



Air Quality Assessment for Proposed residential development at land off Bradford Road / Birkby Lane Bailiff Bridge, Halifax,

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1. Introduction

- 1.1. Martin Environmental Solutions has been commissioned to undertake an air quality assessment in support of a planning application for a proposed residential development on land at the corner of Bradford Road and Birkby Lane, Bailiff Bridge, Halifax.

Site Location and Context

- 1.2. Planning permission is being sought for a residential development of 31 properties at site located on the corner of the A641 Bradford Road and Birkby Lane, is roughly rectangular in shape and covering an area of approx. 0.53 ha. It is currently unused waste land being a former industrial site demolished in the early 2000's
- 1.3. To the east of the site are additional recent residential units, to the south industrial warehousing, to the west retail units, a park and primary school and to the north a light industrial area. An aerial photograph is enclosed in Figure 1.
- 1.4. The development has the potential to affect the air quality in the area due to the associated increased traffic movements and on a greater scale to be adversely affected by any poor air quality, as such this air quality assessment has been required by the local planning department as part of the application.



2. Policy, Legislation and Relevant Agencies

2.1. Air Quality can be a material consideration in the determination of planning applications.

The planning system has the task of guiding development to the most appropriate locations. It is recognised that most developments will have some impact on air quality particularly if the development results in an increase of traffic movements in an area of existing poor air quality.

2.2. However, appropriate design and placement of development combined with suitable mitigation measures can ensure that development is still possible even within areas of poor air quality.

2.3. The Government's publication of the National Planning Policy Framework (NPPF), which seeks to prevent new and existing development from contributing to or being put at unacceptable risk from pollution, has replaced previous Planning Policy Statements and Planning Policy Guidance Notes.

Documents Consulted

2.4. The following documents were consulted during the undertaking of this assessment:

Legislation and Best Practice Guidance

- The Air Quality Standards Regulations, 2010;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007;
- The Environment Act, 1995;
- National Planning Policy Framework, Department for Communities and Local Government, March 2012;
- Planning Policy Statement 23 (PPS23): Planning and Pollution Control, Office of the Deputy Prime Minister, 2004 (now replaced by the National Planning Policy Framework, but still useful in terms of detailed advice);
- Local Air Quality Management Technical Guidance LAQM.TG(16), DEFRA, 2016;
- Minerals Policy Statement 2, Annex 1: Dust, Office of the Deputy Prime Minister, 2005;



- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07 - Air Quality, Highways Agency, 2007; and,
- Development Control: Planning for Air Quality, National Society for Clean Air and Environmental Protection, 2010 update.
- Assessment of dust from demolition and construction 2014, IAQM, 2014
- Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017

Websites Consulted

- Calderdale Council (www.calderdale.gov.uk);
- Low Emission Strategies website, www.lowemissionstrategies.org
- The Department for Environment Food and Rural Affairs DEFRA (www.defra.gov.uk);

Site Specific Reference Documents

- 2016 Air Quality Annual Status Report
- Local Air Quality Management Updating and Screening Assessment 2015 for Calderdale Metropolitan Borough Council.
- 2011 Air Quality Progress Report for Calderdale MBC

Air Quality Legislative Framework

Local Air Quality Management

2.5. Under Section 82 of the Environment Act (1995) (Part IV) LAs are required to periodically review and assess air quality within their area of jurisdiction under the system of LAQM. This review and assessment of air quality involves assessing present and likely future air quality against the AQO levels. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) 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 (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.



Dust Nuisance

- 2.6. The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments are provided in Section 79 of Part III of the Environmental Protection Act (1990).
- 2.7. 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."
- 2.8. Enforcement of the Act, with 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).
- 2.9. 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).

Planning and Policy Guidance

National Policy

- 2.10. The Government sets out its policy on air quality in relation to planning in the National Planning Policy Framework (NPPF). The NPPF states that planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in the local area. The NPPF adds that planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.

Local Policy

- 2.11. Calderdale MBC currently has no specific local policies in relation to air quality. However, it is mentioned throughout the planning policy documents in context with transportation and climate change and within the Local Plan as a specific public health issue.



3. Impact Assessment

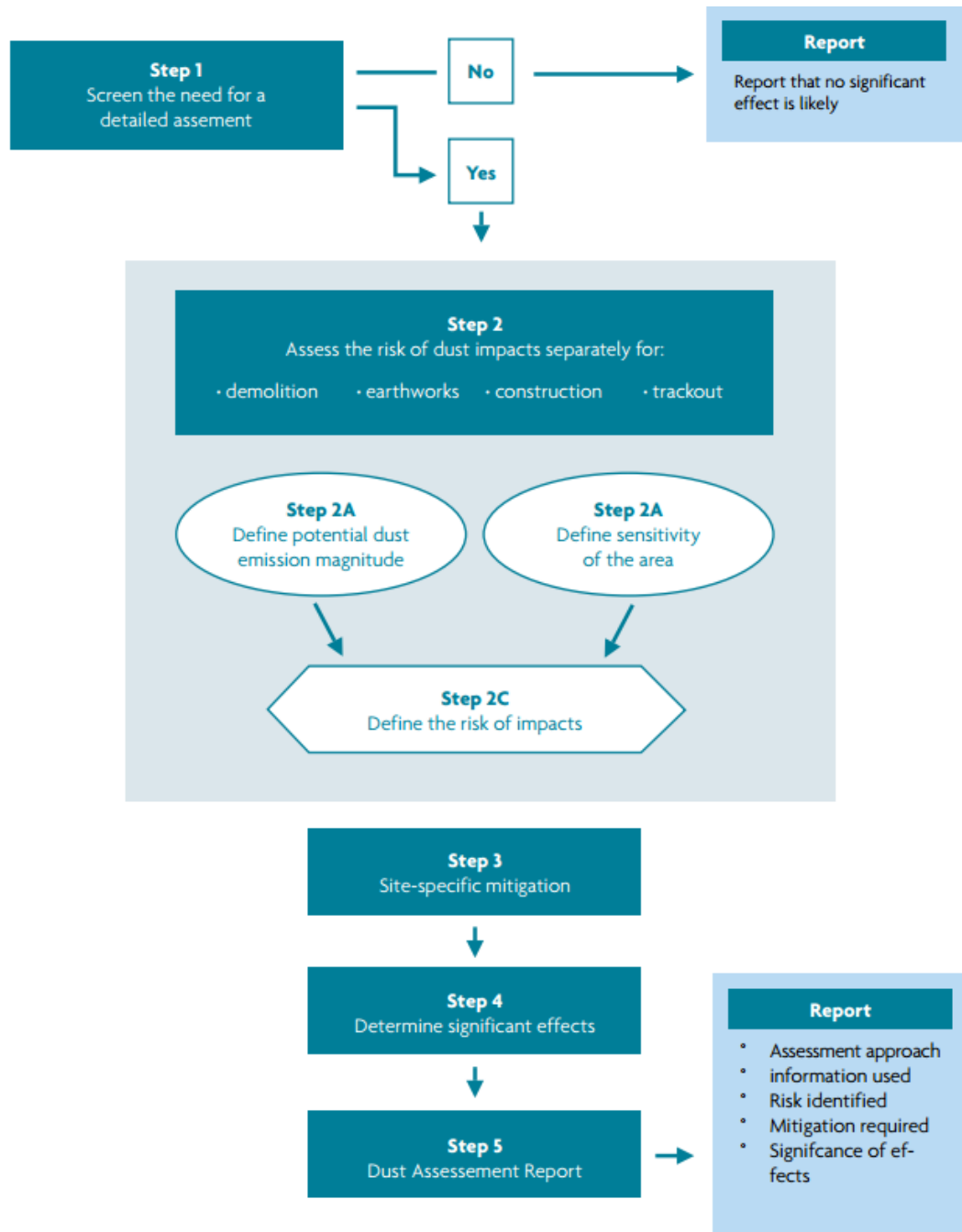
- 3.1. The impact assessment of the proposed development will consider two phases of the development. The first the construction phase and the impact on the surrounding land uses. The second the operational phases, i.e. once the properties are occupied and the impact the additional traffic generation will have on the surrounding land-use and the impact of the current air pollution on the proposed development.

Construction Impacts on Local Air Quality

- 3.2. During the construction phase, there will be a number of activities undertaken which have the potential to generate and/or re-suspend dust and PM₁₀/PM_{2.5}. Such activities include site clearance and preparation, storage of materials, laying of hard surfaces and landscaping.
- 3.3. Dust comprises particles typically in the size range 10-75 micrometres in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. Due to its relatively large size dust is usually only resident in the air for a short period of time after initial release and falls out of suspension fairly quickly. Dust is therefore unlikely to cause long-term or wide spread changes to the air quality of the area; however, its deposition on property and cars can cause soiling and discoloration resulting in nuisance complaints from surrounding properties.
- 3.4. Small particles of dust are known as particulate matter (PM₁₀/PM_{2.5}) and are small enough to be drawn into the lungs of people during breathing, which may have adverse reactions to sensitive members of the public. As a result of the potential impacts on health objectives for PM₁₀ have been defined in the Air Quality Strategy and Regulations.
- 3.5. There is also the potential for traffic associated with the construction activities on the site to have an effect on local pollution concentrations, in particular NO_x/NO₂ and PM₁₀ levels. The potential for construction traffic emissions to be a significant issue will be dependent on existing and likely future concentrations in the vicinity of the proposed development and the anticipated magnitude of the construction traffic.

Assessment of Risk

3.5. The IAQM guidance 'Guidance on the assessment of dust from demolition and construction 2014, IAQM' details a 5-stage process for assessing the impacts from the construction phase of the development, as depicted in the chart below:





3.6. It is considered that the main source of emissions during the construction phase of dust and PM10 will include: -

- Excavations and earthworks
- Use of haulage roads
- Transportation and storage of materials
- Materials handling
- Cut and processing materials
- Exhaust emissions from site off-road machinery
- Emissions from construction vehicles

3.7. The majority of releases are likely to occur during the 'working week' but there is some potential for releases to occur 24 hours a day from material storage and exposed soil unless these are suitably managed and controlled.

3.8. Properties most likely to be exposed to any dust or PM₁₀ from the site are those located immediately adjoining the site to the east.

The Assessment

Phase 1

3.9. As identified by the IAQM guidance document the development site is located within 20m of a suitable receptor, namely the adjacent residential properties. Therefore, an assessment of the likely impact from the construction phase is required.

Phase 2

3.10. The IAQM guidance considers the magnitude of potential dust emissions from four distinct activities during the construction phase. These are Demolition, Earthworks, Construction and Track out, and the magnitude is rated as either large, medium or small for each activity.

3.11. No demolition works are to be undertaken on site and so no assessment of demolition activities is required.

3.12. For the earthworks assessment, the site lies within the largest class of sites being between 2,500m²-10,000m², at approx. 5,500m² and therefore has a medium magnitude for potential dust emissions.

3.13. For the construction phase the guidance indicates that the magnitude of potential dust emissions is low, being less than 25,000m³



3.14. Finally, for the potential dust emissions for 'track out' the magnitude is small.

Table 7: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	N/A
Earthworks	Medium
Construction	Small
Track out	Small

3.15. The receptor sensitivity of the area has been identified as detailed below given the number of nearby residential receptors.

3.16. The residential receptors are adjacent to the site and therefore within 20m of the site. The background annual mean PM₁₀ levels within the area are <24µg/m³ (11.98µg/m³). The surrounding area has not been designated as an ecological area of importance.

3.17. Sensitivity of the receptors is assessed based on the type of receptor, the number and distance from the site and for three different affects, dust soiling, human health impacts and ecology. In this case the receptors have been identified as having a high sensitivity for dust soiling, and for human health and low sensitivity for ecology receptor.

3.18. Four distances are recommended, <20m, <50m, <100m, and <350m. The following tables are used within the guidance document to assess the sensitivity of the receptors to dust soiling, human health and ecology.



Table 2: Sensitivity of the Area to Dust Soiling Effects on People and Property ^{a b}

Receptor Sensitivity	Number of Receptors	Distance from the Source (m) ^c			
		<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

^a The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See **STEP 2B, Box 6** and **Box 9**.

^b Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

^c For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50m from the edge of the road.

Table 3: Sensitivity of the Area to Human Health Impacts^{a b}

Receptor Sensitivity	Annual Mean PM ₁₀ concentration ^c	Number of Receptors ^d	Distance from the Source (m) ^e				
			<20	<50	<100	<200	<350
High	>32 µg/m ³ (>18 µg/m ³ in Scotland)	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m ³ (16-18 µg/m ³ in Scotland)	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m ³ (14-16 µg/m ³ in Scotland)	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m ³ (<14 µg/m ³ in Scotland)	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³ (>18 µg/m ³ in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m ³ (16-18 µg/m ³ in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m ³ (14-16 µg/m ³ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m ³ (<14 µg/m ³ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

^a The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See **STEP 2B, Box 7** and **Box 9**.

^b Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m), noting that only the **highest level** of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 m is 102. If the annual mean PM₁₀ concentration is 29 µg/m³, the sensitivity of the area would be high.

^c Most straightforwardly taken from the national background maps, but should also take account of local sources. The values are based on 32 µg/m³ being the annual mean concentration at which an exceedance of the 24-hour objective is likely in England, Wales and Northern Ireland. In Scotland there is an annual mean objective of 18 µg/m³.

Table 4: Sensitivity of the Area to Ecological Impacts^{a b}

Receptor Sensitivity	Distance from the Source (m) ^c	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

^a The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout and for each designated site. See **STEP 2B, Box 8** and **Box 9**.

^b Only the highest level of area sensitivity from the table needs to be considered.

^c For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site.

- 3.19. Based on the sensitivity tables within the guidance document for Dust Soiling, human health impacts and ecology the resulting sensitivity impacts of the development have been assessed as high for dust soiling but low for human health and ecological sensitivity.

Table 8: Sensitivity of the surrounding area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	Med	Med	Med
Human Health	Low	Low	Low
Ecological	Low	Low	Low

- 3.20. Based on the above information in line with the IAQM guidance the impact risk of each of the three activities has been assessed with a resulting low impact risk for all activities.

Table 9: Impact risk of construction phase

Potential Impact	Impact risk		
	Earthworks	Construction	Trackout
Dust Soiling	Med risk	Low risk	Neg risk
Human Health	Neg risk	Neg risk	Neg risk
Ecological	Neg risk	Neg risk	Neg risk

Phase 3

- 3.21. Given the impact risk associated with demolition, earthworks, construction and track-out activities it is recommended that the following site-specific mitigation measures are undertaken. These have been identified from 'The Control of Dust and Emissions from Construction and demolition, Best Practice Guidance, London Councils 2006' and the IAQM guidance.
- 3.22. This section details the mitigation measures identified as required to reduce the potential impact associated with the activities anticipated to take place during the construction phase of the development. If required these can be tailored once more specific information is available on the construction activities. This can be controlled



by the imposition of a suitable condition on the planning permission for the proposed development.

- 3.23. Construction activities with the potential to generate emissions to the atmosphere require two levels of mitigation measures to be adopted. These are termed 'hard' and 'soft' measures. Hard measures include physical actions taken to prevent, suppress or contain emissions; soft measures include management and communication actions.
- 3.24. The most effective way to manage and prevent dust and PM₁₀ generation and re-suspension during construction is through effective control of the potential source.

Mitigation

- 3.25. The set of mitigation measures considered appropriate for the development of the proposed site area are as follows:

Hard Measures:

Where reasonable, appropriate and practicable the contractor should;

Site Management

- Plan the site layout to locate machinery and dust-causing activities away from sensitive receptors.
- Use appropriate methods, such as the erection of hoardings or other barriers around dusty operations, to mitigate the spread of dust to any sensitive receptors.
- Provide hard standing areas for vehicles and regularly inspect and clean these areas
- No burning on site
- Consider weather conditions prior to potential dusty works. For example, if there are strong winds blowing towards residential properties, works may need to be postponed until more favourable conditions return
- Consider the provision of wheel washing facilities to prevent material being carried off site on to the public highway.
- Ensure access to a good water supply.
- Site access if possible should not run through the existing housing estate, minimising the potential for 'track-out' dust from the site.

Construction Plant and Vehicles

- Operate construction plant in accordance with the manufacturer's written recommendations
- Switch off vehicles and plant when not in use
- Direct vehicle and plant exhausts away from the ground
- Enclose or shield plant likely to generate excessive quantities of dust
- Keep movements of construction traffic on site to a minimum



- Design site access points to avoid queuing of traffic
- Avoid the use of diesel or petrol-powered generators
- Keep roads and accesses clean
- Where available use ultra-low sulphur tax-exempt fuel for all non-road mobile machinery.
- No site run-off of water

Transportation, Storage and Handling of Materials

- Employ appropriate measures, such as covering materials
- Do not overload vehicles
- Keep stockpiles and mounds away from sensitive receptors and site them taking account of the predominant wind direction
- Ensure stockpiles are set at a suitable angle to avoid material slippage
- Cover or stabilise long-term stockpiles – grass long term earth bunding
- Store fine dry material inside or under cover
- Keep the number of handling operations for materials to a minimum
- Maintain and use appropriate watering and sprinkling facilities to reduce or prevent the escape of dust from the site.

Haulage Routes

- Agree haulage routes prior to commencement of the development
- Maintain the surface of all haulage routes on site, in such a condition so as to minimise dust generation. This will be more important in the early stages of the development as haulage routes are likely to be unmade. As the development progresses it is expected that routes will become hard surfaced.
- Inspect haulage routes periodically and repair as necessary to prevent dust generation, record inspections and outcomes.
- Impose and enforce appropriate speed limits on roads for safety reasons and for the purposes of suppressing dust emissions.
- Ensure vehicles entering and leaving the site are covered

Excavation and Earthworks

- Strip topsoil as close as reasonably practicable to the period of excavation or other earthworks to avoid or minimise dust generation
- Keep drop heights from excavators to a minimum
- Use appropriate methods to avoid dust emissions such as shielding or damping sprays
- Undertake soiling, seeding, planting or sealing of completed earthworks as soon as reasonably practicable.
- Use water suppressant where applicable



Soft Measures

- Establish a clear protocol of communication with the local residents, and the local Environmental Health Department including readily displayed contact details.
- All complaints received should be logged and fully investigated. The contractor may wish to set up a website or newsletter to keep residents informed of activities on site.
- If very dusty works are unavoidable then residents (and the local Environmental Health Department) should be given prior notice.
- Carry out daily on-site and off-site inspections to monitor dust emissions.
- Develop a Dust Management Plan including the measures outlined here along with monitoring and checks carried out to ensure dust generation is minimised.
- Record any incidents of exceptional dust generation and the actions taken to resolve them.
- Consider holding regular liaison meetings with residents if dust or other emissions generate complaints.
- Plan works to avoid or reduce dust generation.
- Provide appropriate training to staff and sub-contracts on methods to avoid dust generation.

Phase 4

- 3.26. The inclusion of the above mitigation measures as appropriate will help to reduce dust generation and therefore dust emissions off-site. Thereby preventing significant effects on receptors. The determination of the most effective mitigation measures and the controls required are best confirmed in the development of a dust management plan which should be developed in conjunction with the construction method plan.
- 3.27. With the implementation of the above recommended mitigation measures the formation of dust and harmful emissions from the construction phase will be minimised as much as practicable and should ensure that no harmful impacts will occur to the identified receptors. These mitigation measures can be secured by the imposition of a suitably worded planning condition on any planning permission for the proposed development (e.g. requiring the submission, approval and then implementation of a construction management plan covering the items [and any other items as necessary] outlined in this report). Once implemented it is anticipated that the impact of the construction phase can be reclassified to low.



4. Operational Phase

DMRB Screening Assessment

- 4.1. The assessment will use The Design Manual for Roads and Bridges (DMRB) assessment method to assess the impact of the proposed development on the air quality in the vicinity of the development.
- 4.2. The software is free to use and uses traffic flow figures, together with background pollutant information for up to five of the air quality objective pollutants in order to predict the likely levels post-development.
- 4.3. Evidence shows that the proportion of primary NO₂ in vehicle exhaust has increased. This means that the relationship between NO_x and NO₂ at the roadside has changed from that currently used in the DMRB model. A new NO_x to NO₂ calculator has been developed to compensate for this relationship and the instructions for its use are available on the DEFRA website. These have been followed in this case.

Predicting Magnitude of Impact

- 4.4. Magnitude (scale of change) is determined by considering the predicted deviation from baseline conditions. Possible impacts of the proposed development on air quality have been assessed with reference to the baseline conditions and environmental assessment criteria. The rationale for determining the magnitude of an impact is shown below.
- 4.5. The recently published '*Land-Use Planning & Development Control: Planning For Air Quality, IAQM, January 2017*' guidance provides an updated methodology for the consideration of impact as shown in the table below.



Table 10: Impact descriptors

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

- 4.6. The matrix simplifies reality and places impacts in a discontinuous scale. Therefore, impact significance scores should always be qualified. For example, it is noted that in certain cases an impact of minor significance, whether adverse or beneficial, can be very important for local residents, and deserves attention in the report, i.e. through mitigation. In some cases, upon reflection, the resulting impact significance should be adjusted if necessary with explanation.
- 4.7. It is common to devise mitigation measures for impacts that are of moderate or substantial significance. However, measures which reduce any impact should be considered whenever cost effective and practicable.

Analysis of Traffic Data

- 4.8. Traffic data has been provided by Hydrock Transport planning consultants, who have carried out the *Transport Assessment* for the proposed development. Hydrock have confirmed the current and predicted AADT figure for the area.
- 4.9. Baseline traffic figures at the main junction have been identified for the year 2017 with projected figures for 2022, including all committed development
- 4.10. Vehicle mix along the road has been identified from the local department for transport traffic counts undertaken in 2016, and are still considered to be reliable for the assessment.

4.11.

Link name	2017 base year		2022 opening year no development, including committed		2022 opening year with development	
	Total	HGV %	Total	HGV %	Total	HGV %
A641 Bradford Road North	14895	2.3	16525	2.3	16611	2.3
A641 Bradford Road South	16244	1.7	18283	1.7	18349	1.7
Wakefield Road	9436	1.2	10587	1.2	10600	1.2
Birkby Road	7983	0.8	8799	0.8	8806	0.8

*HGV% have been rounded up based on the dft data for all years.

4.12. Detailed information on the traffic speeds along the road have not been made available however, a conservative speed of 16Km/hr (10mph) has been used within the assessments to account for slow moving traffic around the junction

Identification of Relevant Receptors

4.13. The regulations require that likely exceedances of the Air Quality Objectives are assessed in relation to:

".. the quality of the air at locations which are situated outside buildings or other natural or manmade structures, above or below ground, and where members of the public are regularly present..."

4.14. Air Quality assessments should therefore be focused on locations where members of the public are likely to be regularly present and are likely to be exposed to air pollution over the averaging period of the objective.



- 4.15. Overall seven relevant receptors have been identified using mapping information available from Calderdale MBC and Google Earth. One of these corresponds to a discontinued Council monitoring location. The site was discontinued in 2010. The remaining identified receptor sites correspond to the development site, and nearby residential housing. These were then modelled to ascertain annual mean concentrations of NO₂ and PM₁₀.
- 4.16. These relevant receptor locations were considered representative of locations where members of the public are exposed for a period of time appropriate to the averaging period of the objective. They also represent the closest locations to the centre of the roads in the immediate area and therefore represent a worse case situation for each locality.
- 4.17. The relevant receptor locations are shown in the map within Appendix A and have been identified as:
- Historic monitoring location, BB1 356 Wakefield Road
 - 350 Wakefield Road,
 - 645 Bradford Road, A641
 - 591 Bradford Road A641
 - 20 Bobbin Close
 - Plot 9 proposed development
 - Plot 14 proposed development

Table 11: Description of Relevant receptors

Relevant Receptor	Site Type	Grid Ref		Distance from centre of Road (m)	Monitoring location site (results), NO ₂
		X	Y		
Monitoring location	Residential	414385	425144	8.4	35(in 2010)
350 Wakefield Rd	Residential	414819	425142	8.3	
645 Bradford Road	Residential	414865	425212	8.5	
591 Bradford Road	Residential	414769	425038	28.5	
20 Bobbin Close	Residential	415020	425172	9.0	
Plot 9	Residential	414923	425182	6.9	
Plot 14	Residential	414884	425220	9.6	

*the above measurements include the distance from the centre of the link to the relevant receptor.

Background data

4.17. Background concentrations of NO₂ and PM₁₀ within the study area for the baseline and opening year have been derived from the national maps (1Km x 1Km spatial resolution) of annual mean background concentrations available from DEFRA, via the DEFRA website. See Table 12 below.

Table 12: Average background concentrations across the study area (µg/m³)

Relevant Receptor	2017 (Baseline) (µg/m ³)			2022 (Opening year) (µg/m ³)		
	NOx	NO ₂	PM ₁₀	NOx	NO ₂	PM ₁₀
Monitoring location	19.91065	14.42252	11.97778	16.1057	11.89738	11.68253
350 Wakefield Rd	19.91065	14.42252	11.97778	16.1057	11.89738	11.68253
645 Bradford Road	19.91065	14.42252	11.97778	16.1057	11.89738	11.68253
591 Bradford Road	19.91065	14.42252	11.97778	16.1057	11.89738	11.68253
*20 Bobbin Close	18.41121	13.43439	11.89821	15.00344	11.1449	11.6073
Plot 9	19.91065	14.42252	11.97778	16.1057	11.89738	11.68253
Plot 14	19.91065	14.42252	11.97778	16.1057	11.89738	11.68253

*receptor, Bobbin Close, is just inside the adjacent 1Km grid square and is given a lower background pollutant concentration. For the purpose of the assessment it has been decided to use the same, higher pollutant concentration as the other sites.

- 4.18. The above table (Table 12) shows the annual mean background concentrations of NO_x, NO₂ and PM₁₀ at the identified relevant receptors. All concentration levels are well below the annual mean objective for both NO₂ and PM₁₀ of 40 µg/m³ during the baseline year of 2017 and future year of 2022. Current evidence shows that the levels of NO₂ and PM₁₀ are not reducing as quickly as anticipated and as such, to ensure a conservative assessment, future years including the opening year and beyond will be modelled on the 2017 background data.
- 4.19. Current monitoring data available from Calderdale MBC has been obtained. These results show a general decline in pollutant concentrations over the previous years. The historic monitoring location, discontinued in 2010 identified an NO₂ concentration level of 35µg/m³. Based on the other monitoring results by Calderdale MBC have been reducing since 2010 it has been decided to use the 2010 data as a conservative figure for validation of the modelled results, thus providing a worse-case scenario.



Results

- 4.20. The results from the DMRB assessment and the NO_x to NO₂ calculator are shown in Appendix B. The NO₂ results have then been multiplied by the verification factor of 1.96 derived from the Council's monitoring result from 2010 which has since been discontinued, See Appendix C. It should be noted that a review of the monitoring data for the 2010 data set compared to the 2016 data shows a distinct downward trend in the monitoring locations across Calderdale's area. Therefore, had the above monitoring location still been operational it is highly likely that the levels of Nitrogen Dioxide being measured would also be reduced, on average around 3-6µg/m³, thus a lower verification factor would have been determined.
- 4.21. The final results within this assessment are therefore considered to be a very conservative, worse-case scenario.

4.22. The final predicted pollutant concentrations are shown below;

NO₂ 2022					
Receptor	without dev.	with dev.	Change	% of objective	Overall % of objective with development
Monitoring location	35.34	35.34	0.00	0.00	88.3
350 Wakefield Rd	35.34	35.36	0.02	0.05	88.4
645 Bradford Road	40.49	40.51	0.02	0.05	101.2
591 Bradford Road	35.10	35.10	0.00	0.00	87.75
*20 Bobbin Close	33.67	33.67	0.00	0.00	84.18
Plot 9	33.93	33.93	0.00	0.00	84.83
Plot 14	40.16	40.20	0.04	0.10	100.5
PM₁₀ 2022					
Receptor	without dev.	with dev.	Change	% of objective	Overall % of objective with development
Monitoring location	13.10	13.11	0.01	0.025	32.78
350 Wakefield Rd	13.11	13.11	0.00	0.00	32.78
645 Bradford Road	13.75	13.76	0.01	0.025	34.40
591 Bradford Road	13.01	13.01	0.00	0.00	32.53
*20 Bobbin Close	12.88	12.88	0.00	0.00	32.20
Plot 9	12.92	12.92	0.00	0.00	32.30
Plot 14	13.70	13.71	0.01	0.025	34.28

4.22. As can be seen from the table above the change in the level of pollutants with and without the development is negligible. When these levels of change are considered in line with table 10 in section 4.5 above the resulting impact of the development during the operation phase for both PM₁₀ and NO₂ is negligible, with the exception of two identified receptors which are identified as having a slight impact.



- 4.23. The above results highlight that the predicted levels at two of the identified receptors, 645 Bradford Road and Plot 14 of the proposed site are just over the objective value for Nitrogen Dioxide of $40\mu\text{g}/\text{m}^3$, at 14.2 and $14.5\mu\text{g}/\text{m}^3$ respectfully.
- 4.24. However, that the assessment has been based on a number of factors which have ensured a worse-case scenario is represented. These have included the conservative values that have been used within the assessment in relation to the presumption that background NO_2 and vehicle emission levels will not fall as indicted by the current monitoring trend, that traffic speeds remain very low at $16\text{Km}/\text{Hr}$ (10mph), and using a verification factor based on 2010 monitoring results, it is highly unlikely that these exceedances will be realised.
- 4.25. It is therefore appropriate to including mitigation measures within the development to minimise a negative impact from the development and to protect future residents.
- 4.26. Identified mitigation measures will include:
- An Electric vehicle charging point within the carparking area for each property
 - A travel / welcome pack for each residential unit with details on alternative travel options, public transport timetables and cycle routes etc.
 - Alternative ventilation systems for plots 10, 14 and 18 which are adjacent to the main road. The accompanying noise assessment has already identified the need for an increased glazing specification and alternative ventilation to ensure suitable internal sound levels within these plots. The inclusion of a Positive input ventilation system with an inlet in the attic space will ensure levels of nitrogen dioxide will be much lower than those experienced at the boundary of the property. Appendix D provides copies of the NO_2 falloff with distance calculator which shows the difference for plots 10 and 18 compared with plot 9 and the difference with an inlet point within the roof of plot 9. In addition, a 2m close board fence is to be erected along this western boundary which will also reduce the levels of pollutants that will be experienced by the future residents.



5. Conclusions

Construction Phase

- 5.1. The impact of the construction phase of the development has been assessed in line with the IAQM guidance 'Guidance on the assessment of dust from demolition and construction 2014, IAQM' and has identified the potential risk from the construction phase as medium too low for dust soiling and negligible for human health and ecological impact.
- 5.2. Suitable mitigation measures which can be secured by the imposition of a suitably worded planning condition have been identified within paragraph 3.25 above. Implementation of these measures will reduce the level of risk of the estimated impacts from the construction phase to a Negligible impact.

Operational Phase

- 5.3. As assessment of the likely impacts of the proposed development on local air quality has been carried out at worse case receptors along roads to be affected by traffic from the proposed development. Annual mean concentrations of NO₂ and PM₁₀ have been modelled for a baseline 2017 year and opening year of 2022 for both the 'with' and 'without' development scenarios using the DMRB dispersion model.
- 5.4. Conservative input figures using 2017 pollutant, and emission levels have been used and a verification factor applied using the 2010 monitoring results from Calderdale MBC, which are likely to be significantly higher than current pollutant levels.
- 5.5. The predicted increase for both NO₂ and PM₁₀ levels from the development are negligible, with predicted levels at most relevant receptor locations being below the national objective value of 40µg/m³ for both PM₁₀ and NO₂.
- 5.6. However, the verification factor used has resulted in two sites being just above the objective value for both the with and without scenarios with a negligible difference in the two. These receptors being 645 Bradford Road (40.49µg/m³ without development 40.51µg/m³ with) opposite the development site and plot 14 on the site (40.16µg/m³ without development 40.2µg/m³ with).



- 5.7. While in reality it is unlikely that these levels will be realised it is considered appropriate that mitigation measures are included in the development to minimise any increase in pollutants and to protect the future residents of the site.
- 5.8. These mitigation measures include:
- To reduce pollutant levels
- Electric vehicle recharging point for each property
 - Travel packs for the residential development are recommended.
- To protect future occupants
- Alternative ventilation systems to the properties to include a positive ventilation system
 - A 2m high close boarded fence along the western boundary of the site to act as a barrier and prevent pollutants entering the amenity areas.
- 5.9. The provision of the travel packs and electric vehicle recharging points will have a positive impact by changing some trips from the development to less polluting trips e.g. active travel options (bikes and walking) or through the use of public transport. The ability to charge electric vehicles combined with the reducing costs of these vehicles and the government commitment to remove diesel cars from our roads will also have a positive impact on pollutant levels.
- 5.10. The ventilation system proposed and use of the close boarded fencing will protect the future residents of the development from any adverse impacts of pollution from the existing traffic.

Figure 1 – Aerial photograph



Figure 2 – Site layout plan





Appendix A – Relevant Receptor Locations





Appendix B – DMRB & NO_x to NO₂ Calculations

All receptors			Pollutant concentrations at receptor						
Receptor number	Name	Year	CO *	Benzene	1,3-butadiene	NO _x	NO ₂ *	PM ₁₀	
			Annual mean mg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Days >50µg/m ³
1	Monitorign Location	2017	0.10	0.10	0.06	6.38	2.57	13.04	0.00
2	350 Wakefield Road (Base)	2017	0.10	0.10	0.06	6.39	2.58	13.04	0.00
3	645 Bradford Road (base)	2017	0.14	0.14	0.10	11.37	4.13	13.67	0.00
4	591 Bradford Road (base)	2017	0.09	0.09	0.06	6.26	2.53	12.96	0.00
5	20 Bobbin Close (Base)	2017	0.08	0.08	0.04	4.70	1.99	12.79	0.00
6	Plot 9 (base)	2017	0.08	0.08	0.05	4.93	2.07	12.83	0.00
7	Plot 14 (base)	2017	0.14	0.14	0.10	11.06	4.04	13.63	0.00
8	Monitorign Location (W/o 2022)	2017	0.10	0.10	0.06	6.80	2.71	13.10	0.00
9	350 Wakefield Road (w/o 2022)	2017	0.10	0.10	0.06	6.81	2.71	13.11	0.00
10	645 Bradford Road (w/o 2022)	2017	0.15	0.16	0.11	11.90	4.29	13.75	0.00
11	591 Bradford Road (w/o 2022)	2017	0.09	0.10	0.07	6.57	2.63	13.01	0.00
12	20 Bobbin Close (w/o 2022)	2017	0.08	0.09	0.05	5.18	2.16	12.88	0.00
13	Plot 9 (w/o 2022)	2017	0.09	0.09	0.05	5.43	2.25	12.92	0.00
14	Plot 14 (w/o 2022)	2017	0.15	0.16	0.11	11.58	4.19	13.70	0.00
15	Monitorign Location (W 2022)	2017	0.10	0.10	0.06	6.80	2.71	13.11	0.00
16	350 Wakefield Road (w 2022)	2017	0.10	0.10	0.06	6.82	2.72	13.11	0.00
17	645 Bradford Road (w 2022)	2017	0.15	0.16	0.11	11.93	4.30	13.76	0.00
18	591 Bradford Road (w 2022)	2017	0.09	0.10	0.07	6.58	2.64	13.01	0.00
19	20 Bobbin Close (w 2022)	2017	0.08	0.09	0.05	5.18	2.16	12.88	0.00
20	Plot 9 (w 2022)	2017	0.09	0.09	0.05	5.44	2.25	12.92	0
21	Plot 14 w 202(2)	2017	0.15	0.16	0.11	11.60	4.20	13.71	0



NO_x to NO₂ Calculator

Local Authority: Calderdale			Year: 2017						
			Traffic Mix: All other urban UK traffic						
Receptor ID	Easting, m	Northing, m	Road increment NO _x µg m ⁻³	Background µg m ⁻³		Fraction emitted as NO ₂ (fNO ₂)	Total NO ₂ µg m ⁻³	Road NO ₂ µg m ⁻³	Notes
				NO _x	NO ₂				
1			6.377757755	19.91065	14.42252		17.81	3.38	
2			6.393246639	19.91065	14.42252		17.82	3.39	
3			11.37101303	19.91065	14.42252		20.39	5.97	
4			6.264301598	19.91065	14.42252		17.75	3.33	
5			4.695187783	19.91065	14.42252		16.92	2.5	
6			4.928647418	19.91065	14.42252		17.05	2.62	
7			11.05661609	19.91065	14.42252		20.23	5.81	
8			6.79562413	19.91065	14.42252		18.03	3.6	
9			6.812127835	19.91065	14.42252		18.03	3.61	
10			11.90435624	19.91065	14.42252		20.66	6.24	
11			6.566086593	19.91065	14.42252		17.91	3.48	
12			5.175116786	19.91065	14.42252		17.18	2.75	
13			5.432440014	19.91065	14.42252		17.31	2.89	
14			11.57521291	19.91065	14.42252		20.49	6.07	
15			6.80396862	19.91065	14.42252		18.03	3.61	
16			6.82049259	19.91065	14.42252		18.04	3.62	
17			11.92896886	19.91065	14.42252		20.67	6.25	
18			6.575507782	19.91065	14.42252		17.91	3.49	
19			5.179233824	19.91065	14.42252		17.18	2.76	
20			5.436761764	19.91065	14.42252		17.31	2.89	
21			11.59914501	19.91065	14.42252		20.51	6.08	



Appendix C - Verification

Verification factor

Site	2010 measured ($\mu\text{g}/\text{m}^3$)	2017 modelled ($\mu\text{g}/\text{m}^3$)	ratio
Historic Monitoring location	35.0	17.81	1.96



Appendix D – Distance Attenuation Calculations to Compare Plots 10 & 18

Using V6.1 Oct 2017 calculator from Defra Website

Site	Distance measurement from kerb (Plot 14 result) (m)	Distance of Receptor from Kerb (aka centre of link for comparison) (m)	Calculated annual mean background At measuring point (2017)	Measured annual mean (plot 14 result)	Predicted annual mean background at receptor
	Without development				
Plot 10	4.9	8.65	14.42252	40.16	35.8
Plot 18	4.9	5.4	14.42252	40.16	39.4
Plot 14 far eastern roof line for PIV input point	4.9	9.1	14.42252	40.16	35.4
Plot 10	4.9	8.65	14.42252	40.2	35.9
Plot 18	4.9	5.4	14.42252	40.2	39.5
Plot 14 far eastern roof line for PIV input point	4.9	9.1	14.42252	40.2	35.5

The table above identifies that the plots 10 and 18 are below the objective value without any additional mitigation measures. Plot 14 will have the intake for the Positive Input Ventilation system located in an area that is also below the objective value.

If a similar location to the eastern side of the plots 10 and 18 are also used for the PIV input then the levels will be even lower.