12. Air Quality and Odour

Introduction

1. This chapter assesses the impact of the proposed development on local air quality and the effect of odour on future site users. In particular it considers the potential effects of construction phase dust and operational phase road traffic emissions on air quality at existing receptor locations, as well as the potential for loss of amenity at the development as a result of odour emissions from existing sources within the vicinity of the site.

2. The chapter describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect air quality impacts of the proposed development, the mitigation measures required to prevent, reduce, or offset the impacts and the residual impacts. It has been written by Redmore Environmental Ltd.

Legislation and Planning Policy Context

Legislation

3. The Air Quality Standards Regulations (UK, Government, 2010) came into force on 11th June 2010 and include Air Quality Limit Values (AQLVs) for the following pollutants:

- Nitrogen dioxide (NO_2);
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$);
- Benzene; and,
- Carbon monoxide

4. Air Quality Target Values (AQTVs) were also provided for several additional pollutants.

5. Part IV of the Environment Act (UK Government, 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 2007 (DEFRA, 2007). The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that area not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determinations of compliance vary.

6. **Table 12.1** presents the AQOs for pollutants considered within the assessment.

Table 12.1: Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/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

7. **Table 12.1** summarises the advice provided in DEFRA guidance (DEFRA, 2018) on where the AQOs for pollutants considered with this Chapter apply.

Table 12.1: Examples of Where the Air Quality Objectives Apply

Pollutant	Air Quality Objective	
	Concentration (µg/m^3)	Averaging Period
Annual mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour 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	Kerbside sites where the public would not be expected to have regular access.

	public might reasonably be expected to spend one hour or longer.	

Local Air Quality Management

8. Under Section 82 of the Environment Act (Part IV) (UK Government, 1995) 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 12.1**, 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

9. The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (UK Government, 2016) and subsequent amendments, such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (UK Government, 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"

10. 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 (UK Government, 1990). 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 practicable means.

National Planning Policy

11. The revised National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) was published in February 2019 and sets out the Government's planning policies for England and how these are expected to be applied.

12. The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives, including the following of relevance to air quality:

    "c) An environmental objective - to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

13. Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

    "Planning policies and decisions should contribute to and enhance the natural and local environment by:

    […]

    e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality

    […]"

14. Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

    "Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

15. The implications of the NPPF have been considered throughout this assessment.

National Planning Policy

16. The National Planning Practice Guidance (NPPG) (Ministry of Housing, Communities and Local Government, 2019) web-based resource was launched on 6th March 2014 and updated on 1st November 2019 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

    1. What air quality considerations does planning need to address?
    2. What is the role of plan-making 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 considerations be relevant to the development management process?
    6. What specific issues may need to be considered when assessing air quality impacts?
    7. How detailed does an air quality assessment need to be?
    8. How can an impact on air quality be mitigated?

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

Local Planning Policy

18. The Kirklees Local Plan was adopted by Kirklees Council (KC) on 27th February 2019 and is the statutory development plan for the district. Review of the Strategy & Policies document (KC, 2019) from the Local Plan indicated the following policy of relevance to this report:

"Policy PLP 47 - 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 PLP 51 - Protection and improvement of local air quality

Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.

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. […]"

19. The above policies were taken into consideration throughout the undertaking of the assessment.

Other Relevant Policy, Standards and Guidance

20. The following air quality related guidance was utilised throughout the assessment:

- Guidance on the Assessment of Dust from Demolition and Construction Version 1.1 (Institute of Air Quality Management (IAQM), 2016);
- Guidance of Land-Use Planning & Development Control: Planning for Air Quality (IAQM, 2017);
- Local Air Quality Management Technical Guidance (TG16) (DEFRA, 2018);
- Design Manual for Roads and Bridges (DMRB) LA 105: Air Quality (Highways England, 2019);

- Town and Country Planning (Environmental Impact Assessment) Regulations (UK Government, 2011); and,
- West Yorkshire Low Emissions Strategy (WYLES) Technical Planning Guidance (West Yorkshire Low Emissions Group, 2014)

Methodology

21. The proposals include two separate applications. As such, the following have been considered throughout the assessment:

- Bradley Villa Farm phase of development to provide circa 275 dwellings; and,
- Full Allocation - Bradley Park Golf Course Allocation Site HS11 with estimated delivery of circa 1,958 dwellings overall

22. Both the Bradley Villa farm phase of development area and the Full Allocation are predicted to result in the same level of construction phase dust impact. As such, the presented assessment covers both elements.

Construction Phase

23. There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction V1.1' (IAQM, 2016).

24. Due to the scale and nature of the development, there will be a need to sequence the construction phase. As such, the assessment assumed that initially developed properties will be in place throughout construction to provide an assessment of the worst-case scenario.

25. Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and,
- Trackout.

26. The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

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

27. The first stage screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment proceeds to the next stage. Additionally, should ecological receptors be identified within 50m of the site, or the construction vehicle route up to 500m from the site entrance, then the assessment also proceeds to the next stage.

28. The second stage of the assessment screens the risk of potential dust impacts. It should be noted that the standard IAQM terminology of risk has been replaced with significance criteria, and the magnitude of dust emissions '**small**', '**medium**' and '**large**' have been replaced with '**minor**', '**moderate**' and '**major**', respectively, to allow continuity throughout the Environmental Statement (ES) and comparison of various effects. A site is initially allocated an effect significance (risk) category based on two factors:

- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity; and,
- The scale and nature of the works, which determines the magnitude of dust arising as low, medium or high.

29. The two factors are combined in order to determine the potential effect significance without the mitigation applied.

30. The influencing factors that define the sensitivity of the area around a development to potential impacts as shown in **Table 12.2**.

Table 12.2: Construction Dust - Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	• Users expect of high levels of amenity; • High aesthetic or value property; • People expected to be present continuously for extended periods of time; and • Locations where members of the public are exposed over a time period relevant to the AQO for PM_{10} e.g. residential properties, hospitals, schools and residential care homes.	• Internationally or nationally designated site e.g. Special Area of Conservation.
Medium	• Users would expect to enjoy a reasonable level of amenity; • Aesthetics or value of their property could be diminished by soiling; and • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work.	• Nationally designated site e.g. Sites of Special Scientific Interest.
Low	• Enjoyment of amenity would not reasonably be expected; • Property would not be expected to be diminished in appearance; and • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields,	• Locally designated site e.g. Local Nature Reserve.

	farmland, footpaths, short term car park and roads.	

31. The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and,
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

32. These factors were considered in the undertaking of this assessment.

33. The criteria for determining the sensitivity of the area to dust soiling effects on people and property is summarised in **Table 12.3**.

Table 12.3: Construction Dust - Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

34. **Table 12.4** outlines the criteria for determining the sensitivity of the area to human health impacts.

Table 12.4: Construction Dust - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Background Annual Mean PM_{10} Conc.	Number of Receptor	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 350	Less than 20
High	Greater than 32µg/m^3	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m^3	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m^3	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m^3	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m^3	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32µg/m^3	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m^3	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Less than 24µg/m^3	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

35. **Table 12.5** outlines the sensitivity of the area to ecological impacts.

Table 12.5: Construction Dust - Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

36. The scale and nature of the construction works determine the magnitude of dust impacts arising from each activity. The relevant criteria are summarised in **Table 12.6**.

Table 12.6: Construction Dust - Magnitude of Emission

Magnitude	Activity.	Criteria
Large	Demolition	• Total volume of building to be demolished greater than 50,000m^3 • Potentially dusty material (e.g. concrete) • On-site crushing and screening • Demolition activities more than 20m above ground level
	Earthworks	• Total site area greater than 10,000m^2 • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	• Total building volume greater than 100,000m^3 • On site concrete batching • Sandblasting
	Trackout	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Demolition	• Total volume of building to be demolished between 20,000m^3 and 50,000m^3 • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	• Total site area 2,500m^2 to 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	• Total building volume 25,000m^3 to 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On site concrete batching
	Trackout	• 10 to 50 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Demolition	• Total volume of building to be demolished less than 20,000m^3

		• Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities less than 10m above ground and during wetter months
	Earthworks	• Total site area less than 2,500m^2 • Soil type with large grain size (e.g. sand) • Less than 5 heavy earth moving vehicles active at any one time • Formation of bunds less than 4m in height • Total material moved less than 20,000 tonnes • Earthworks during wetter months
	Construction	• Total building volume less than 25,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	• Less than 10 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

37. The dust emission impact magnitude and the sensitivity of the area is combined to determine the impact significance. This is explained in the Significance Criteria Section.

Operational Phase

38. The proposed development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site. Potential impacts were defined by predicting pollutant concentrations at sensitive locations using dispersion modelling for the following scenarios:

- 2019 - Verification;
- Bradley Villa farm phase of development Opening year Do-Minimum (DM) (predicted traffic flows in 2029 should the Bradley Villa farm phase of development not proceed);
- Bradley Villa farm phase of development Opening year Do-Something (DS) (predicted traffic flows in 2029 should the Bradley Villa farm phase of development be completed);
- Full Allocation Opening year DM (predicted traffic flows in 2034 should the Full Allocation development not proceed); and,
- Full Allocation Opening year DS (predicted traffic flows in 2034 should the Full Allocation development be completed).

39. The DM scenario (i.e. without the proposed development) included baseline traffic data, inclusive of anticipated growth and committed developments for the relevant assessment year. The DS scenarios Bradley Villa farm phase of development and Full Allocation (i.e. with the proposed development) included baseline traffic data, inclusive of anticipated growth for the relevant assessment year and committed developments for the relevant assessment year, in addition to predicted traffic associated with the operation of the proposed development for each corresponding scenario.

40. For the purpose of the assessment traffic data for 2029 and 2034 was utilised as the proposed Bradley Villa farm phase of development and Full Allocation development opening years respectively. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2019 were utilised within the dispersion model. The use of 2029 and 2034 traffic data and 2019 emission factors is considered to provide a worst-case scenario and therefore the predicted pollution concentrations are likely to overestimate actual levels during the operation of the proposed development.

41. Reference should be made to **Appendix 12.1** for assessment input data and details of the verification process.

42. Locations sensitive to potential changes in off-site pollutant concentrations were identified within 200m of the highway network in accordance with the guidance provided within the DMRB (Highways England, 2019) on the likely limits of pollutant dispersion from road sources. The criteria provided within DEFRA guidance (DEFRA, 2018) on where the AQOs apply, as summarised in **Table 12.1**, was utilised to determine worst-case receptor positions in the vicinity of links likely to be affected by changes in traffic flows as a result of the proposed development.

43. The sensitivity of receptors to potential changes in pollutant concentrations as a result of road vehicle exhaust emissions is outlined in **Table 12.7**. It should be noted that these are based on the values provided within the IAQM guidance (IAQM, 2017) with additional descriptors in ensure consistency throughout the ES.

Table 12.7: Operational Phase Receptor Sensitivity

Receptor Sensitivity	Pollutant Concentration at Receptor in Assessment Year
Very High	110% or more of AQO
High	103 - 109% of AQO
Medium	95 - 102% of AQO
Low	76 - 94% of AQO
Very Low	75% or less of AQO

44. The magnitude of predicted air quality impacts was calculated based on the predicted concentration change between DM and DS scenarios as a proportion of the AQO. This is outlined in **Table 12.8**.

Table 12.8: Operational Phase Magnitude of Impact

Predicted Concentration Change as a Proportion of AQO (%)	Magnitude of Impact
0	Negligible
1	Very Minor

2 - 5	Minor
6 - 10	Moderate
More than 10	Major

45. It should be noted that the categories in **Table 12.8** are intended to be used by rounding the change in percentage pollutant concentration to whole numbers.

Assumptions and Limitations

46. A number of air quality factors are likely to change in future years and therefore act as limitations to the assessment, these include:

- Background pollutant concentrations are predicted to decrease in future years as a result of Government policies and legislation to reduce pollutant emissions. However, there is current uncertainty over the level of likely decrease. As such, a worst-case assumption that air quality conditions do not improve in the future was adopted to ensure robust results; and,
- Road traffic exhaust emissions are predicted to decrease in future years with changes to the UK's vehicle fleet in line with Government legislation. However, similarly to background concentrations, there is current uncertainty over the level of likely decrease. As such, a worst-case assumption that emission factors do not reduce in the future was adopted to ensure robust results.

47. A number of assumptions have been made in the undertaking of the assessment. These include the following:

- The meteorological data used for the assessment is representative of the conditions at the site;
- The background concentrations used for the assessment are representative of baseline annual mean pollutant concentrations at the site;
- The traffic data obtained for the purpose of the assessment is accurate;
- The road widths and speeds applied to traffic data are accurate;
- The emissions factors obtained from the Emission Factor Toolkit, as described in **Appendix 12.1** and used in the assessment of operational phase road traffic exhaust emissions, are representative of vehicle emissions;
- The monitoring data used in the assessment was accurate; and,
- The unpaved length of roads on-site during the construction phase will be more than 100m.

Significance Criteria

48. The significance of potential effects was determined by integrating the assessments of sensitivity and impact magnitude in a reasoned way. This is described separately for the construction and operational phase impacts in the following Sections.

Construction Phase

49. The dust emission magnitude and the sensitivity of the area were combined to determine the significance of the unmitigated effects.

50. **Table 12.9** outlines the effect significance from demolition activities.

Table 12.9: Construction Dust - Effect Significance from Demolition Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Major	Moderate
Medium	Medium	Major	Moderate
Low	Low	Moderate	Minor

51. **Table 12.10** outlines the effect significance from earthworks and construction activities.

Table 12.10: Construction Dust - Effect Significance from Earthworks and Construction Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	Major	Moderate	Minor
Medium	Moderate	Moderate	Minor
Low	Minor	Minor	Negligible

52. **Table 12.11** outlines the effect significance from trackout.

Table 12.11: Construction Dust - Effect Significance from Trackout Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	Major	Moderate	Minor
Medium	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible

53. It should be noted that all construction dust impacts are classified as adverse as they relate to a deterioration in baseline air quality.

54. Site specific mitigation measures were identified from the IAQM guidance (IAQM, 2016) to reduce potential dust impacts based upon the predicted effect significance. For sites with **negligible** effects, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

55. The significance of residual impacts was determined based on the dust effect significance and appropriate mitigation measures. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible, hence the residual effect will normally be **negligible**. This is regarded as **not significant** with respect to the Town and Country Planning (Environmental Impact Assessment) Regulations (UK Government, 2017).

Operational Phase

56. For operational phase road vehicle exhaust emissions impacts, the interaction between the magnitude of impact and sensitivity of the receptor was utilised to define the significance of the effect, as outlined in **Table 12.12**.

Table 12.12: Operational Phase Road Vehicle Exhaust Emissions - Effect Significance

Magnitude	Sensitivity				
	Very High	High	Medium	Low	Very Low
Major	Major Adverse/ Beneficial	Major Adverse/ Beneficial	Major Adverse/ Beneficial	Moderate Adverse/ Beneficial	Moderate Adverse/ Beneficial
Moderate	Major Adverse/ Beneficial	Major Adverse/ Beneficial	Moderate Adverse/ Beneficial	Moderate Adverse/ Beneficial	Minor Adverse/ Beneficial
Minor	Major Adverse/ Beneficial	Moderate Adverse/ Beneficial	Moderate Adverse/ Beneficial	Minor Adverse/ Beneficial	Negligible
Very Minor	Moderate Adverse/ Beneficial	Moderate Adverse/ Beneficial	Minor Adverse/ Beneficial	Negligible Adverse/ Beneficial	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

57. An adverse impact would be a deterioration in baseline air quality, whilst a beneficial impact would be an improvement.

58. Following the prediction of impacts at discrete receptor locations, the IAQM document (IAQM, 2017) provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

- The existing and future air quality in the absence of the proposed development;
- The extent of current and future population exposure to the impacts; and,
- The influence and validity of any assumptions adopted when undertaken the prediction of impacts.

59. The IAQM guidance (IAQM, 2017) states that an assessment must reach a conclusion on the likely significance of the predicted impact. Where the overall effect is **moderate** or **major**, the effect is likely to be considered **significant** in regards the EIA Regulations (UK Government, 2017), whilst if the impact is **minor** or **negligible**, the impact is likely to be considered **not significant** in regards the EIA Regulations (UK Government, 2017).

Baseline Conditions

Introduction

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

Local Air Quality Management

61. As required by the Environment Act, KC has undertaken Review and Assessment of air quality within their area of jurisdiction. This has indicated that annual mean NO_2 and 24-hour mean PM_{10} concentrations are above the relevant AQOs. As such, ten AQMAs have been declared. The closest of these to the proposed development is described as follows:

    "Kirklees AQMA - 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."

62. The proposed development is located approximately 840m north-west of the AQMA. As such, there is the potential for vehicles travelling to and from the site to increase pollution levels in this sensitive area. This has been considered throughout the assessment.

63. The site is located approximately 300m south-east of Calderdale Council's (CC's) administrative extents. CC have also undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean NO_2 concentrations are above the relevant AQO within the area. As such, eight AQMAs have been declared. The closest of these to the proposed development is described as follows:

    "Calderdale AQMA No.6 (Brighouse) - An area encompassing the main roads and surrounding buildings in the centre of Brighouse."

64. The Calderdale AQMA is positioned approximately 1.87km north-west of the proposed development. This has also been considered throughout the assessment.

65. CC and KC have 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.

Background Concentrations

66. 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 is located in grid square National Grid Reference (NGR): 415500, 420500. Data for this location was downloaded from the DEFRA website (DEFRA, 2017) for the purpose of the assessment and is summarised in **Table 12.13**.

Table 12.13: Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentrations (µg/m^3)			
	2019	2020	2029	2030
NO_2	16.63	15.87	11.34	11.08
PM_{10}	13.01	12.77	12.18	12.16

67. As shown in **Table 12.13**, predicted background NO_2 and PM_{10} concentrations are below the relevant AQOs at the site. It should be noted that DEFRA background concentrations

are only available up until 2030. As such, concentrations for 2030 were utilised to represent 2034 in lieu of other data.

Local Air Quality Monitoring Data

68. Monitoring of pollutant concentrations is undertaken by KC throughout their area of jurisdiction. Recent results recorded in the vicinity of the proposed development are shown in **Table 12.14**. Exceedences of the relevant AQO are shown in **bold**.

Table 12.14: Monitoring Results - KC

Monitoring Site		Monitored NO_2 Concentrations (µg/m^3)		
		2017	2018	2019
K6	Leeds Road - Cooper Bridge	**42.6**	36.3	37.9
K9	Bradley Road	35.3	27.5	34.4
K10	Leeds Road Bradley 1	37.3	39.3	34.5
K12	Leeds Road Bradley 2	37.4	38.8	27.4
K22	Leeds Road Bradley 3	**41.4**	**40.6**	33.4

69. As shown in **Table 12.14**, annual mean NO_2 concentrations were above the AQO at the K6 and K22 monitors in recent years. As these sites are positioned adjacent to the road network within an AQMA, exceedences would be expected. It should be noted that concentrations at the remaining monitoring locations were below the relevant AQO. Reference should be made to **Figure 12.1** for a map of the survey positions.

70. CC also undertake monitoring of pollutant concentrations within their administrative extents. Recent results from sites in the vicinity of the proposed development are shown in **Table 12.15**. Exceedences of the relevant AQO are shown in **bold**.

Table 12.15: Monitoring Results - CC

Monitoring Site		Monitored NO_2 Concentrations (µg/m^3)		
		2017	2018	2019
LV-62E	Wakefield Road	**40**	38	36
LV-62W	Wakefield Road	**40**	**40**	37
WR2	Wakefield Road	38	36	33
LV-BRD	Bradford Road	31.	28	27
HXR1	Halifax Road	**49**	**49**	**42**
BH3	Huddersfield Road	**46**	**42**	**43**
BE4	Briggate	**47**	**45**	**42**
BE2	Bramston Street	38	37	35
LV-LEE	Cooper Bridge Road	32	30	27

71. As shown in **Table 12.15**, annual mean NO_2 concentrations were above the AQO at the LB-62E, LV-62W, HXR1, BH3 and BE4 sites in recent years. It should be noted that concentrations at the remaining monitoring locations were below the relevant AQO. Reference should be made to **Figure 12.1** for a map of the survey positions.

72. KC and CC do not undertake monitoring of PM_{10} concentrations in the vicinity of the site.

Air Quality Receptors

73. A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

Construction Phase Sensitive Receptors

74. Receptors sensitive to potential dust impacts during demolition, earthworks and construction were identified from a desk-top study of the area up to 350m from both the Bradley Villa farm phase of development and Full Allocation site boundaries. These are summarised in **Table 12.16**. It should be noted that no demolition works are anticipated for the Bradley Villa farm phase of development.

Table 12.16: Construction Dust - Demolition, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	10 - 100	0
Up to 50	More than 100	0
Up to 100	More than 100	-
Up to 350	More than 100	-

75. Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of both the Bradley Villa farm phase of development and Full Allocation site access routes. These are summarised in **Table 12.17**.

Table 12.17: Construction Dust - Trackout Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	More than 100	0
Up to 50	More than 100	0

76. A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in **Table 12.18**.

Table 12.18: Additional Area Dust Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	A review of Google Maps imagery revealed the Bradley Park Waste Management facility is located approximately 15m north-east of the Full Allocation site boundary. It is therefore possible that operational activities of the waste management facility may have caused dust generation in the area over recent months
The likelihood of concurrent dust generating activity on nearby sites	There are a number of proposed developments in the vicinity of the site. It is therefore possible that there will be concurrent dust generation in the area should the construction phases overlap
Pre-existing screening between the source and the receptors	Woodland lies adjacent to the north-eastern site boundary with trees and shrubs also located sporadically across the remaining boundaries. These may act as a barrier between emission sources and receptors should they be retained during construction
Conclusions drawn from analysing local meteorological data which accurately represents the area and if relevant the season during which the works will take place	As shown in Figure 12.3, the predominant wind bearing at the site is from the west. As such, receptors to the east of the boundary are most likely to be affected by dust releases
Conclusions drawn from local topography	There are no significant topographical constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	The construction phases of the Bradley Villa farm phase of development and Full Allocation sites are likely to last approximately eight and 13 years respectively. It is considered unlikely that the sensitivity of receptors will change over this time
Any known specific receptor sensitivities which go beyond the classifications given in the document	No specific receptor sensitivities identified during the baseline assessment

77. Based on the criteria shown in **Table 12.18**, the sensitivity of the receiving environment to potential dust soiling and health impacts is classified as **high**. This was because identified receptors included residential properties.

78. The sensitivity of the receiving environment to specific dust impacts is shown in **Table 12.19**.

Table 12.19: Sensitivity of the Surrounding Areas to Specific Dust Impacts

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High

Human Health	Medium	Medium	Medium	Medium

Operational Phase Sensitive Receptors

79. Receptors sensitive to potential road vehicle exhaust emission impacts were identified from a desk top study and are summarised in **Table 12.20**.

Table 12.20: Operational Phase Road Vehicle Exhaust Emissions Sensitive Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - A641, Bradford Road	414938.7	420100.3
R2	Residential - A641, Bradford Road	414882.1	420240.2
R3	Residential - A6107, Fixby Road	414810.9	420280.8
R4	Residential - A6107, Fixby Road	414585.8	420215.6
R5	Residential - A6107, Bradley Road	414969.1	420247.8
R6	Residential - A641, Bradford Road	414894.3	420340.3
R7	Residential - A641, Bradford Road	414913.9	420441.3
R8	Residential - A641, Bradford Road	414855.4	420437.3
R9	Residential - A641, Bradford Road	414859.7	420515.1
R10	Residential - A641, Bradford Road	414541.0	421212.7
R11	Educational Facility - Bradley Bar Nursery	415220.4	420308.0
R12	Residential - A6107, Bradley Road	415388.1	420398.4
R13	Residential - A6107, Bradley Road	415627.3	420484.4
R14	Residential - A6107, Bradley Road	415858.3	420589.6
R15	Residential - Sycamore Park Care Home	416312.9	420665.2
R16	Residential - A6107, Bradley Road	416486.1	420746.5
R17	Residential - A6107, Bradley Road	416523.4	420709.3
R18	Residential - A6107, Bradley Road	417201.9	420441.7
R19	Residential - A6107, Bradley Road	417295.2	420507.4
R20	Residential - A6107, Bradley Road	417396.6	420534.1
R21	Residential - A62, Cooper Bridge Road	417455.1	420552.2
R22	Residential - B6188, Colne Bridge Road	417507.9	420463.9
R23	Residential - A62, Leeds Road	417374.4	420460.1

R24	Residential - A62, Leeds Road	417121.8	420249.8
R25	Residential - A644, Leeds Road	417498.7	420583.5
R26	Residential - A644, Wakefield Road	417884.2	421035.4

80. Reference should be made to **Figure 12.3** for a graphical representation of operational phase road vehicle exhaust emission sensitive receptor locations.

Existing Odour Conditions

81. The development is located in the vicinity of Bradley Villa Farm and the Bradley Park Waste Management facility. There is the potential for odour emissions from these sites to cause loss of amenity for future site users and act as a constraint to planning consent. An Odour Assessment was therefore undertaken in accordance with the IAQM guidance (IAQM, 2018) in order to determine baseline conditions at the site and consider its suitability for the proposed end-use. Reference should be made to **Appendix 12.4** for full details of the Odour Assessment inputs and findings.

82. In accordance with the IAQM guidance (IAQM, 2018), the Odour Assessment utilised a two-stage approach. This included three Field Odour Surveys which were undertaken to assess baseline conditions across the development site and potential odour exposure at proposed residential locations. An Odour Risk Assessment was also undertaken to consider the potential risk of reduced amenity as a result of emissions from Bradley Villa Farm and the Bradley Park Waste Management facility. The results of these two assessments were combined and a number of additional factors considered to determine the overall significance of effect.

83. Based on the results of the staged assessment, odour emissions from the Bradley Park Waste Management facility and Bradley Villa Farm are not considered to represent a constraint to planning consent for the Bradley Villa farm phase of development development or approval for Site Allocation HS11. As such, odour impacts have not been considered further within this Chapter.

Assessment of Impact

Demolition and Construction

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

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

86. The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of both the Bradley Villa farm phase of development and Full

Allocation site boundaries. As such, a detailed assessment of potential dust impacts has been undertaken.

87. It should be noted that predicted environmental impacts from construction phase activities are considered to be adverse but temporary in nature.

Demolition

88. Demolition will be undertaken at the start of the construction phase and will involve clearance of existing buildings across the Bradley Park Golf Course on the Full Allocation site. It is estimated that the building volume to be demolished is less than 20,000m^3. In accordance with the criteria outlined in **Table 12.6**, the magnitude of potential dust emissions from earthworks is therefore **small**. It should be noted that no demolition works are anticipated for the Bradley Villa farm phase of development.

89. **Table 12.3** indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in **Table 12.9**, the significance of unmitigated dust soiling effects as a results of demolition activities is predicted to be **moderate adverse**, which is considered to be **significant**.

90. **Table 12.4** indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in **Table 12.9**, the significance of unmitigated human health effects as a result of demolition activities is predicted to be **moderate adverse**, which is considered to be **significant**.

Earthworks

91. Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The Bradley Villa farm phase of development and Full Allocation sites both cover an area greater than 10,000m^2. In accordance with the criteria outlined in **Table 12.6**, the magnitude of potential dust emissions from earthworks is therefore **large**.

92. **Table 12.3** indicates the sensitivity of the area to dust soiling effects on people of property is **high**. In accordance with the criteria outlined in **Table 12.10**, the significance of unmitigated dust soiling effects as a results of earthworks is predicted to be **major adverse**, which is considered to be **significant**.

93. **Table 12.4** indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in **Table 12.10**, the significance of unmitigated human health effects as a result of earthworks is predicted to be **moderate adverse**, which is considered to be **significant**.

Construction

94. Based on the site layout designs for the Bradley Villa farm phase of development and the anticipated scale of the Full Allocation site, new buildings are expected to have a total volume of more than 100,000m^3. In accordance with the criteria outlined in **Table 12.6**, the magnitude of potential dust emissions from construction is therefore **large**.

95. **Table 12.3** indicates the sensitivity of the area to dust soiling effects on people of property is **high**. In accordance with the criteria outlined in **Table 12.10**, the significance of unmitigated dust soiling effects as a results of construction activities is predicted to be **major adverse**, which is considered to be **significant**.

96. **Table 12.4** indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in **Table 12.10**, the significance of unmitigated human health effects as a result of construction activities is predicted to be **moderate adverse**, which is considered to be **significant**.

Trackout

97. Based on the Bradley Villa farm phase of development and Full Allocation site areas, it is anticipated that the unpaved road length may be greater than 100m. In accordance with the criteria outlined in **Table 12.6**, the magnitude of potential dust emissions from trackout is therefore **high**.

98. **Table 12.3** indicates the sensitivity of the area to dust soiling effects on people of property is medium. In accordance with the criteria outlined in **Table 12.11**, the significance of unmitigated dust soiling effects as a result of trackout activities is predicted to be **major adverse**, which is considered to be **significant**.

99. **Table 12.4** indicates the sensitivity of the area to human health is **medium**. In accordance with the criteria outlined in **Table 12.11**, the significance of unmitigated human health effects as a result of trackout activities is predicted to be **moderate adverse**, which is considered to be **significant**.

Summary of Dust Effects

100. A summary of the potential construction phase effect significance from each dust generating activity is provided in **Table 12.21**.

Table 12.21: Summary of Potential Unmitigated Construction Dust Effect Significance

Potential Impact	Potential Effect on the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Moderate Adverse/Significant	Major/Significant	Major/Significant	Major/Significant
Human Health	Moderate Adverse/Significant	Moderate Adverse/Significant	Moderate Adverse/Significant	Moderate Adverse/Significant

Completed Development

101. Vehicle movements associated with the operation of the proposed development will generate exhaust emissions on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutants concentrations at sensitive locations in the vicinity of the site.

102. For the purpose of the assessment, traffic data for 2029 and 2034 was utilised to represent the anticipated opening years of the proposed Bradley Villa farm phase of development and Full Allocation developments respectively. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors and background concentrations for 2019 were utilised within the dispersion model. The use of 2029 and 2034 traffic data and 2019 emission factors is considered to provide a worst-case scenario and therefore predicted pollution concentrations are likely to overestimate actual levels during the operation of the development. Reference should be made to **Appendix 12.1** for assessment inputs.

103. It should be noted that predicted impacts from operational phase activities are considered to be adverse and permanent in nature.

104. Potential air quality impacts associated with vehicle exhaust emissions were considered for the following two modelling scenarios:

- Bradley Villa farm phase of development; and,
- Full Allocation - Bradley Park Golf Course.

105. The results are outlined below.

Predicted Concentrations - Bradley Villa farm phase of development

106. Annual mean NO_2 concentrations were predicted at the sensitive receptor locations for the Bradley Villa farm phase of development DM and DS scenarios. The results are summarised in **Table 12.22**.

Table 12.22: Predicted Annual Mean NO_2 Concentrations - Bradley Villa farm phase of development

Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A641, Bradford Road	27.10	27.22	0.12
R2	Residential - A641, Bradford Road	26.83	26.98	0.15
R3	Residential - A6107, Fixby Road	26.55	26.67	0.12
R4	Residential - A6107, Fixby Road	24.49	24.55	0.06
R5	Residential - A6107, Bradley Road	28.80	29.06	0.26
R6	Residential - A641, Bradford Road	27.30	27.59	0.29
R7	Residential - A641, Bradford Road	28.07	28.39	0.32
R8	Residential - A641, Bradford Road	26.04	26.20	0.16
R9	Residential - A641, Bradford Road	28.38	28.45	0.07
R10	Residential - A641, Bradford Road	29.14	29.18	0.04
R11	Educational Facility - Bradley Bar Nursery	26.44	26.58	0.14

R12	Residential - A6107, Bradley Road	27.29	27.46	0.17
R13	Residential - A6107, Bradley Road	28.59	28.79	0.20
R14	Residential - A6107, Bradley Road	26.44	26.56	0.12
R15	Residential - Sycamore Park Care Home	27.23	27.38	0.15
R16	Residential - A6107, Bradley Road	27.60	27.76	0.16
R17	Residential - A6107, Bradley Road	26.69	26.82	0.13
R18	Residential - A6107, Bradley Road	26.51	26.62	0.11
R19	Residential - A6107, Bradley Road	28.14	28.29	0.15
R20	Residential - A6107, Bradley Road	28.60	28.75	0.15
R21	Residential - A62, Cooper Bridge Road	28.93	29.06	0.13
R22	Residential - B6188, Colne Bridge Road	29.15	29.24	0.09
R23	Residential - A62, Leeds Road	29.75	29.84	0.09
R24	Residential - A62, Leeds Road	26.68	26.70	0.02
R25	Residential - A644, Leeds Road	28.91	29.03	0.12
R26	Residential - A644, Wakefield Road	29.37	29.46	0.09

107. As shown in **Table 12.22**, predicted annual mean NO_2 concentrations were below the relevant AQO at all sensitive receptors in both the DM and DS scenarios.

108. Reference should be made to **Figure 12.4** and **Figure 12.5** for graphical representations of annual mean NO_2 concentrations across the assessment area for the Bradley Villa farm phase of development DM and DS scenarios respectively.

109. Annual mean PM_{10} concentrations were predicted at the sensitive receptor locations for the Bradley Villa farm phase of development DM and DS scenarios. The results are summarised in **Table 12.23**.

Table 12.23: Predicted Annual Mean PM_{10} Concentrations - Bradley Villa farm phase of development

Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A641, Bradford Road	14.74	14.77	0.03
R2	Residential - A641, Bradford Road	14.57	14.60	0.03
R3	Residential - A6107, Fixby Road	14.60	14.62	0.02
R4	Residential - A6107, Fixby Road	14.20	14.21	0.01

R5	Residential - A6107, Bradley Road	14.88	14.93	0.05
R6	Residential - A641, Bradford Road	14.64	14.70	0.05
R7	Residential - A641, Bradford Road	14.89	14.96	0.07
R8	Residential - A641, Bradford Road	14.44	14.48	0.03
R9	Residential - A641, Bradford Road	14.93	14.94	0.02
R10	Residential - A641, Bradford Road	15.14	15.15	0.01
R11	Educational Facility - Bradley Bar Nursery	14.54	14.57	0.03
R12	Residential - A6107, Bradley Road	14.68	14.71	0.03
R13	Residential - A6107, Bradley Road	14.82	14.86	0.04
R14	Residential - A6107, Bradley Road	14.53	14.55	0.03
R15	Residential - Sycamore Park Care Home	14.73	14.76	0.03
R16	Residential - A6107, Bradley Road	14.81	14.84	0.04
R17	Residential - A6107, Bradley Road	14.62	14.65	0.03
R18	Residential - A6107, Bradley Road	14.54	14.57	0.02
R19	Residential - A6107, Bradley Road	14.85	14.88	0.03
R20	Residential - A6107, Bradley Road	14.87	14.89	0.03
R21	Residential - A62, Cooper Bridge Road	14.89	14.91	0.02
R22	Residential - B6188, Colne Bridge Road	14.97	14.99	0.02
R23	Residential - A62, Leeds Road	15.11	15.13	0.02
R24	Residential - A62, Leeds Road	14.59	14.60	0.00
R25	Residential - A644, Leeds Road	14.90	14.92	0.02
R26	Residential - A644, Wakefield Road	14.91	14.93	0.02

110. As shown in **Table 12.23**, predicted annual mean PM_{10} concentrations were significantly below the relevant AQO at all sensitive receptors in both the DM and DS scenarios.

111. Reference should be made to **Figures 12.6** and **Figure 12.7** for graphical representations of annual mean PM_{10} concentrations across the assessment area for the Bradley Villa farm phase of development DM and DS scenarios respectively.

Effect Significance - Bradley Villa farm phase of development

112. Predicted effects on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in **Table 12.24** for the Bradley Villa farm phase of development.

Table 12.24: Predicted Operational Phase Road Vehicle Exhaust Emissions Effect Significance - NO_2 - Bradley Villa farm phase of development

Receptor		Sensitivity of Receptor	Magnitude of Impact	Effect Significance
R1	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R2	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R3	Residential - A6107, Fixby Road	Very Low	Negligible	Negligible
R4	Residential - A6107, Fixby Road	Very Low	Negligible	Negligible
R5	Residential - A6107, Bradley Road	Very Low	Very Minor	Negligible
R6	Residential - A641, Bradford Road	Very Low	Very Minor	Negligible
R7	Residential - A641, Bradford Road	Very Low	Very Minor	Negligible
R8	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R9	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R10	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R11	Educational Facility - Bradley Bar Nursery	Very Low	Negligible	Negligible
R12	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R13	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R14	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R15	Residential - Sycamore Park Care Home	Very Low	Negligible	Negligible
R16	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R17	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R18	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R19	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R20	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R21	Residential - A62, Cooper Bridge Road	Very Low	Negligible	Negligible
R22	Residential - B6188, Colne Bridge Road	Very Low	Negligible	Negligible
R23	Residential - A62, Leeds Road	Very Low	Negligible	Negligible
R24	Residential - A62, Leeds Road	Very Low	Negligible	Negligible
R25	Residential - A644, Leeds Road	Very Low	Negligible	Negligible
R26	Residential - A644, Wakefield Road	Very Low	Negligible	Negligible

113. As indicated in **Table 12.24**, impacts on annual mean NO_2 concentrations as a result of road vehicle exhaust emissions associated with the Bradley Villa farm phase of development were predicted to be **negligible** at all receptors.

114. Predicted effects an annual mean PM_{10} concentrations at the sensitive receptor locations are summarised in Bradley Villa farm phase of development

115. **Table 12.25** for Bradley Villa farm phase of development

Table 12.25: Predicted Operational Phase Road Vehicle Exhaust Emissions Effect Significance - PM_{10} - Bradley Villa farm phase of development

Receptor		Sensitivity of Receptor	Magnitude of Impact	Effect Significance
R1	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R2	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R3	Residential - A6107, Fixby Road	Very Low	Negligible	Negligible
R4	Residential - A6107, Fixby Road	Very Low	Negligible	Negligible
R5	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R6	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R7	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R8	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R9	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R10	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R11	Educational Facility - Bradley Bar Nursery	Very Low	Negligible	Negligible
R12	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R13	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R14	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R15	Residential - Sycamore Park Care Home	Very Low	Negligible	Negligible
R16	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R17	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R18	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R19	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R20	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R21	Residential - A62, Cooper Bridge Road	Very Low	Negligible	Negligible

R22	Residential - B6188, Colne Bridge Road	Very Low	Negligible	Negligible
R23	Residential - A62, Leeds Road	Very Low	Negligible	Negligible
R24	Residential - A62, Leeds Road	Very Low	Negligible	Negligible
R25	Residential - A644, Leeds Road	Very Low	Negligible	Negligible
R26	Residential - A644, Wakefield Road	Very Low	Negligible	Negligible

116. As indicated in **Table 12.25**, impacts on annual mean PM_{10} concentrations as a result of road vehicle exhaust emissions associated with the Bradley Villa farm phase of development were predicted to be **negligible** at all receptors.

Predicted Concentrations - Full Allocation

117. Annual mean NO_2 concentrations were predicted at the sensitive receptor locations for the Full Allocation DM and DS scenarios. The results are summarised in **Table 12.26**.

Table 12.26: Predicted Annual Mean NO_2 Concentrations - Full Allocation

Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A641, Bradford Road	27.34	27.81	0.47
R2	Residential - A641, Bradford Road	27.02	27.58	0.56
R3	Residential - A6107, Fixby Road	26.71	27.30	0.59
R4	Residential - A6107, Fixby Road	24.59	24.93	0.34
R5	Residential - A6107, Bradley Road	29.07	29.77	0.70
R6	Residential - A641, Bradford Road	27.62	28.31	0.69
R7	Residential - A641, Bradford Road	28.51	29.21	0.70
R8	Residential - A641, Bradford Road	26.33	26.73	0.40
R9	Residential - A641, Bradford Road	28.84	29.15	0.31
R10	Residential - A641, Bradford Road	29.70	29.94	0.24
R11	Educational Facility - Bradley Bar Nursery	26.52	26.86	0.34
R12	Residential - A6107, Bradley Road	27.37	27.75	0.38
R13	Residential - A6107, Bradley Road	28.67	29.16	0.49
R14	Residential - A6107, Bradley Road	26.52	26.90	0.38
R15	Residential - Sycamore Park Care Home	27.30	27.83	0.53
R16	Residential - A6107, Bradley Road	27.66	28.41	0.75

R17	Residential - A6107, Bradley Road	26.75	27.54	0.79
R18	Residential - A6107, Bradley Road	26.59	27.42	0.83
R19	Residential - A6107, Bradley Road	28.22	29.29	1.07
R20	Residential - A6107, Bradley Road	28.72	29.70	0.98
R21	Residential - A62, Cooper Bridge Road	29.09	29.98	0.89
R22	Residential - B6188, Colne Bridge Road	29.37	29.93	0.56
R23	Residential - A62, Leeds Road	29.99	30.58	0.59
R24	Residential - A62, Leeds Road	26.89	27.31	0.42
R25	Residential - A644, Leeds Road	29.07	29.90	0.83
R26	Residential - A644, Wakefield Road	29.51	30.10	0.59

118. As shown in **Table 12.26**, predicted annual mean NO_2 concentrations were below the relevant AQO at all sensitive receptors in both the DM and DS scenarios.

119. Reference should be made to **Figure 12.8** and **Figure 12.9** for graphical representations of annual mean NO_2 concentrations across the assessment area for the Full Allocation DM and DS scenarios respectively.

120. Annual mean PM_{10} concentrations were predicted at the sensitive receptor locations for the Full Allocation DM and DS scenarios. The results are summarised in **Table 12.27**.

Table 12.27: Predicted Annual Mean PM_{10} Concentrations - Full Allocation

Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A641, Bradford Road	14.79	14.89	0.10
R2	Residential - A641, Bradford Road	14.61	14.72	0.11
R3	Residential - A6107, Fixby Road	14.63	14.76	0.13
R4	Residential - A6107, Fixby Road	14.22	14.29	0.07
R5	Residential - A6107, Bradley Road	14.93	15.06	0.13
R6	Residential - A641, Bradford Road	14.70	14.83	0.13
R7	Residential - A641, Bradford Road	14.98	15.14	0.15
R8	Residential - A641, Bradford Road	14.50	14.58	0.09
R9	Residential - A641, Bradford Road	15.02	15.09	0.07
R10	Residential - A641, Bradford Road	15.26	15.32	0.06

R11	Educational Facility - Bradley Bar Nursery	14.55	14.62	0.07
R12	Residential - A6107, Bradley Road	14.69	14.77	0.08
R13	Residential - A6107, Bradley Road	14.83	14.92	0.09
R14	Residential - A6107, Bradley Road	14.54	14.62	0.08
R15	Residential - Sycamore Park Care Home	14.74	14.85	0.11
R16	Residential - A6107, Bradley Road	14.82	14.98	0.16
R17	Residential - A6107, Bradley Road	14.63	14.80	0.17
R18	Residential - A6107, Bradley Road	14.56	14.72	0.16
R19	Residential - A6107, Bradley Road	14.86	15.08	0.21
R20	Residential - A6107, Bradley Road	14.89	15.07	0.18
R21	Residential - A62, Cooper Bridge Road	14.91	15.07	0.16
R22	Residential - B6188, Colne Bridge Road	15.01	15.11	0.10
R23	Residential - A62, Leeds Road	15.15	15.27	0.12
R24	Residential - A62, Leeds Road	14.63	14.71	0.08
R25	Residential - A644, Leeds Road	14.93	15.08	0.15
R26	Residential - A644, Wakefield Road	14.93	15.03	0.10

121. As shown in **Table 12.27**, predicted annual mean PM_{10} concentrations were below the relevant AQO at all sensitive receptors in both the DM and DS scenarios.

122. Reference should be made to **Figure 12.10** and **Figure 12.11** for graphical representations of annual mean PM_{10} concentrations across the assessment area for the Full Allocation DM and DS scenarios respectively.

Effect Significance - Full Allocation

123. Predicted effects on annual mean NO_2 concentrations at the sensitive receptor locations in are summarised in **Table 12.28** for Full Allocation.

Table 12.28: Predicted Operational Phase Road Vehicle Exhaust Emissions Effect Significance - NO_2 - Full Allocation

Receptor		Sensitivity of Receptor	Magnitude of Impact	Effect Significance
R1	Residential - A641, Bradford Road	Very Low	Very Minor	Negligible
R2	Residential - A641, Bradford Road	Very Low	Very Minor	Negligible
R3	Residential - A6107, Fixby Road	Very Low	Very Minor	Negligible

R4	Residential - A6107, Fixby Road	Very Low	Very Minor	Negligible
R5	Residential - A6107, Bradley Road	Very Low	Minor	Negligible
R6	Residential - A641, Bradford Road	Very Low	Minor	Negligible
R7	Residential - A641, Bradford Road	Very Low	Minor	Negligible
R8	Residential - A641, Bradford Road	Very Low	Very Minor	Negligible
R9	Residential - A641, Bradford Road	Very Low	Very Minor	Negligible
R10	Residential - A641, Bradford Road	Very Low	Very Minor	Negligible
R11	Educational Facility - Bradley Bar Nursery	Very Low	Very Minor	Negligible
R12	Residential - A6107, Bradley Road	Very Low	Very Minor	Negligible
R13	Residential - A6107, Bradley Road	Very Low	Very Minor	Negligible
R14	Residential - A6107, Bradley Road	Very Low	Very Minor	Negligible
R15	Residential - Sycamore Park Care Home	Very Low	Very Minor	Negligible
R16	Residential - A6107, Bradley Road	Very Low	Minor	Negligible
R17	Residential - A6107, Bradley Road	Very Low	Minor	Negligible
R18	Residential - A6107, Bradley Road	Very Low	Minor	Negligible
R19	Residential - A6107, Bradley Road	Very Low	Minor	Negligible
R20	Residential - A6107, Bradley Road	Very Low	Minor	Negligible
R21	Residential - A62, Cooper Bridge Road	Very Low	Minor	Negligible
R22	Residential - B6188, Colne Bridge Road	Very Low	Very Minor	Negligible
R23	Residential - A62, Leeds Road	Low	Very Minor	Negligible
R24	Residential - A62, Leeds Road	Very Low	Very Minor	Negligible
R25	Residential - A644, Leeds Road	Very Low	Minor	Negligible
R26	Residential - A644, Wakefield Road	Low	Very Minor	Negligible

124. As indicated in **Table 12.28**, impacts on annual mean NO_2 concentrations as a result of road vehicle exhaust emissions associated with Full Allocation were predicted to be **negligible** at all receptors.

125. Predicted effects an annual mean PM_{10} concentrations at the sensitive receptor locations are summarised in

126.

127. **Table 12.29**.

Table 12.29: Predicted Operational Phase Road Vehicle Exhaust Emissions Effect Significance - PM_{10} - Full Allocation

Receptor		Sensitivity of Receptor	Magnitude of Impact	Effect Significance
R1	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R2	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R3	Residential - A6107, Fixby Road	Very Low	Negligible	Negligible
R4	Residential - A6107, Fixby Road	Very Low	Negligible	Negligible
R5	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R6	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R7	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R8	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R9	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R10	Residential - A641, Bradford Road	Very Low	Negligible	Negligible
R11	Educational Facility - Bradley Bar Nursery	Very Low	Negligible	Negligible
R12	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R13	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R14	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R15	Residential - Sycamore Park Care Home	Very Low	Negligible	Negligible
R16	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R17	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R18	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R19	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R20	Residential - A6107, Bradley Road	Very Low	Negligible	Negligible
R21	Residential - A62, Cooper Bridge Road	Very Low	Negligible	Negligible
R22	Residential - B6188, Colne Bridge Road	Very Low	Negligible	Negligible
R23	Residential - A62, Leeds Road	Very Low	Negligible	Negligible
R24	Residential - A62, Leeds Road	Very Low	Negligible	Negligible

R25	Residential - A644, Leeds Road	Very Low	Negligible	Negligible
R26	Residential - A644, Wakefield Road	Very Low	Negligible	Negligible

As shown in

128. **Table 12.29**, impacts on annual mean PM_{10} concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

Overall Impact Significance

129. The overall significance of operational phase road traffic emission impacts was determined as **negligible** for both the Bradley Villa farm phase of development and the Full Allocation, which is considered to be **not significant**. This was based on the overall predicted impacts at discrete receptor locations and the considerations outlined previously. Further justification is provided in **Table 12.30**.

Table 12.30: Operational Phase Road Vehicle Exhaust Emissions - Overall Impact Significance

Guidance	Comment
The existing and future air quality in the absence of the development	Predicted annual mean NO_2 and PM_{10} concentrations were below the relevant AQOs at all receptor locations in the absence of the proposed development It is considered unlikely that future air quality conditions will change significantly in the absence of the proposed development based on the relatively established nature of the area
The extent of current and future population exposure to the impacts	The proposed development is not predicted to affect the population exposed to exceedences of the AQOs
The influence and validity of any assumptions adopted when undertaking the prediction of impacts	The assessment assumed that vehicle exhaust emission rates and background pollutant levels will not reduce in future years. This provides worst-case results when comparted with DEFRA and Highways England methods Due to the adopted assumptions it is considered the presented results are sufficiently robust for an assessment of this nature

Environmental Mitigation Measures / Residual Impact Assessment

Demolition and Construction

130. Due to the size and nature of both the Bradley Villa farm phase of development and Full Allocation developments, Construction Environmental Management Plans (CEMPs) should be produced to control potential impacts during both construction phases. The mitigation measures outlined in **Table 12.31** should be included within the CEMPs to mitigate fugitive dust emissions during construction. These are based on the advice provided within IAQM guidance (IAQM, 2016) and are therefore considered suitable for the site. It should be noted that these measures will also provide adequate control of potential impacts on early phases of the proposed development that may be finished prior to construction of the overall site.

Table 12.31: Fugitive Construction Dust Emissions Mitigation Measures

Guidance	Comment
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or site manager Display the head or regional office contact information Develop and implement a Dust Management Plan (DMP) as part of the CEMP, which may include measures to control other emissions, approved by the LA
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measure taken Make the complaints log available to the LA upon request Record any exceptional incidents that cause dust and/or air emissions, either on- or off site, and the action taken to resolve the situation in the log book
Monitoring	Undertake daily on-site and off-site visual inspections to monitor dust, record inspection results, and make the log available to the LA upon request Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the LA upon request Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions
Site Preparation	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site Fully enclose specific operations where there is a high potential for dust production and they are active for an extensive period Avoid site runoff of water or mud Keep site fencing, barriers and scaffolding clean using wet methods Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery	Ensure all vehicles switch off engines when stationary - no idling vehicles

and sustainable travel	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques Ensure an adequate water supply on the site for effective dust suppression, using non-potable water where possible and appropriate Use enclosed chutes and conveyors and covered skips Minimise drop heights and use fine water sprays wherever appropriate Ensure equipment is available to clean any dry spillages, and clean up spillages as soon as reasonably practicable using wet cleaning methods
Waste Management	Avoid bonfires and burning of waste materials
Demolition	Ensure effective waster suppression is used during demolition operations Avoid explosive blasting, using appropriate manual or mechanical alternatives Bag and remove any biological debris or damp down such material before demolition
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable Only remove the cover in small areas during work and not all at once
Construction	Avoid scabbing (roughening of concrete surfaces) if possible Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out
Trackout	Use water-assisted dust sweeper on access and local roads, if required Avoid dry sweeping of large areas Ensure vehicles entering and leaving site are covered to prevent escape of materials Inspect on-site hall routes and any subsequent action in a site log book Record all inspections of haul routes and any subsequent action in a site log book Implement a wheel washing system, if required Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits Access gates to be located at least 10m from receptors where possible

Operational Phase

West Yorkshire Planning Guidance

131. The air quality assessment has shown that impacts associated with vehicle emissions produced by both the Bradley Villa farm phase of development and the Full Allocation are predicted to be **negligible** at all receptors. However, the West Yorkshire Low Emissions Strategy (WYLES) Technical Planning Guidance (West Yorkshire Low Emissions Group, 2014) provides a methodology for determining the scale of a development as **minor**, **medium** or **major** and the required air quality mitigation for the relevant banding. Review of the relevant criteria identified both the Bradley Villa farm phase of development and Full

Allocations developments are considered to be **major** scale proposals under the following conditions:

- Provision of more than 50 residential dwellings (C3) for individuals, families or not more than six people in a single household;
- Any developments generating 100 or more two-way vehicle movements per day; and,
- Development falls within the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011.

132. The WYLES Technical Planning Guidance (West Yorkshire Low Emissions Group, 2014) provides a number of mitigation measures that should be included within developments. Those relevant for use in the proposals can be summarised as follows:

- Provision of electric vehicle charging points throughout the proposed development; and,
- Production of a full Travel Plan to encourage the use of non-transport modes and assist with the reduction of development transport related emissions.

133. The mitigation measures outlined above are considered appropriate for the proposed development and would be anticipated to further reduce air quality impacts of road traffic emissions.

Damage Cost Assessment

134. The WYLES Technical Planning Guidance (West Yorkshire Low Emissions Group, 2014) also sets out a Damage Cost Assessment methodology in order to assess the local emissions from a development. The first step is to undertake a calculation to identify the monetary value of predicted emissions from the proposals. This uses the Emissions Factor Toolkit (EFT) to calculate the amount of transport related pollutant emissions the development is likely to produce. The output is then multiplied by the Interdepartmental Group on Costs and Benefits damage costs for the key pollutants NO_x and $PM_{2.5}$, and finally multiplied by 5 to provide a five-year exposure cost value. This is the value of mitigation that is expected to be spent on measures to reduce the impact of the proposed development. This has been summarised in the following equation:

5 Year Exposure Cost Value = EFT Output x Damage Costs x 5

135. It should be noted that the calculation has been undertaken using the most recent damage costs released by DEFRA in July 2020.

136. The input data values used in the assessment are shown in **Table 12.32**.

Table 12.32: Emissions Assessment - Inputs

Guidance	Bradley Villa farm phase of development	Full Allocation
Daily Vehicle Movements Produced by Development	858	7,050
HDV Proportion (%)	0	0
Average Speed (km/h)	50	50

Average Trip Length (km)	10	10
NO_x Output (kg/year)	344	2.567
$PM_{2.5}$ Output (kg/year)	54	441
NO_x Output (tonnes/year)	0.34	2.57
$PM_{2.5}$ Output (tonnes/year)	0.05	0.44
NO_x Damage Costs (£/tonne)	6,385	6,385
$PM_{2.5}$ Damage Costs (£/tonne)	73,403	73,403

137. The calculation is shown in

138. **Table 12.33**.

Table 12.33: Emissions Assessment - Calculation

Guidance	Bradley Villa farm phase of development	Full Allocation
Annual Cost of NO_x Emissions (£)	2,198	16,392
Annual Cost of $PM_{2.5}$ Emissions (£)	3,953	32,406
Total Annual Exposure Cost Value (£)	6,151	48,798
Total Five Year Exposure Cost Value (£)	30,757	243,991

139. As shown in

140. **Table 12.33**, the calculation determined the proposed Bradley Villa farm phase of development and Full Allocation developments should include mitigation measures to reduce the air quality impacts of road traffic emissions equal to £30,757 and £243,991 respectively. As previously outlined, the schemes will include provision of EV charging points as well as a full Travel Plan to encourage the use of non-transport modes and assist with the reduction of development transport related emissions. A number of additional strategies to further reduce the air quality impacts of road traffic emissions may include the following:

- Improved Pedestrian Links;
- Local Sourcing of Staff, products and Raw Materials;
- Smart driving Training and,
- Secure and Safe Cycle Parking Facilities.

141. It should be noted that specific measures could not be finalised at the time of this assessment. As such, it is recommended that a condition is attached to any forthcoming permission requiring a Low Emissions Strategy to be produced prior to occupation.

Residual Impacts

142. Residual effects are summarised in **Table 12.34**.

Table 12.34: Residual Effects Summary

Description of Effect	Potential impact including significance	Mitigation	Residual Effect including significance
Construction Phase			
Fugitive dust emissions associated with demolition, earthworks, construction and trackout activities	Demolition: **Moderate** in the short term at local level Earthworks: **Major** in the short term at local level Construction: **Major** in the short term at local level Trackout: **Major** in the short term at local level	Suitable mitigation measures identified in **Table 12.31** would be detailed in the CEMP to control effects to an acceptable level	**Negligible** and **not significant**
Operational Phase			
Road traffic vehicles exhaust emissions associated with vehicles travelling to and from the site	**Negligible** in the long term at local level and **not significant**	Further mitigation to reduce potential impacts is not considered necessary	**Negligible** and **not significant**

Cumulative Effects

Demolition and Construction

143. Should the construction phases of both the Bradley Villa farm phase of development and Full Allocation developments overlap, or any other developments within 700m of the boundary, it is possible that cumulative dust impacts may occur. However, as previously outlined, any fugitive dust emissions generated by the proposals will be controlled through the outlined mitigation measures. A similar level of control would also be expected for any other scheme. Therefore, residual cumulative impacts are predicted to be **not significant** in accordance with the EIA Regulations (UK Government, 2017).

Completed Development

144. Several planning applications have been submitted within the vicinity of the proposed site. Traffic generation associated with these schemes were therefore provided by Optima Highways & Transportation, the Transport Consultants for the proposed development, in order to ensure consideration of cumulative impacts from developments within the local area:

1. LP1461 – Calderdale Draft Local Plan Woodhouse Garden Suburb. Housing allocation;
2. HS11 - Land off Tithe House Way (reference: 2018/93965);
3. HS12 – Land north and west of Gernhill Avenue, Fixby (reference: 2018/92055);
4. ES1 – Land at Bradley Business Park, Dyson Wood Way, Bradley (reference: 2018/91432);
5. HS13 – Land to the east of Netheroyd Hill Road, Cowcliffe housing allocation;
6. HS14 – Land north of Ashbrow Road, Brackenhall (reference: 2019/92940);
7. ES9 – Former Cooper Bridge Wastewater Treatment Works, Leeds Road; and,
8. MXS6 – Land at Slipper Lane and Leeds Road, Mirfield mixed use allocation.

145. It should be noted that in addition to the above, traffic data provided by Optima Highways & Transportation also included predicted growth up to 2029 and 2034. This is considered to provide a reasonable representation of potential increases in traffic flows as a result of local committed developments, as well as schemes throughout the wider area.

146. As such, the presented results consider cumulative impacts from road vehicle exhaust emissions. Residual cumulative impacts are therefore predicted to be **not significant** in accordance with the EIA Regulations (UK Government, 2017).

Summary and Conclusions

147. The proposed development has the potential to cause air quality impacts as a result of fugitive dust emissions during construction and road traffic exhaust emissions associated with vehicles travelling to and from the site during operation, as well as expose future site users to existing odour issues. As such, assessments were undertaken in order to determine baseline conditions and assess potential effects as a result of the proposed development.

148. During the construction phase of the proposed development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology (IAQM, 2016). Assuming good practice dust control measures are implemented, the residual effect of potential air quality effects from dust generated by demolition, earthworks, construction and trackout activities was predicted to be **negligible**, which is considered to be **not significant**.

149. Potential impacts during the operational phase of the proposals may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. Dispersion modelling was therefore undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the local highway network both with and without the proposed development in place. Results were subsequently verified using local monitoring data.

150. Review of the dispersion modelling results indicated that effects on annual mean NO_2 and PM_{10} concentrations as a result of traffic generated by the proposed development were classified as **negligible** at all receptor locations. Following consideration of the relevant factors, the overall significance of potential air quality effects was classified as **negligible**, which is considered to be **not significant**.

151. The development is located in the vicinity of Bradley Villa Farm and the Bradley Park Waste Management facility. There is the potential for odour emissions from these sites to cause loss of amenity for future occupants of the development and act as a constraint to planning consent. A two stage Odour Assessment was therefore undertaken in order to determine baseline conditions at the site and consider its suitability for the proposed end-use.

152. Based on the results of the staged assessment, overall odour effects at the site are not considered to be significant. As such, odour is not considered to represent a constraint to planning consent for the Bradley Villa farm phase of development or Site Allocation HS11.

References

Ministry of Housing, Communities & Local Government, UK Government (2019). NPPF.

Ministry of Housing, Communities & Local Government, UK Government (2019). NPPG.

KC, 2019, Kirklees Local Plan - Strategy and Policies.

UK Government, 1995. The Environment Act.

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

UK Government, 2010. Air Quality Standards Regulations.

DEFRA, 2018. Local Air Quality Management (TG16).

UK Government, 1990. The Environmental Protection Act 1990.

UK Government, 2017. Town and Country Planning (Environmental Impact Assessment) Regulations.

WYLES Technical Planning Guidance, 2014. West Yorkshire Low Emissions Group.

UK Government, 2016. Environmental Permitting (England and Wales) Regulations.

IAQM, 2016. Guidance on the Assessment of Dust from Demolition and Construction.

IAQM, 2017. Land-Use Planning & Development Control: Planning for Air Quality.

Highways Agency, 2019. DMRB Volume 11, Section 3, Part 1, LA 105.

DEFRA, n.d. Background Mapping Data for Local Authorities - 2017.

IAQM, 2018. Guidance on the Assessment of Odour for Planning.IAQM, 2018. Mitigation of Development Air Quality Impacts V1.1.