

Air Quality and Odour Appraisal
Whitechapel Road, Cleckheaton

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Executive Summary

Redmore Environmental Ltd was commissioned by Martin Walsh Architectural to undertake an Air Quality and Odour Appraisal in support of the allocation of a parcel of land between Whitechapel Road and Whitehall Road, Cleckheaton, for industrial use through the development plan process.

Industrial land use has the potential to cause air quality impacts during construction and operation, as well as expose future occupants to any existing air quality or odour issues. As such, an Air Quality and Odour Appraisal has been undertaken in order to determine baseline conditions at the site, consider its suitability for the proposed end-use and support its allocation within the forthcoming development plan.

The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. It is suggested that these are assessed and suitable mitigation techniques identified to reduce releases to an acceptable level. Following the specification of control options, the residual effect of construction dust emissions will normally be not significant. As such, potential impacts are not considered a constraint to the proposals, subject to the completion of a detailed assessment.

The development has the potential to affect existing air quality as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site during the operational phase. Although trip generation information was unavailable to inform the appraisal, it is considered likely that a detailed assessment using dispersion modelling will be required. Based on the results of the assessment, mitigation may be required to reduce effects to an acceptable level.

Places of work are not considered locations of relevant exposure when determining compliance with the relevant air quality standards. As such, existing pollution levels at the site are not considered a constraint to the proposals.

Any development at the proposed location has the potential to expose future occupants to any existing odour issues. As such, baseline conditions were assessed through a desk-top study and Field Odour Survey. This indicated effects are unlikely to be significant and odour should not be viewed as a constraint to the site allocation.

If required it would be possible to undertake further assessment of odour conditions at the site in support of any development planning application. However, it is considered unlikely that any additional works would provide indication of odour constraints to the proposed land use.

Table of Contents

1.0	INTRODUCTION	1
1.1	Background	1
1.2	Site Location and Context	1
2.0	LEGISLATION AND POLICY	2
2.1	Air Quality	2
	European Directives	2
	UK Legislation	2
	Local Air Quality Management	4
	Dust	5
2.2	Odour	5
	Odour Definition	5
	Odour Impacts	6
	Odour Legislative Control	7
2.3	Planning Policy	8
	National Planning Practice Guidance	8
	Local Planning Policy	9
3.0	AIR QUALITY	12
3.1	Baseline	12
	Local Air Quality Management	12
	Air Quality Monitoring	13
	Background Pollutant Concentrations	13
3.2	Appraisal	14
	Construction Phase Impacts	14
	Operational Phase Impacts	15
4.0	ODOUR	18
4.1	Baseline	18
	Site Setting	18
	Field Odour Survey	19
4.2	Appraisal	25
5.0	CONCLUSION	27
6.0	ABBREVIATIONS	29

Appendices

Appendix 1 - Curriculum Vitae

1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Martin Walsh Architectural to undertake an Air Quality and Odour Appraisal in support of the allocation of a parcel of land between Whitechapel Road and Whitehall Road, Cleckheaton, for industrial use through the development plan process.

1.1.2 The proposals have the potential to cause impacts at sensitive locations, as well as expose future occupants to any existing air quality or odour issues. As such, an Air Quality and Odour Appraisal was undertaken in order to determine baseline conditions, assess any potential constraints to development and identify any further work required to support a planning application for the site.

1.2 Site Location and Context

1.2.1 The site is located on land between Whitechapel Road and Whitehall Road, Cleckheaton, at approximate National Grid Reference (NGR): 417580, 426300. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 Kirklees Council (KC) are currently in the process of generating a new statutory development plan for the area, scheduled for adoption in 2017. Review of draft documents produced for the Local Plan revealed that the site is intended for designation for employment use. The proposals aim to support the approval for this allocation, specifically for industrial development.

1.2.3 Industrial land use has the potential to cause air quality impacts during construction and operation, as well as expose future occupants to any existing air quality or odour issues. As such, an Air Quality and Odour Appraisal has been undertaken in order to determine baseline conditions at the site, consider its suitability for the proposed end-use and support its allocation within the forthcoming development plan. This is detailed in the following report.

2.0 LEGISLATION AND POLICY

2.1 Air Quality

European Directives

2.1.1 European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new Air Quality Limit Values (AQLVs) for particulate matter with an aerodynamic diameter of less than 2.5µm. The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient AQLVs for nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

2.1.2 The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

UK Legislation

2.1.3 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 5 pollutants.

2.1.4 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving

ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.1.5 Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM ₁₀	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum

2.1.6 Table 2 summarises the advice provided in DEFRA guidance LAQM.TG(09)² on where the AQOs for pollutants considered within this report apply.

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed	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 mean	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 mean	All locations where the annual mean and 24 and 8-hour 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

Local Air Quality Management

2.1.7 Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

Dust

2.1.8 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2010), such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."

2.1.9 Enforcement of the Act, in regard to nuisance, is currently under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to Best Practice Measures (BPM).

2.2 Odour

Odour Definition

2.2.1 DEFRA guidance³ defines odour as:

"An odour is the organoleptic attribute perceptible by the olfactory organ on sniffing certain volatile substances. It is a property of odorous substances that make them perceptible to our sense of smell. The term odour refers to the stimuli from a chemical compound that is volatilised in air. Odour is our perception of that sensation and we interpret what the odour means. Odours may be perceived as pleasant or unpleasant. The main concern with odour is its ability to cause a response in individuals that is considered to be objectionable or offensive.

³ Odour Guidance for Local Authorities, DEFRA, 2010.

Odours have the potential to trigger strong reactions for good reason. Pleasant odours can provide enjoyment and prompt responses such as those associated with appetite. Equally, unpleasant odours can be useful indicators to protect us from harm such as the ingestion of rotten food. These protective mechanisms are learnt throughout our lives. Whilst there is often agreement about what constitutes pleasant and unpleasant odours, there is a wide variation between individuals as to what is deemed unacceptable and what affects our quality of life."

Odour Impacts

2.2.2 The magnitude of odour impact depends on a number of factors and the potential for complaints varies due to the subjective nature of odour perception. The FIDOR acronym is a useful reminder of the factors that will determine the degree of odour pollution:

- Frequency of detection - frequent odour incidents are more likely to result in complaints;
- Intensity as perceived - intense odour incidents are more likely to result in complaints;
- Duration of exposure - prolonged exposure is more likely to result in complaints;
- Offensiveness - more offensive odours have a higher risk of resulting in complaints; and,
- Receptor sensitivity - sensitive areas are more likely to have a lower odour tolerance.

2.2.3 It is important to note that even infrequent emissions may cause loss of amenity if odours are perceived to be particularly intense or offensive.

2.2.4 The FIDOR factors can be further considered to provide the following issues in regards to the potential for an odour emission to cause a nuisance:

- The rate of emission of the compound(s);
- The duration and frequency of emissions;
- The time of the day that this emission occurs;
- The prevailing meteorology;
- The sensitivity of receptors to the emission i.e. whether the odorous compound is more likely to cause nuisance, such as the sick or elderly, who may be more sensitive;
- The odour detection capacity of individuals to the various compound(s); and,

- The individual perception of the odour (i.e. whether the odour is regarded as unpleasant). This is greatly subjective, and may vary significantly from individual to individual. For example, some individuals may consider some odours as pleasant, such as petrol, paint and creosote.

Odour Legislative Control

Environmental Permitting

2.2.5 The main requirement with respect to odour control from large industrial activities is the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments. If a process is deemed potentially odorous then the relevant regulator will usually include an appropriate condition in the site's Environmental Permit to restrict impacts beyond the facility boundary.

2.2.6 Enforcement of the condition is by the relevant regulator, either the Environment Agency for Part A(1) processes, or the Local Authority for Part (A2) and B processes. If the regulator is satisfied that odour from a facility is causing pollution beyond the site boundary then they can serve an improvement notice that requires remedial works to be undertaken to reduce impacts to an acceptable level. The measures that are deemed appropriate will depend on the industry sector and site-specific circumstances and will take costs and benefits into account. Should appropriate actions not be taken by the operator then the regulator has a number of available options, cumulating in the revocation of the Environmental Permit and cessation of all activities on site.

Environmental Protection Act

2.2.7 Similarly to dust, the main requirement with respect to odour control from premises not designated under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments is that provided in Section 79 of Part III of the Environmental Protection Act (1990).

2.2.8 If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice. Enforcement can insist that there be no odour beyond the boundary of the works. The only defence is to show that the process to which the

nuisance has been attributed and its operation are being controlled according to BPM. The term BPM is defined as:

- a) "Practicable" means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;
- b) The "means" to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;
- c) The test is to apply only so far as compatible with any duty imposed by law; and,
- d) The test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.

2.2.9 It should be noted that where an operator can demonstrate that BPM is being applied, or where an agreed degree of abatement deemed to be BPM is added, this will not necessarily result in the total elimination of odours.

2.3 Planning Policy

National Planning Practice Guidance

2.3.1 The National Planning Practice Guidance⁴ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. Why should planning be concerned about air quality?
2. What is the role of Local Plans with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality be relevant to a planning decision?
6. Where to start if bringing forward a proposal where air quality could be a concern?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?

⁴ <http://planningguidance.planningportal.gov.uk>.

9. How do considerations about air quality fit into the development management process?

2.3.2 These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

Local Planning Policy

2.3.3 The Unitary Development Plan (UDP)⁵ sets out KC's policies and proposals for the use and development of land and buildings. The UDP was adopted in March 1999, and a direction issued by the Secretary of State for Communities and Local Government in September 2007 led to a review of the plans, where a number of policies were removed.

2.3.4 Review of the UDP policies saved beyond September 2007 revealed the following of relevance to this report:

"Built Environment

BE1

all development should be of good quality design such that it contributes to a built environment which:

[...]

iv. promotes a healthy environment, including space and landscaping about buildings and avoidance of exposure to excessive noise or pollution; [...]"

2.3.5 KC are currently developing a new Local Plan which will form the new statutory plan for the district and will supersede the UDP. Review of the Strategy & Policies⁶ document from the Draft Local Plan revealed the following policies of relevance to this report:

"Policy DLP 48

⁵ Kirklees Unitary Development Plan, Written Statement - Revised with Effect from 28 September 2007, KC, 2007.

⁶ Strategies and Policies, Draft Local Plan, KC, 2015.

Healthy, active and safe lifestyles

The council will, with its partners, create an environment which supports healthy, active and safe communities and reduces inequality. Healthy, active and safe lifestyles will be enabled by:

[...]

g. ensuring that the current air quality in the district is monitored and maintained and, where required, appropriate mitigation measures included as part of new development proposals; [...]"

"Policy DLP51

Protection and improvement of local air quality

Proposals that have the potential to increase local air pollution either individually or cumulatively must be accompanied by evidence to show that the impact of the development has been assessed in accordance with the relevant guidance.

Development which has the potential to cause levels of local air pollution to increase to unsafe levels must incorporate sustainable mitigation measures that reduce this impact to a safe level. If sustainable measures cannot be introduced the development will not be permitted.

Where the development introduces new receptors into Air Quality Management Areas or Areas of Concern or near other areas of relatively poor air quality, for example near roads or junctions, the development must incorporate sustainable measures that protect the new receptors from unacceptable levels of air pollution. Where sustainable measures cannot be introduced which prevent receptors from being exposed to unsafe levels of air pollution, development will not be permitted.

All development will be carried out in accordance with the most relevant and up to date strategies, guidance, legal requirements and action plans."

2.3.6 The above policies were taken into consideration throughout the undertaking of the appraisal.

3.0 AIR QUALITY

3.1 Baseline

3.1.1 Existing air quality conditions in the vicinity of the proposed development site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

Local Air Quality Management

3.1.2 As required by the Environment Act (1995), KC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO₂ are above the AQO at one location within the council's administrative extents. As such, an AQMA has been designated which is described as:

"An area encompassing properties along two sections of the A62 Leeds Road, in the vicinity of the junctions with the A6107 Bradley Road, and with the A644."

3.1.3 The council has also identified that 24-hour PM₁₀ concentrations are above the AQO at one location within the council's administrative extents. As such, an AQMA has been designated which is described as:

"Incorporating a number of properties along part of the Huddersfield Road A644"

3.1.4 The closest AQMA is situated approximately 5.7km from the scheme boundary. It is considered unlikely that the proposals would affect air quality over a distance of this magnitude or conditions within the designation would be representative of those at the development location. As such, the AQMAs are not considered a constraint to site allocation for industrial use.

3.1.5 KC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMAs have been designated.

Air Quality Monitoring

3.1.6 Monitoring of pollutant concentrations is undertaken by KC using continuous and periodic methods throughout their area of jurisdiction. Recent results from sites in the vicinity of the development are shown in Table 3. Exceedences of the relevant AQO are shown in **bold**.

Table 3 Monitoring Results

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)		
		2012	2013	2014
68	Cleckheaton - A638	44.08	42.31	43.03

3.1.7 As shown in Table 3, annual mean NO₂ concentrations were above the relevant AQO at diffusion tube 68 during recent years. This would be expected as the monitoring site is located adjacent to the A638, A58, M606 and M62 junction.

Background Pollutant Concentrations

3.1.8 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 417500, 426500. Data for this location was downloaded from the DEFRA website⁷ for the purpose of the assessment and is summarised in Table 4.

Table 4 Background Pollutant Concentration Predictions

Pollutant	Predicted 2016 Background Pollutant Concentration (µg/m ³)
NO ₂	19.88
PM ₁₀	17.43

3.1.9 As shown in Table 4, predicted background concentrations are below the relevant AQOs at the development site.

⁷ <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011>.

3.2 Appraisal

3.2.1 The proposed development has the potential to cause air quality impacts during construction and operation. These are considered in the following Sections.

Construction Phase Impacts

3.2.2 The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

3.2.3 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

3.2.4 Review of mapping resources has indicated a number of receptors within the vicinity of the site. As such, any emissions may cause adverse impacts at these sensitive locations during construction. These should be assessed in accordance with the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'⁸ and the findings included within a full Air Quality Assessment which can be submitted in support of the planning application for the development. This should also include identification of suitable mitigation to control potential emissions to an acceptable level.

3.2.5 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step will be to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible⁹. Hence the residual effect will normally be **not significant**. As such, potential dust impacts are not considered a constraint to the proposals, subject to the completion of a detailed assessment.

⁸ Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

⁹ Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

Operational Phase Impacts

Vehicle Exhaust Emission Impacts

- 3.2.6 The development has the potential to affect existing air quality conditions as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site during the operational phase. Although trip generation information was unavailable to inform this appraisal, the development site is relatively large and industrial land use has the potential to produce a fairly large number of movements per day, a significant proportion of which may be Heavy Duty Vehicles (HDVs).
- 3.2.7 The proposed location benefits from direct access on to the A58, with the M62 and M606 junction within 240m of the boundary. As such, any trips generated by the development are likely to be distributed onto the wider road network without the formation of bottlenecks on local links.
- 3.2.8 The Highways Agency 'Design Manual for Roads and Bridges' (DMRB)¹⁰ and IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'¹¹ guidance documents provide a number of criteria to determine the potential for trips generated by development to affect local air quality.
- 3.2.9 The DMRB¹² provides the following criteria for determination of road links potentially affected by changes in traffic flow:
- Daily Annual Average Daily Traffic (AADT) flows change by 1,000 or more;
 - Daily HDV AADT flows change by 200 or more;
 - Daily average speed changes by 10km/hr or more; or,
 - Peak hour speed changes by 20km/hr or more.

¹⁰ DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

¹¹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

¹² DMRB 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

3.2.10 The IAQM 'Land-Use Planning & Development Control: Planning for Air Quality' guidance¹³ document provides the following criteria to help establish when an assessment of potential impacts on the local area is likely to be considered necessary:

- A change of Light Duty Vehicle (LDV) flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- A change of HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- Realignment of roads where the change is 5m or more and the road is within an AQMA; or,
- Introduction of a new junction or removal of an existing junction near to relevant receptors.

3.2.11 Should these criteria not be met, then the DMRB¹⁴ and IAQM guidance¹⁵ documents consider air quality impacts associated with a scheme to be **negligible** and no further assessment is required.

3.2.12 It is considered likely that the proposed development will exceed the DMRB and IAQM criteria. As such, a detailed assessment of road vehicle exhaust emission impacts using dispersion modelling may be required. The findings could be included within a full Air Quality Assessment which can be submitted in support of the planning application for the development.

3.2.13 If the assessment indicates significant air quality impacts, effects could be mitigated through a number of potential options. These include:

- Provision of electric vehicle charging points within the development;
- Restrictions on vehicle fleet type; and,
- Financial off-setting of emissions.

¹³ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

¹⁴ DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

¹⁵ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2015.

3.2.14 These are considered suitable for an industrial development in this location. As such, operational phase road vehicle exhaust emission impacts are not considered a constraint to the proposals, subject to the completion of a detailed assessment.

Future Exposure

3.2.15 As shown in Table 2, places of work are not considered locations of relevant exposure for the determination of AQO compliance. As such, existing pollution levels at the site are not considered a constraint to the proposals.

4.0 ODOUR

4.1 Baseline

4.1.1 Existing odour conditions in the vicinity of the development site were identified in order to identify any constraints to the proposals. These are detailed in the following Sections.

Site Setting

4.1.2 The site is located in a mainly rural location, with open farmland and a golf course dominating the surrounding landscape. The settlement of Cleckheaton is located to the east, with Scholes to the south-west. The M62 runs to the east of the site, the A58 to the north and the B6120 to the south.

4.1.3 The north-west corner of the site borders a gas works and nursery. The Wyke Chemical Works operated by Nufarm UK Ltd is approximately 1.0km from the boundary in this direction. A pig farm is also situated approximately 1.3km to the north-west. No other potentially significant sources of odour were identified in the vicinity of the development. Reference should be made to Figure 2 for a map of the potential odour source locations.

4.1.4 During the site visit the gas works was noted to consist of overground pipework and various plant items. No obvious sources of odour were observed. As such, this facility has not been considered further in the context of this appraisal.

4.1.5 Nurseries can cause odour impacts as a result of emissions from fertiliser. However, any releases are likely to be agricultural in nature, which would be considered acceptable for a rural area. Additionally, due to the relatively small size of the site any emissions are unlikely to be significant. As such, the nursery has not been considered further in the context of this appraisal.

4.1.6 The potential for odour to impact at sensitive locations depends significantly on the meteorology, particularly wind direction, during emissions. In order to consider prevailing conditions at the site review of historical weather data was undertaken. The closest observation station to the facility is Leeds Bradford Airport at NGR: 422676, 441150, which is approximately 15.9km north-east of the boundary. It is considered that conditions are

likely to be reasonably similar over a distance of this magnitude and the information is a suitable source of data for an assessment of this nature.

4.1.7 Meteorological data was obtained from Leeds Bradford Airport meteorological station over the period 1st January 2010 to 31st December 2014 (inclusive). This is summarised in Table 5. Reference should be made to Figure 3 for a wind rose of the meteorological data.

Table 5 Wind Frequency Data

Wind Direction (°)	Frequency of Wind (%)
337.5 - 22.5	8.81
22.5 - 67.5	8.25
67.5 - 112.5	8.77
112.5 - 157.5	7.95
157.5 - 202.5	8.57
202.5 - 247.5	16.66
247.5 - 292.5	31.70
292.5 - 337.5	6.75
Sub-Total	97.44
Calms	1.92
Missing/Incomplete	0.64

4.1.8 All meteorological data used in the assessment was provided by Atmospheric Dispersion Modelling Ltd, which is an established distributor of meteorological data within the UK.

4.1.9 As shown in Table 5, the prevailing wind direction at the site is from the west, with moderate frequencies from the south-west. Winds from the other sectors are relatively infrequent, which is indicative of conditions within the north of the UK.

Field Odour Survey

4.1.10 An adverse effect of odour exposure, such as annoyance or loss of amenity, is subjective and is not something that can be wholly defined or assessed by scientific methods alone.

An assessment can therefore be strengthened by including a subjective assessment of prevailing odour conditions by those directly affected or by experienced, trained, observers.

- 4.1.11 Sensory testing techniques use the human nose as the analytical sensor to enable the odour magnitude (as either intensity or concentration), frequency, duration and offensiveness of the odour to be recorded at a particular location at a specific time. This is a sound approach considering that no analytical instrument can currently give a unified measure of a complex mixture of compounds that quantifies it as a whole in the same way that a human experiences odour. Sensory testing also allows the character of the odour to be assessed, which is a great benefit when there are a number of different odour sources.
- 4.1.12 Subjective sensory tests, such as the Field Odour Survey, should not automatically be considered inferior to quantitative ambient monitoring. When carried out to a rigorous, well-designed methodology, the results of such sensory surveys can be expected to be robust and reproducible.
- 4.1.13 A Field Odour Survey was undertaken across the site in order to determine baseline conditions. These followed the methodology outlined within the IAQM 'Guidance on the Assessment of Odour for Planning'¹⁶ document, as summarised in the following subsections.
- 4.1.14 It should be noted that the assessment relies on professional judgement and reasoning should be provided as far as practicable. The IAQM guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 1.

Procedure

- 4.1.15 A sensory test was carried out at each survey location over a 5-minute period. The positions started at locations affected by the least-intense odours, to avoid olfactory fatigue. For each test location, the start time of the observation period, meteorological conditions and the attributes of the odour were recorded as follows:

¹⁶ Guidance on the Assessment of Odour for Planning, IAQM, 2014.

- The assessor breathed normally, inhaling ambient air samples through the nose every 10-seconds, to give 30 samples over the 5-minute observation period;
- For each sample, the odour intensity was recorded using the scale outlined in Table 6;

Table 6 Odour Intensity Scale

Odour Strength	Intensity Level	Comments
No odour/not perceptible	0	No odour when compared to the clean site
Slight/very weak	1	There is probably some doubt as to whether the odour is actually present
Slight/weak	2	The odour is present but cannot be described using precise words or terms
Distinct	3	The odour character is barely recognisable
Strong	4	The odour character is easily recognisable
Very strong	5	The odour is offensive. Exposure to this level would be considered undesirable
Extremely strong	6	The odour is offensive. An instinctive reaction would be to mitigate against further exposure

- At the end of the observation period at the test location, the odour unpleasantness was noted by classifying it as unpleasant, neutral (neither pleasant nor unpleasant) or pleasant. This assumed that at least some of the 30 samples were of intensity 3 or more (i.e. the odour is at least 'barely recognisable');
- The odour descriptor and meteorological conditions were also noted;
- The pervasiveness/extent of the odour at the test location was assessed by calculating the percentage odour time, $t_{\geq 4}$, which is the number of samples where odour was recognisable divided by the total number of samples (i.e. 30). Note that 'recognisable odour' is where the odour strength exceeds the recognition threshold and is definitely recognisable by the assessor i.e. the assessor is capable of definitely identifying its quality/character, which corresponds to an intensity of 4 or more; and,
- The average odour intensity (I_{mean}) over the test period was calculated and the maximum intensity (I_{max}) noted.

4.1.16 The above procedure was repeated at all survey locations. These were chosen during the site visit based on the perceived odour sources and locations of interest.

4.1.17 The following additional factors were also adopted to safeguard the quality of the sensory assessments:

- The odour assessor would not have undertaken the assessment if they had a cold, sore throat, sinus trouble, etc;
- The odour assessor was not hungry or thirsty;
- The odour assessor did not work within half an hour of the end of their last meal;
- The odour assessor did not smoke or consume strongly flavoured food or drink, including coffee, for at least half an hour before the field odour survey was carried out, or during the survey;
- The odour assessor did not consume confectionery or soft drinks for at least half an hour before the field odour survey was carried out, or during the survey;
- Scented toiletries, such as perfume/aftershave were not used on the day of the field odour survey; and,
- The vehicle used during the field odour survey did not contain any deodorisers.

4.1.18 Following completion of the Field Odour Survey, the matrix outlined in Table 7 was utilised to determine the level of odour exposure at each monitoring location.

Table 7 Odour Exposure

Average Intensity (I_{mean})	Percentage Odour Time ($t_{\geq 4}$)				
	≤10%	11% to 20%	21% to 30%	31% to 40%	≥41%
6	Large	Very Large	Very Large	Very Large	Very Large
5	Medium	Large	Large	Very Large	Very Large
4	Small	Medium	Medium	Large	Large
3	Small	Medium	Medium	Medium	Medium
2	Small	Small	Medium	Medium	Medium
1	Small	Small	Small	N/A	N/A
0	Negligible	Negligible	Negligible	Negligible	Negligible

4.1.19 It should be noted that I_{mean} was rounded to the nearest whole number.

4.1.20 The following overriding considerations also affect the scoring of the odour annoyance impact:

- If $I_{\text{mean}} = 0$, then the odour effect can for practical purposes be considered **negligible**; and,
- If $I_{\text{mean}} = 1$ but $t_{\geq 4} = 0\%$, then the odour effect can for practical purposes be considered **negligible**.

4.1.21 Following the determination of the odour exposure level, the significance of effect can be determined through the interaction with receptor sensitivity, as outlined in Table 8.

Table 8 Odour Receptor Sensitivity

Sensitivity	Description
High	Surrounding land where: <ul style="list-style-type: none"> • Users can reasonably expect enjoyment of a high level of amenity; and, • People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land Examples may include residential dwellings, hospitals, schools/education and tourist/cultural
Medium	Surrounding land where: <ul style="list-style-type: none"> • Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or, • People would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land Examples may include places of work, commercial/retail premises and playing/recreation fields
Low	Surrounding land where: <ul style="list-style-type: none"> • The enjoyment of amenity would not reasonably be expected; or, • There is transient exposure, where the people would reasonably be expected to present only for limited periods of time as part of the normal pattern of use of the land Examples may include industrial use, farms, footpaths and roads

4.1.22 The assessment matrix is provided in Table 9.

Table 9 Odour Effect Significance

Overall Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
Very Large	Substantial	Substantial	Substantial

Overall Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
Large	Moderate	Moderate	Substantial
Medium	Slight	Slight	Moderate
Small	Negligible	Negligible	Slight

Results

4.1.23 The Field Odour Survey was undertaken between 14:09 and 15:28 on 8th January 2016. This involved testing at eight locations throughout the site, as shown in Figure 4. The meteorological conditions during the monitoring were clear skies with some white clouds, a westerly/south-westerly wind which had a speed between 1mph and 18mph and cold temperatures of approximately 8°C. The wind speed was noted to vary dependant on the level of cover at the survey position and elevation in relation to the remainder of the site.

4.1.24 The Field Odour Survey results are summarised in Table 10.

Table 10 Field Odour Survey - Results

Position	$t_{\geq 4}$ (%)	I_{mean}	I_{max}	Unpleasantness	Odour Description	Notes
1	0	0	0	Neutral	None	-
2	0	0	0	Neutral	None	-
3	0	0	2	Neutral	Smoke, traffic fumes	Adjacent to M62
4	0	0	1	Neutral	Smoke, soil	-
5	0	0	1	Neutral	Cooking / oily	Adjacent to A58
6	0	0	2	Neutral	Smoke	Adjacent to gas works
7	0	0	2	Neutral	Smoke	-
8	0	1	2	Neutral	Smoke, traffic fumes	-

4.1.25 Following completion of the Field Odour Survey, odour exposure at each of the monitoring locations was determined. This is summarised in Table 11.

Table 11 Odour Exposure

Position	Odour Exposure
1	Negligible
2	Negligible
3	Negligible
4	Negligible
5	Negligible
6	Negligible
7	Negligible
8	Negligible

4.1.26 As shown in Table 11, odour exposure was **negligible** at all survey locations.

4.2 Appraisal

4.2.1 Any development on the proposed site has the potential to expose future occupants to any existing odour issues. As shown in Table 8, industrial land use is considered to be of **low** sensitivity. This is because people are less likely to be exposed for long periods and a certain level of impact would be expected in such locations before loss of amenity would be experienced. As such, effects of greater significance could occur at the site when compared with more sensitive land uses, such as residential, without being a constraint to development.

4.2.2 The results of the desk-top study indicated there are few odour sources in the vicinity of the site, with the most significant identified as the Wyke Chemical Works. However, this is located approximately 1km to the north-west of the boundary. As shown in Table 5, winds from this direction only occur for 6.75% of the year. As such, the conditions required to disperse any emissions towards the development location are relatively rare. Additionally, 1km is considered a fairly large distance for significant odour effects to be experienced over. It is noted there are a number of residential receptors closer to the facility than the proposed site. These would be considered of greater sensitivity to potential impacts than

industrial land use and the operation of the installation in close proximity to these receptors would indicate odour effects are unlikely to be an issue.

4.2.3 The results of the Field Odour Survey indicated **negligible** impacts at all locations on the site. The wind direction during the monitoring period was from the west to south-west, which is typical of prevailing conditions at the development location. As such, similar effects would be expected during the majority of the year, based on the limited survey results and meteorological data.

4.2.4 It is considered that existing odour conditions are not a constraint to the proposed site allocation. This view was adopted based upon:

- The distance between the site and significant odour sources;
- The sensitivity of the proposed land use;
- The prevailing meteorological conditions; and,
- The results of the Field Odour Survey.

4.2.5 If required by KC it would be possible to undertake further assessment of odour conditions at the site in support of any development planning application. This could include additional Field Odour Surveys and/or dispersion modelling of emissions from Wyke Chemical Works to quantify odour concentrations across the site. However, it is considered unlikely that any additional works would provide indication of odour constraints to the proposed land use.

5.0 CONCLUSION

- 5.1.1 Redmore Environmental Ltd was commissioned by Martin Walsh Architectural to undertake an Air Quality and Odour Appraisal in support of the allocation of a parcel of land between Whitechapel Road and Whitehall Road, Cleckheaton, for industrial use through the development plan process.
- 5.1.2 The proposals have the potential to cause impacts at sensitive locations, as well as expose future occupants to any existing air quality or odour issues. As such, an Air Quality and Odour Appraisal was undertaken in order to determine baseline conditions, assess any potential constraints to development and identify any further work required to support a planning application for the site.
- 5.1.3 The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. It is suggested that these are assessed in accordance with the IAQM guidance and suitable mitigation techniques identified to reduce releases to an acceptable level. Following the specification of control options, the residual effect of construction dust emissions will normally be **not significant**. As such, potential impacts are not considered a constraint to the proposals, subject to the completion of a detailed assessment.
- 5.1.4 The development has the potential to affect existing air quality as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site during the operational phase. Although trip generation information was unavailable to inform the appraisal, it is considered likely that the DMRB and IAQM criteria for detailed assessment will be exceeded. As such, a dispersion modelling assessment of road vehicle exhaust emission impacts should be undertaken in support of any planning application for the site. Based on the results, mitigation may be required to reduce effects to an acceptable level.
- 5.1.5 Places of work are not considered locations of relevant exposure for the determination of AQO compliance. As such, existing pollution levels at the site are not considered a constraint to the proposals.

5.1.6 Any development at the proposed location has the potential to expose future occupants to any existing odour issues. These were assessed through a desk-top study and Field Odour Survey. The results indicated that odour conditions are not a constraint to the proposed site allocation. This view was adopted based upon the following:

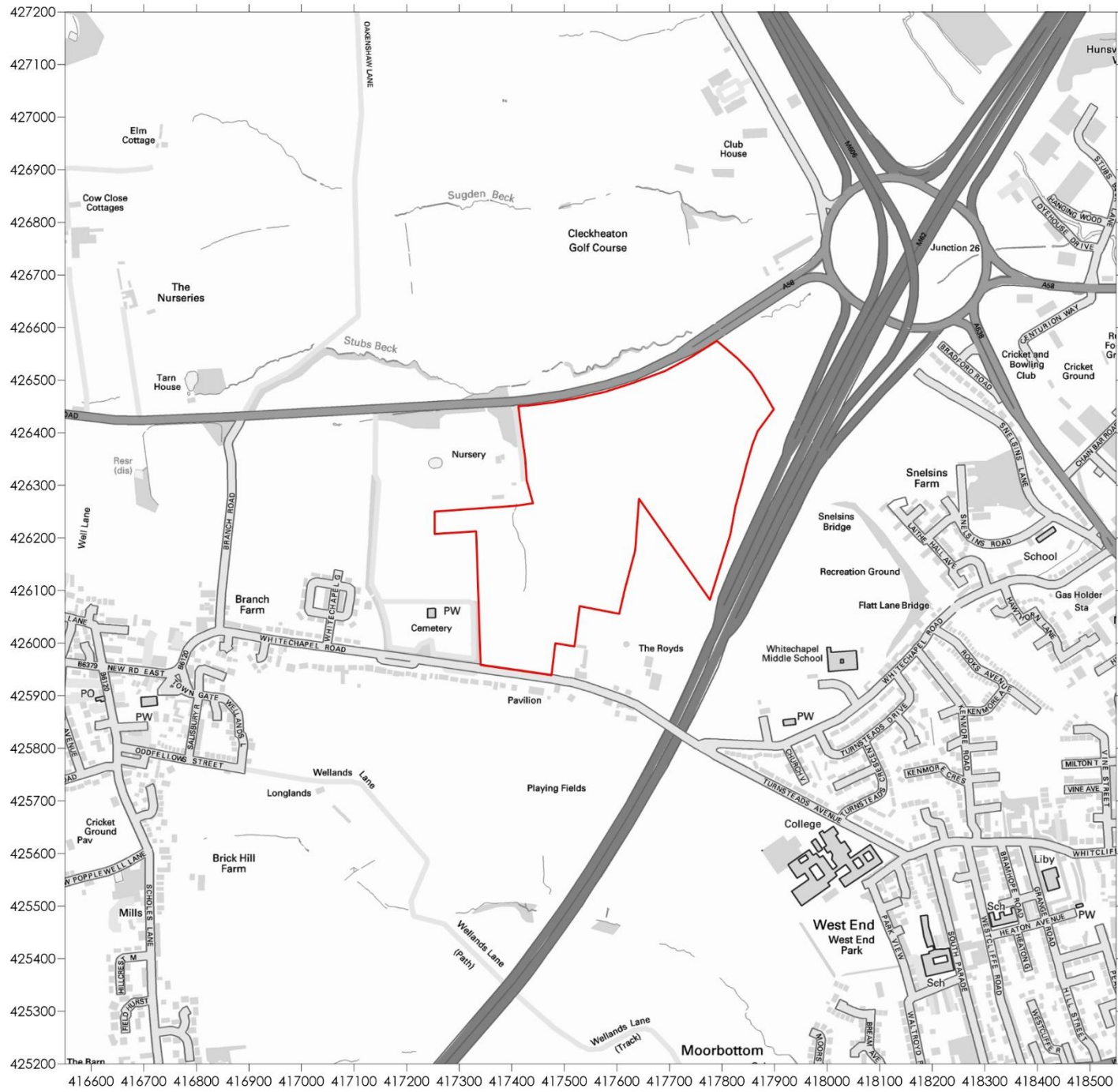
- The distance between the site and significant odour sources;
- The sensitivity of the proposed land use;
- The prevailing meteorological conditions; and,
- The results of the Field Odour Survey.

5.1.7 If required by KC it would be possible to undertake further assessment of odour conditions at the site in support of any development planning application. This could include additional Field Odour Surveys and/or dispersion modelling to quantify odour concentrations across the site. However, it is considered unlikely that any additional works would provide indication of odour constraints to the proposed land use.

6.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
BPM	Best Practicable Means
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
KC	Kirklees Council
LA	Local Authority
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
UDP	Unitary Development Plan

Figures



Legend
 Site Boundary

Title
Figure 1 - Site Location Plan

Project
Air Quality and Odour Appraisal
Whitechapel Road, Cleckheaton

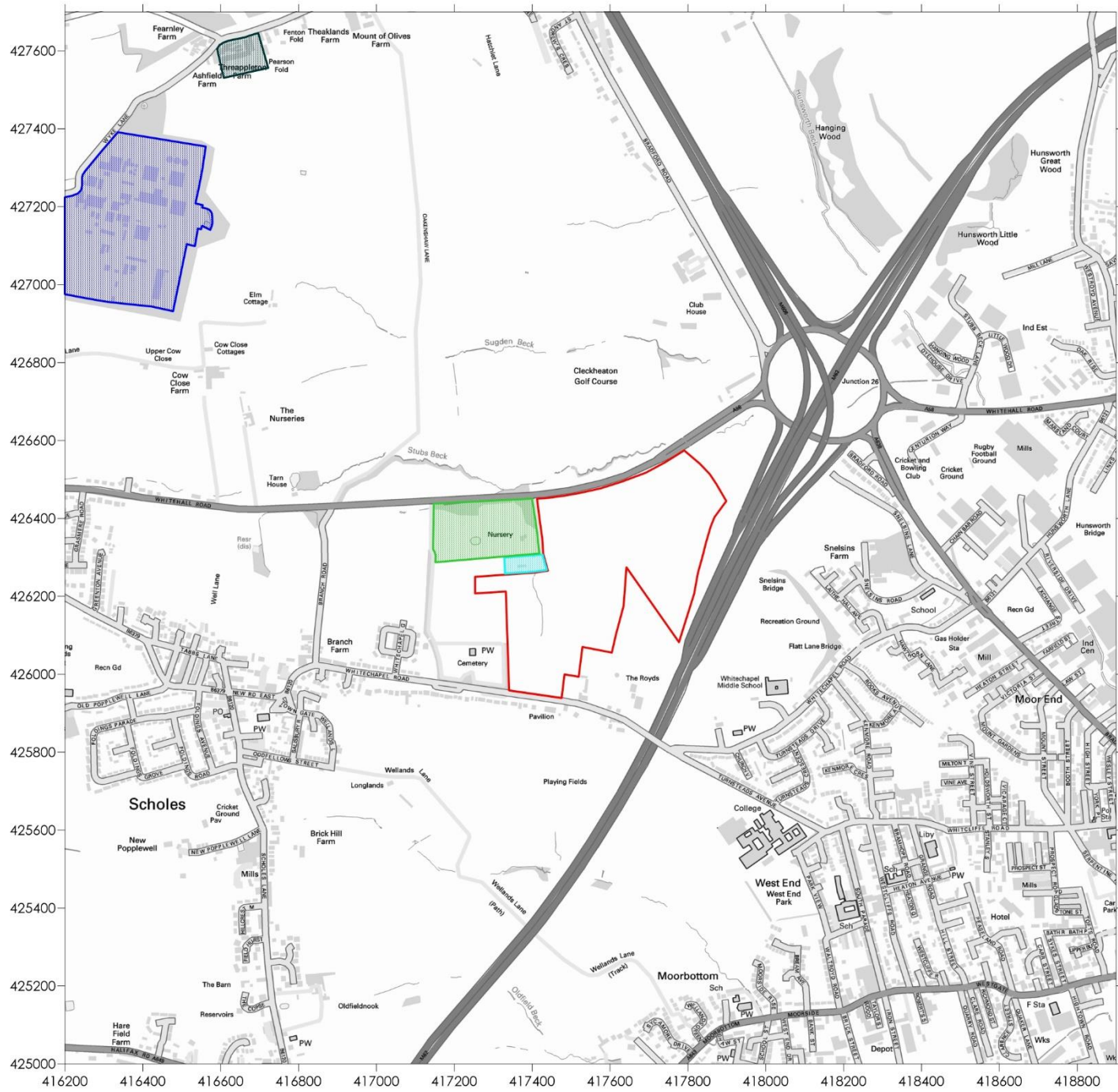
Project Reference
1186

Client
Martin Walsh Architectural

Contains Ordnance Survey Data
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- Legend**
- Site Boundary
 - Wyke Chemical Works
 - Pig Farm
 - Nursery
 - Gas Works

Title
Figure 2 - Potential Odour Sources

Project
Air Quality and Odour Appraisal
Whitechapel Road, Cleckheaton

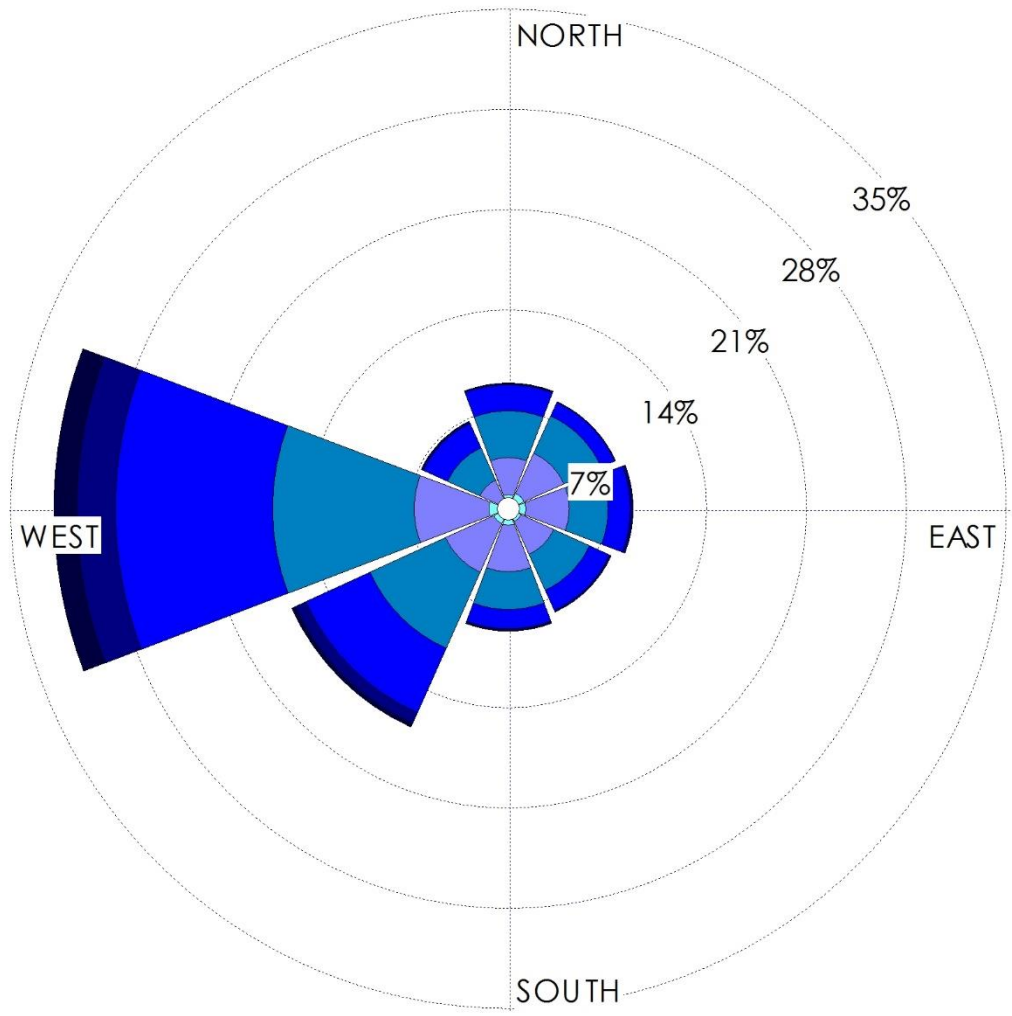
Project Reference
1186

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WIND SPEED (m/s)

- >= 11.1
- 8.8 - 11.1
- 5.7 - 8.8
- 3.6 - 5.7
- 2.1 - 3.6
- 0.5 - 2.1

Calms: 1.92%

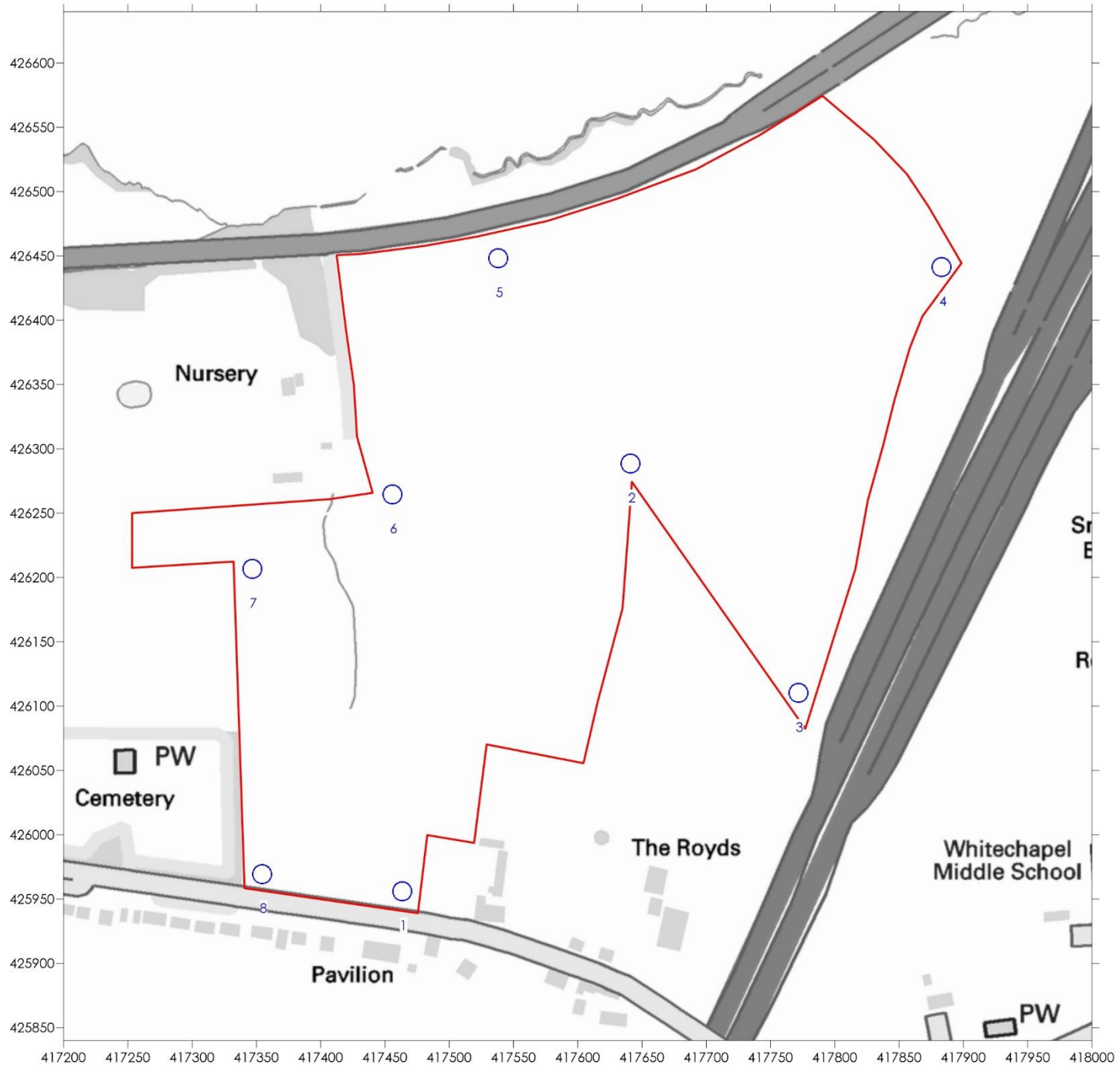
Legend

Title
 Figure 3 - Wind Rose of 2010 to 2014
 Leeds Bradford Airport
 Meteorological Data

Project
 Air Quality and Odour Appraisal
 Whitechapel Road, Cleckheaton

Project Reference
 1186

Client
 Martin Walsh Architectural



- Legend**
-  Site Boundary
 -  Survey Position

Title
Figure 4 - Field Odour Survey Positions

Project
Air Quality and Odour Appraisal
Whitechapel Road, Cleckheaton

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Appendix 1 - Curriculum Vitae

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist and Director of Redmore Environmental with specialist experience in the air quality and odour sectors. His key capabilities include:

- Production and management of Air Quality, Dust and Odour Assessments for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Production and co-ordination of Environmental Permit applications for a variety of industrial sectors.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads, ADMS-5, AERMOD-PRIME and BREEZE-ROADS. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of Environmental Impact Assessments and scoping reports for developments throughout the UK.
- Provision of expert witness services at Planning Inquiries.
- Design and project management of pollutant monitoring campaigns.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Provision of expert advice to local government and international environmental bodies, as well as involvement in production of industry guidance.

SELECT PROJECTS SUMMARY:

Industrial

Shanks Waste Management - Odour Assessments of two waste management facilities to support Environmental Permit Applications.

Tatweer Petroleum - dispersion modelling of Bahrain oil field.

Doha South Sewage Treatment Works - AQA for works extension in Qatar.

IRIS Environmental Appraisal Report Reviews, Isle of Man Government - odour assessment reviews.

Lankem, Greater Manchester - Environmental Permit Application for chemical manufacturing plant.

Newport Docks Bulk Drying, Pelleting and CHP Facility - air quality EIA for gas CHP.

Springshades, Leicester - Environmental Permit Variation Application for textile manufacturing plant.

Valspar, Chester - Odour Assessment and production of Odour Management Plan for a paint manufacturing plant in response to neighbour complaints.

Agrivert - dispersion modelling of odour and CHP emissions from numerous AD plants.

James Cropper Paper Mill, Cumbria - air quality EIA, Environmental Permit Variation and Human Health Risk Assessment for new biomass boiler adjacent to SSSI.

Rigg Approach, Leyton - Air Quality Assessment in support of waste transfer site.

Lynchford Lane Waste Transfer Station - biomass facility energy recovery plant.

Barnes Wallis Heat and Power, Cobham - biomass facility adjacent to AQMA.

Residential

Wood St Mill, Bury - residential development adjacent to scrap metal yard.

Hyams Lane, Holbrook - Odour Assessment to support residential development adjacent to sewage works.

North Wharf Gardens, London - peer review of EIA undertaken for large residential development.

Loxford Road, Alford - Air Quality EIA for residential development, included consideration of impacts from associated package sewage works

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre.

Castleford Growth Delivery Plan - baseline air quality constraints assessment for town redevelopment.

York St, Bury - residential development adjacent to AQMA.

Temple Point Leeds - residential development adjacent to M1.

Commercial and Retail

Etihad Stadium - Air Quality EIA for the extension to the capacity of the Etihad Stadium, Manchester.

Wakefield College - redevelopment of city centre campus in AQMA.

Manchester Airport Cargo Shed - commercial development.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

National Youth Theatre, Islington - redevelopment to provide new arts space and accommodation.