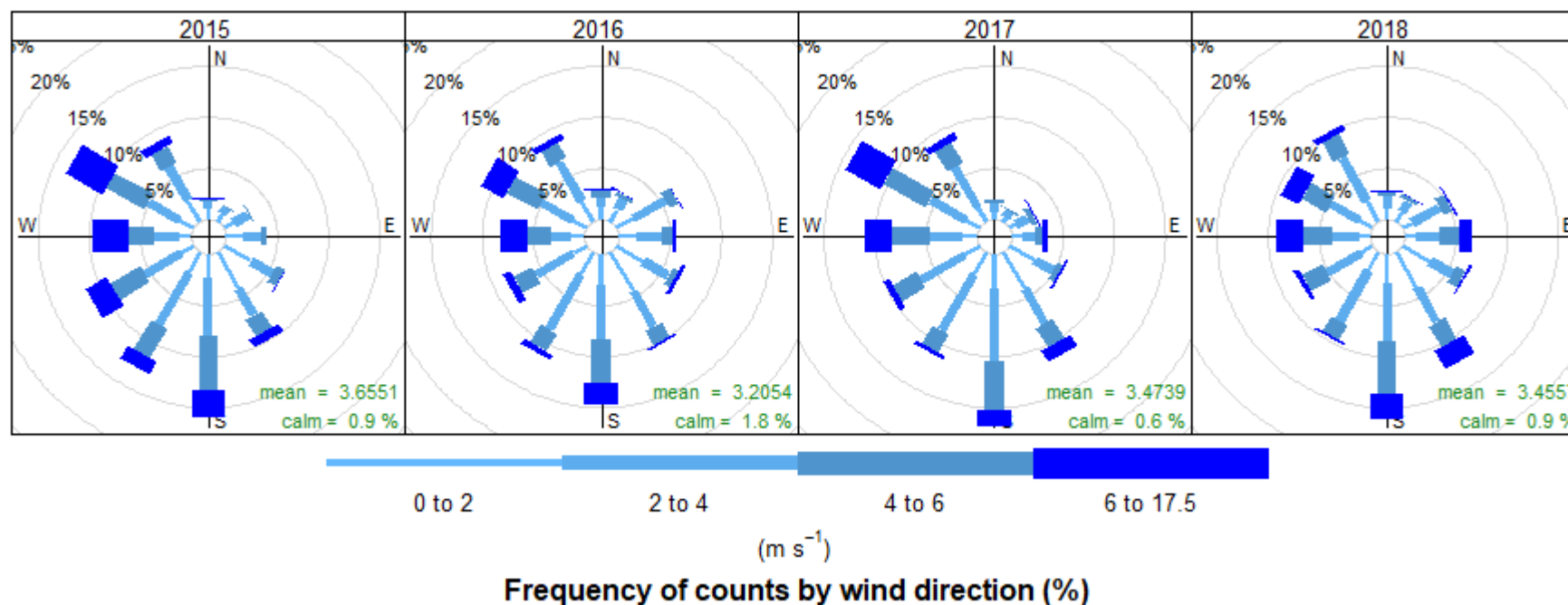


Figure 7 - Wind rose from Rostherne weather station for the past 4 years

Deansgate is a street canyon and the closest façade of the development site is 40m away from the edge of Deansgate. Defra's practical guidance for diffusion tubes provides site classifications. Defra's Practical guide to diffusion tube monitoring²¹ states that an "urban background" location is defined as:

- >50 m from any major source of NO₂, such as multi-storey car parks;
- >30 m from any very busy road (> 30,000 vehicles per day). The old NO₂ Network required urban background sites to be at least 50 m from any busy road;

²¹ "Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users" (Department for Food, Environment and Rural Affairs (Defra), February 2008), https://laqm.defra.gov.uk/documents/0802141004_NO2_WG_PracticalGuidance_Issue1a.pdf.

- >20 m from a busy road (10,000 – 30,000 vehicles per day) or from any medium sized sources, e.g. petrol stations or ventilation outlets from catering establishments;
- >10 m from any main road. (Quiet roads, for example within residential estates, are acceptable); and
- >5 m from anywhere where vehicles may stop with their engines idling.

Therefore, it is expected that concentrations at the site are similar to those at the background monitoring sites, which is between 28 and 35µg/m³ and below the NAQO.



Figure 8 - Site area and distance from Deansgate roadside

4. POINT SOURCE EMISSIONS

The development will not have on site plant in excess of the threshold for assessment (5mg/NO_x/s).

In the area surrounding the development there are no point sources that might impact on the development. Figure 9 shows the proximity of these sites, labelled 5 and 7.

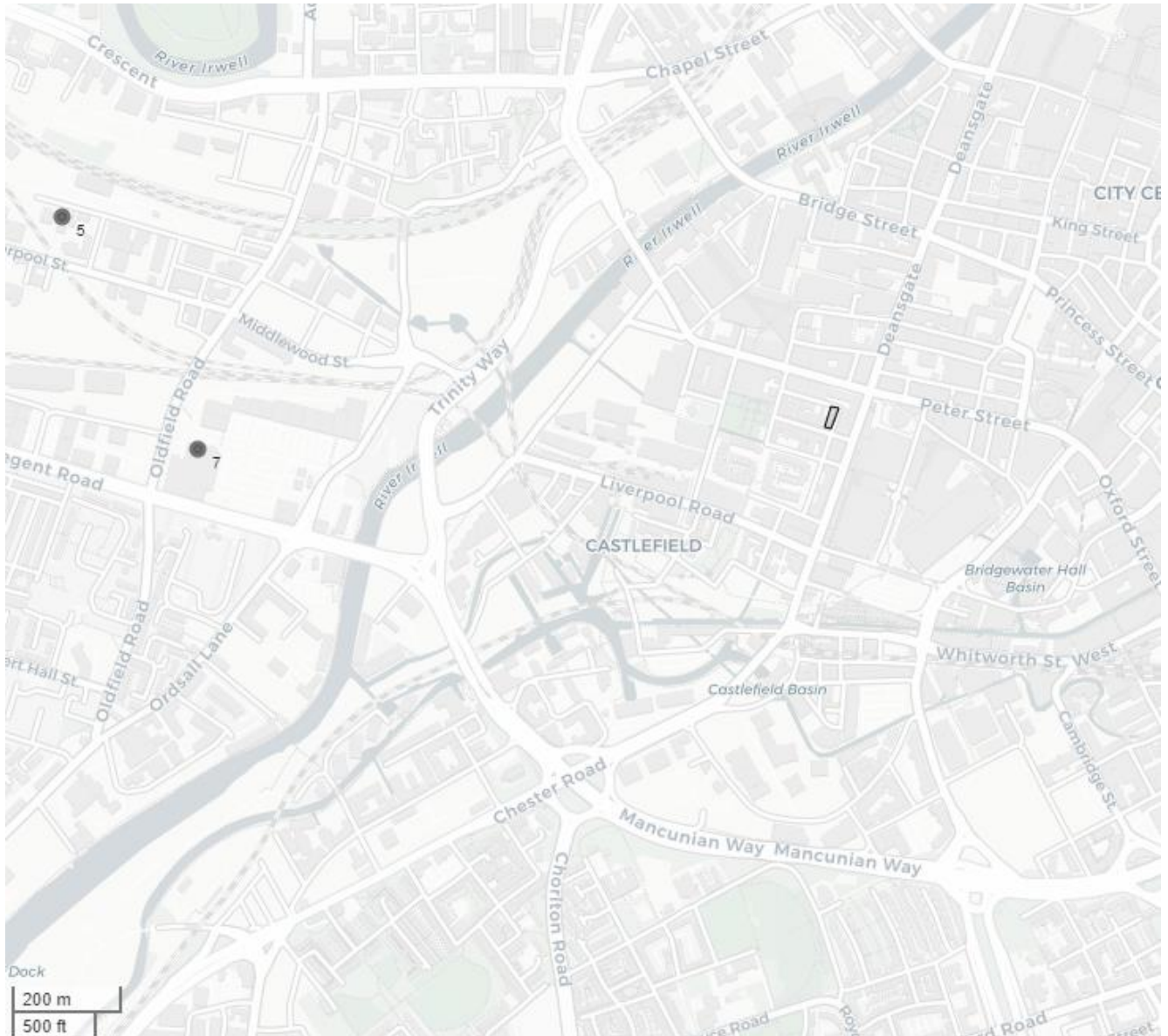


Figure 9 - Proximity of closest point sources to the development site

5. CONSTRUCTION DUST

Using the methodology laid out in the IAQM guidance²², it is predicted that construction dust has the potential to have a medium impact, the worst-case impact, on surrounding properties and developments. However, it is possible to mitigate these by following guidance laid out by the IAQM, which has been documented in the appendix.



Figure 10 - Construction dust receptors

²² IAQM, "Guidance on the Assessment of Dust from Demolition and Construction" (Institute of Air Quality Management (IAQM)), February 2014), <http://www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf>.



Figure 11 - Estimated classification of surrounding buildings to the development (red = residential, yellow = commercial/office)



Figure 12 - Dust impacts at surrounding sensitive receptors



Figure 13 - Human Health impacts

6. CONCLUSION

The air quality conditions and construction dust impacts have been assessed at and around this development.

The background pollutant concentrations in the locality of the development site are well within the NAQOs. Concentrations at monitoring sites at similar locations have been reducing over recent years but are close to the objective and slightly over in some cases. It is estimated that concentrations along Deansgate are similar to these sites and given the proximity of the development, which is 40m from the side of the road, concentrations are likely to be similar to background levels. The building will therefore be suitable for full natural ventilation if required.

The development is expected to reduce the number of trips to and from the development site compared to previous use and emissions from any onsite plant will be below the threshold for assessment. Therefore, in direct compliance with Policy EN 16 of the Core Strategy, the development will have a negligible air pollution impact on the surrounding area.

All construction dust impacts are able to be mitigated provided the guidance recommended by the IAQM and provided in the appendix of this report, is followed.

Appendix

Construction mitigation

In order to mitigate the worst-case dust impacts the following mitigation measures are highly recommended by the IAQM for a Medium risk site.

Highly Recommended

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.
- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high-risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.

- Erect solid screens or barriers around dusty activities or the site boundary which are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- Avoid bonfires and burning of waste materials.
- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.
- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.

- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

Desirable

- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Background Concentration maps

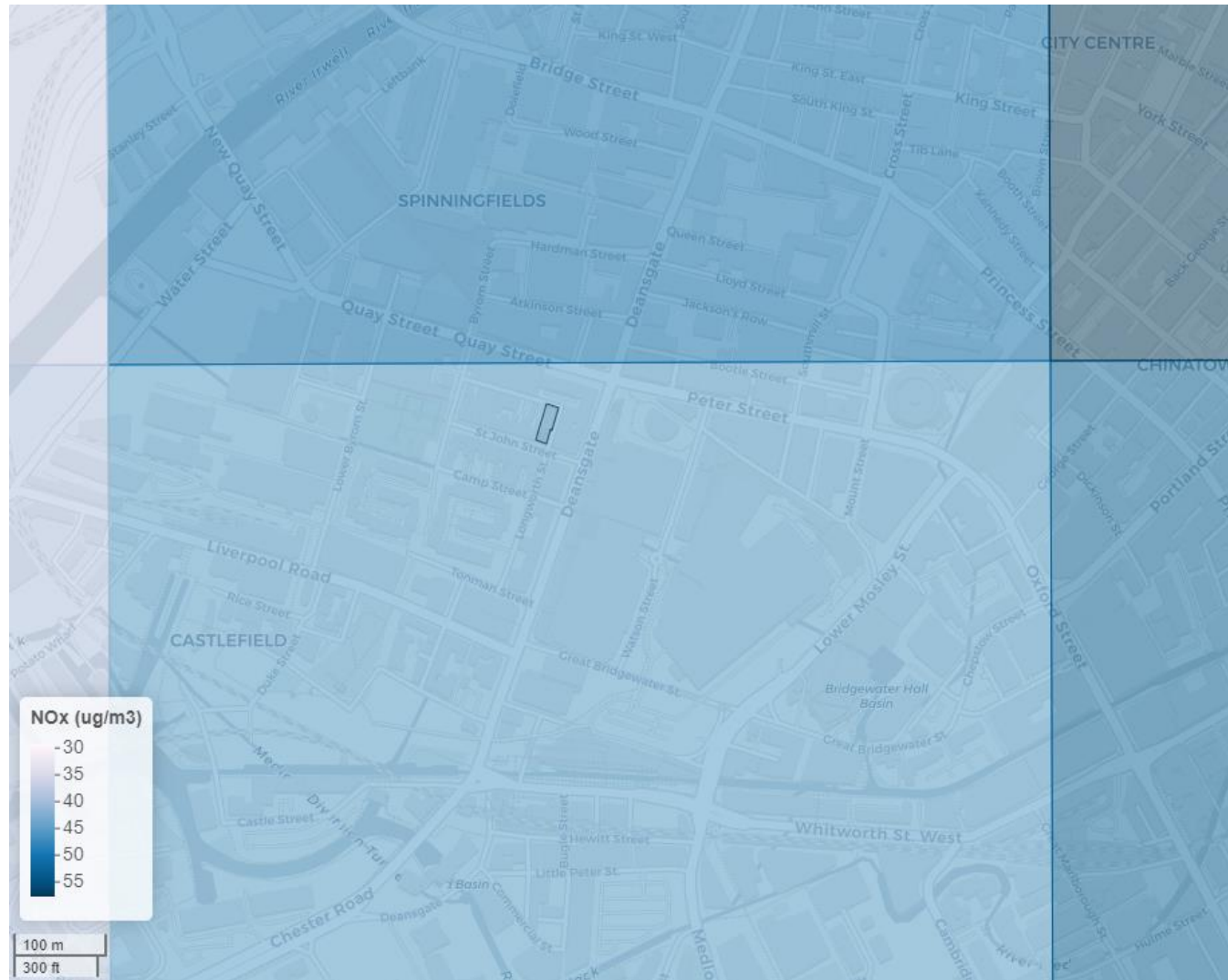


Figure 14 - Estimated 1km Background NOx concentrations

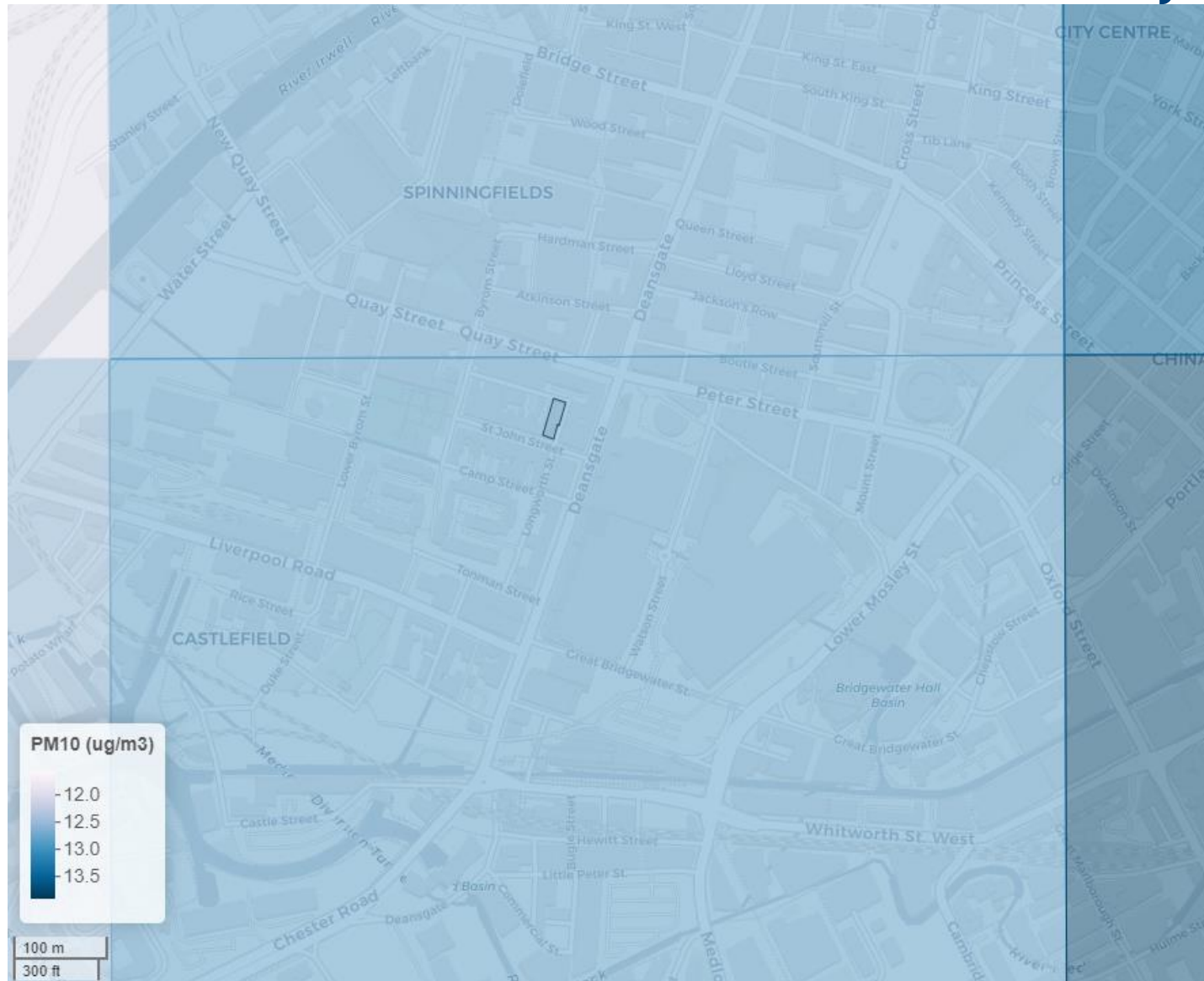


Figure 15 - Estimated background PM₁₀ concentrations

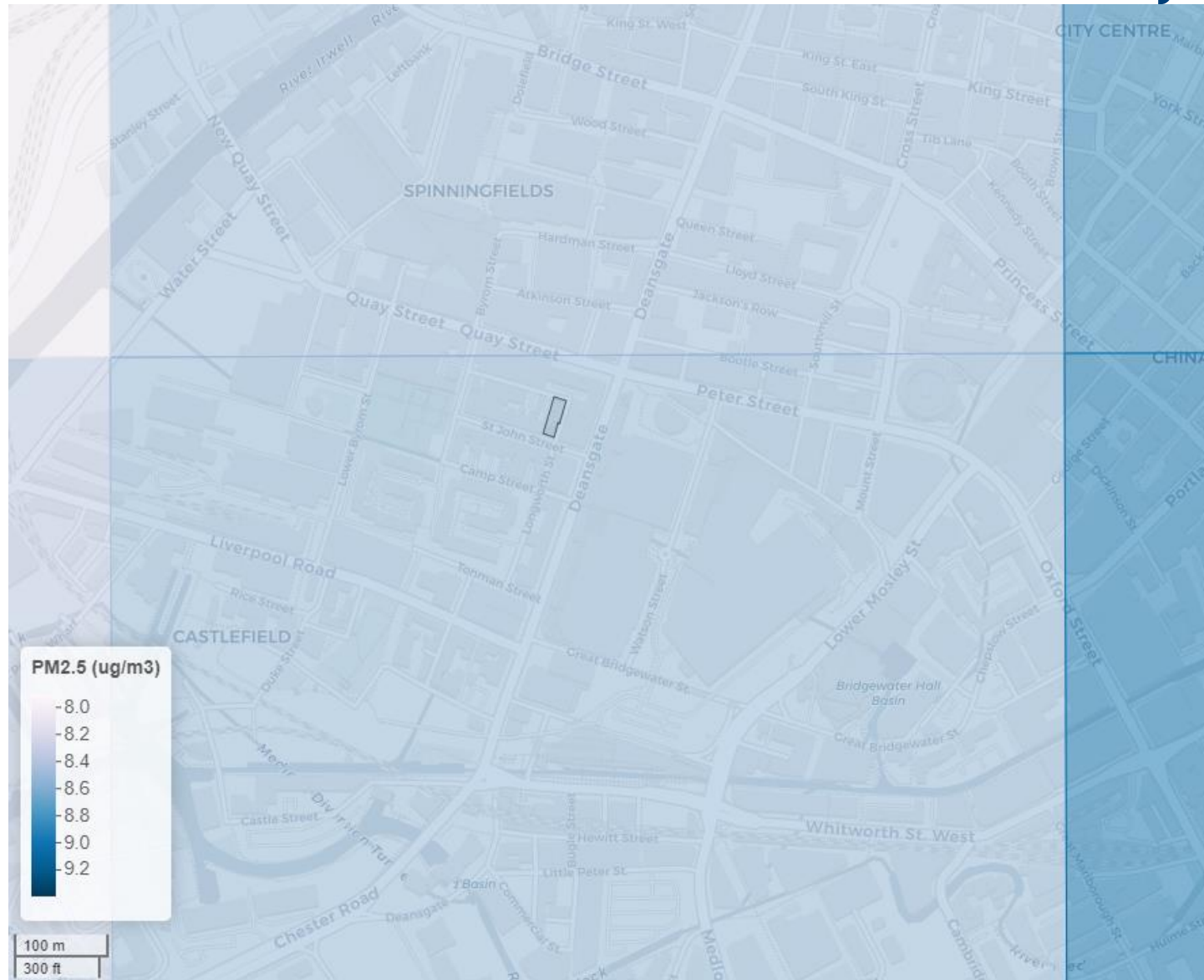


Figure 16 - Estimated background PM_{2.5} concentrations