

10. Air Quality

Introduction

- 10.1 This chapter describes the potential air quality impacts associated with the proposed Oldlands Farm Business Park, Bognor Regis.
- 10.2 As explained in Chapter 1, the Site comprises undeveloped agricultural land situated in the Shripney area on the north-eastern outskirts of Bognor Regis. The Site is bounded by the Southern Cross Industrial Estate to the south, with undeveloped agricultural land to the north and east. Buildings associated with Oldlands Farm are situated adjacent to the south-eastern corner of the Site. The A29 (Shripney Road) forms the western boundary, beyond which is a caravan park. A further caravan park is situated approximately 250m south west of the Site boundary. The Site is shown in Figure 10.1.
- 10.3 The Proposed Development is a mixed-use employment and retail scheme, together with new highway and servicing infrastructure and landscaping. The Proposals would result in changes to traffic flows on local roads, which may impact on local air quality. The main air pollutants of concern related to traffic emissions are nitrogen dioxide and fine particulate matter (PM₁₀). There is also the potential for the construction activities to impact upon surrounding land-uses. The main pollutants of concern related to construction activities are dust and PM₁₀.
- 10.4 The assumptions underpinning this assessment are those set out Chapter 8 Transport. The first phase of development would comprise the Asda store and a further 1100 m² of business units. It is assumed that this phase would open in 2011. Development of the remainder of the Site would be phased over a 14 year period, completing in 2025. By 2011, it is expected that the Eastern Relief Road and the Western Relief Road will both be in place whether the Oldlands Farm Business Park development goes ahead or not.
- 10.5 This report describes existing local air quality conditions (2007), and the predicted air quality in the future assuming that the Proposed Development does, or does not go ahead. The assessment of traffic-related impacts focuses on the opening year (2011) and the completion year (2025). The assessment of construction dust impacts focuses on the anticipated duration of the works.
- 10.6 This report has been prepared taking into account all relevant local and national guidance and regulations, and follows a methodology agreed with Arun District Council (DC).

Policy Context

Air Quality Strategy

- 10.7 The Air Quality Strategy (Defra, 2007a) provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in

its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

National Planning Policy

- 10.8 National policy on air quality and planning is set out in Planning Policy Statement 23 (PPS23) (ODPM, 2004). This contains advice on when air quality should be a material consideration in development control decisions. Existing, and likely future, air quality should be taken into account, as well as the presence of any AQMAs. PPS23 notes that the findings of local authority air quality reviews and assessments will be important, as they will identify local air pollution problems, which may in turn influence the siting of certain types of development. The need for compliance with any statutory environmental quality standards or objectives, including the air quality objectives prescribed by the Air Quality Regulations 2000 (Stationery Office, 2000) and Amending Regulations 2002 (Stationery Office, 2002), will also be a factor in determining whether air quality is a material consideration.
- 10.9 Further emphasis is given to the importance of air quality objectives and AQMAs in the Appendices to PPS23. The impact of a development on air quality is likely to be particularly important:
- where the development is proposed inside, or adjacent to an AQMA;
 - where the development could in itself result in the designation of an AQMA; and
 - where to grant planning permission would conflict with, or render unworkable, elements of a LA's air quality action plan.
- 10.10 PPS23 states clearly that not all planning applications for developments inside or adjacent to AQMAs should be refused, even if the development would result in a deterioration of local air quality, as such an approach could sterilise development.

Local Policies

- 10.11 The Arun DC Local Plan was adopted in April, 2003 and covers the period up to 2011 (Arun DC, 2003). Policies and proposals within the plan seek to guide development to meet needs, such as economic regeneration and housing, and ensure the provision of appropriate infrastructure, whilst protecting precious resources such as the countryside, open spaces and sites important for nature conservation. The review process has abolished Local Plans and replaced them with a Local Development Framework (LDF). The portfolio of planning documents, individually known as Local Development Documents, will set out the Council's policies for meeting the community's economic, environmental and social aims for the future.
- 10.12 The new planning system places an emphasis on strengthening community and stakeholder involvement in the planning process. The Statement of Community Involvement (SCI) sets out how local communities and stakeholders with an interest in the area can play a part in the preparation and revision of planning documents and the consideration of planning applications. The SCI was adopted in July 2006 (Arun DC, 2007a).

Assessment Criteria

- 10.13 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality Regulations, 2000 (Stationery Office, 2000) and the Air Quality (England) (Amendment) Regulations 2002, (Stationery Office, 2002). The relevant objectives for this assessment are provided in Table 10.1.

Table 10.1 - Relevant Air Quality Objectives

Pollutant	Time Period	Objective	To be achieved by ^a
Nitrogen Dioxide	1-hour mean	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	2005
	Annual mean	40 $\mu\text{g}/\text{m}^3$	2005
Fine Particles (PM_{10})	24-hour mean	50 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times a year	2004
	Annual mean	40 $\mu\text{g}/\text{m}^3$	2004

^a The achievement dates for the UK objectives are the end of the specified year.

^b Measured by the gravimetric method.

- 10.14 The objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The Air Quality Strategy Addendum (Defra, 2003) proposed a set of more stringent provisional objectives for PM_{10} to be achieved by 2010. However, the 2007 Air Quality Strategy replaces these provisional PM_{10} objectives with an exposure-reduction approach for $\text{PM}_{2.5}$. The exposure-reduction objective will be a 15% reduction in average urban background concentrations across the UK between 2010 and 2020. It will be supplemented with a 'backstop' annual mean objective for $\text{PM}_{2.5}$ of 25 $\mu\text{g}/\text{m}^3$ to be achieved by 2020, which is designed to deliver a minimum level of protection to all areas. Examination of UK monitoring data shows it is highly unlikely that the $\text{PM}_{2.5}$ backstop objective will be exceeded if the 24-hour PM_{10} objective is attained. These $\text{PM}_{2.5}$ objectives have not been included in Regulations, and they are not considered further in this assessment.
- 10.15 Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded where the annual mean concentration is below 60 $\mu\text{g}/\text{m}^3$ (Laxen and Marner, 2003). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level.
- 10.16 The European Union has also set limit values for both nitrogen dioxide and PM_{10} . Achievement of these values is a national obligation rather than a local one. The limit values for nitrogen dioxide are the same levels as the UK objectives, and are to be achieved by 2010 (Stationery Office, 2007). The limit values for PM_{10} are also the same level as the UK statutory objectives, and were to be achieved by 2005. The objectives are the same

as, or more stringent than, the limit values, thus it is appropriate to focus the assessment on the objectives.

Assessment Methodology & Significance Criteria

Existing Conditions

- 10.17 Information on existing air quality has been obtained by collating the results of monitoring carried out by Arun DC and Chichester DC. Additional monitoring data for this area were collected during a short-term survey in 2003-2004 (WSP, 2004) but because of the short monitoring period, and since these data were collected several years ago, they are not considered relevant to this assessment. The background concentrations across the study area have been defined using the national pollution maps published by Defra (Defra, 2007b). These cover the whole country on a 1x1 km grid. Future year baseline concentrations have been derived from existing values using the forward projection calculator published by Defra (2007b). This is based on national projections of concentration changes over future years. These factors currently only project as far forward as 2020 and so the factors for 2020 have been used to predict background concentrations in 2025.

Road Traffic Impacts

Sensitive Locations for Road Traffic Impacts

- 10.18 Concentrations of nitrogen dioxide and PM₁₀ have been predicted at a number of worst-case locations close to the Proposed Development. Receptors have been selected to represent these worst-case locations. Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, sensitive receptors will generally be residential properties, schools, nursing homes etc.. When selecting these receptors, particular attention has been given to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links.
- 10.19 As noted above, residential properties represent relevant exposure in terms of both the annual mean and the 24-hour objectives. It is usually assumed that hotels that do not house permanent residents represent relevant exposure to the 24-hour objectives but not to the annual mean objectives. The status of seasonal caravan parks is unclear. For the purpose of this assessment, a worst-case approach has been taken. It is assumed that both the annual mean and the 24-hour objectives apply at all caravan plots in the area. This provides a robust assessment.
- 10.20 Seven locations have been identified as receptors for the assessment. Three represent worst-case locations within the caravan park opposite the Site; one represents the worst-case point within the caravan park beside the A29 south of Rowan Way, and the remainder represent residential properties. Receptor 4 is near to the expected junction of the Western Relief Road with Rowan Way. Road alignments in 2011 and 2025 have taken account of the expected changes to local infrastructure. All seven receptors are described in Table 10.2 and shown in Figure 10.1.

Table 10.2 - Description of Receptor Locations

Receptor	Type	Description
Receptor 1	Roadside	Caravan Park opposite Site, closest plot to A29
Receptor 2	Roadside	Caravan Park opposite Site, closest plot to junction
Receptor 3	Roadside	Caravan Park on Shripney Road South of Rowan Way, closest plot to A29
Receptor 4	Roadside	Property on Bronze Close, closest property to Rowan Way
Receptor 5	Roadside	Property on Addison Way, closest property to Rowan Way
Receptor 6	Roadside	Caravan park opposite Site, closest plot to Western Relief Road
Receptor 7	Roadside	Property in Shripney, closest property to A29

Road Traffic Impact Prediction Methods

- 10.21 Predictions of nitrogen dioxide and PM₁₀ concentrations have been carried out for the current year (2007), the year of opening (2011), and the year of completion (2025). For 2011 and 2025, predictions have been made assuming both that the Proposed Development does proceed (With Scheme), and does not proceed (Without Scheme). As explained above, the traffic flows and road alignments included in the modelling assume that in 2011 and 2025, both the Western Relief Road and the Eastern Relief Road will be in place. They also assume that other committed developments, as described in Chapter 8 Transport, will be present. These assumptions apply to both With Scheme (with the Proposed Development) and Without Scheme (without the Proposed Development) scenarios.
- 10.22 Predictions have been carried out using the Design Manual for Roads and Bridges (DMRB) model v1.03, (Highways Agency, 2007). The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of heavy duty vehicles (HDVs), the distance of the road from the receptor, and the vehicle speed. It is also necessary to input background pollutant concentrations. These have been derived from the national maps discussed in the section on Existing Conditions.
- 10.23 AADT flows, and the proportions of HDVs for each scenario have been derived provided by Cottee Transport Planning. Traffic speeds have been derived from information provided by Cottee Transport Planning, but where appropriate, these speeds have been adjusted based on professional experience in order to take account of the tendency for slower speeds near to junctions. The traffic flow assumptions used in the air quality assessment are summarised in Table 10.3.

Table 10.3 - Summary of AADT Traffic Data used in the Assessment

Road Link	Base Year (2007)	2011 (Without Scheme)	2011 (With Scheme)	2025 (Without Scheme)	2025 (With Scheme)
Rowan Way West of Junction with Western Relief Road	11039 (4%) ^a	8500 (2%)	8900 (2%)	9900 (2%)	10650 (2%)
Rowan Way East of Junction with Western Relief Road	11039 (4%)	22350 (4%)	23200 (4%)	23900 (4%)	25400 (4%)
A29 South of Rowan Way	25824 (3%)	33500 (3%)	29000 (3%)	38900 (3%)	36700 (3%)
Steyning Way	2450 (10%)	2630 (10%)	2630 (10%)	3050 (10%)	3050 (3%)
A29 adjacent the Site	12412 (4.4%)	30300 (4%)	34600 (4%)	35280 (4%)	41700 (4%)
A29 North of Junction with Eastern Relief Road	12412 (4.4%)	16000 (4%)	17750 (4%)	19820 (4%)	22700 (4%)
Eastern Relief Road	-	16400 (4%)	17660 (4%)	19100 (4%)	20500 (4%)
Western Relief Road	-	13200 (4%)	13600 (4%)	15350 (4%)	16150 (4%)

^a Values in parentheses are proportions of HDVs.

Road Traffic Impact Magnitude and Significance Criteria

- 10.24 In terms of receptor sensitivity, all of the receptors at which air quality has been assessed are judged to be of high sensitivity. This is because the air quality objectives protect the health of all members of the public. There is no official guidance in the UK on how to define the magnitude of air quality impacts or their significance. Criteria have therefore been developed by Air Quality Consultants to define 'impact magnitude' and 'overall impact significance'. The definition of impact magnitude is solely related to the degree of change in pollutant concentrations. Impact significance takes account of the impact magnitude and of the absolute concentrations and how they relate to the air quality objectives or relevant standards. These criteria have been adopted by the Irish National Roads Authority in its 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes' (NRA, 2006). They are also set out as an example in the National Society for Clean Air guidance document 'Development Control: Planning for Air Quality' (NSCA, 2006). The criteria describing the magnitude of change due to the Proposals are set out in Table 10.4, while Table 10.5 sets out the significance criteria, which relate the magnitude of change to the air quality objectives.

Table 10.4 - Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO ₂ / PM ₁₀	Days PM ₁₀ >50 µg/m ³
Very large	Increase/decrease > 25%	Increase/decrease > 25 days
Large	Increase/decrease 15-25%	Increase/decrease 15-25 days
Medium	Increase/decrease 10-15%	Increase/decrease 10-15 days
Small	Increase/decrease 5-10%	Increase/decrease 5-10 days
Very Small	Increase/decrease 1-5%	Increase/decrease 1-5 days
Extremely Small	Increase/decrease <1%	Increase/decrease <1 days

Table 10.5 - Air Quality Impact Significance Criteria

Absolute Conc. in Relation to Objective	Change in Concentration					
	Extremely Small	Very Small	Small	Medium	Large	Very Large
Decrease with Scheme						
Above Objective with Scheme	slight beneficial	slight beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Above Objective in Do-min, Below with Scheme	slight beneficial	moderate beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Below Objective in Do-min	negligible	slight beneficial	slight beneficial	moderate beneficial	moderate beneficial	substantial beneficial
Well Below Objective in Do-min	negligible	negligible	slight beneficial	slight beneficial	slight beneficial	moderate beneficial
Increase with Scheme						
Above Objective in Do-min	slight adverse	slight adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Objective in Do-min, Above with Scheme	slight adverse	moderate adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Objective	negligible	slight adverse	slight adverse	moderate adverse	moderate adverse	substantial adverse

with Scheme						
Well Below Objective with Scheme	negligible	negligible	slight adverse	slight adverse	slight adverse	moderate adverse

'Do-min' = future baseline condition in the assessment year

'Below Objective' = 75-100% of the objective level

'Well Below Objective' = < 75% of the objective level.

Construction Impacts

Sensitive Locations for Construction Impacts

- 10.25 Locations sensitive to dust emitted during construction will be places where members of the public are regularly present. Residential properties and commercial operations close to the Site will be most sensitive to construction dust. Any areas of sensitive vegetation or ecology that is very close to dust sources may also be susceptible to some negative effects.

Construction Impact Prediction Methods

- 10.26 It is very difficult to quantify emissions of dust from construction activities and there are no formal assessment criteria for dust. In the absence of formal criteria, a set of distance based criteria has been developed. These criteria are based on the professional experience of the consultants, drawn from many years of involvement with assessments of many different types of project, together with discussions with many practitioners in the field, and consideration of a range of published reports. It is common practice to provide a qualitative assessment of potential impacts, making reference to the criteria set out in Table 10.6.
- 10.27 There is also the possibility of dust being tracked out of the Site along roads. Table 10.7 sets out the assessment criteria in terms of distance from the Site along roads where significant dust may be tracked out and potential distance from the roadside for significant effects.
- 10.28 The assessment method is thus to identify all potentially sensitive locations within the appropriate distances. These are the locations with a risk of experiencing impacts.

Table 10.6 - Assessment Criteria for Dust from Construction Activities, with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	Description	Soiling	PM ₁₀ ^a	Vegetation effects
Major	Large construction sites, with high use of haul routes	100 m	25 m	25 m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50 m	15 m	15 m
Minor	Minor construction sites, with limited use of haul routes	25 m	10 m	10 m

^a Significance based on the 2004 objective, which allows 35 daily exceedences/year of 50 µg/m³

Table 10.7 - Assessment Criteria for Construction Dust Track-Out with Standard Mitigation in Place

Source	Potential Distance from roadways for Significant Effects (Distance from edge of road)			
Scale	Distance along roadway that dust might be tracked	Soiling	PM ₁₀	Vegetation effects
Major	250 m	50 m	15 m	15 m
Moderate	100 m	25 m	10 m	10 m
Minor	25 m	15 m	5 m	5 m

Construction Impact Magnitude and Significance Criteria

- 10.29
- In terms of receptor sensitivity, it is considered that any locations that are relevant in terms of elevated PM₁₀ levels are of high sensitivity, since air quality objectives protect the health of all members of the public. In terms of dust soiling, sensitivity is usually a matter of individual perception. The sensitivity of these locations has thus been judged based on professional experience. Sensitivity of vegetation receptors is not appraised within this chapter, since this issue is covered in detail in Chapter 6 Ecology and Nature Conservation.
- 10.30
- The distances given in Tables 10.6 and 10.7 are those within which there is a risk of significant effects. This does not mean that impacts are certain, since, for example, if dust raising conditions were not to coincide with dry weather conditions, there would be no reason to expect any impacts. If impacts do occur, then their magnitude will depend not only on the distance between the dust source and the receptor, but also on the scale of dust-raising activity, the particular weather conditions at that time, and the duration of the impact. Given the difficulty of predicting the scale of dust soiling impacts, impact magnitude has been defined based on professional judgement.
- 10.31
- Impact significance has been appraised using the matrix set out in Chapter 1 Introduction.

Baseline Conditions

- 10.32 The Site is currently in agricultural use, with tree and shrub vegetation at field boundaries. It is currently bounded to the north and west by agricultural fields. Immediately south of the Site is the Southern Cross Industrial Estate, which contains a mixture of manufacturing, distribution and warehousing uses, with ancillary offices, parking and goods handling/vehicle areas. The western Site boundary runs alongside the A29 (Shirpney Road), beyond which is a caravan park. The Site is shown in Figure 10.1. By the proposed year of opening, it is expected that the Western Relief Road will be open, and this will run along the northern Site boundary.
- 10.33 Arun DC, as part of the Sussex Air Quality Steering Group, has investigated air quality within its area as part of its responsibilities under the local air quality regime. The Council completed its Updating and Screening Assessment (USA) in 2006 (Arun DC, 2006), and concluded that none of the air quality objectives are likely to be exceeded in this area. The Council completed a Progress Report in 2007 (Arun DC, 2007b), which confirmed this conclusion.
- 10.34 Arun DC operates four diffusion tube monitoring sites within Bognor Regis, all of which are more than 1km from the Proposed Development. The diffusion tubes were supplied and analysed by the South Yorkshire Laboratory and the data have been adjusted for bias by Arun DC using a multiplication factor of 1.01, which was provided for this purpose by Defra (2007c). Since the air quality objectives refer to calendar years, data are provided for the most recent complete calendar year, which is 2006 (i.e. the year before the base year for this assessment). Data from the four diffusion tube monitoring sites in Bognor Regis are presented in Table 10.8. The largest measured concentration was adjacent to the A256 (Felpham Way), east of the centre of Bognor Regis. The closest of these monitors to the Proposed Development (Mornington Crescent), measured an annual mean concentration of just 16 $\mu\text{g}/\text{m}^3$, less than half of the objective level.
- 10.35 Arun DC does not carry out any monitoring for PM_{10} . The closest PM_{10} monitoring site is in Chichester, approximately 8km away. The measurements made during 2006 are shown in Table 10.9. Both the annual average and the number of 24-hour exceedences were well below the objective levels.

Table 10.8 - Summary of Nitrogen Dioxide (NO₂) Diffusion Tube Monitoring (2006)^a

Site No.	Site Type	Location	NO ₂ concentration (µg/m ³)
1	Background	Mornington Crescent	16
2	Roadside	Felpham Way	38
3	Roadside	Canada Grove	25
4	Roadside	Bognor High Street	30
Objective			40

^a All data taken from Arun DC (2007b). Diffusion tubes supplied and analysed by South Yorkshire Lab, adjusted for bias by Arun DC using a factor of 1.01.

Table 10.9 - Summary of PM₁₀ Monitoring (2006)^a

Site	Site Type	Annual Mean (µg/m ³)	No. Days >50µg/m ³
A27 Ring Road, Chichester	Roadside	29	7
Objectives		40	35

^a Data taken from Arun DC, 2007b (in which Arun DC cite data collected by Chichester DC)

- 10.36 In addition to these locally measured concentrations, estimated background concentrations across the UK have been obtained from the national maps (Table 10.10). The estimated background nitrogen dioxide concentrations are lower than the measured background concentration at Mornington Crescent, which is to be expected since Mornington Crescent is within an urban area, but the study area is at the edge of the urban area. All of the predicted background concentrations are well below the relevant objectives.

Table 10.10 - Estimated Annual Mean Background Pollutant Concentrations across the Study Area in 2007, 2011, and 2025 (µg/m³)

Year	NO _x	NO ₂	PM ₁₀
2007	12.6 - 15.3	10.2 - 12.4	18.6 - 19.6
2011	11.1 - 13.4	8.7 - 10.6	17.5 - 18.5
2025 ^a	9.8 - 11.8	8.2 - 10.0	16.2 - 17.2
Objectives		40	40

^a Predictions for 2025 do not currently exist and thus predictions for 2020 have been used to describe conditions in 2025.

- 10.37 The DMRB model has been used to predict baseline concentrations of nitrogen dioxide and PM₁₀ at each of the receptors identified in Table 10.2. The results, covering both existing baseline and future year baseline (without the Proposed Development), are set out in Tables 10.11 and 10.12.
- 10.38 The predicted annual mean concentrations of both nitrogen dioxide and PM₁₀ are all well below the objectives in all three years. Similarly, the predicted number of 24-hour exceedences is a small fraction of the objective level. Concentrations at all receptors are expected to fall between 2007 and 2011 and to continue to fall between 2011 and 2025. This is despite the predicted increases in traffic volumes along most of these links over the same period (Table 10.3). These reductions reflect the implementation of more stringent emission controls, in particular those for new vehicles. In the case of Receptor 4, it also reflects a slightly altered alignment of Rowan Way, which is assumed to be in place by 2011.

- 10.39 These results are consistent with the conclusions of Arun DCs air quality review and assessment work.

Table 10.11 - Modelled Annual Mean Baseline Concentrations of Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)

Location	Existing (2007)	2011	2025
Receptor 1	17.2	16.0	14.3
Receptor 2	17.5	16.5	14.6
Receptor 3	18.5	15.6	14.1
Receptor 4	16.4	15.8	14.3
Receptor 5	16.8	13.4	12.4
Receptor 6	15.4	14.7	13.3
Receptor 7	16.2	14.4	12.9
Objective	40	40	40

Table 10.12 - Modelled Baseline Concentrations of PM_{10} ($\mu\text{g}/\text{m}^3$)

Location	Existing (2007)	2011	2025	Existing (2007)	2011	2025
	Annual Mean			No.Days $>50\mu\text{g}/\text{m}^3$		
Receptor 1	20.9	20.0	18.4	5	3	2
Receptor 2	21.4	20.4	18.7	5	4	2
Receptor 3	21.4	19.9	18.4	5	3	2
Receptor 4	20.8	20.0	18.5	4	3	2
Receptor 5	20.9	19.3	17.9	5	3	1
Receptor 6	20.3	19.6	18.1	4	3	1
Receptor 7	20.2	19.0	17.5	4	2	1
Objective	40	40	40	35	35	35

Identification & Evaluation of Key Impacts

Road Traffic Impacts

- 10.40 Predicted annual mean concentrations of nitrogen dioxide and PM_{10} and days with $\text{PM}_{10} > 50 \mu\text{g}/\text{m}^3$ in 2011 are set out in Table 10.13 for both the "Without Scheme" (without the Proposed Development) and "With Scheme" (with the Proposed Development) scenarios. Predictions for 2025 are set out in Table 10.14.
- 10.41 Predicted concentrations of both nitrogen dioxide and PM_{10} remain well below the objectives in 2011 and 2025, whether the Proposed Development proceeds or not; in fact, all of the predicted concentrations are less than half of the objective level. Predicted concentrations in 2011 and 2025, with the Proposed Development, also remain below existing (2007) levels (compare with values in Tables 10.11 - 10.12).

Table 10.13 - Predicted Concentrations of Nitrogen Dioxide (NO₂) and PM₁₀ in 2011

Location	2011 "Without Scheme"			2011 "With Scheme"		
	NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)		NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)	
	Annual Mean	Annual Mean	No.Days >50µg/m ³	Annual Mean	Annual Mean	No.Days >50µg/m ³
Receptor 1	16.0	20.0	3	16.3	20.1	3
Receptor 2	16.5	20.4	4	16.7	20.5	4
Receptor 3	15.6	19.9	3	15.3	19.8	3
Receptor 4	15.8	20.0	3	15.9	20.1	3
Receptor 5	13.4	19.3	3	13.5	19.3	3
Receptor 6	14.7	19.6	3	14.9	19.7	3
Receptor 7	14.4	19.0	2	14.6	19.1	2
Objectives	40	40	35	40	40	35

Table 10.14 - Predicted Concentrations of Nitrogen Dioxide (NO₂) and PM₁₀ in 2025

Location	2025 "Without Scheme"			2025 "With Scheme"		
	NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)		NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)	
	Annual Mean	Annual Mean	No.Days >50µg/m ³	Annual Mean	Annual Mean	No.Days >50µg/m ³
Receptor 1	14.3	18.4	2	14.6	18.5	2
Receptor 2	14.6	18.7	2	14.9	18.8	2
Receptor 3	14.1	18.4	2	14.0	18.4	2
Receptor 4	14.3	18.5	2	14.4	18.5	2
Receptor 5	12.4	17.9	1	12.6	18.0	1
Receptor 6	13.3	18.1	1	13.5	18.2	2
Receptor 7	12.9	17.5	1	13.2	17.6	1
Objectives	40	40	35	40	40	35

Construction Impacts

- 10.42 The Site is currently farmland and there will be no extensive demolition work required. The greatest potential for construction impacts are likely to be from the initial phase of site clearance, during soil excavation, and from the passage of vehicles travelling across unpaved ground during periods of dry weather. There is also the potential for dust emissions during the handling of dusty materials and the cutting of stone/concrete. Dust may also be tracked out of the Site onto the adjoining road network.
- 10.43 The scale of expected construction activities is judged to be "moderate" in terms of the criteria given in Tables 10.6 and 10.7. Table 10.6 thus shows that there is a risk of dust soiling within 50m of dust-raising activities, and a risk of PM₁₀ and vegetation impacts within 15m of these activities. It is not known at this stage precisely what activities will take place where on the Site during the construction phase. In order to provide a robust assessment, it has thus been assumed that dust could be raised anywhere within the Site at some time during the construction period. As well as these direct impacts, dust may also be raised from material tracked along local roads, Table 10.7 shows that dust might be tracked up to 100m along

the roadway from the Site exit and might then affect receptors alongside these roadways.

- 10.44 The locations considered to be at risk of dust soiling impacts are those within a thin strip (ca 25m deep) of the caravan park directly opposite the Site; a small number of units (and associated car parks) within Southern Cross Industrial Estate and Oldlands Farm itself. Once the initial phase of the Proposed Development is open, there is also a risk of dust from the construction of subsequent phases impacting on the Proposed Development itself. There are no residential premises within 15m of the Site boundary and there are thus no receptors at risk of significant PM₁₀ impacts. An assessment of the potential for dust impacts on vegetation is given in Chapter 6 Ecology and Nature Conservation and is not repeated here.
- 10.45 The number of construction vehicles and plant that would operate on site is expected to be small in relation to existing traffic on local roads, such that any impacts related to exhaust emissions from these construction vehicles will be negligible. The impacts of construction vehicles and plant have therefore been scoped out of any subsequent assessment.

Prediction of Impact Magnitude

Road Traffic Impact Magnitude

- 10.46 The changes in annual mean concentrations and days with PM₁₀ >50 µg/m³ brought about by the Proposals are set out in Tables 10.15 and 10.16 for 2011 and 2025 respectively. The largest predicted change in 2011 is for the annual mean nitrogen dioxide concentration at Receptor 3; where a 1.7% reduction in concentration is expected. This reflects an expected reduction in traffic along the A29 south of Rowan Way which, as explained in Chapter 8 Transport, relates to the anticipated reduced need for existing customers of the Tesco store to travel along this section of road. Elsewhere, the predicted changes are all smaller than this, but alongside all of the other roads, the predictions are for an increase in concentration. This relates to increased traffic flows along these roads. In 2025, the largest predicted change is an increase in the annual mean nitrogen dioxide concentration of 1.9% at Receptor 1, which is the caravan park immediately opposite the Site.
- 10.47 The predicted changes have been interpreted using the impact magnitude descriptors presented in Table 10.4. The results are set out in Tables 10.17 and 10.18 respectively. They are the same in 2025 as in 2011. All of the predicted changes in annual mean nitrogen dioxide concentrations are either very small or extremely small; with the extremely small changes both being beside Rowan Way. All of the predicted changes in PM₁₀ concentrations are extremely small.

Table 10.15 - Percentage Change in Predicted Concentrations as a Result of the Proposals in 2011

Location	NO ₂	PM ₁₀	No. Days >50µg/m ³
	Annual Mean	Annual Mean	
Receptor 1	1.6%	0.4%	<1 day
Receptor 2	1.2%	0.3%	<1 day
Receptor 3	-1.7%	-0.4%	<1 day
Receptor 4	0.6%	0.2%	<1 day
Receptor 5	0.9%	0.2%	<1 day
Receptor 6	1.4%	0.3%	<1 day
Receptor 7	1.5%	0.3%	<1 day

Table 10.16 - Percentage Change in Predicted Concentrations as a Result of the Proposals in 2025

Location	NO ₂	PM ₁₀	No. Days >50µg/m ³
	Annual Mean	Annual Mean	
Receptor 1	1.9%	0.5%	<1 day
Receptor 2	1.5%	0.4%	<1 day
Receptor 3	-0.7%	-0.2%	<1 day
Receptor 4	0.6%	0.2%	<1 day
Receptor 5	1.4%	0.3%	<1 day
Receptor 6	1.5%	0.3%	<1 day
Receptor 7	1.8%	0.4%	<1 day

Table 10.17 - Air Quality Impact Magnitude in 2011

Location	NO ₂	PM ₁₀	No. Days >50µg/m ³
	Annual Mean	Annual Mean	
Receptor 1	Very Small	Extremely Small	Extremely Small
Receptor 2	Very Small	Extremely Small	Extremely Small
Receptor 3	Very Small	Extremely Small	Extremely Small
Receptor 4	Extremely Small	Extremely Small	Extremely Small
Receptor 5	Extremely Small	Extremely Small	Extremely Small
Receptor 6	Very Small	Extremely Small	Extremely Small
Receptor 7	Very Small	Extremely Small	Extremely Small

Table 10.18 - Air Quality Impact Magnitude in 2025

Location	NO ₂	PM ₁₀	No. Days >50µg/m ³
	Annual Mean	Annual Mean	
Receptor 1	Very Small	Extremely Small	Extremely Small
Receptor 2	Very Small	Extremely Small	Extremely Small
Receptor 3	Very Small	Extremely Small	Extremely Small
Receptor 4	Extremely Small	Extremely Small	Extremely Small
Receptor 5	Extremely Small	Extremely Small	Extremely Small
Receptor 6	Very Small	Extremely Small	Extremely Small

Receptor 7	Very Small	Extremely Small	Extremely Small
------------	------------	-----------------	-----------------

Construction Impact Magnitude

- 10.48 As noted above, there is a risk of dust soiling affecting the caravan park opposite the Site, as well as units within Southern Cross Industrial Estate, and Oldlands Farm itself. Professional judgement suggests that the caravan park is likely to be of high sensitivity to dust soiling, while the industrial units and the farm will be of low sensitivity. Even if dust raising activities were to coincide with dry weather conditions and winds blowing toward the nearest receptor, it is unlikely that these conditions would occur for long periods and thus any impacts would be brief and temporary. Given this point, the overall magnitude of these impacts is judged to be minor.

Assessment of Impact Significance

Road Traffic Impact Significance

- 10.49 The significance of the predicted changes in concentration relates both to the impact magnitude and the relationship between the absolute concentrations and the relevant air quality objectives, as defined in Table 10.5. The results are set out in Tables 10.19 and 10.20, for 2011 and 2025 respectively. All of the predicted impacts of the Proposed Development on concentrations of nitrogen dioxide and PM₁₀ are of negligible significance during both assessment years.

Table 10.19 - Air Quality Impact Significance during 2011

Location	NO ₂	PM ₁₀	No.Days >50µg/m ³
	Annual Mean	Annual Mean	
Receptor 1	Negligible	Negligible	Negligible
Receptor 2	Negligible	Negligible	Negligible
Receptor 3	Negligible	Negligible	Negligible
Receptor 4	Negligible	Negligible	Negligible
Receptor 5	Negligible	Negligible	Negligible
Receptor 6	Negligible	Negligible	Negligible
Receptor 7	Negligible	Negligible	Negligible

Table 10.20 - Air Quality Impact Significance during 2025

Location	NO ₂	PM ₁₀	No.Days >50µg/m ³
	Annual Mean	Annual Mean	
Receptor 1	Negligible	Negligible	Negligible
Receptor 2	Negligible	Negligible	Negligible
Receptor 3	Negligible	Negligible	Negligible
Receptor 4	Negligible	Negligible	Negligible
Receptor 5	Negligible	Negligible	Negligible
Receptor 6	Negligible	Negligible	Negligible
Receptor 7	Negligible	Negligible	Negligible

Construction Impact Significance

- 10.50 Using the significance matrix provided in Chapter 1 Introduction, the significance of any dust soiling impacts is judged to be minor adverse.

Mitigation Measures

Mitigation of Road Traffic Impacts

- 10.51 The assessment has demonstrated that the Proposed Development would not cause any exceedences of the air quality objectives and that any impacts would be negligible. Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered by the introduction of more stringent emissions standards, largely via European legislation. It is not considered appropriate to propose further mitigation measures for the Proposed Development.

Mitigation of Construction Impacts

- 10.52 Measures to mitigate dust emissions would be required during construction of the Proposed Development in order to reduce impacts upon nearby residential properties. Guidance is available from the Building Research Establishment on controlling dust from construction sites (BRE, 2003), with Part 2 dealing with demolition and site preparation activities. This reflects best practice experience of dust controls and has been used, together with the professional experience of the consultant, to draw up the following set of measures that should, where practicable, be incorporated into the specification for the works. Mitigation should be straightforward, as most of the necessary measures are routinely employed as 'good practice' on construction sites. The measures are likely to include:

- Use of water-sprays to ensure that any unpaved routes across the Site are maintained in a damp condition when in use. Use of consolidated surfaces close to residential boundary;
- Imposition and enforcement of a 5mph speed limit on unpaved ground;
- Hard surfacing of the proposed new access road at an early stage of the works;
- Minimise any dust generating activities on very dry or windy days;
- Sheeting of all lorries carrying materials on and off site;
- Location and/or covering of stockpiles as far from sensitive locations as possible, and provision of appropriate hoardings;
- Wherever practicable, off-road plant to use Ultra-Low Sulphur Diesel and be equipped with exhaust after-treatment;
- Regular cleaning of all paved areas on-site;
- Use of a jet-spray vehicle and wheel wash for all vehicles leaving the Site;
- Regular use of a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the Site; and
- Use of water suppression during any cutting of stone or concrete.

- 10.53 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

Cumulative Effects

Cumulative Road Traffic Impacts

- 10.54 The assumptions underpinning the traffic data that have been used for this assessment are described in Chapter 8 Transport. They take account of the Western Relief Road and the Eastern Relief Road, as well as other committed developments as defined in Chapter 8. As such, the predicted impacts described previously already take account of the cumulative effect of all of these developments on local air quality.

Cumulative Construction Impacts

- 10.55 Given that construction dust impacts are only likely to occur very close to the Site, it is considered unlikely that there would be cumulative effects with other developments.

Residual Effects

- 10.56 Since the methodology for assessing dust impacts assumes that standard mitigation measures will be in place, and since no additional mitigation measures are proposed during either the construction or operational phases, the residual impacts are the same as those described above. These impacts are summarised in Table 10.21.

Table 10.21 - Residual Impact Table

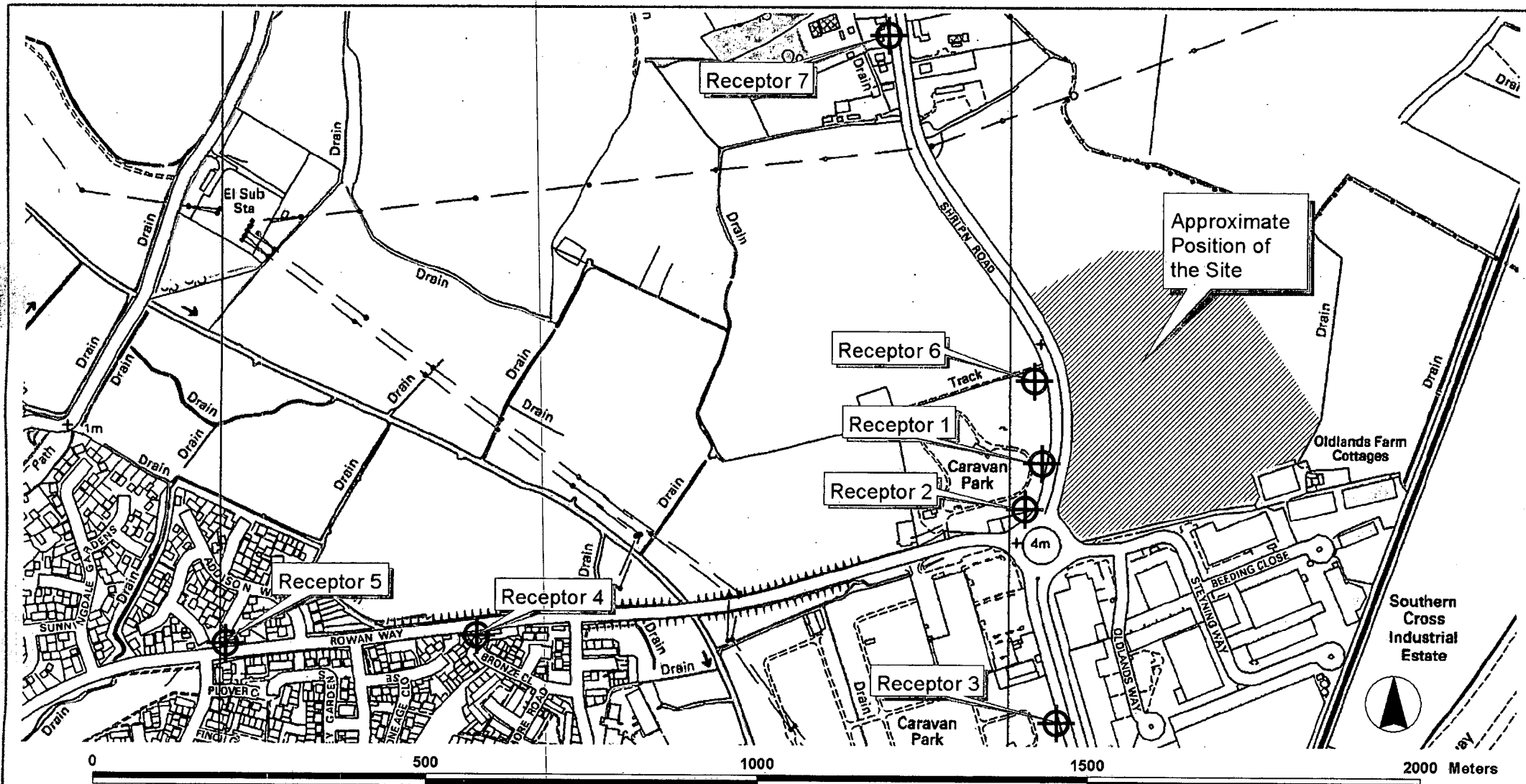
Impacts	Description of Impact		Description of Mitigation Measures	Description of Residual Impact	
	Description	Significance		Description	Significance
Construction Impacts	Dust Soiling. Negative; Direct; Temporary; Short Term	Minor adverse	Dust Control Measures	Dust Soiling. Negative; Direct; Temporary; Short Term	Minor adverse
Operational Impacts	Change in concentrations of Nitrogen Dioxide and PM ₁₀ . Negative/Positive; Indirect; Long Term.	Negligible	None Required	Change in concentrations of Nitrogen Dioxide and PM ₁₀ . Negative/Positive; Indirect; Long Term.	Negligible

Summary

- 10.57 The air quality impacts associated with the construction and operation of the proposed Oldlands Farm Business Park have been assessed. Existing conditions within the study area show acceptable air quality, with concentrations all below the air quality objectives.
- 10.58 The operational impacts are principally those associated with road traffic emissions. The impacts of altered traffic on local roads with the Proposed Development have been assessed. Concentrations have been modelled for seven worst-case receptors, representing properties and caravan plots where impacts are expected to be greatest.
- 10.59 The impacts of road traffic emissions have been modelled, using a standard approach, and it is concluded that concentrations of nitrogen dioxide and PM₁₀ would remain below the objectives in 2007, whether the Proposals are developed or not. This is consistent with the outcome of the

reviews and assessments prepared by Arun District Council, which have concluded that exceedences of the nitrogen dioxide objective are unlikely in this area.

- 10.60 Because of changes to local traffic flows, the Proposed Development would increase concentrations at some locations and lead to reduced concentrations at other locations. The predicted changes are judged to be, at most, very small, and all of the impacts are judged to be negligible.
- 10.61 It is concluded that road traffic emissions do not provide any constraints to the Proposed Development.
- 10.62 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emission. Even with these measures in place, there is a risk of occasional dust soiling impacts to properties adjacent the Site. Any effects will be temporary and relatively short lived, and will only arise during dry weather with the wind blowing towards a receptor, at a time when dust is being generated and mitigation measures are not being fully effective. The overall impacts during construction are judged to be minor adverse.



© Crown copyright 2007. All rights reserved. License number 100046099

Figure:	10.1
Title:	Air Quality Receptor Locations
Project:	Oldlands Farm, Bognor Regis
Date:	13 th December 2007
Scale:	See bar