November 2020

EXPANSION OF ANFIELD ROAD STAND, ANFIELD

F1/1 - Air Quality Assessment

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Pre-amble

This Air Quality Assessment is one of a suite of core documents prepared in support of the application submitted on behalf of Liverpool Football Club and Athletic Grounds Limited ("Liverpool FC" or "the Club") for full planning permission to expand the Anfield Road Stand to accommodate an additional c.7,000 spectators with associated hospitality and spectator facilities, new public realm, and the realignment of Anfield Road.

This development forms part of the phased regeneration of the Anfield stadium and follows successful delivery of the Main Stand redevelopment and associated public realm (96 Avenue and Paisley Square) and a new free-standing LFC retail store and cafe.

It also reflects the wider regeneration of the Anfield area (The Anfield Project) that includes new and improved homes and regeneration of the Walton Breck Road high street, fuelled by the Club's significant investment in the redevelopment of Anfield Stadium.

The following documents comprise the application:

A1/1 Summary Guide to the Planning Application

B1/3 Planning Statement

B2/3 Appendices to Planning Statement

B3/3 Draft S106 Agreement

C1/2 Application Drawings

C2/2 Design and Access Statement

D1/3 Environmental Statement, Volume 1: ES Chapters and Figures

D2/3 Environmental Statement, Volume 2: Technical Appendices

D3/3 Environmental Statement, Volume 3: Non-Technical Summary

E1/3 Transport Assessment

E2/3 Transport Strategy

E3/3 Staff Travel Plan

F1/1 Air Quality Assessment

G1/1 Phase I Geo-Environmental Desk Study

H1/1 Flood Risk Assessment

I1/1 Heritage Assessment

J1/1 Socio-Economic Statement

K1/1 Health and Wellbeing Statement

L1/1 Lighting Impact Assessment

M1/1 Statement of Community Engagement

N1/1 Sustainability Statement

This statement has been prepared by Mott MacDonald (Consultant Engineers, Environmental Consultants and Transport Planners) with additional work, research and information provided, with thanks, by:

- Turley (Planning and Development Consultants)
- Planit ie (Urban Design, Landscape and Master planners)
- KSS Design Group (Architects)
- Liverpool Football Club
- Liverpool City Council

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LFC Anfield Road Stand

Air Quality Assessment

23 February 2020

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LFC Anfield Road Stand

Air Quality Assessment

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Contents

Introduction

1.1 Overview

This air quality assessment has been undertaken to accompany the planning application for the proposed redevelopment of the Anfield Road Stand at Liverpool Football Club (LFC) (hereafter referred to as 'the Proposed Scheme'). The Proposed Scheme would include demolishing the existing Anfield Road Stand and replacing it with a new stand which would increase the seating capacity of Anfield Stadium by approximately 7,000. The Proposed Scheme would be located over Anfield Road, which would subsequently be diverted to the north to accommodate the development. During construction of the Proposed Scheme, a section of Anfield Road will be closed so a local diversion route would be introduced on Walton Lane, Priory Road and Arkles Lane.

This report provides an assessment of the following key impacts associated with the construction phase of the Proposed Scheme:

- Nuisance, loss of amenity and health impacts caused by construction dust at sensitive receptors.
- Changes in traffic related pollutant concentrations at nearby sensitive receptors associated with the diversion route during the construction phase.

No assessment of the air quality impacts associated with operation of the Proposed Scheme has been undertaken as the change in road traffic emissions is not expected to be significant (this is discussed in further detail in Section 0). This approach has been agreed with the Air Quality Support Officer at Liverpool City Council (LCC).

The assessment has been undertaken in accordance with the latest Environmental Protection UK (EPUK) / Institute of Air Quality Management (IAQM) guidance documents, 'Land-use planning & development control: planning for air quality'[1] and 'Guidance on the Assessment of dust from demolition and construction'[2].

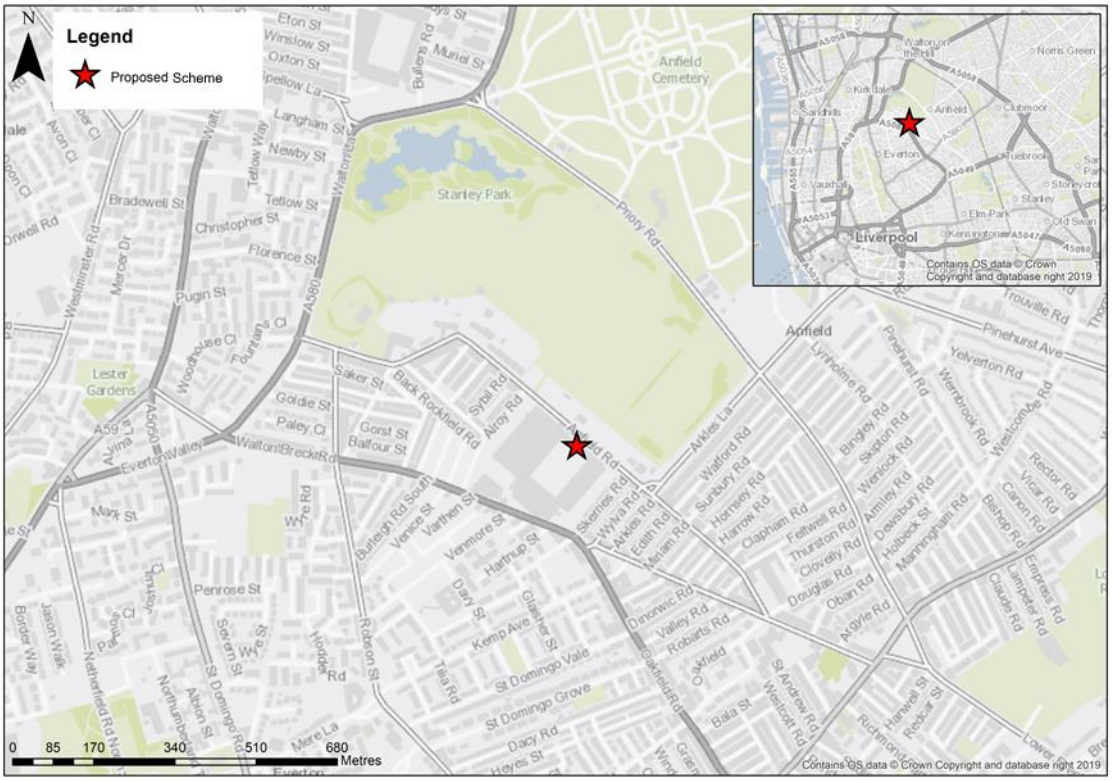
1.2 Proposed Scheme location

The Proposed Scheme is located at Anfield Stadium on Anfield Road, Liverpool, as presented in Figure 1.

[1] Environmental Protection UK and Institute of Air Quality Management (January 2017), 'Land-Use Planning and Development Control: Planning for Air Quality' version 1.2

[2] Institute of Air Quality Management (2014). 'Guidance on the assessment of dust from demolition and construction.'

Figure 1: Proposed Scheme location



1.3 Key pollutants

The assessment considers concentrations of oxides of nitrogen (NO_x) as this is the key pollutants of concern associated with road traffic emissions within Liverpool. A description of this pollutant is provided below.

Fine particulates (PM_{10} and $PM_{2.5}$; particles with a diameter smaller than 10 microns and 2.5 microns respectively) are of less concern within Liverpool as monitored concentrations of these pollutants are well below the EU air quality standards for both PM_{10} and $PM_{2.5}$[3] and the applicable air quality objectives and target levels, which are the responsibility of the local authority. A description of this pollutant is also provided below.

1.3.1 Oxides of Nitrogen

Oxides of nitrogen is a term used to describe a mixture of nitric oxide (NO) and NO_2, referred to collectively as NO_X. These are primarily formed from atmospheric and fuel nitrogen as a result of high temperature combustion. The main sources in the UK are road traffic and power generation.

During the process of combustion, atmospheric and fuel nitrogen is partially oxidised via a series of complex reactions to NO. The process is dependent on the temperature, pressure, oxygen concentration and residence time of the combustion gases in the combustion zone. Most NO_X exhausting from a combustion process is in the form of NO, which is a colourless and tasteless gas. It is readily oxidised to NO_2, a more harmful form of NO_X, by chemical reaction

[3] Liverpool City Council (2019). 2019 Air Quality Annual Summary Report (ASR).

with ozone and other chemicals in the atmosphere. NO_2 is a yellowish-orange to reddish-brown gas with a pungent, irritating odour and is a strong oxidant.

1.3.2 Particulate Matter

Particulate matter is a complex mixture of organic and inorganic substances present in the atmosphere. Sources are numerous and include power stations, other industrial processes, road transport, domestic coal burning and trans-boundary pollution. Secondary particulates, in the form of aerosols, attrition of natural materials and, in coastal areas, the constituents of sea spray, are significant contributors to the overall atmospheric loading of particulates. In urban areas, road traffic is generally the greatest source of fine particulate matter, although localised effects are also associated with construction and demolition activity.

Legislation and policy context

Introduction

This section summarises the relevant international and national legislation, policy and planning guidance in relation to air quality for the Site. In addition, local planning policy has been reviewed in order to identify relevant air quality policy implications related to the Proposed Scheme.

Legislation

European Union

EU Directive 2008/50/EC on ambient air quality and cleaner air for Europe was adopted in May 2008[4]. This Directive defines Limit Values and times by which they are to be achieved for the purpose of protecting human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

Directive 2008/50/EC sets out that the Limit Values apply everywhere with the exception of:

- any locations situated within areas where members of the public do not have access and there is no fixed habitation;
- in accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and
- on the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access to the central reservation.

Defra assesses and reports on the compliance with the Air Quality Directive for each of the 43 zones and agglomeration across the UK.

England

Air quality

The Air Quality Standards Regulations 2010[5] and Air Quality Standards (amendment) Regulations 2016[6] implement the EU's Directive 2008/50/EC on ambient air quality.

Part IV of the Environment Act 1995[7] requires that every local authority shall periodically carry out a review of air quality within its area, including likely future air quality. As part of this review, the authority must assess whether air quality objectives are being achieved, or likely to be achieved within the relevant periods. Any parts of an authority's area where the objectives are not being achieved, or are not likely to be achieved, within the relevant period must be identified and declared as an Air Quality Management Area (AQMA). Once such a declaration has been made, local authorities are under a duty to prepare an Action Plan which sets out measures to pursue the achievement of the air quality objectives within the AQMA.

4 European Union. (1996), 'Ambient air quality assessment management', Framework Directive 96/62/EC.
5 Statutory Instrument. (2010), 'The Air Quality Standards Regulations', No. 1001. Queen's Printer of Acts of Parliament.
6 Statutory Instrument (2016) The Air Quality Standards (Amendment) Regulations, No. 1184.
7 Department for Environment Food and Rural Affairs. (2003), 'Part IV of the Environment Act 1995 Local Air Quality Management'.

The air quality objectives specifically for use by local authorities in carrying out their air quality management duties are set out in the Air Quality (England) Regulations 2000[8] and the Air Quality (England) (Amendment) Regulations 2002[9]. In most cases, the air quality objectives are numerically synonymous with the limit values specified in the EU Directives, although compliance dates differ.

The Environment Act also requires that the UK Government produces a national 'Air Quality Strategy' (AQS) containing standards, objectives and measures for improving ambient air quality and to keep these policies under review. Further details of the AQS are presented in Section 0.

Statutory nuisance

Section 79(1)(d) of the Environmental Protection Act 1990[10] defines one type of 'statutory nuisance' as "*any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*". Where a local authority is satisfied that a statutory nuisance exists, or is likely to occur or recur, it must serve an abatement notice. Failure to comply with an abatement notice is an offence. However, it is a defence if an operator employs the best practicable means to prevent or to counteract the effects of the nuisance.

Policy

UK Air Quality Strategy

As described above, the Environment Act 1995 requires the UK Government to produce a national AQS. The AQS establishes the UK framework for air quality improvements. Measures agreed at the national and international level are the foundations on which the strategy is based. The first Air Quality Strategy was adopted in 1997[11] and was replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in January 2000.[12] The 2000 Strategy has subsequently been replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007.[13] The 2007 Air Quality Strategy has now been superseded as of the 14th January 2019 with the Clean Air Strategy 2019 (CAS).[14]

Although the CAS does not set legally binding objectives, the CAS instead has targets for reducing total UK emissions of nitrogen oxides (NOx) and fine particulate matter ($PM_{2.5}$) from sectors such as road transport, domestic sources and construction plant (non-road mobile machinery or NRMM).

National Planning Policy Framework

The revised National Planning Policy Framework[15] was published on 24 July 2018 and sets out government planning policies for England. With regard to air quality it states that:

8 Statutory Instrument. (2000), 'Air Quality (England) Regulations', No. 928. Queen's Printer of Acts of Parliament.

9 Statutory Instrument. (2002), 'Air Quality (England) (Amendment) Regulations', No. 3043. Queen's Printer of Acts of Parliament.

10 Parliament of the United Kingdom. (1990), 'Environmental Protection Act', Chapter 43. Queen's Printer of Acts of Parliament.

11 Department for Environment Food and Rural Affairs. (March 1997), 'The United Kingdom National Air Quality Strategy', Cm 3587, Department for Environment Food and Rural Affairs.

12 Department for Environment Food and Rural Affairs. (January 2000), 'The Environment Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air', Cm 4548, Department for Environment Food and Rural Affairs.

13 Department for Environment Food and Rural Affairs. (July 2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland', Cm 7169, Department for Environment Food and Rural Affairs.

14 Department for Environment Food and Rural Affairs. (January 2019), 'The Clean Air Strategy'

15 Department of Communities and Local Government (July 2018). Planning Policy Framework.

"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas…"

And:

"Planning policies and decisions 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. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. 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."

National Planning Practice Guidance

On 6 March 2014, the Department for Communities and Local Government (DCLG) published a national planning practice guidance web-based resource[16] which was updated on 1 November 2019.

The national planning practice guidance includes a dedicated section on air quality. It notes that, for new planning applications, the local planning authority may require information on:

- "*the 'baseline' local air quality;*
- *"whether the Proposed Scheme could significantly change air quality during the construction and operational phases "and the consequences of this for public health and biodiversity); and*
- *"whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.*"

It also states the following in relation to determining whether air quality is relevant to a planning decision:

"*Whether air quality is relevant to a planning decision will depend on the Proposed Scheme and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the Proposed Scheme would be particularly sensitive to poor air quality in its vicinity.").*"[17]

[16] National Planning Practice Guidance web-based resource. Accessible at: https://www.gov.uk/government/collections/planning-practice-guidance

[17] National Planning Practice Guidance 'Air Quality Section'. Accessible at: https://www.gov.uk/guidance/air-quality--3 (published 1 November 2019)

Local Planning Policy

Liverpool Unitary Development Plan

The Liverpool Unitary Development Plan (UDP) was adopted in November 2002[18] and provides a "statutory framework to guide development and protect and enhance the environment of the City". The main policy of relevance to air quality within the UDP is EP11 Pollution, which states that:

1. "Planning permission will not be granted for development which has the potential to create unacceptable air, water, noise or other pollution or nuisance.
2. Where existing uses adversely affect the environment through noise, vibration, soot, grit, dust, smoke, fumes, smell, vehicle obstruction or other environmental problems, the City Council will:
    a. Seek to reduce the problem on site
    b. Refuse planning permission for development which would result in a consolidation or expansion of uses giving rise to environmental problems
    c. Impose appropriate conditions on any permission which may be granted and/or obtain legal agreements in relation to such a permission, in order to regulate uses
    d. Take enforcement action where appropriate…
3. In the case of new development close to existing users which are authorised or licensed under pollution control legislation, and which are a potential nuisance to the proposed development, planning permission will not be granted unless the City Council is satisfied that sufficient measures can and will be taken to protect amenity and environmental health."

Liverpool Local Plan

The draft LCC Local Plan[19], which will eventually replace the UDP, outlines the vision and key policies for future development within Liverpool up to 2033. The main policy of relevance to air quality is Policy R1 Air, Light and Noise Pollution which states that:

- "Development proposals which are likely to have a pollution impact should demonstrate that:
    a. Appropriate measures are incorporated to avoid pollution to air, water and soil;
    b. The impact of noise, vibration and lighting will not be significant;
    c. The proposal will not undermine the achievement of Air Quality Management Area (AQMA) objectives; and
    d. It will not lead to a significant decline in air quality.
- Where existing uses adversely affect the environment through noise, vibration, dust, smoke, fumes, smell, vehicle obstruction or other environmental problems the City Council will:
    a. Refuse planning permission for proposals which would result in a consolidation or expansion of uses giving rise to environmental problems; and
    b. Impose appropriate conditions on any permission which may be granted and/or obtain legal agreements in relation to such a permission in order to regulate uses.
- New development proposals close to existing uses which are authorised or licenced under pollution control legislation, and which are a potential nuisance to the Proposed Scheme, will

[18] Liverpool City Council, 2002. A Plan for Liverpool Written Statement, Liverpool Unitary Development Plan, Adopted November 2020.

[19] Liverpool City Council, 2018. Liverpool Local Plan 2013-2033 Pre-submission draft January 2018. Available at: https://liverpool.gov.uk/media/1356834/01-local-plan-january-2018-final.pdf

not be permitted unless the City Council is satisfied that sufficient measures will be taken by the developer to protect amenity and environmental health.

- Where appropriate Major developments should incorporate measures to reduce and minimise air pollution."

Liverpool Air Quality Action Plan (AQAP)

The Liverpool City Region Combined Authority have developed an interim AQAP which will be refined in the coming months to replace the previous action plan from 2007[20]. This AQAP has been developed as part of the Council's obligations under Part IV of the Environment Act 1995 to implement measures to help achieve the air quality objectives within the Liverpool AQMA (see Section 4.2 for further details on the Liverpool AQMA). This action plan sets out a series of actions to improve air quality by:

- Reducing emissions from existing vehicles;
- Planning for active travel and public transport use;
- Promoting low emission vehicles and reducing demand for more polluting forms of transport; and
- Using the planning process to reduce sources and exposure to pollution.

The actions proposed are aimed at Central Government and its agencies; the Combined Authority; local authorities and partners; and LCR residents, communities and businesses and include actions such as:

- Boosting active travel;
- Promoting clean fuels and technologies;
- Enforcement of idling vehicles to reduce pollution at source; and
- Speed management to encourage modal shift and cleaner air.

Summary

This section has identified the legislation and policy framework relevant to the assessment. On the basis of the above, applicable numerical environmental quality standards are summarised in Table 1.

It should be noted that the UK air quality objectives only apply at locations where the members of the public might reasonably be exposed to pollutants for the respective averaging periods.

Table 2 provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to the assessment.

[20] Liverpool City Region Combined Authority (2019). Initial Air Quality Action Plan, draft final v7

Table 1: Relevant Air Quality Standards

Pollutant	Averaging period	Air Quality Objective and Limit Values		Attainment date
		Concentration	Allowance	
Nitrogen Dioxide (NO_2)	1-hour	200 µg/m^3	18 per calendar year[(d)]	31 December 2005[(a)] 1 January 2010[(b)]
	Annual	40 µg/m^3	-	31 December 2005[(a)] 1 January 2010[(b)]
Particulates (PM_{10})	24-hour	50 µg/m^3	35 per calendar year[(e)]	31 December 2004[(a)] 1 January 2005[(b)]
	Annual	40 µg/m^3	-	31 December 2004[(a)] 1 January 2005[(b)]
Particulates ($PM_{2.5}$)	Annual	25 µg/m^3	-	2020[(f)] 1st January 2010[(b)]

Notes: [(a)] Air Quality (England) Regulations 2000 as amended.
[(b)] EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe and The Air Quality Standards Regulations 2010. Derogations (time extensions) have been agreed by the EU for meeting the NO_2 limit values in some zones/agglomerations.
[(c)] Can be expressed as the 99.79th percentile of 1 hour means.
[(d)] Can be expressed as the 90.41st percentile of 24 hour means.
[(e)] Also a 'Target' of 15% reduction in annual mean concentrations at urban background between 2010 and 2020.

Table 2: Locations where the air quality objectives apply

Averaging period	Objectives should apply at:	Objectives should not apply at:
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades 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 locations at the building façade), or any other location where public exposure is expected to be short-term.
24 Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1 Hour	All locations where the annual mean and 24 mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Source: Defra 2018[21]

[21] Department for Environment, Food and Rural Affairs (2018), Local Air Quality Management – Technical Guidance (16).

Methodology

Overview

This section sets out the approach that has been undertaken to assess the air quality effects associated with the Proposed Scheme.

Construction

Construction dust emissions

Construction activities can result in temporary effects from dust. 'Dust' is a generic term which usually refers to particulate matter in the size range 1-75 microns in diameter; the most common effects from dust emissions are soiling and increased ambient PM_{10} concentrations[22]. Dust can arise from numerous construction activities such as concrete-batching, piling, sand blasting, wind erosion on material stockpiles and earth-moving activities. It can be mechanically transported either by wind or through the movement of vehicles onto the public highway (transport of debris on vehicle wheels, or uncovered loads).

The IAQM[23] recommends splitting the construction activities into four separate source categories and determining the dust risk associated with each of these individually. This assessment has determined the risk of each of the following source categories:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (the transport of dust and dirt onto the public road network).

The risk of each source for dust effects is described as 'negligible', 'low risk', 'medium risk' or 'high risk' depending on the nature and scale of the construction activities and the proximity of sensitive receptors to the construction activities or site boundary. The assessment is used to identify appropriate mitigation measures proportional to the level of risk, to reduce the effects such that they are not significant.

The assessment considers three separate effects from dust:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10}.

Step 1 of the assessment applies screening criteria to the Proposed Scheme which states that an assessment will normally be required where there is:

- A 'human receptor' within:
    - 350m of the boundary of the site; or
    - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- An 'ecological receptor' within:

[22] Department for Environment, Food and Rural Affairs (2018), Local Air Quality Management – Technical Guidance (16).

[23] Institute of Air Quality Management (2014). 'Guidance on the assessment of dust from demolition and construction.'

- 50m of the boundary of the site; or
- 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

No further assessment is required if there are no receptors within the defined boundaries.

To assess the likely dust risk, firstly the overall dust emission magnitude ('small', 'medium' or 'large') from each of the dust sources identified (demolition, earthworks, construction and trackout) is established in accordance with the criteria outlined in Appendix A.

The sensitivity of receptors is then defined (as high, medium or low) for each dust effect (dust soiling, human health and ecosystem impacts) in accordance with the criteria presented within Table 13 in Appendix A.

The sensitivity of the surrounding area is determined for each activity using the matrices in Table 14, Table 15 and Table 16 in Appendix A. The sensitivity of the area is based on; the distance of the source to the closest receptors, the receptor sensitivity, and in the case of PM_{10} effects, the local background concentration. The highest level of area sensitivity defined for each dust effect has been used in this assessment.

The final step of the assessment combines the dust emission magnitude and the sensitivity of the area, using the matrices presented within Table 17, Table 18, Table 19 and Table 20 in Appendix A to determine the dust risk categories for each activity for dust soiling and health effects.

The dust risk category defined for each dust source and effect is then used to determine appropriate site-specific mitigation measures to be adopted.

Results of the dust assessment are presented in Section 0.

Construction site plant emissions

Construction requires the use of different equipment such as excavators, cranes and on-site generators. All construction plant has an energy demand with some as direct emissions to air from exhausts. Guidance from the IAQM[24] notes that effects from exhaust will likely not be significant. Given the size and temporary nature of the site plant, effects of plant emissions on local air quality are considered of negligible significance relative to the surrounding road traffic contributions on the local road network. Construction plant emissions have therefore not been assessed further.

Notwithstanding, mitigation measures to reduce the impacts associated with site plant on local air quality are presented in Section 0. This includes prevention measures which would be incorporated with the Construction Environmental Management Plan (CEMP), such as avoiding the use of diesel or petrol-powered generators and the use of mains electricity or battery powered equipment where practicable and ensuring all vehicles switch off engines when not in use.

Construction road traffic emissions

EPUK/IAQM[25] guidance indicates that an assessment of traffic emissions is only likely to be required for large, long term construction sites that will generate an additional annual average

[24] Institute of Air Quality Management (2014). 'Guidance on the assessment of dust from demolition and construction.

[25] Environmental Protection UK and Institute of Air Quality Management (January 2017), 'Land-Use Planning and Development Control: Planning for Air Quality' version 1.2

flow greater than 25 Heavy Duty Vehicles (HDVs) per day or greater than 100 Light Duty Vehicles (LDVs) per day within an AQMA.

On an annual average basis, the total additional flows of LDVs and HDVs associated with construction vehicles for the Proposed Scheme are expected to be less than the EPUK/IAQM criteria. However, the section of Anfield Road adjacent to the Proposed Scheme will be closed throughout the construction period (which is expected to last up to 23 months). During this time, a diversion route will be implemented along Walton Lane, Priory Road and Arkles Lane. Based on existing traffic flows on Anfield Road, the increase in vehicles on roads on the diversion route are likely to be above the EPUK/IAQM criteria and therefore requires consideration to "provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality".

A simple, quantitative assessment in accordance with EPUK/IAQM guidance using the DMRB calculation spreadsheet has therefore been undertaken to determine the significance of the air quality impacts associated with the increase in traffic on diversion routes during the construction phase. Further details of the approach for the assessment is presented below.

Model selection

The DMRB calculation spreadsheet dispersion formulas have been used for this assessment in conjunction with the latest Local Air Quality Management (LAQM) tools provided by Defra, including the Emissions Factors Toolkit (EFT v9) and background mapping. Only NO_2 has been assessed within this assessment as this is the main pollutant of concern in Liverpool – ambient concentrations of PM_{10} and $PM_{2.5}$ are well below the respective objectives so any change in particulate concentrations from the diversion routes at receptors would not be significant. Emission factors for PM_{10} and $PM_{2.5}$ are also smaller than NO_2 so the change in concentrations and associated impact magnitude as a result of the Proposed Scheme would be less than assessed for NO_2.

The increase in concentrations of NO_2 have been modelled using 2020 emission factors as this is the earliest possible year of construction. This was selected as a worst-case year as vehicle emissions and background concentrations of NO_2 are predicted to decline in future years due to the transition to newer, less polluting vehicles on the road network.

The adopted approach calculates concentrations of pollutants at individual receptors based on the proximity of receptors to roads and the traffic flows on these roads (total flows, type of vehicles and average speed). The outputs for NOx should then be converted to NO_2 to allow for comparison with the relevant air quality objectives. Defra provides a spreadsheet-based method on the Air Information Resource Website[26] for the conversion of NOx to NO_2, which has been used within the assessment.

Modelling scenarios

The Transport Chapter of the Environmental Impact Assessment (EIA) has assessed two diversion routes associated with the Proposed Scheme: a strategic diversion route and an alternative, local diversion route. The strategic diversion route is via Walton Lane, Priory Road and Arkles Lane and is expected to be used by non-local traffic approaching Anfield Stadium via the A59 from centre of Liverpool or north. However, it is understood that a significant proportion of the existing traffic on Anfield Road is local traffic originating from the adjacent residential streets which may choose to travel the shortest distance possible, via Walton Breck Road and

[26] Department for Environment Food and Rural Affairs (2018). Air Quality Information Resource (Air) Website, available at: http://uk-air.defra.gov.uk/

Wylfa Road/Arkles Road. Therefore, this alternative, local diversion route has also been assessed. This local diversion route consists of local residential roads (Alroy Road, Sybil Road, Walton Breck Road, Wylva Road and Arkles Road) to the south of the Proposed Scheme and would be expected to be used by local residents who live close to the stadium.

For the purpose of the Transport chapter, it has been assumed that 100% of the traffic that currently uses Anfield Road would be tested on both the strategic and local diversion routes. This has been undertaken as a worst-case assessment to understand the percentage change in flows along these routes. However, it would be inappropriate to adopt the same approach for this air quality assessment as the outcome would be overly conservative and not realistically reflect the impact of the Proposed Scheme on air quality during the construction phase.

It has therefore been assumed for this air quality assessment that all roads on the strategic and local diversion routes would experience 50% of the existing traffic flows from Anfield Road. This is considered a more realistic scenario as there are multiple routes that vehicles could use to avoid the Anfield Road closure and all vehicles would not use the same route. Multiple roads on the strategic diversion route (Alroy Road, Sybil Road, Wylva Road and Arkles Road) are also one way only, while traffic on Anfield Road is two way, so traffic flows on these roads would be much lower than the existing flows on Anfield Road.

To align with the Transport Assessment (TA) and capture the worst-case impacts, a sensitivity test has been undertaken assuming that 100% of the traffic flow from Anfield Road would travel on the strategic and local diversion route roads. The results from this sensitivity test are presented in Appendix B.

Traffic data

The traffic flows used in the assessment are based on the flows from the Automatic Traffic Count (ATC) survey undertaken in November 2019 on Anfield Road. These flows have been uplifted to 2020 using TEMPro growth factors. The assessment has then applied these flows to all roads on the strategic and local diversion routes to model the increase in traffic flows associated with the diversion routes on each road. Existing flows on these roads have been accounted for within the assessment in the ambient concentrations assigned to receptors (see Section 4.2.3).

The traffic data used within the main assessment and sensitivity test are presented in Table 3 below.

Table 3: Traffic data used within the assessment

Scenario	Road	Diversion route	Additional traffic flow (AADT)	%HDV	Average speed (kmph)*
Main assessment (50% traffic flows of Anfield Road)	149 Walton Lane	Strategic	1463	10	48
	Arkles Lane	Strategic	1463	10	38
	Sybil Road	Local	1463	10	35.4
	Alroy Road	Local	1463	10	35.4
	Wylva Road	Local	1463	10	35.4
	Arkles Road	Local	1463	10	35.4
Sensitivity test (100% traffic	149 Walton Lane	Strategic	2926	10	48
	Arkles Lane	Strategic	2926	10	38
	Sybil Road	Local	2926	10	35.4

Scenario	Road	Diversion route	Additional traffic flow (AADT)	%HDV	Average speed (kmph)*
flows of Anfield Road)	Alroy Road	Local	2926	10	35.4
	Wylva Road	Local	2926	10	35.4
	Arkles Road	Local	2926	10	35.4

Note: * All roads have been assessed at 35.4kmph (average monitored speed on Anfield Road) except Walton Lane and Arkles Lane, where the maximum speed limit has been assumed. For receptors modelled near junctions, speeds have been reduced by 10kmph in accordance with best practice guidance from Defra (TG16).

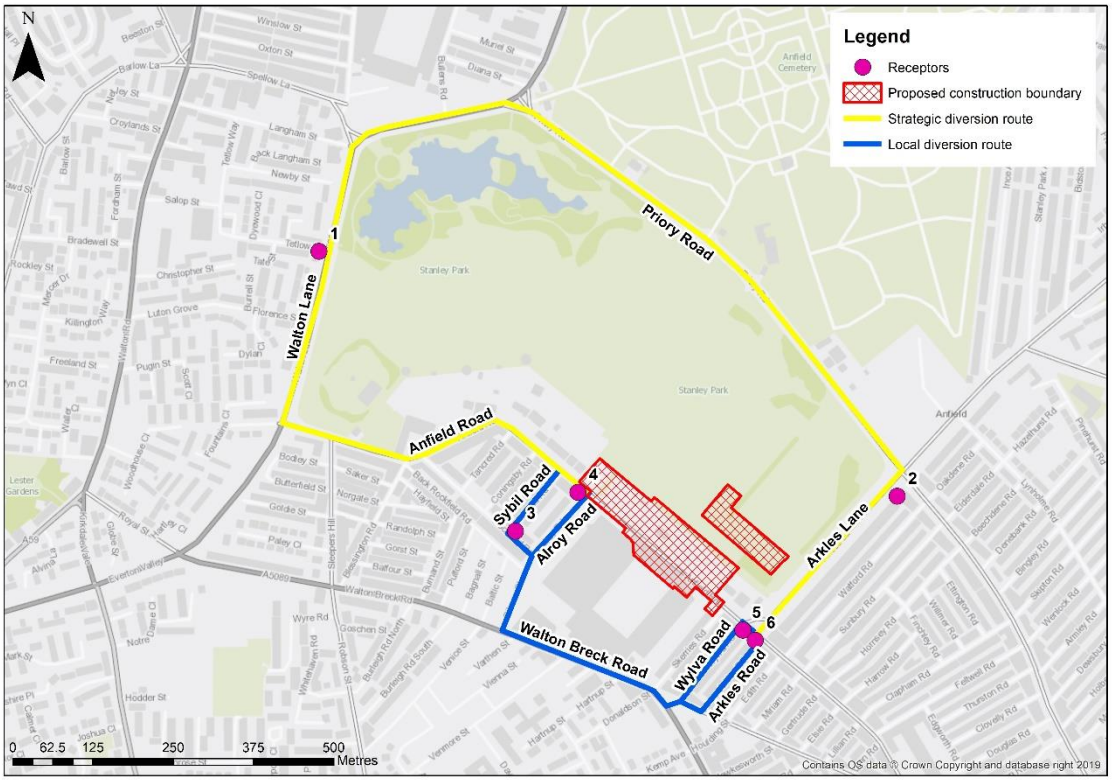
Receptors

The assessment has considered the change in NO_2 concentrations at the worst-case receptor on each road on the strategic and local diversion routes. The receptors selected were those closest to the road and/or a road junction. The locations of the receptors considered within the assessment are presented in Table 4 and Figure 2.

Table 4: Modelled receptors

Receptor ID	Road	X	Y	Proximity to nearest road (m)
1	149 Walton Lane	335771	393642	5.5
2	Arkles Lane	336672	393261	7.5
3	Sybil Road	336077	393207	4.0
4	Alroy Road	336175	393267	9.3
5	Wylva Road	336432	393053	2.1
6	Arkles Road	336451	393037	2.1

Figure 2: Receptor locations



Assessment criteria

A number of approaches can be used to determine whether the potential air quality effects of a development are significant. However, there remains no universally recognised definition of what constitutes 'significance' for air quality effects.

Guidance is available from a range of regulatory authorities and advisory bodies on how best to determine and present the significance of effects within an air quality assessment. It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively.

Any description of an effect of a development is informed by numerical results. However, an element of professional judgement must also be involved. To ensure that the descriptions of effects used within the assessment are clear, consistent and in accordance with the latest guidance, definitions for the assessment of air quality concentration changes at individual human health receptors have been adopted from the EPUK/IAQM guidance[27]. Table 5 provides effect descriptors for changes in NO_2 concentrations as a result of the Proposed Scheme.

The magnitude of any concentration change identified must be considered in relation to the Air Quality Assessment Level (AQAL), which may be an air quality objective, EU limit or target value or an Environment Agency Environmental Assessment Level (EAL). For this report, the relevant AQALs have been presented in Table 1. The most important aspects to consider are the percentage of long term average concentrations at the individual receptor in the assessment

[27] Institute of Air Quality Management & Environmental Protection UK (2017). 'Land-use planning & development control: planning for air quality'.

year in relation to the AQAL and the percentage of change in concentration in relation to the AQAL.

EPUK/IAQM recognises that professional judgement is required in the interpretation of air quality assessment significance. Table 5 is intended as a tool to help interpret the results to the air quality assessment and will therefore be employed in conjunction with professional judgement.

Table 5: Effect descriptors for individual receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76%-94% of AQAL	Negligible	Slight	Moderate	Moderate
95%-102% of AQAL	Slight	Moderate	Moderate	Substantial
103%-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes: [(a)] AQAL = Air Quality Assessment Level i.e. 40µg/m^3 for annual mean NO_2. The table is only designed to be used with annual mean concentrations

[(b)] Percentage pollutant concentrations are intended to be rounded to whole numbers. For example, the '<1%' category in this table includes all changes from 0.5% to 1.4% (equivalent to an annual mean NO_2 absolute concentration change of between 0.2µg/m^3 and 0.6µg/m^3). Changes of 0% (i.e. less than 0.5%) are described as negligible.

[(c)] When defining the concentration as a percentage of the AQAL, use the 'do minimum' concentrations where there is a decrease in pollutant concentration and the 'do something' concentration for an increase.

Addressing uncertainty

The DMRB calculation approach has associated with it an inherent level of uncertainty, primarily as a result of:

- Uncertainties with emissions/traffic data; and
- Simplifications made in the model algorithms or post processing of the data that represent atmospheric dispersion or chemical reactions.

A process known as model verification aims to address these uncertainties. This is done by comparing modelled concentrations with monitored concentrations to identify any disparity. Traffic data for 2018 was obtained from the Department of Transport for roads in the area surrounding the Proposed Scheme and compared against 2018 Local Authority monitoring data. The outcome of this verification was that the approach was found to be performing well as the modelled concentrations of pollutants were in line with monitored concentrations (modelled concentrations at three of the four monitoring sites considered were within 10% of the monitored concentrations).

A sensitivity test was also undertaken where 100% of the traffic flows from Anfield Road were assumed to travel on all roads on the strategic and local diversion routes. As previously discussed, this is a highly robust assumption and therefore accounts for the uncertainties associated with the traffic data.

Operation

The increase in stadium capacity is not expected to create an increase in road traffic in the vicinity of the Proposed Scheme during operation as no additional vehicle parking will be made available, in addition to 149 spaces being removed from the Anfield Road car park. Therefore there is not predicted to be an increase in traffic flows that would exceed the screening criteria within the EPUK/IAQM guidance, and no further assessment of operation impacts has been undertaken as changes in road traffic emissions during the operation phase are unlikely to lead significant air quality effects.

Liverpool Football Club have implemented a Transport Strategy which supports fan travel to and from the stadium on match days, with a focus on supporting sustainable travel choices. The Proposed Scheme would not change the Transport Strategy beyond updating the Strategy to ensure it delivers the same principles as a result of the Proposed Scheme. Key measures within the Transport Strategy are discussed in Section 0.

Baseline

Overview

Information on air quality within the UK can be obtained from a variety of sources including Local Authorities, national network monitoring sites and other published sources. The primary sources of data examined in this assessment are from LCC[28] and Defra. The most recent full year of automatic monitoring data available is for 2018.

Local Authority Review and Assessment

The Liverpool citywide AQMA was declared in May 2008 for exceedances of the annual mean NO_2 objective.[29] This AQMA encompasses the whole of the City of Liverpool. The latest air quality monitoring indicates a maximum monitored concentration of NO_2 of 42.8µg/m^3 at a location of relevant exposure within the AQMA.

As stated within the LCC Annual Summary Report (ASR), PM_{10} and $PM_{2.5}$ is not a pollutant of concern within Liverpool as concentrations of these pollutants are well below the respective air quality standards.

Local Authority monitoring

Automatic monitoring

LCC undertakes air quality monitoring at one automatic monitoring station within the city; the Speke Automatic Urban and Rural Network (AURN) site. This is an urban background site approximately 12km south east of the Proposed Scheme so is not considered representative. Therefore, this monitoring site has not been considered further within the assessment.

Diffusion tube monitoring

LCC undertakes diffusion tube monitoring at 88 locations across the city. There are four diffusion tubes in close proximity to the Proposed Scheme which are considered representative of the Proposed Scheme and modelled receptors. N7 and N9 are located on the A580 Walton Lane/A59 Scotland Road so are representative of the receptor on Walton Lane. N8 is also located on the A580 Walton Lane close to the Proposed Scheme but is not considered representative as it is located on a traffic island. B14 and B13 are located less than 1km east/south east of the Proposed Scheme so are considered representative of air quality at the Proposed Scheme site and receptors on the residential roads near the stadium (Sybil Road, Alroy Road etc.), which will have lower traffic flows.

Table 6 presents the concentrations monitored at these sites between 2016 and2018. No exceedances of the NO_2 annual mean objective were monitored during this period.

Figure 3 present the location of these monitoring sites in relation to the Proposed Scheme.

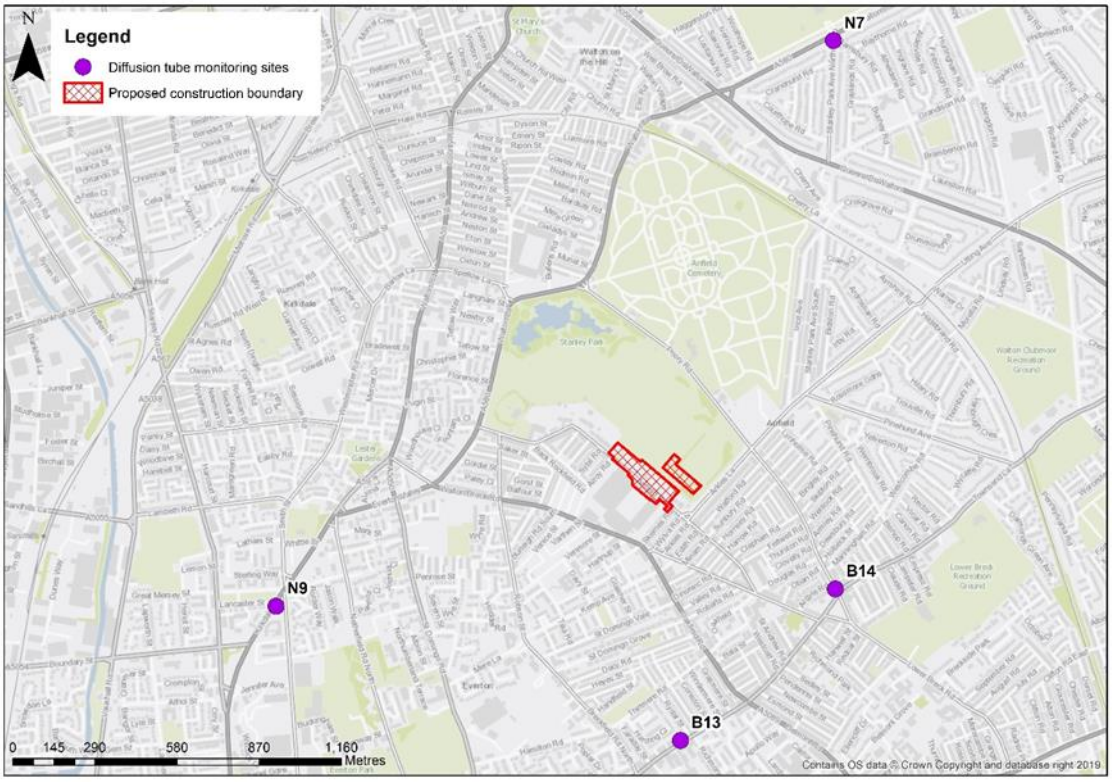
[28] Liverpool City Council (2019). 2019 Air Quality Annual Summary Report (ASR).
[29] Liverpool City Council (2019). 2019 Air Quality Annual Summary Report (ASR).

Table 6: LCC diffusion tube monitoring results

Site ID	Site Classification	National Grid Reference		Annual mean NO_2 concentration µg/m^3		
		X	Y	2016	2017	2018
B13	Roadside	336430	392270	35	26	26
B14	Roadside	336977	392804	41	31	30
N7	Kerbside	336970	394737	-	-	36
N9	Roadside	335003	392743	-	-	36

Source: LCC 2019
Note: Data capture for all sites was >92% in 2018. Bias adjustment factor for 2018=0.9

Figure 3: Nearby monitoring locations



Defra projected background concentrations

Defra provides estimates of background pollution concentrations for NO_X, NO_2, PM_{10} and $PM_{2.5}$ across the UK for each one kilometre grid square for every year from 2017 to 2030. Future year projections have been developed from the base year of the background maps, which is currently 2017. The maps include a breakdown of background concentrations by emission source, including road and industrial sources which have been calibrated against 2017 UK monitoring data.

The background concentrations for the 1km grid square containing the Proposed Scheme in 2020 are presented in Table 7. The data shows background concentrations are all below the relevant objectives.

Table 7: 2020 Defra projected background concentrations for Proposed Scheme and air quality objectives/target values for NO_x, NO_2, PM_{10} and $PM_{2.5}$ (µg/m^3)

1km Grid Square Location (OS Grid Reference)	2020 background concentration (µg/m^3)			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$
336500, 393500	23.9	16.6	11.6	8.4

Source: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017
Note: Annual mean air quality objectives: NO_2 and PM_{10} = 40µg/m^3 and targets: $PM_{2.5}$ = 25µg/m^3

Ambient concentrations assumed within the assessment

The 2018 concentrations monitored at sites N9 and B14 have been used within this assessment to represent the ambient concentrations at modelled receptors. This is because the receptors considered within the assessment are close to the roadside so the monitored roadside concentrations are more representative than the Defra background concentrations. The 2018 concentration at N9 has been assumed for the receptor on Walton Lane (36µg/m^3) and the 2018 concentration at B14 (30µg/m^3) has been assumed for the remaining receptors (which are located on roads with lower traffic flows than Walton Lane).

This is a conservative approach as concentrations of NO_2 in Liverpool have been decreasing over time (as demonstrated in Table 6). Therefore, the 2018 NO_2 concentrations are likely to be greater than at receptors concentrations during the construction period (2020-2022). Several roads considered within the assessment are also one-way, so will likely have lower vehicle flows (and roadside NO_2 concentrations) than the two-way roads these diffusion tubes are located on.

Potential impacts

Overview

This section provides details of the likely impacts predicted to occur as a result of the construction phase of the Proposed Scheme. As discussed in Section 0, no assessment of operation impacts has been undertaken as the impact is expected to be insignificant due to the nature of the Proposed Scheme (reduction in car parking spaces and no additional trips expected).

Construction dust

The magnitude and sensitivity descriptors that have been applied to assess the overall effect of the construction phase are presented in Appendix A. Table 8 presents a summary of the dust emission magnitude assigned to each construction activity based on these descriptors.

Table 8: Dust emission magnitude

Activity	Dust emission magnitude	Justification
Demolition	Medium	Demolition volume is expected to be between 20,000m^3-50,000m^3. The height of demolition activities will be between 10-20m above ground level and will include demolition of concrete/masonry.
Earthworks	Large	Site area is greater than 10,000m^2.
Construction	Medium	Total building volume is between 25,000m^3 – 100,000m^3 and will include potential dusty material (concrete).
Trackout	Medium	10-50 outward HDV movements per day anticipated (which, when averaged over the year, is equivalent to less than 25 AADT)

Table 9 presents the sensitivity of the area to effects caused by construction activities and is based on the criteria presented in Table 14, Table 15 and Table 16 within Appendix A. Figure 4 and Figure 5 present the dust assessment buffers.

There are no ecological designated sites within 50m of the site entrance or possible routes used by construction vehicles on the public highway. The nearest ecological designation is at the Mersey Narrows SSSI/Ramsar/SPA. This site is approximately 4.3km west of the Proposed Scheme so is outside the screening distance and therefore has not been considered further.

Table 9: Area sensitivity

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
Demolition	High	There are more than 10 high sensitivity receptors (residential dwellings) within 20m of the Proposed Scheme and 20m of the route used by construction vehicles on the public highway. These are located on Anfield Road, Skerries Road and Arkles Lane.	Low	Background annual PM_{10} concentration at Proposed Scheme site in 2020 <24µg/m^3. There are more than 10 high sensitivity receptors (residential dwellings) within 20m of the Proposed Scheme and 20m of the route used by construction vehicles on the public highway. These are located on Anfield Road, Skerries Road and Arkles Lane.
Earthworks	High		Low	
Construction	High		Low	
Trackout	High		Low	

The overall risk to receptors from dust soiling and PM_{10} effects are presented in Table 10. Risk is based on the criteria presented in Table 17 to Table 20 within Appendix A.

Table 10: Summary of the risk of construction effects

Activity	Dust soiling effects	PM_{10} effects
Demolition	Medium	Low
Earthworks	High	Low
Construction	Medium	Low
Trackout	Medium	Low

Dust soiling effects are ‘Medium to High Risk’ and PM_{10} effects are ‘Low Risk’ without mitigation. Mitigation measures appropriate for the Proposed Scheme have been presented in Section 6. These measures will be incorporated within the Construction Environmental Management Plan (CEMP) to further reduce the risk.

Figure 4: Construction dust assessment buffers (demolition, earthworks and construction)

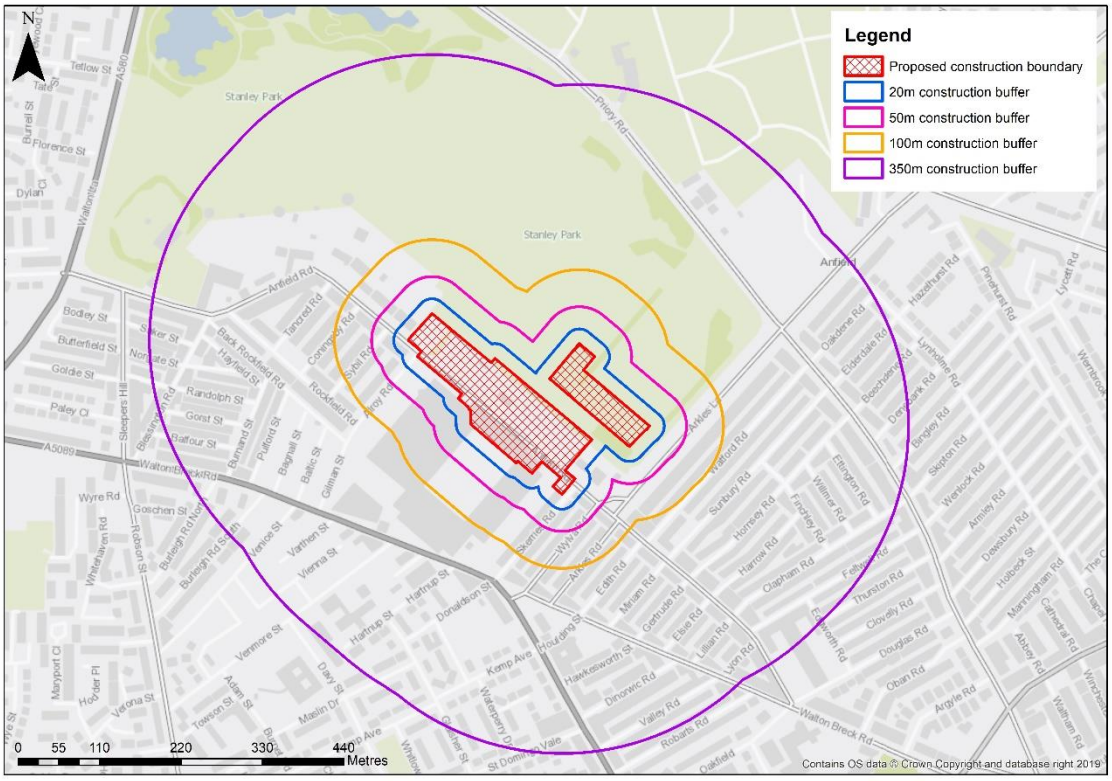
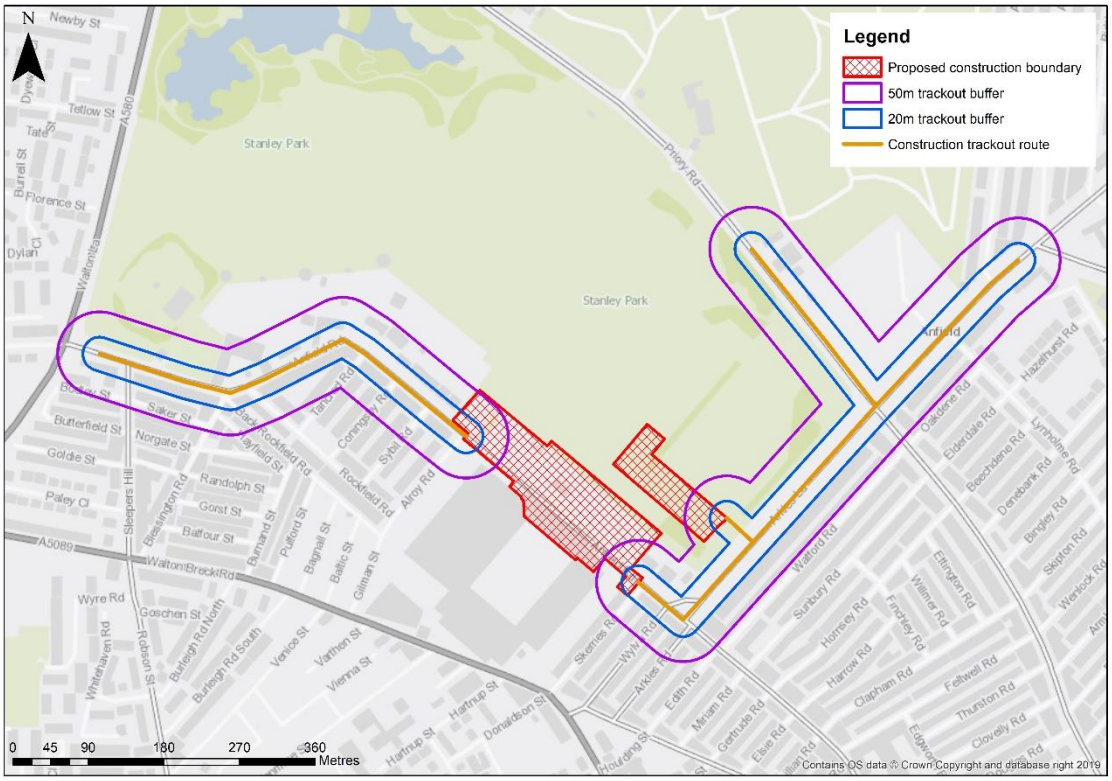


Figure 5: Construction dust assessment buffers (trackout)



Construction diversion route – vehicle emissions

The modelled increase in annual mean NO_2 concentrations due to the closure of a section of Anfield Road during the construction period and subsequent diversion of vehicles on to roads in the surrounding area is presented in Table 11. The impact presented is conservative as worst-case receptors, emission factors and ambient concentrations have been used. The impact is considered as temporary as the construction period is anticipated to last less than 2 years, after which time Anfield Road would reopen.

Across all the receptors, the impact is described as 'negligible' or 'slight' in accordance with IAQM/EPUK best practice guidance. The greatest increase in annual mean NO_2 concentrations of 1.5µg/m^3 is predicted at the receptors on Wylva Road and Arkles Lane.

The diversion routes would also likely reduce the number of vehicles travelling on Anfield Road, resulting in a reduction in NO_2 concentrations at sensitive receptors along this road. Based on these findings, and the conservative assumptions used within the assessment, the temporary impact associated with diversion routes during the construction phase of the Proposed Scheme are considered insignificant. As presented in Appendix B, the sensitivity test undertaken also concluded that the impact associated with the diversion routes would be insignificant, even when assuming highly conservative increases in vehicle numbers.

Table 11: Increase in NO_2 concentrations at the worst-case receptors as a result of diversion routes during construction

Receptor	Annual mean Increase in NO_2 ($\mu g/m^3$)	Existing annual mean NO_2 ($\mu g/m^3$)*	Total annual mean NO_2 ($\mu g/m^3$)	Annual NO_2 objective ($\mu g/m^3$)	% change in concentration relative to AQAL	Impact descriptor
149 Walton Lane	0.7	36	36.7	40	1.8	Negligible
Arkles Lane	0.7	30	30.7	40	1.7	Negligible
Sybil Road	1.2	30	31.2	40	3.1	Slight
Alroy Road	0.7	30	30.7	40	1.8	Negligible
Wylva Road	1.5	30	31.5	40	3.8	Slight
Arkles Road	1.5	30	31.5	40	3.8	Slight

Note: AQAL = Air Quality Assessment Level ($40\mu g/m^3$)
*Accounts for the existing vehicle flows on these roads

Mitigation

Overview

This section presents the proposed mitigation measures associated with the construction and operation phases of the Proposed Scheme.

Construction phase

Construction activities are predicted to have a 'Medium to High Risk' in terms of dust soiling and 'Low Risk' in terms of PM_{10} effects with no mitigation in place. Best practice mitigation measures for the Proposed Scheme as outlined in guidance from the IAQM and are presented below:

General

- 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 application site boundary;
- Display head or regional office contact information;
- Develop and implement a Dust Management Plan (DMP), including regular site inspections;
- Record all dust and air quality complaints, identify causes and take appropriate action and record measures to reduce emissions. Make complaints log available to the Local Authority when asked;
- Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust;
- 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 issue on site when activities with a potential to produce dust are being carried out during dry or windy conditions;
- Erect solid screens or barriers around dusty activities or the application site boundary that are at least as high as any stockpiles on site. Keep clean using wet methods;
- 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 run-off of water or mud. A record of any site run off should be kept and actions to prevent reoccurrence;
- Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site;
- Cover, seed or fence stockpiles to prevent wind whipping;
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques;
- 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 where appropriate;

- Ensure equipment is readily available on site to clean any dry spillages;
- No burning of waste;
- Ensure all vehicles switch off engines when stationary - no idling vehicles; and
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

Demolition

- Soft strip inside building before demolition;
- Ensure effective water suppression is used during demolition operations; and
- Bag and remove any biological debris or damp down such material before demolition.

Earthworks

- Re-vegetate earthworks and exposed areas to stabilise surfaces as soon as practicable. Use Hessian, mulches or trackifiers where is it not possible to re-vegetate or cover with topsoil; and
- Only remove the cover in small areas during work and not all at once.

Trackout

- 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 the site are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record all inspections of haul routes and subsequent action in a site logbook; and
- Implement a wheel washing system.

Operation phase

The existing Transport Strategy includes measures to manage traffic on match days. This includes measures such as closure of the roads near the stadium and encouraging the use of public transport (train and buses) and active transport (cycling and walking). Travelling to Anfield Stadium by car is discouraged by restricting the amount of parking available at the stadium and by advising visitors against parking on residential streets surrounding the stadium by emphasising that parking enforcement will be in operation on these streets on match days. Softer measures are also included within the Strategy to discourage behaviours which could have an adverse impact on air quality. For example, to discourage the idling of coaches, coach drivers are invited to the Kop Bar within the stadium to watch the football matches rather than stay within their coaches with the engines running.

This existing Match Day and Event Transport Management Strategies have proven to be effective in encouraging a modal shift to sustainable transport modes and managing traffic on match / event days; they are consistently monitored and reviewed, being updated as appropriate in response to changes in circumstances, including changes associated with Proposed Scheme.

Summary

This report provides an assessment of the following key impacts associated with the construction phase of the Proposed Scheme:

- Nuisance, loss of amenity and health impacts caused by construction dust at sensitive receptors
- Changes in traffic related pollutant concentrations at nearby sensitive receptors associated with the diversion route during the construction phase

A qualitative assessment of construction dust effects has been undertaken for the Proposed Scheme (see Section 0). There is predicted to be a 'Medium to High Risk' of dust creating nuisance and/or loss of amenity and 'Low Risk' of PM_{10} leading to adverse health effects (without mitigation). Following the appropriate implementation of the mitigation measures listed in Section 0, impacts are predicted not to be significant.

The assessment of the impact associated with the construction phase diversion routes demonstrates that the changes in NO_2 concentrations at the worst-case sensitive receptors will be 'negligible' or 'slight' in accordance with the EPUK/IAQM guidance adopted for this assessment. This impact will also be temporary as the construction phase (and associated diversion routes) are planned to last for less than two years. Therefore, the impact of the Proposed Scheme on air quality at existing receptors is not significant. Due to the nature of the Proposed Scheme, the air quality impacts during operation are also expected to be insignificant.

The Proposed Scheme is not considered to conflict with any national, regional or local planning policy within LCC.

Appendices

Construction dust

Table 12: Determination of Dust Raising Magnitude

Source	Large	Medium	Small
Demolition	Total building volume > 50,000m3, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities > 20m above ground	Total building volume 20,000m3 - 50,000m3, potentially dusty construction material, demolition activities 10-20m above ground level	Total building volume <20,000m3, construction material with low potential for dust release (e.g .metal cladding or timber), demolition activities <10m above ground, demolition during wetter months
Earthworks	Total site area >10,000m2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes	Total site area 2,500m2 – 10,000m2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000 tonne – 100,000 tonne	Total site area <2,500m2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000tonne, earthworks during wetter months
Construction	Total building volume >100,000m3, piling, on site concrete batching; sandblasting	Total building volume 25,000m3 – 100,000m3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching	Total building volume <25,000m3, construction material with low potential for dust release (e.g. metal cladding or timber)
Track out	>100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m	25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m	<25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m

Source: IAQM

Table 13: Receptor Sensitivity

Source	High	Medium	Low
Sensitivities of people to dust soiling effects	Users can reasonably expect an enjoyment of a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks (See note B) and car showrooms.	Users would expect a to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	The enjoyment of amenity would not reasonably be expected (See note A); or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or There is transient exposure, where the people or Property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative examples include playing fields, farmland (unless

		Indicative examples include parks and places of work.	commercially-sensitive horticultural), footpaths, short term car parks (See note B) and roads.
Sensitivities of people to the health effects of PM10	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day - See note C) Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Locations where the people exposed are workers (See note D), and exposure is over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM10, as protection is covered by Health and Safety at Work legislation.	Locations where human exposure is transient (See note E) Indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of receptors to ecological effects (See note F)	Locations with an international or national designation and the designated features may be affected by dust soiling; or Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain (See note G). Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • Locations with a national designation where the features may be affected by dust deposition. • Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	Locations with a local designation where the features may be affected by dust deposition. Indicative example is a local Nature Reserve with dust sensitive features.

A The public's expectations will vary depending on the existing dust deposition in the area

B Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

C This follows Defra guidance as set out in LAQM.TG(16).

D Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM10. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

E There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health effects, albeit less certain.

F A Habitat Regulation Assessment of the site may be required as part of the planning process, if the site lies close to an internationally designated site i.e. Special Conservation Areas (SACs), Special Protection Areas (SPAs) designated under the Habitats Directive (92/43/EEC) and RAMSAR sites.

G Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

Table 14: Sensitivity of the area to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 15: Sensitivity of the area to human health effects

Receptor Sensitivity	Annual Mean PM10 Concentration	Number of Receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg/m3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 16: Sensitivity of the area to ecological effects

Receptor Sensitivity	Distance from the source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table 17: Risk of Dust Effects - Demolition

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Low Risk

Table 18: Risk of Dust Effects - Earthworks

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 19: Risk of Dust Effects - Construction

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 20: Risk of Dust Effects – Trackout

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Sensitivity test

A sensitivity test to assess the impact associated with the construction phase diversion routes has been undertaken where it is assumed that 100% of the traffic that would travel on Anfield Road would travel on the roads on the strategic and local diversion routes. This is to account for uncertainties associated with modelling and align with the Transport Assessment where this worst-case scenario has been assessed. The results from this sensitivity test are presented in Table 21.

Across all the receptors, the impact is described as 'slight' or 'moderate' in accordance with IAQM/EPUK best practice guidance. The greatest increase in annual NO_2 concentrations of 3.0µg/m^3 is predicted at the receptors on Wylva Road and Arkles Road. Based on these findings, the conservative assumptions used within the assessment, and that these impacts would be temporary, the impact associated with the diversion routes during the construction phase are still considered insignificant.

Table 21: Increase in NO_2 concentrations at the worst-case receptors as a result of diversion routes during construction (100% traffic flow)

Receptor	Increase in anneal mean NO_2 (µg/m^3)	Existing annual mean NO_2 (µg/m^3)	Total annual mean NO_2 (µg/m^3)	Annual NO_2 objective (µg/m^3)	% change in concentration relative to AQAL	Impact descriptor
149 Walton Lane	1.4	36	37.4	40	3.6	Slight
Arkles Lane	1.3	30	31.3	40	3.3	Slight
Sybil Road	2.5	30	32.5	40	6.2	Moderate
Alroy Road	1.4	30	31.4	40	3.6	Slight
Wylva Road	3.0	30	33.0	40	7.6	Moderate
Arkles Road	3.0	30	33.0	40	7.6	Moderate

Note: AQAL = Air Quality Assessment Level (40µg/m^3)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