Introduction

11.1 This chapter describes the potential effects of the proposed development on air quality.

11.2 The topics covered by this assessment are as follows:

- Potentially significant emissions of dust from the following sources:
  - The management of fugitive dust during handling of air pollution control (APC) residues which are to be deposited at the site. This includes consideration of the trace constituents of APC residues;
  - The management of fugitive dust from disposal of contaminated soils;
  - The management of fugitive dust from disposal of non-hazardous waste;
  - The management of fugitive dust from clay extraction;
  - The control of hazardous materials during landfilling of asbestos;
  - The management of fugitive dust from ancillary activities such as storage and movement of soils and daily cover materials;
  - The control of fugitive dust from the materials recycling facility (MRF)

- Potentially significant emissions of odour from the following sources:
  - The management of landfill gas, and in particular, the potential effects of emissions of untreated landfill gas;
  - Odours associated with the transportation, handling and disposal of biodegradable waste materials;
  - Odours associated with the MRF.

- The following sources of potentially significant harmful substances:
  - The management of landfill gas, including the potential effects of emissions of untreated landfill gas and emissions from landfill gas combustion plant.
  - Emissions from road traffic movements associated with the facility.

11.3 The main features of the assessment are as follows:

- Liaison with statutory and non-statutory consultees;
- Assessment of baseline air quality;
- Identification of potential effects on air quality;
- Air dispersion modelling studies to predict ground level concentrations of emitted pollutants at sensitive locations in the vicinity of the proposed development and evaluation in terms of air quality standards and guidelines;
- Identification of mitigation measures;
- Assessment of the effects of air emissions relative to baseline conditions;
- Assessment of odours and other potential fugitive emissions from the facility;
- Assessment of potential effects of emissions from the proposed facility on nearby designated habitat sites; and
- Evaluation of residual impacts.

11.4 The limitations of the assessment are summarised briefly as follows. Study assumptions are set out where appropriate in the chapter. The limitations of using forecasting techniques are taken into account by the adoption of a worst-case approach to the study.

- Limitations of dispersion modelling – in common with any forecasting tool, it is only as good as the data used in the model. Dispersion models are less well validated for area sources (e.g. fugitive gas sources) than for point sources (e.g. landfill gas combustion plant);
- Limitations of measurement surveys – e.g. laboratory detection limits and reliability;
- Limitations in forecasting the future quantities and nature of biodegradable waste deposited at the site, and consequent emissions of landfill gas; and
- Variations in the performance of landfill gas collection and combustion plant.

Study Area

11.5 The study area comprises a number of specified locations in the vicinity of Wingmoor Farm which could potentially be affected by emissions to air associated with the proposed development. The locations used in the assessment of fugitive dust, fugitive gas and gas combustion emissions are listed in Table 11.1 and 11.2, and shown in Figure 11.1. The locations used to assess emissions from road traffic movements were:

- The closest property to Stoke Road/Stoke Orchard Road (property on Farriers Reach)
- The closest property to the A435 north of the junction with Stoke Orchard Road (property on Stoke Road)
- The closest property to the A435 south of the junction with Stoke Orchard Road (property on Littlecote Close)
- The closest property to the junction of the A435 and Stoke Orchard Road (property on Yarlington Close)

Methodology

11.6 As set out above, there are a range of potentially significant air quality effects which require assessment. The methods used for each assessment are set out below.

Road traffic assessment methodology

11.7 The potential effects on air quality of road traffic accessing the application site were assessed using the method provided in the Department of Transport's "Design Manual for Roads and Bridges" volume 11 (DMRB). The DMRB procedure was developed by the Highways Agency and is regularly employed to assess the potential impacts of traffic-derived pollutants in close proximity to roads.

11.8 The DMRB screening assessment was used to assess levels of airborne pollutants at locations close to roads surrounding the application site which would be expected to carry traffic to and from Wingmoor Farm. These comprise Stoke Road/Stoke Orchard Road between the site entrance and the junction with the A435, and the A435 in Bishop's Cleeve, north of the junction with Stoke Orchard Road.

11.9 Following liaison with Tewkesbury Borough Council, the DMRB assessment focused on levels of nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter less than 10 microns, known as PM_{10}. The potential effects of smaller size fractions was also considered in semi-quantitative terms. These substances are commonly associated with vehicle emissions.

11.10 The DMRB procedure uses information on traffic flows, pollutant emission factors, and the distance between the roads and potentially sensitive locations. The model then provides an estimate of levels of airborne pollutants at the locations of concern. These levels can be assessed against air quality standards and guidelines to decide whether a study using more detailed modelling techniques is required. Using information from the traffic impact assessment (Chapter 9), concentrations were estimated for three scenarios:

- The notional do-nothing scenario in 2009, with the site closing in May 2009 and no further operations taking place at the site

Eleven
Air Quality
Wingmoor Farm Integrated Waste Management Facility

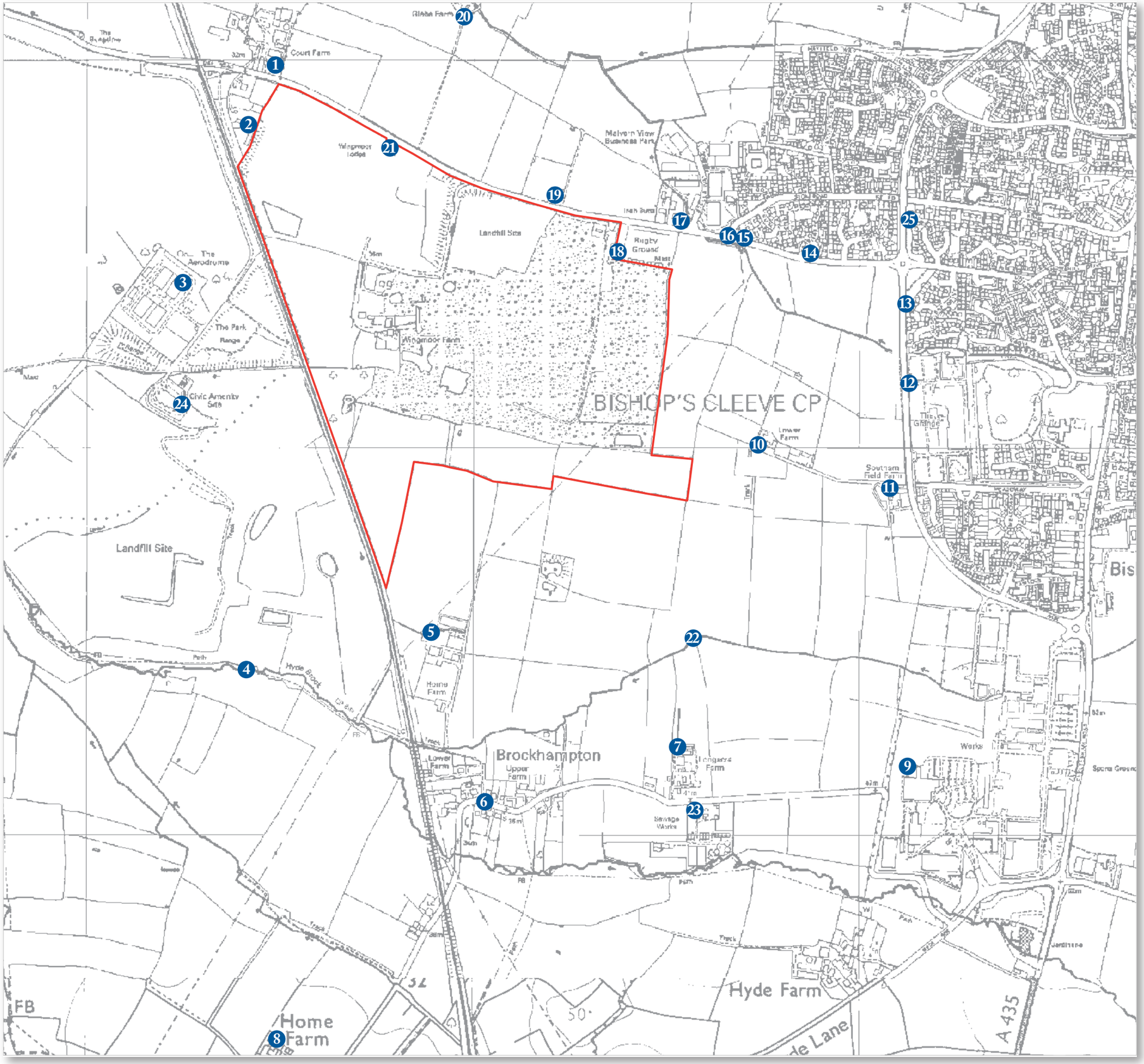

Figure 11.1 : Potentially Sensitive Locations

1 Potentially sensitive location

1. Court Farm
2. Cattery
3. Print Waste
4. Footpath (Brockhampton)
5. Home Farm (Brockhampton)
6. Brockhampton
7. Longacre Farm
8. Home Farm (Swindon)
9. Works
10. Lower Farm
11. Cleeves Machinery
12. Zurich Building
13. Residence A435 south
14. Farriers Reach
15. Stoke Road
16. Residence Stoke Road
17. Malvern View
18. Rugby Club
19. Haydon
20. Glebe Farm
21. Wingmoor Lodge
22. Footpath to south west
23. Sewage Works
24. Civic Amenity Site
25. Residence A435 north

NORTH

Scale
0 250 500m

Source. Enviros

Scale. 1:10 000

Table 11.1 Potentially sensitive locations in the vicinity of the Wingmoor Farm landfill site

Location	Easting	Northing
1 Court Farm	393500	227974
2 Pussy Willows Cattery	393434	227822
3 Print Waste Recycling	393255	227424
4 Footpath No. ABC/26/1, Brockhampton	393383	226440
5 Home Farm, Brockhampton	393900	226518
6 Brockhampton village	394036	226074
7 Longacre Farm	394533	226225
8 Home Farm and caravan site, Swindon	393477	225483
9 Industrial estate, Orchard Road, Woodmancote	395130	226178
10 Lower Farm	394736	227003
11 Cleeves Garden Machinery	395077	226898
12 Zurich building	395132	227160
13 Residential property adjacent to A435 south of Stoke Orchard Road, Bishop's Cleeve	395122	227343
14 Farriers Reach	394867	227499
15 The Laurels	394745	227529
16 Residential property, Stoke Road, Bishop's Cleeve	394716	227539
17 Malvern View, Bishop's Cleeve	394549	227571
18 Cheltenham North Rugby Club	394370	227498
19 Haydon	394216	227652
20 Glebe Farm	393974	228107
21 Wingmoor Lodge	393795	227767
22 Footpath No. ABC/19/1 southwest of Bishop's Cleeve	394578	226506
23 Sewage Works	394567	226071
24 Civic Amenity Site	393251	227097
25 Residential property adjacent to A435 north of Stoke Orchard Road, Bishop's Cleeve	395124	227579

Source: Site visit and Ordnance Survey mapping

Table 11.2 Designated sensitive habitat sites in the vicinity of the Wingmoor Farm landfill site

Habitat site	Easting	Northing	Approximate distance from site (km)
Cleeve Common SSSI	398192	226567	4.4
Severn Ham Tewkesbury SSSI	388734	232270	7.0
Coombe Hill Canal SSSI	388651	227225	5.3
Ashleworth Ham SSSI	383854	226046	10.2
Turvey's Piece SSSI	388268	230022	6.2
Dixton Wood SSSI	398055	231036	5.4
Puckham Woods SSSI	400712	222373	8.5
Badgeworth SSSI	391036	220646	7.5
Wingmoor Farm Meadow Gloucestershire Wildlife Trust Reserve	394095	227032	0.6

Source: www.magic.gov.uk and Gloucestershire Wildlife Trust. Distance measured from site gatehouse.
Note: Wingmoor Farm Meadow forms part of the application area, and immediately south of the non-hazardous landfill area.

- The minimum engineered scheme (MES), required to leave the site in a safe and suitably managed form, in 2024
- The proposals, in 2024.

11.11 The technique is designed as a screening tool, and is used to establish whether a more detailed air quality assessment is appropriate for any of the air pollutants under consideration. The technique consists of a series of data tabulations that are used to provide estimated levels of traffic pollutants within 200 m of a road. The DMRB does not involve detailed modelling techniques. The method takes into account vehicle flow and speed, the distance of the location being assessed from the roads carrying the traffic, and changes in exhaust emissions likely to be brought about by new technology and more stringent legislation. It was used to estimate levels of traffic pollutants at four locations as listed in paragraph 11.5.

11.12 The DMRB provides estimates of annual average concentrations of nitrogen dioxide and PM_{10}. Values are derived from these annual averages for comparison with air quality objectives and guidelines. The DMRB assessment requires the following input data:

- Plans of the local area to determine distance from the roads;
- Annual average daily traffic flow (AADT) figures; and
- Information on traffic speeds and vehicle composition.

11.13 The concentrations predicted by the DMRB assessment are compared with air quality criteria specified in the DMRB, which are derived from the statutory air quality objectives. The criteria are as follows:

- Maximum annual mean NO_2 concentration: 40 $\mu g/m^3$;
- Maximum annual mean PM_{10} concentration: 40 $\mu g/m^3$; and
- Maximum 24 hour mean PM_{10} concentration: 50 $\mu g/m^3$, not to be exceeded more than 35 times per year.

11.14 The DMRB is a statistical screening model largely based on national averages concerning, for example, traffic composition and site dispersion characteristics. Because of its use as a general screening model for national application, irrespective of local conditions, its approach errs on the side of caution, tending to overestimate predicted concentrations (e.g. by application of worst case meteorological dispersion conditions). Should any of the concentrations exceed the relevant criterion value, this does not mean that an exceedance will occur in practice, but indicates a need for a more detailed assessment.

Methodology for assessment of landfill gas fugitive and combustion emissions

11.15 The effects on air quality of landfill gas fugitive emissions were provided in a report prepared in relation to the site Environmental Permit. This study included a modelling study of the generation of landfill gas and trace components. The report goes on to provide screening assessments of fugitive emissions of landfill gas, and landfill gas combustion products. The study provided estimated levels of trace components of landfill gas due to fugitive emissions from the site in the local area, together with estimated levels of combustion products. The study was used to assess the levels of these substances that would result from the proposed development.

11.16 The air quality assessment (*Grundon Waste Management Ltd, "Wingmoor Landfill Site – Air Quality Assessment for Increase in Engine Capacity," SLR Ref.: 090511_406.0013.00044, May 2009;)* screened out all components of potential concern with the exception of odours due to hydrogen sulphide. Consequently, a dispersion modelling study of hydrogen sulphide emissions was carried out to investigate potential levels of hydrogen sulphide in more detail. The ADMS dispersion modelling system version 4.1 was used for this assessment. The ADMS model is a new generation system and is an industry-standard model for this kind of application. It is normally accepted in applications of this nature by local authorities and the Environment Agency. The model was used to forecast levels of hydrogen sulphide and overall odour due to fugitive emissions of landfill gas from the proposed facility in the surrounding area and at nearby sensitive locations.

11.17 The modelling study was carried out in accordance with the Environment Agency's *(Environment Agency, "Air dispersion modelling report requirements," undated, available from www.environment-agency.gov.uk)* guidance document for dispersion modelling studies. Information on emissions was taken from the screening assessment as described above. Additionally, the likely odour strength of fugitive landfill gas emissions was estimated from published data. *(TG Trust, " Assessment and control of amenity effects associated with landfills – guidance manual for odour, litter and dust," 2000)* The odour strength was estimated as approximately 200,000 odour units per cubic metre (OU/m^3). This estimate is subject to some uncertainty as it was obtained

from a limited database, and is based on data which is 10 or more years old. Measurements obtained at the Wingmoor Farm site indicate that levels of hydrogen sulphide in landfill gas from the older parts of the site are between 13% and 43% of those from the more recent parts of the site. A similar reduction in the overall odour intensity of landfill gas might be expected to occur between older and newer parts of the site, suggesting that the value used in the assessment is likely to be an over-estimate of the odour strength of landfill gas at the site.

11.18 The location of emissions of hydrogen sulphide would be expected to evolve over the lifetime of the proposed development. Emissions of hydrogen sulphide were assumed to be released from a notional area of approximately 5 hectares located towards the centre of the site. The co-ordinates of the assumed area of surface emissions were: (393909, 227413), (394090, 227367, (393972, 227094), (393830, 227138). In practice, surface emissions are likely to be released from a wider area, which would tend to reduce the potential impact of surface emissions at any one location.

11.19 The ADMS model used five years of meteorological data. This data was recorded at the Brize Norton meteorological station between 1994 and 1998. The dispersion model was run to provide modelled ground-level concentrations of hydrogen sulphide and odour at the locations identified in Table 11.1.

11.20 The concentrations of pollutants due to the modelled sources were combined with estimated baseline concentrations in the vicinity of the site. Modelled levels of hydrogen sulphide and odours were assessed against the appropriate air quality and odour guidelines.

11.21 Modelled levels of hydrogen sulphide were assessed against a benchmark of 7 $\mu g/m^3$ for 30 minute mean concentrations. *(Environment Agency, Guidance Note EPR-H1, "Environmental Risk Assessment Part 2: Assessment of point source releases and cost-benefit analysis," March 2008)* Modelled odour strength levels were assessed against a benchmark of 1.5 OU/m^3 for hourly mean odour levels. Odours were assessed on the basis of the 98th percentile forecast levels. Environment Agency guidance *(Technical Guidance Note IPPC H4, "Draft Horizontal Guidance for Odour, Part 1 – Regulation and Permitting," Environment Agency, 2002)* indicates that odours below these levels would not be expected to give reasonable cause for annoyance due to odour.

11.22 It is anticipated that the air quality assessment study will be developed to provide a more detailed assessment of emissions of hydrogen sulphide for the purposes of the site Environmental Permit. This study would be able to draw on more detailed model results.

Methodology for assessment of dust

11.23 As set out in Section 11.2, there is a range of potentially significant sources of dust from the Wingmoor Farm landfill site. These comprise:

- Handling of APC residues, including consideration of the trace constituents of APC residues;
- Disposal of contaminated soils;
- Disposal of non-hazardous waste;
- Fugitive dust from clay extraction;
- Disposal of asbestos; and
- Ancillary activities such as storage and movement of soils and daily cover materials.

11.24 It is important to ensure that impacts associated with dust generation at the site are controlled. The potential impacts are associated with deposition of dust; airborne particulate matter; and the potential effects of trace constituents of the dust. The issues to be addressed are as follows:

- Airborne particulate matter associated with all sources of dust at the site;
- Deposition of particulate matter associated with all sources of dust at the site;
- Trace metals and organic chemicals contained in APC residues and contaminated soils; and
- Asbestos.

11.25 In this section, the study methodology is set out. Firstly, the dust control measures for the different activities are set out. Secondly, the dust measurement database is summarised. Thirdly, the methods for evaluating the dust sources, control measures and dust measurement database are described.

Dust control measures

11.26 The management of fugitive dust from processing air pollution control (APC) residues is a key issue for the Wingmoor Farm site. These materials arrive at the site in the form of a fine powder, and contain trace levels of potentially hazardous substances such as dioxins and furans and metals. APC residues are brought onto the site in sealed tankers. The residues are blown into silos and blended with leachate and water to form a semi-solid matrix. This process can generate a plume of white water vapour. The key risk areas for air quality are associated with the control of dust during transfer and handling of APC residues prior to mixing and formation of the semi-solid matrix. Areas of the active cell that are not in use are covered with a special paper pulp and binder (known as "Concover"), to minimise the risk of dust generation as the matrix dries out. The Concover re-hydrates when it rains giving long-term control of dusts, and it can also be reapplied if it becomes ineffective. A tanker towed by a tractor on dry and/or dusty days dampens active areas of the APC residues cell. This process is also used for internal haul roads. APC residues are not normally covered daily as it generally sets hard in its granular conditioned form. However the APC residues are covered by contaminated soils when deposited at the site, acting as cover.

11.27 Dust controls used during clay extraction and storage/movement of soils and daily cover materials include the following:

- Damping down of bare soil and/or temporary bunds and stock piles in dry windy conditions;
- All vehicles on site are limited to 10 mph;
- Regular maintenance of access roads and internal haul roads including filling in potholes;
- Cleaning drains, and emptying gullies;
- Operation of a road sweeper;
- Regular damping down of site access roads and internal haul roads during dry conditions using a mobile water bowser; and
- Using wheel wash facilities for vehicles leaving the site to prevent material being deposited on the highway

11.28 In addition to the above controls, vehicles containing waste are required to be sheeted when entering the site. Daily cover is placed on deposited wastes at the end of each working day, and deposited waste is damped down during dry windy conditions.

11.29 Contaminated soils are subject to the controls described in paragraph 11.27. Contaminated soils are generally moist and do not generate dust when deposited. If a load is suspected of being dry and dusty, a pressure washer is used to minimise dust release. Contaminated soils are compacted on deposition within the cell, and additional cover material can be used in very dry conditions.

11.30 Asbestos is normally deposited at the site in sealed bags from specialist contractors. A pressure washer is used to dampen the waste in each consignment as it is tipped from the vehicle. The rear of the vehicle is also rinsed down. Asbestos sheets are not crushed, but pushed under the waste face and covered with fresh waste materials. If asbestos arrives at the site in loose form it is deposited into a pit within the landfill cell and covered immediately to prevent any fibres becoming airborne.

11.31 Using these control measures, dusts from all sources will be minimised so that any dust generated from minerals extraction or waste disposal activities does not have a significant effect on local air quality or the amenity of local residents.

Dust Monitoring Programme

11.32 The operators of the Wingmoor Farm site carry out an extensive and detailed programme of airborne dust monitoring. The programme is designed to enable the operators to measure the effects of operations at the facility on levels of dust and trace components of the dust in the local area. As well as using established dust measurement techniques, the monitoring programme includes the development of innovative techniques to improve understanding and survey tools for application at this site and elsewhere.

11.33 Measurements of **airborne dust** are made using an optical particle analysis technique. This provides measurements of levels of total airborne particulate matter, together with finer fractions of particulates. These comprise particulates less than 10 microns in diameter (PM_{10}), particulates less than 2.5 microns in diameter ($PM_{2.5}$), and particulates less than 1 micron in diameter (PM_1).

11.34 Measurements of **dust deposition** are carried out at a number of locations in the vicinity of the site. A state-of-the-art technique is used which enables dust flux measurements to be linked to the wind direction. A clear sticky pad is exposed for a period of approximately 2 weeks. It is then scanned and analysed to identify whether each individual pixel on the scanned image has a deposited particle, and the darkness of the particle. This data is used to provide measurements of absolute area coverage (AAC) and effective area coverage (EAC).

Dust Evaluation Methods

11.35 The results of the airborne dust and dust deposition monitoring programme were reviewed to establish the effect on airborne dust levels of current landfill activities at the site. This assessment had four components.

- Measured levels of **airborne dust** were assessed against air quality standards and guidelines.

- Directional **dust flux** measurements were reviewed to identify the potential for effects on amenity to occur due to dust deposition, and to identify the most likely sources of dust in the local area.

- The **trace components** within the dust were evaluated on a worst-case basis to identify any potential concerns in relation to dust specifically associated with landfill of APC residues. This included an outline pathway exposure assessment for dioxins and furans to ensure that potential exposure via direct and indirect exposure routes was taken into account. This assessment was carried out using a methodology published by Her Majesty's Inspectorate of Pollution (HMIP). *(Her Majesty's Inspectorate of Pollution, "Technical Guidance Note D1 (Dispersion): Guidelines on Discharge Stack Heights for Polluting Emissions", HMIP 1996)* This method allows an outline assessment of potential exposure via all potentially significant pathways to be carried out. It was used to estimate potential exposure of local residents and local farmers to levels of dioxins and furans which could potentially be present in dust in the local area. As a worst-case, it was assumed that all the dust experienced by a local resident could theoretically result from air pollution control residues. In practice, only a relatively small proportion of dust will result from APC residues.

- **Asbestos** survey measurements were assessed against benchmarks for the management of asbestos fibres set by the Health and Safety Executive.

11.36 The results of these analyses were assessed against appropriate standards and guidelines for airborne pollutants and dust deposition.

- **Airborne dust** levels were assessed against air quality standards for PM_{10}, as set out in paragraph 11.13.

- **Dust deposition** rates were assessed against a guideline for a low nuisance potential, of 5% Effective Area Coverage (EAC) per two week sample. *(Beaman, AL and Kingsbury, RWSM, "Assessment of nuisance from deposited particulates," Clean Air, 11, pp77 – 81, 1981. Schwar, MJR, "A dust meter for measuring dust deposition and soiling of glossy surfaces," Clean Air 24, pp. 164–169, 1994. Quoted in Dustscan Ltd, "Guidance Note No. 3: Directional Dust Data Assessment")*

Table 11.3 : Air quality standards and guidelines for trace components of dust

Substance	Air quality standard/ guideline (µg/m³)	Basis
Arsenic	0.006	Air Quality Standards Regulations 2007 No. 64 (applies to total content of arsenic in the PM_{10} fraction)
Cadmium	0.005	Air Quality Standards Regulations 2007 No. 64 (applies to total content of cadmium in the PM_{10} fraction)
Cobalt	0.2	Derived from workplace exposure limit
Chromium	0.1	Derived from workplace exposure limit (applies to fraction present as Chromium VI)
Copper	10	Derived from workplace exposure limit
Mercury	0.25	Derived from workplace exposure limit
Manganese	1	World Health Organisation guideline
Nickel	0.02	Air Quality Standards Regulations 2007 No. 64 (applies to total content of nickel in the PM_{10} fraction)
Lead	0.5	Air Quality Standards Regulations 2007 No. 64
Antimony	5	Derived from workplace exposure limit
Tin	20	Derived from workplace exposure limit
Thallium	1	Derived from workplace exposure limit
Vanadium	1	World Health Organisation guideline (24 hour reference period)
Asbestos fibres	1 fibre per litre	World Health Organisation guideline
Dioxins and furans	2 picograms Toxic Equivalent per kilogram body weight per day	Committee on Toxicity recommendation

Note: Guidelines are annual mean airborne concentrations in units of micrograms per cubic metre, except where stated

- The potentially hazardous **trace components** of airborne dust were assessed against standards and guidelines for long-term exposure to airborne levels of these substances. The applicable standards and guidelines were taken from the relevant Environment Agency guidance. These are set out in Table 11.3.

11.37 The forecast impacts on air quality of the proposed development were reviewed to identify whether any additional air quality control measures are required over and above those already in place at the site, as described in paragraphs 11.26 to 11.31.

Methodology for assessment of Materials Recycling Facility (MRF)

11.38 An air quality assessment for the Materials Recycling Facility was prepared in July 2005. This formed part of the approved planning application 05/4037/1317FUL. The air quality assessment includes consideration of odours, dust and road traffic impacts potentially associated with the MRF.

11.39 The potential effects of exhaust emissions from road vehicles associated with the MRF were taken into account as part of the overall assessment of traffic impacts. The potential effects of fugitive odour and dust emissions from with the MRF were evaluated by considering the findings of the 2005 study.

Consultation

11.40 The project consultation process is described in Chapter 7 of this ES. Specific consultation discussions on air quality matters were held with representatives of Tewkesbury Borough Council and the Environment Agency in October 2008.

11.41 The points covered in consultation with Tewkesbury Borough Council were as follows:

- The issues to be addressed as set out in Section 11.2 were listed to confirm that there were no obvious omissions. These were subsequently amended to reflect the inclusion of the MRF in the proposed development.

- It was confirmed that the air quality assessment would include assessment of odours.

- Tewkesbury Borough Council receives a low number of complaints in respect of odours associated with the Wingmoor Farm facility. The majority of complaints are made to the Environment Agency. A copy of the single complaint received during 2007 and 2008 was provided.

- It was confirmed that the traffic assessment should focus on levels of oxides of nitrogen and PM_{10}.

- The Council records levels of nitrogen dioxide in the borough, but not at locations relevant to the Bishop's Cleeve area.

11.42 The points covered in consultation with the Environment Agency were as follows:

- The issues to be addressed as set out in paragraph 11.2 were listed to confirm that there were no obvious omissions. These were subsequently amended to reflect the inclusion of the MRF in the proposed development.

- The Environment Agency has received a substantial number of complaints in respect of odours associated with the Grundon and/or Cory landfill sites. The Agency is not able to investigate the majority of these individually. The Agency considers that odours from the Wingmoor Farm site can often be detected off-site, but also notes that odours could be due to the adjacent Wingmoor Farm West landfill operated by Cory Environmental Ltd. A record of odour complaints was subsequently requested and the appropriate records provided.

- The Agency considers that emissions to air from the site will require modelling. The proposed approach of dispersion modelling of landfill gas and gas combustion emissions, and assessment of particulate matter emissions via the extensive monitoring database was discussed. The Agency considered that this approach was appropriate.

- The Environment Agency has carried out a significant dust monitoring programme in the local area. This has not highlighted any cause for concern with the current operations of the Wingmoor Farm facility.

Implications of Policy and Guidance

11.43 The following policy and guidance has been identified as potentially relevant to the assessment of air quality impacts in relation to the proposed development.

Planning Policy Statement 23

11.44 PPS23 states:

"The following matters (not in any order of importance) should be considered in the preparation of development plan documents and may also be material in the consideration of individual planning applications where pollution considerations arise:

- …
- *the existing, and likely future, air quality in an area, including any Air Quality Management Areas (AQMAs) or other areas where air quality is likely to be poor (including the consideration of cumulative impacts of a number of smaller developments on air quality, and the impact of development proposals in rural areas with low existing levels of background air pollution). The findings of air quality reviews and assessments will be important in the consideration of local air pollution problems and the siting of certain types of development;*
- …
- *the need for compliance with any statutory environmental quality standards or objectives*

Gloucestershire Local Transport Plan:

11.45 This plan confirms that air quality will need to be assessed in line with other relevant policies and the impacts of traffic generated by the proposals upon local air quality should also be assessed. The application site, its servicing roads and the closest Motorway Junction (Junction 9 of the M5) do not lie within Air Quality Management Areas.

Adopted Regional Spatial Strategy for the South-West (RPG10)

11.46 RPG10 Policy EN2 "Air Quality" states:

Local authorities should:
• include in their development plans and proposals policies on the location of potentially polluting developments and of sensitive developments in the vicinity of existing polluting developments, in line with guidance in PPG23 (as and when it is updated) and in Air Quality and land use planning LAQM.G3 (00);
• designate air quality management areas where required as part of the local air quality management process;
• ensure that air quality considerations are properly considered along with other material considerations in the planning process, particularly where any air quality management areas have been designated."

Draft Regional Spatial Strategy for the South-West 2006 - 2026

11.47 The draft RSS document sets the context for air quality in the south-west as follows:

"Air quality is generally good in the South West, with low levels of sulphur, oxides of nitrogen and particulates in comparison to the rest of England, although 24 Air Quality Management Areas (AQMAs) have been declared in 12 local authority areas where national air quality objectives are not likely to be achieved. These are generally in urban areas where air pollution results mainly from traffic. Policies within this Draft RSS which reduce the need to travel and encourage access by non-car modes should help to reduce air pollution, as well as CO2 emissions. However, local authorities and others will need to ensure that air quality is considered when assessing development proposals, particularly in or near AQMAs and where significant doubt arises as to the air quality impact then the precautionary principle should be applied."

11.48 Policy RE9 of the draft Regional Spatial Strategy states:

"*The impacts of development proposals on air quality must be taken into account and local authorities should ensure, through LDDs, that new development will not exacerbate air quality problems in existing and potential AQMAs."*

Gloucestershire Structure Plan, Second Review, adopted 1999, (Saved policies):

11.49 Saved Policy P.1 of the Structure Plan states:
"Provision will only be made for development where it does not have an unacceptable effect in terms of: … (a) the environment and local community in terms air, noise or light pollution;"

11.50 The policy goes on to provide further detail:
19.2.2 Pollution of the environment can arise from a variety of activities and can manifest itself in a number of ways; for example, as dust and smog, fumes, smells, noise, vibration and light (e.g. sky glow etc.). All these types of pollution can adversely affect the quality of life of residents and working populations as well as upsetting the ecological balance of an area.
…
19.2.6 Where development is permitted, but does pose a pollution threat or is threatened by pollution, measures should be taken to minimise this threat and mitigate against future threats.

11.51 Tewkesbury Borough Council Local Development Framework Annual Monitoring Report 2007 states (section 8.2 Air Quality):

"The air quality in the borough is at present within the Government's Air Quality Target objectives for the 8 pollutants set out for control (the pollutants are Benzene, 1,3 Butadiene, Carbon Monoxide, Lead, Nitrogen Dioxide, Particulates and Sulphur Dioxide.) There is also Air Quality Management Area (AQMA) declared at Withybridge adjacent to the M5. The area is designated in relation to a likely breach of the nitrogen dioxide objective as specified in the Air Quality Regulations (England & Wales) 2000. The AQMA remains in force until it is varied or revoked by a subsequent order."

Summary

11.52 In summary, national, regional and local planning guidance confirms that the air quality impacts of the proposed development need to be carefully addressed including the potential effects of road traffic on air quality. A precautionary approach is required where there is significant doubt as to potential effects on air quality. The proposed development is not located in or near an Air Quality Management Area. This indicates that there is a low risk of levels of the pollutants addressed under local air quality management exceeding the relevant air quality standards in the vicinity of the proposed development.

Existing Environment

11.53 This section provides information on the existing background air quality in the local area. It sets out background conditions in relation to dust, trace contaminants within dust, combustion products (in particular, oxides of nitrogen and fine particulate matter), and odours.

11.54 Emissions to air from road traffic, industrial/commercial and domestic sources of pollution in Bishop's Cleeve are likely to contribute to background air quality in the vicinity of the site. Traffic using the M5 motorway is likely to contribute to background levels of air pollution in the local area. The potential effects of emissions from these sources on background air quality were taken into account via the use of appropriate measurements and databases of air pollution.

11.55 Information on baseline ambient air quality levels was taken from the following sources:

- Information held by Tewkesbury Borough Council and Gloucestershire County Council, in particular, data obtained in fulfilment of the Borough Council's duties relating to local air quality management.
- Information held by Grundon Waste Management Limited in respect of the existing activities at the Wingmoor Farm Waste Management Facility.
- National air quality monitoring records. This includes measurements of substances covered under local air quality management (oxides of nitrogen, sulphur dioxide, carbon monoxide and fine particulate matter (PM_{10})), as well as other potentially significant substances including dioxins and furans and metals.
- Background ammonia measurements were obtained from the national ammonia monitoring network (www.cara.ceh.ac.uk).
- National databases of interpolated air quality data. Defra has produced a set of databases of background levels of substances covered under local air quality management. *(National air quality archive, www.airquality.co.uk, accessed October 2008)* These can be used to estimate background levels of these substances in areas for which representative air quality monitoring data is not available.

11.56 Future trends in baseline levels of air pollutants were assessed. Baseline levels of the air pollutants relevant to this application are constant, or if anything decreasing. The assessment includes an assessment of likely future trends in pollutants where these can be forecast with confidence – that is, oxides of nitrogen, including nitrogen dioxide, and PM_{10}.

Combustion products

11.57 The local authority's air quality review and assessment confirms that baseline levels of nitrogen dioxide, carbon monoxide, sulphur dioxide and fine particulate matter (PM_{10}) comply with the relevant air quality standards in the vicinity of the Wingmoor Farm site. Baseline levels of PM_{10} are discussed on the basis of site-specific air monitoring records below. The Council's review documents identify the following baseline levels in this area:

- Sulphur dioxide: 3.7 μg/m^3 (measurement carried out in 2002). More recent measurements have been carried out specifically in relation to a steam railway activity.
- Carbon monoxide: No air monitoring carried out.
- Nitrogen dioxide: Monitoring surveys have been carried out in relation to areas of potential concern. Tewkesbury Borough Council confirmed separately that the Council has not carried out air monitoring in the vicinity of the site.

11.58 Levels of nitrogen dioxide are a potential concern because nitrogen dioxide is emitted from landfill gas combustion plant, and from road traffic. A baseline survey of levels of nitrogen dioxide was carried out. This survey used an established diffusion tube technique to provide an indication of levels of nitrogen dioxide at key locations adjacent to the local road network to the north and north-east of the site. Diffusion tubes were placed in duplicate at five roadside locations in this area which were selected to be representative of the locations at greatest potential risk of exposure to substances emitted from landfill gas combustion plant and/or road traffic.

11.59 The levels of nitrogen dioxide measured in the survey are set out in Table 11.4.

11.60 The measured baseline levels of nitrogen dioxide comply with the air quality standard for annual mean nitrogen dioxide levels. The survey technique is indicative only, and the survey duration was 6 months. Defra guidance *(Defra, Technical Guidance. LAQM. TG(03). Local Air Quality Management, Part IV of the Environment Act 1995, 2003 (updated subsequent to survey))* indicates that this technique is appropriate for a study of this nature. The survey results indicate that the current activities at the site do not give rise to levels of nitrogen dioxide that would be of concern. This is consistent with the findings of Tewkesbury Borough Council. The measured level of nitrogen dioxide at Location 16, Residential property Stoke Road was used as a worst-case background level for locations other than those listed in Table 11.5. The road traffic assessment tool also required an estimated baseline level of oxides of nitrogen. An estimated value is provided by Defra for the study area, but the estimated value is lower than the measured level of nitrogen dioxide at Location 16, whereas it must logically be higher than this value. In order to account for this, the background level of oxides of nitrogen at locations within Bishop's Cleeve was calculated from the measured background level of nitrogen dioxide multiplied by the ratio of oxides of nitrogen to nitrogen dioxide concentration in the Defra interpolated datasets. This gave a value of 43.1 $\mu g/m^3$.

11.61 Levels of nitrogen dioxide throughout the UK have been declining for some time, mainly as a result of the increasing implementation of catalytic converters on petrol-engined cars. More recently, this trend has flattened out, and there are indications that levels of nitrogen dioxide may have started to increase in some areas. This reflects the fact that the majority of petrol-engined cars are now fitted with catalytic converters. There are also indications that a higher proportion of oxides of nitrogen emitted from road traffic may be in the form of nitrogen dioxide, rather than the less potentially harmful nitric oxide. *(Air Quality Expert Group, Trends in Primary Nitrogen Dioxide in the UK, Report prepared for Defra and Devolved Administrations, 2007)* This factor is likely to play a more significant role in areas where air quality is strongly influenced by emissions from diesel-engined vehicles – typically urban roadside locations. This factor is less likely to be significant in locations away from urban centres, such as the vicinity of the Wingmoor Farm site. On this basis it is concluded that background levels of nitrogen dioxide are not likely to show a strong upward or downward trend in the foreseeable future.

11.62 Background levels of carbon monoxide and PM10 were estimated from interpolated datasets provided by Defra. The background level of carbon monoxide in the vicinity of the site was estimated to be 0.29 mg/m^3. The background level of PM_{10} in the vicinity of the site was estimated to be 17 $\mu g/m^3$.

Table 11.4 Measured baseline levels of nitrogen dioxide

Location	Measured concentration ($\mu g/m^3$) (2008-2009)						
	Jul-Aug	Aug-Sep	Sep-Oct	Oct-Nov	Nov-Dec	Dec-Jan	Average
Site entrance	22.2	25.9	17.3	23.2	29.3	32.0	25.0
19. Haydon	24.6	24.9	23.6	28.2	29.6	33.6	27.4
17. Malvern View Industrial Estate	20.0	21.9	20.8	27.2	25.4	32.3	24.6
16. Residential property, Stoke Road	28.9	No data	23.3	29.9	40.9	46.0	33.8
16. A435 north of junction with Stoke Orchard Road	28.4	28.6	28.9	32.5	37.9	38.3	32.4
13. A435 south of junction with Stoke Orchard Road	33.5	36.4	29.8	33.5	49.6	53.7	39.4

Hydrogen sulphide

11.63 There are few local sources of hydrogen sulphide. Consequently, baseline levels of hydrogen sulphide were considered likely to be negligible in comparison with the air quality guideline for odour protection.

Airborne Particulate matter

11.64 A comprehensive dust monitoring survey has been carried out at the Wingmoor Farm site and in the surrounding area. This has used a variety of complementary techniques to measure airborne dust and dust deposition.

11.65 Levels of airborne particulate matter are recorded at six locations in the vicinity of the site. These locations are shown as locations DM1, DM2, DM5, DM7, DM8 and DM9 in Figure 11.2. Measured levels of fine particulate matter (PM10) are shown in Table 11.5, and measured levels of total suspended particulate matter are shown in Table 11.6. Data for 2008 were recorded between January and June 2008. The baseline air quality values shown in Tables 11.5 and 11.6 are evaluated in the light of the proposed development in paragraph 11.107 and following. However, in principle, measured levels of PM10 are not of significant concern provided the measured levels comply with the standard values given in Table 11.5.

11.66 Measured levels of PM_{10} complied with the air quality standard for 24 hour mean concentrations at all measurement survey locations listed in Table 11.6 from 2005 to 2008. Measured annual mean levels of PM_{10} complied with the air quality standard at all locations except for two on-site measurements (location DM1 in 2008; DM5 in 2005). These locations surround the potentially dust generating activities at the site, and are closer to these activities than any other potentially sensitive locations. On this basis, it is concluded that baseline levels of PM_{10} comply with the relevant air quality standard at all potentially sensitive locations in the local area.

Table 11.5 Measured levels of PM_{10} ($\mu g/m^3$)

Location	Year	Data capture	Annual mean	90.4th percentile of 24 hour mean	Number of exceedances of air quality standard
Standard			**40**	**50**	**35**
DM1 West side of site	2005	95%	21	23	10
	2006	92%	18	27	11
	2007	89%	23	21	7
	2008	92%	42	26	8
DM2 North-east side of site	2005	95%	20	28	13
	2006	93%	40	32	15
	2007	92%	32	31	15
	2008	96%	28	20	7
DM5 North side of site	2005	96%	56	29	15
	2006	93%	30	28	12
	2007	89%	14	22	5
	2008	95%	24	20	6
DM7 South side of site	2005	96%	15	22	10
	2006	92%	12	19	4
	2007	91%	36	28	15
	2008	89%	37	22	7
DM8 North-west side of site	2005	Not operational			
	2006	50%	17	26	4
	2007	89%	20	26	9
	2008	89%	24	24	6
DM9 North-east side of site	2005	Not operational			
	2006	15%	Insufficient data (started 1/11/2006)		
	2007	83%	24	32	9
	2008	81%	13	25	1

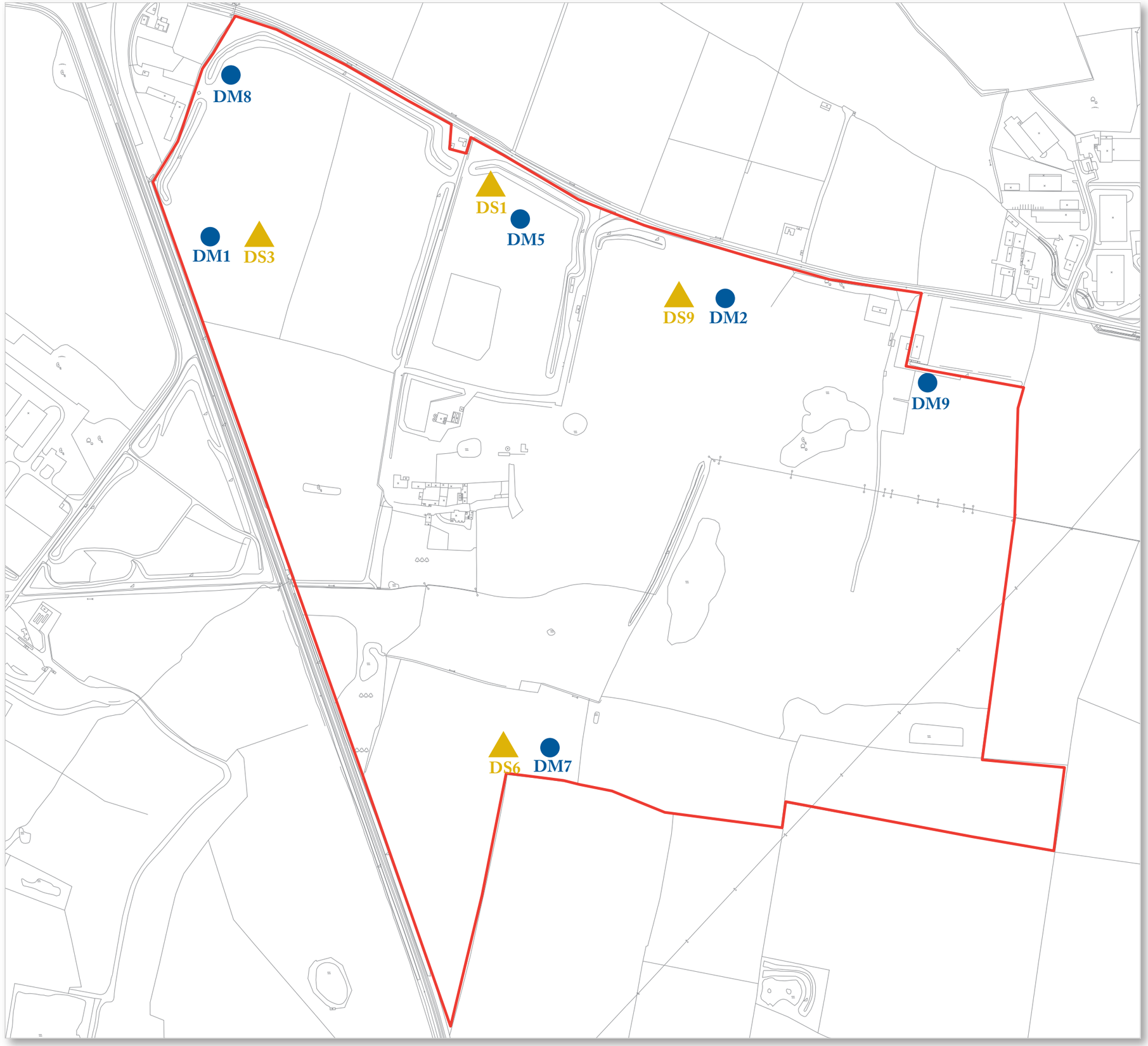

Figure 11.2 : Dust Survey Locations

Airborne dust survey location

Dust deposition survey location

NORTH

Source. Enviros

Scale. 1:5000

Table 11.6 Measured levels of suspended particulate matter (µg/m³)

Location	Year	Data capture	Annual mean	98th percentile of 24 hour mean
DM1 West side of site	2006	50%	15	55
	2007	89%	29	137
	2008	92%	49	128
DM2 North-east side of site	2006	51%	66	569
	2007	92%	44	434
	2008	96%	33	226
DM5 North side of site	2006	49%	40	226
	2007	89%	20	70
	2008	95%	30	142
DM7 South side of site	2006	50%	18	63
	2007	91%	45	233
	2008	89%	44	353
DM8 North-west side of site	2006	50%	23	72
	2007	89%	26	77
	2008	89%	31	179
DM9 North-east side of site	2006	15%	Insufficient data (started 1/11/2006)	
	2007	83%	30	105
	2008	81%	17	60

Table 11.7 Estimated worst-case levels of APC Residue trace components

Substance	Level in APC residues (mg/kg)	Estimated worst-case airborne level (µg/m³)	Air quality standard/ guideline (µg/m³)	Estimated worst-case level as % of air quality standard/ guideline (See below)
Dioxins and furans[1]	0.00080	2.6 ×10-8	See below	20%
Arsenic[2]	37	0.0012	0.006	76%
Cadmium[1]	116	0.0038	0.005	0.37%
Cobalt[2]	23	0.00075	0.2	2.7%
Chromium[1]	82	0.0027	0.1	0.16%
Copper[1]	487	0.016	10	0.13%
Mercury[1]	10.2	0.00034	0.25	1.4%
Manganese[1]	440	0.0145	1	4%
Nickel[1]	27	0.00088	0.02	19%
Lead[1]	2918	0.096	0.5	0.22%
Antimony[2]	333	0.011	5	0.10%
Tin[2]	633	0.021	20	0.034%
Thallium[2]	10	0.00034	1	0.18%
Vanadium[2]	53	0.0018	1	

Note 1: Based on site records.
Note 2: based on Defra, Review of Environmental and Health Effects of Waste Management, March 2004

11.67 Airborne dust could potentially contain trace levels of potentially hazardous substances. These could result from APC residues or contaminated soils. This is discussed in more detail below.

Trace components of APC Residues

11.68 Levels of these substances were assessed on the assumption that, as a worst case, measured levels of airborne PM_{10} and total suspended particulate matter could consist entirely of air pollution control residues. However, the treatment facility at the Wingmoor Farm site is designed to minimise the risk of dust emissions from APC residues. In practice, therefore, airborne particulate matter is likely to be due to a range of sources, including hazardous and non-hazardous landfill and minerals extraction at Wingmoor Farm; other local industrial/waste management activities; agricultural activities; road traffic; and secondary sources of pollution such as aerosols.

11.69 The levels of potentially hazardous substances in APC residues were taken from site records from 2001 to the present day. APC residues are accepted from a wide range of sources. The average levels recorded in all samples from 2001 to the present were used in the assessment. For substances which have not been determined, concentrations of trace constituents of APC residues were estimated from research carried out by Enviros Consulting Ltd for Defra. *(Defra, Review of Environmental and Health Effects of Waste Management, March 2004)* This enabled an estimate to be made of the levels of potentially hazardous substances present in air, if all the suspended particulate matter were derived from APC residues. The estimated airborne concentrations are set out in Table 11.7.

11.70 All worst-case estimated trace component levels comply with the relevant air quality standards and guidelines.

11.71 It was not possible to assess levels of dioxins and furans in this way, because there are no air quality standards for levels of dioxins and furans. The worst-case levels are above typical rural background levels. The potential exposure of individuals living close to the site were estimated from these airborne concentrations using the HMIP methodology. As set out in Table 11.15, all worst-case estimated exposures for local residents and farmers for the current situation comply with the UK Tolerable Daily Intake for exposure to dioxins and furans.

Trace components of contaminated soils

11.72 Contaminated soils received at the site pose a lower risk to air quality than the air pollution control residues described above. This is principally because of the nature of the materials, which are moist and not susceptible to the generation of wind-blown dust. Furthermore, the soils received at the site contain a wide variety of different contaminants, which reduces the risk posed by any individual contaminant. The principal environmental risks associated with the disposal of contaminated soils are associated with the management of leachate and risks to groundwater. This is described in Chapter 12. Nevertheless, strict controls are in place to minimise dust generation during the disposal of contaminated soils. Strict controls are also applied to the handling and disposal of asbestos.

11.73 In view of these considerations, attention was focused primarily on the quantitative assessment of risks associated with the handling and disposal of air pollution control residues. Attention was also focused on ensuring appropriate control and mitigation measures to minimise the risk of dust generation from all potential sources.

Dust Deposition

11.74 As well as measurements of airborne dust, levels of dust deposition are carried out at a number of locations in the vicinity of the site. An innovative technique is used which enables dust deposition measurements to be linked to the wind direction. Dust deposition has been measured over two week periods since 2003. Measurements at four key locations surrounding the site are set out in Figures 11.3 to 11.6. Measurements at four further locations during the period November 2007 to November 2008 are shown in Figure 11.7. The survey locations are shown in Figure 11.2.

11.75 The guideline for a low risk of nuisance due to visible dust soiling is 5% effective area coverage (EAC) per two week sample. The baseline measured deposition rates complied with this guideline at DS1 (except for 2003 and 2004), DS2, DS3, DS6, DS9, DS11 and DS13. The baseline measured deposition rate was above the guideline at DS10 for northerly and north-westerly wind directions. DS10 is located adjacent to Stoke Road, and the measured EAC levels at this location are strongly influenced by road traffic, the majority of which is not associated with the Wingmoor Farm site. This location is not representative of dust levels at locations where members of the public could be affected. On this basis, it is concluded that baseline dust deposition rates due to activities at the Wingmoor Farm site do not give cause for concern with regard to the risk of dust nuisance.

Figure 11.3: Effective Area Coverage recorded at location DS1

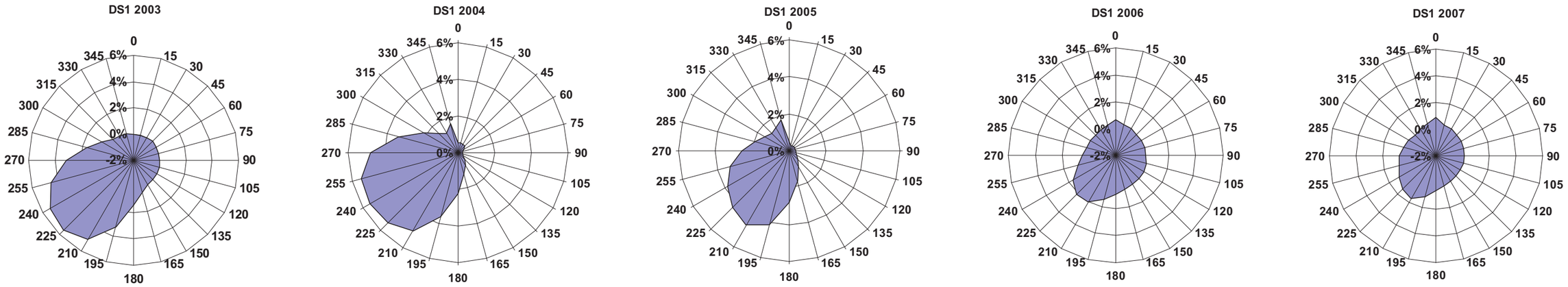

Figure 11.4: Effective Area Coverage recorded at location DS3

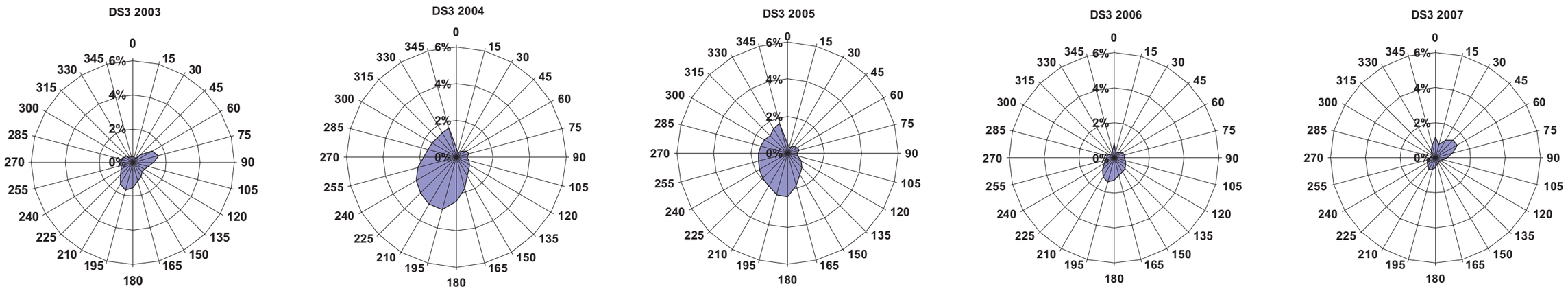

Figure 11.5: Effective Area Coverage recorded at location DS6

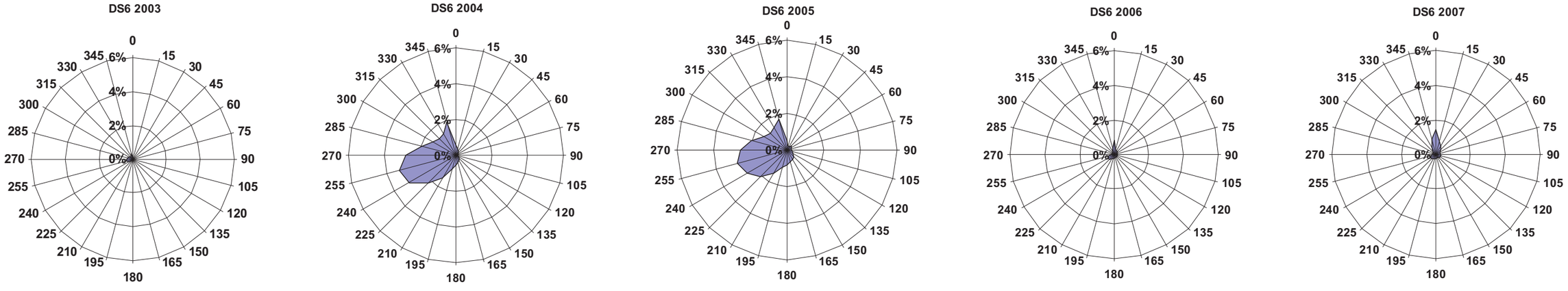

Figure 11.6: Effective Area Coverage recorded at location DS9

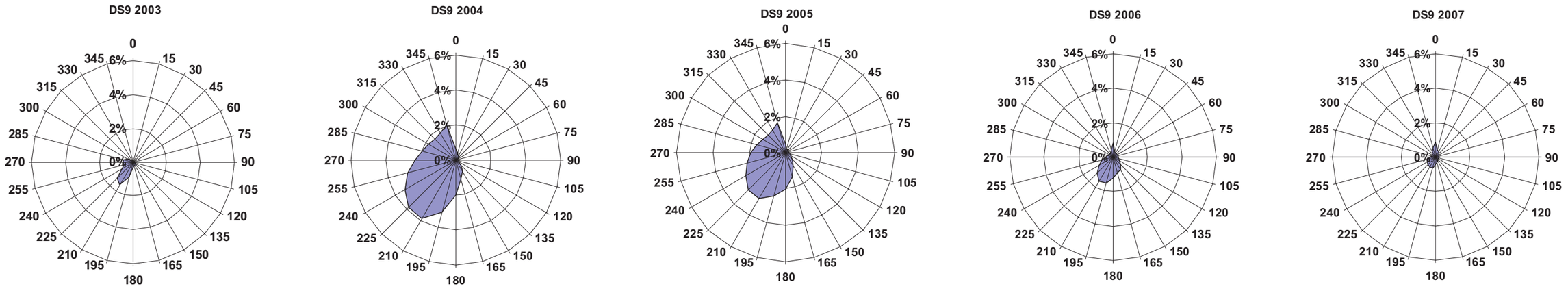

Figure 11.7: Effective Area Coverage recorded at locations DS2, DS10, DS11, DS13

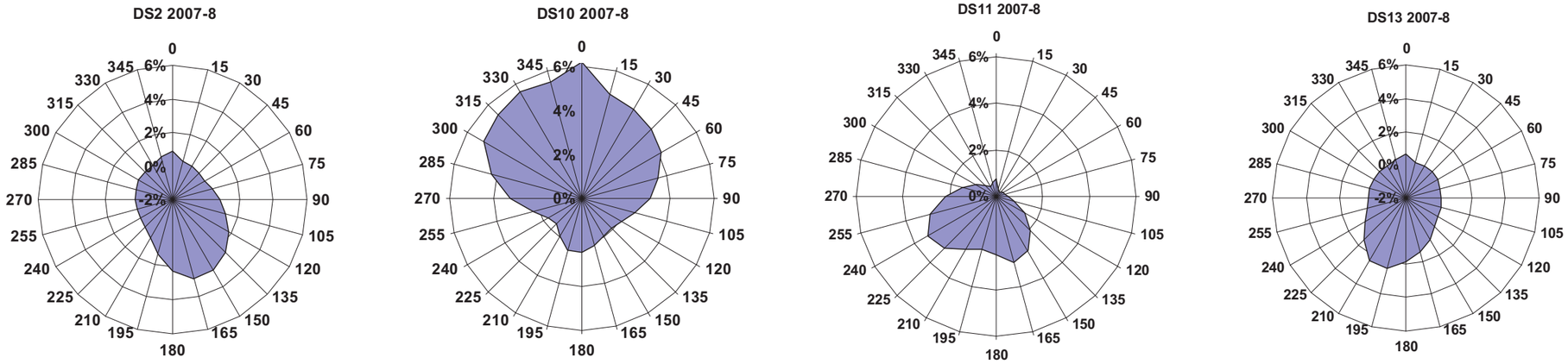

Table 11.8 Odour descriptors

Rank	Description	Evaluation
Odour Strength		
1	Non-existent	No odour detectable
2	Slight	Odour Detectable if no other activity being undertaken
3	Moderate	Odour detectable when other activity being undertaken
4	Strong	Odour interrupts other activities
5	Very strong	Odour prevents other activities (e.g. due to nausea)
Odour persistence (if odour strength > 1)		
A	Occasional	Less than 10% of the time
B	Intermittent	10 – 30% of the time
C	Frequent	30 – 50% of the time
D	Persistent	50 – 75% of the time
E	Constant	More than 75% of the time

Table 11.9 Baseline odour survey findings: 18 June 2008

Location	Odour Intensity (1-5)	Odour Persistance (A-E)	Comments
1 Court Farm	2	A	Wet tarmac
2 Pussy Willows Cattery	2	A	Shrubs
3 Print Waste Recycling	2 to 3	B	Landfill (likely to be Cory)
4 Footpath, Brockhampton	1	None	None
6 Brockhampton village	1	None	None
7 Longacre Farm	1	None	None
8 Home Farm and caravan site, Swindon	1	None	None
9 Industrial estate, Orchard Rd	1	None	None
10 Lower Farm	1	None	None
11 Cleeves Garden Machinery	2	B	Grass
12 Zurich building	2	B	Bonfire / chimney smoke
13 Residential property adjacent to A435 south of Stoke Orchard Road, Bishop's Cleeve	1	None	None
14 Farriers Reach	1	None	None
15 The Laurels	2	A	Cut grass
16 Residential property, Stoke Road, Bishop's Cleeve	2	A	Shrubs
17 Malvern View, Bishop's Cleeve	2	D	Freshly cut grass
18 Cheltenham North Rugby Club	2 to 3	D	Landfill / landfill gas
19 Haydon	2	C	Freshly tipped waste
23 Sewage Works	2	C	Sewage smell
24 Civic Amenity Site	2 to 3	C	Landfill/ landfill gas (likely to be Cory)

11.76 The measured dust deposition rates at location DS1 for 2003, 2004 and 2005 show the influence of dust sources to the immediate south and south-west of the survey location, in the hazardous waste landfill area. Extraction and restoration was also ongoing in areas to the south-east of DS1 during this period. The relatively high deposition rates measured during 2003 and 2004 confirm the need for good control of dust during disposal and restoration activities. Measurements recorded in 2006 and 2007 show a more even distribution of sources. This is because the areas immediately surrounding DS1 were by this stage capped and/or restored.

11.77 No clear pattern is evident in levels recorded at DS3, although extraction and waste placement was being undertaken in areas to the east and south of DS3. This may reflect good control on dust from these sources, and/or the low potential for dust generation of the materials being handled. Location DS6 is to the south of the landfill site, and if the landfill site were a significant source of dust, measurements at this location would be expected to show the influence of sources from the north. Sources from the north did make a detectable contribution to dust deposition at this location in 2007, but sources to the west seem to be a more significant influence on dust deposition at this location. This may indicate a contribution from the neighbouring Wingmoor Farm West landfill site. Measurements at location DS9 indicate a contribution from the south-west, which could be due to gravel extraction, hazardous waste processing, and/or restoration activities in this direction.

11.78 The more recent measurements at location DS2 show the influence of clay extraction and infill immediately to the south-east of the survey location during 2008. Survey location DS10 is adjacent to Stoke Road, as discussed above. Location DS11 is opposite the site entrance, but not adjacent to dust-generating activities. Consequently, levels measured at this location were relatively low, although the influence of the site to the south can be seen. Measurements made at location DS13 are more evenly spread around the compass. These measurements are likely to be influenced more strongly by wind-blown dust from surrounding agricultural land than by dust from the Wingmoor Farm site, although a minor influence from sources to the south can be identified.

Baseline odour survey

11.79 A baseline survey of odours was carried out. This survey was carried out using the methodology set out in Environment Agency guidance. Odour levels were evaluated by an observer on three separate occasions at all relevant locations to which access could be gained. Attention was paid to the presence or otherwise of detectable odours due to the landfill operation. Odour levels were reported on a scale which has been adapted from the Environment Agency guidance for use in surveys of this nature.

11.80 The odour survey findings are set out in Tables 11.9 to 11.12

11.81 Weather conditions during the odour surveys were as follows.

11.82 Records of odour complaints were provided by the Environment Agency and taken from site Liaison Committee reports.

11.83 Odour complaints records covering the 18 month period 29 September 2007 to 31 March 2009 were provided by the Environment Agency. Over this period, 190 odour complaint records were noted. A number of these referred to ongoing odours, or to past incidents. Also, on a number of occasions, there were several complaints referring to a single odour incident. This could be an indication of a more severe odour incident.

11.84 The odour complaint records were classified on the basis of the likely cause of the odour, as follows:

- Attributed to Grundon landfill site:
  6 records
- Attributed to Cory Environmental landfill site:
  33 records
- Attributed to other sources:
  8 records
- Unattributed:
  143 records

11.85 As a first estimate, if the "unattributed" records follow the same pattern as the attributed records, then it would be estimated that approximately 18 records would be due to the Grundon site, approximately 101 records would be due to the Cory Environmental site, and approximately 24 would be due to other sources. This corresponds to approximately 1 odour complaint per month due to the Grundon site.

11.86 Over the period October 2007 – March 2009, the frequency of odour complaints has generally decreased (see Figure 11.8). This change could be due to a number

Table 11.10 Baseline odour survey findings: 14 July 2008

Location	Odour Intensity (1-5)	Odour Persistance (A-E)	Comments
1 Court Farm	1	None	
2 Pussy Willows Cattery	2	A	Conifer odour on road to cattery
3 Print Waste Recycling	2	A	
4 Footpath, Brockhampton	1	None	
6 Brockhampton village	2	A	
7 Longacre Farm	1	None	
8 Home Farm and caravan site, Swindon	1	None	
9 Industrial estate, Orchard Rd	1	None	
10 Lower Farm	1	None	
11 Cleeves Garden Machinery	3	C	Farm odours
12 Zurich building	1	None	
13 Residential property adjacent to A435 south of Stoke Orchard Road, Bishop's Cleeve	1	None	
14 Farriers Reach	1	None	
15 The Laurels	2	A	
17 Malvern View, Bishop's Cleeve	3	B	
18 Cheltenham North Rugby Club	2	B	
19 Haydon	3	D	Odour not strong but detectable
23 Sewage Works	5	E	Sewage works odour
24 Civic Amenity Site	3	D	Landfill gas odour

Table 11.11 Baseline odour survey findings: 29 July 2008

Location	Odour Intensity (1-5)	Odour Persistance (A-E)	Comments
1 Court Farm	1	None	
2 Pussy Willows Cattery	2	D	Fir hedge
3 Print Waste Recycling	3	D	Fresh waste
4 Footpath, Brockhampton	1	-	
6 Brockhampton village	1	None	
7 Longacre Farm	1	None	
8 Home Farm and caravan site, Swindon	1	None	
9 Industrial estate, Orchard Rd	1	None	
10 Lower Farm	1	None	Possible trace vegetation
11 Cleeves Garden Machinery	1	None	
12 Zurich building	1	None	
13 Residential property adjacent to A435 south of Stoke Orchard Road, Bishop's Cleeve	2	B	Flower scent
14 Farriers Reach	2	B	Fresh waste
15 The Laurels	1	None	
17 Malvern View, Bishop's Cleeve	1	None	
18 Cheltenham North Rugby Club	2	D	Grass
19 Haydon	2	B	Fresh waste
23 Sewage Works	3	C	Sewage
24 Civic Amenity Site	2	B	Fresh waste

Table 11.12 Weather conditions during odour surveys

Aspect	18 June 2008	14 July 2008	29 July 2008
Wind speed	Moderate breeze	Light breeze	Light – moderate breeze
Wind direction	Southerly	Southerly	Southerly veering to south-easterly
Cloud cover	8/8	8/8	6/8
Temperature	17 °C	16 °C	22 °C
Ground conditions	Damp	Dry	Wet (recent heavy rain)

of factors, such as improvements in odour control at either or both landfill sites; and/or "complaint fatigue" whereby odour complainants become discouraged from contacting the appropriate authorities over a period of time.

11.87 The odour complaint records confirm that odour problems exist in the local area. Comments in the odour complaints record provided by the Environment Agency indicate that the principal source of odour in the local area is the adjacent Wingmoor Farm West landfill, operated by Cory Environmental. The frequency of odour complaints has decreased in the last year from a peak in the last quarter of 2007, although attributed complaints during this period were almost entirely due to the Cory Environmental site.

Impact Identification

11.88 The following potential impacts could occur as a result of the proposed development.

11.89 These potential impacts are addressed in the following sections. As described in detail in Chapter 7 of this ES, the predicted effects of the Scheme on air quality have been considered against two scenarios:

(i) the notional do nothing scenario, with the site closing in May 2009 and no further operations taking place at the site, and
(ii) the minimum engineered scheme (MES), required to leave the site in a safe and suitably managed form.

Figure 11.8: Monthly breakdown of odour complaint records

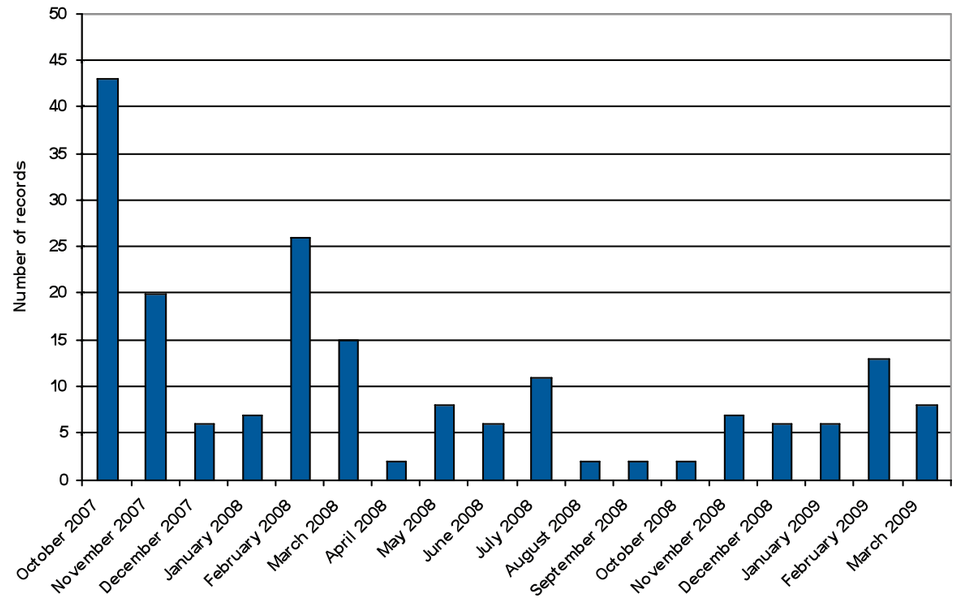

Table 11.13 Potential air quality impacts

Aspect	Construction & operation (O) / Final restoration (F)	Direct/ indirect	Cumulative	Permanent/ temporary	Positive/ negative
Management of fugitive dust from handling of APC residues	O	D	Y (adjacent landfill; background; quarrying)	Temporary long term (site operational lifetime)	N
Management of fugitive dust from quarrying activities	O	D	Y (adjacent landfill; background; APC handling)	Temporary long term (site operational lifetime)	N
Fugitive landfill gas emissions	O F	D	Y (adjacent landfill; background)	Permanent (site lifetime and afterwards)	N
Landfill gas combustion emissions	O F	D	Y (adjacent landfill; background)	Permanent (site lifetime and afterwards)	N
Emissions from road traffic	O	D	Y (background)	Temporary long term (site operation lifetime)	N
Emissions associated with the operation of the MRF	O	D	Y (adjacent landfill; background)	Temporary long term (site operation lifetime)	N

11.90 Under the notional do nothing baseline scenario there would be no further development on the site, however the existence of the site would result in ongoing impacts on air quality, as follows:

- There would no longer be a risk of fugitive dust resulting from quarrying activities, the handling of air pollution control (APC) residues, contaminated soil, asbestos containing wastes or other waste related activities.
- There would be ongoing and progressive emissions of fugitive dust from the site resulting from inadequate or non-existent contouring, capping and maintenance of the site. These dust emissions could potentially contain hazardous materials.
- There would no longer be vehicle movements associated with the site. In view of the low levels of traffic pollutants identified in the assessment of residual impacts, this is unlikely to represent a material change in air quality.
- Landfill gas would continue to be generated at the site. There would be a lower potential for gas to be produced if disposal of biodegradable waste at the site were to cease. However, landfill gas emissions are dependent on a number of factors, including the ingress of water, and the operation and maintenance of landfill gas collection and combustion systems. Under the notional do-nothing scenario, gas collection systems are likely to be less than optimum, and without satisfactory maintenance, gas combustion plant would be expected to fail. This would result in reduced emissions of combustion products, but increased emissions of unburnt landfill gas. This would be expected to give rise to odours in the local area.

11.91 This scenario would not occur in reality.

11.92 Under the minimum engineered scheme scenario, works would be undertaken at the site to leave it in a safe and suitably managed state. There would be air quality impacts arising from these works, and on an ongoing basis, as follows:

- The operational site lifetime would be shorter than the lifetime of the proposed scheme.
- There would be a continued risk of fugitive dust resulting from the handling of air pollution control (APC) residues, contaminated soil, asbestos containing wastes or other waste related activities, although over a shorter period.
- Landfill gas would continue to be generated at the site. On balance, emissions of landfill gas would be expected to be lower under the minimum engineered scheme scenario compared to the proposed scheme, but with potentially lower quality assurance on controls.
- There would continue to be emissions from road traffic movements under the minimum engineered scheme scenario. In view of the low levels of traffic pollutants identified in the assessment of residual impacts, this is unlikely to represent a material change in air quality.

11.93 The potential impacts likely to be associated with the proposals compared to the two reference scenarios are addressed qualitatively in the following section.

Potential impacts of the proposals assessed against the notional do nothing scenario

11.94 In qualitative terms, the potential impacts associated with the proposed scheme when assessed against the do nothing scenario are likely to be as follows.

- Under the proposals, there would continue to be a risk of fugitive dust resulting from quarrying activities, the handling of air pollution control (APC) residues, contaminated soil, asbestos containing wastes or other waste related activities. This would not occur under the do nothing scenario.
- The proposed scheme includes management and control of fugitive dust from the site. This would result in lower impacts compared to the ongoing and progressive emissions of fugitive dust from the site which would result under the do nothing scenario from inadequate or non-existent contouring, capping and maintenance of the site. There would be specific improvements in control of fugitive emissions of dust containing potentially hazardous materials by comparison to the do nothing scenario.
- There would continue to be vehicle movements associated with the site under the proposed scheme, whereas these would cease under the do nothing scenario. In view of the low levels of traffic pollutants identified in the assessment of residual impacts, this is unlikely to represent a material change in air quality compared to the do-nothing scenario.
- Landfill gas would continue to be generated at the site under either scenario. There would be a higher potential for gas to be produced if disposal of biodegradable waste at the site continues under the proposed scheme. However, landfill gas emissions are dependent on a number of factors, including the ingress of water, and the operation and maintenance of landfill gas collection and combustion systems. Under the notional do-nothing scenario, gas collection systems are likely to be less than optimum, and without satisfactory maintenance, gas combustion plant would be expected to fail. Consequently, there would be increased emissions of combustion products for the proposed scheme, but significantly lower emissions of unburnt landfill gas. This would result in substantially lower odours in the local area compared to the do nothing scenario.

Potential impacts of the proposals assessed against the minimum engineered scheme

11.95 In qualitative terms, the potential impacts associated with the proposed scheme when assessed against the minimum engineered scheme are likely to be as follows.

- The operational site lifetime as a result of the proposals would be longer than for the minimum engineered scheme. This would result in any impacts associated with the proposed scheme occurring over a longer time period in comparison with the minimum engineered scheme.
- For both the proposals and the minimum engineered scheme, there would be a risk of fugitive dust resulting from the handling of air pollution control (APC) residues, contaminated soil, asbestos containing wastes or other waste related activities. The quantities of hazardous and non-hazardous waste materials would be greater for the proposed scheme compared to the minimum engineered scheme.
- For the proposals there would be a risk of fugitive dust resulting from minerals extraction activities. No such risk would occur with the minimum engineered scheme.
- Landfill gas would be generated at the site with both the proposals and the minimum engineered scheme. Landfill gas emissions are dependent on a number of factors, including the ingress of water, and the installation and operation of landfill gas collection and combustion systems. Under the proposed scheme, gas collection systems can be optimised, giving improved control of gas compared to the minimum engineered scheme. On balance, emissions of landfill gas would be expected to be higher under the proposed scheme compared to the minimum engineered scheme being in place, but with potentially higher quality assurance on controls.
- There would continue to be emissions from road traffic movements under both the proposed scheme and the minimum engineered scheme. However, in

view of the low impact of traffic emissions (see paragraphs 11.113 and following), this is not considered to constitute a significant issue and little weight should be placed upon differences in traffic emissions between the two scenarios.

Mitigation Measures

11.96 The proposed landfill activities will be carried out in accordance with the principles of the Pollution Prevention and Control / Environmental Permitting Programme regimes. In particular, the site operator will need to use the Best Available Techniques to control pollution. The details of these measures will be identified and agreed with the pollution control regulator (i.e. the Environment Agency) under the terms of the site operating permit.

11.97 The mitigation measures to be used for control of the environmental effects of emissions to air from the proposed development will continue from the current practices. In summary, the proposed control measures are as follows:

- The progressive installation, operation, maintenance and improvement of an effective gas collection and combustion system.

- The progressive capping and completion of the non-hazardous waste landfill site to minimise the ingress of water and consequent production of landfill gas, and to facilitate the collection of gas for combustion.

- The use of established materials handling procedures to minimise the risk of accidental emissions of dust from the handling of APC residues. These include process controls to ensure ash wastes are mixed with the required quantity of liquid waste to give the optimum consistency to minimise dust during disposal.

- The use of established procedures to minimise the risk of fugitive emissions of dust from the handling of APC residues, including minimising dust from residues deposited at the landfill site. These include:

    - Minimising areas of bare soil on restored areas through seeding as soon as possible;
    - Damping down of bare soil and/or temporary bunds and stock piles in dry windy conditions;
    - All vehicles on site are limited to 10 mph;
    - All waste vehicles are required to be sheeted when entering the site;
    - Regular maintenance of access roads and internal haul roads including filling in potholes;
    - Cleaning drains, and emptying gullies;
    - Operation of a road sweeper during the site operational hours and upon closure of the site. The road sweeper is used to clean access roads, internal haul roads and Stoke Orchard Road on the approaches to the site;
    - Regular damping down of site access roads and internal haul roads during dry conditions using a mobile water bowser;
    - Using wheel wash facilities for vehicles leaving the site to prevent material being deposited on the highway;
    - Placement of daily cover on deposited wastes at the end of each days operations;
    - Damping down of deposited waste during dry windy conditions; and
    - Avoiding as far as is possible the deposit of waste at elevated levels during windy conditions.

- The use of good working practices to minimise dust generation from the minerals extraction processes. These include:

    - Damping down of bare soil and/or temporary bunds and stock piles in dry windy conditions;
    - All vehicles on site are limited to 10 mph;
    - Regular maintenance of access roads and internal haul roads including filling in potholes;
    - Cleaning drains, and emptying gullies;
    - Operation of a road sweeper as described above;
    - Regular damping down of site access roads and internal haul roads during dry conditions;
    - Using a mobile water bowser; and
    - Using wheel wash facilities for vehicles leaving the site to prevent material being deposited on the highway.

- The use of good working practices for the MRF, which include the following:

    - All materials will be deposited inside the building;
    - Doors will remain closed except when vehicles are entering and leaving the building, to minimise any dust generation or odour;
    - Loading of materials for export will be carried out in the building where possible;
    - Any materials stored in containers at the site will be covered until exported; and
    - Odour absorption/suppression mist sprays will be used within the building if necessary.

Significance of the Residual Impacts

Fugitive gas

11.98 A landfill gas air quality study has been carried out on behalf of the site operator. This study included an air quality screening component, which indicated that all trace components of landfill gas can be screened out of requiring more detailed assessment, with the exception of the potential for odours due to hydrogen sulphide. In view of this, it was concluded that there would be no significant effects on air quality due to fugitive gas emissions associated with the proposed scheme. An air modelling study was carried out to assess in more detail the potential for odours due to hydrogen sulphide to affect the study area.

11.99 The dispersion modelling study used the highest estimated 95th percentile emission rate of hydrogen sulphide from the proposed development in a dispersion model to forecast levels of hydrogen sulphide and odours in the local area. The results of this assessment are set out in Table 11.14.

11.100 The model results indicate that levels of hydrogen sulphide are forecast to comply with the guideline for odour assessment at all nearby potentially sensitive locations with the exception of the Cheltenham North Rugby Club and Haydon. Modelled levels of odour were above the guideline at eight of the 25 assessed locations. This is consistent with the observations made during the baseline survey, and with the pattern of odour complaints reported by the Environment Agency, which indicates that the site currently gives rise to approximately one odour complaint per month.

11.101 In conclusion, no trace components of landfill gas are forecast to give rise to any significant concerns with regard to potential effects on air quality from the perspective of potential risks to health. The modelled odour levels could give rise to occasional complaints of odour at the closest locations to the site, but this would

Table 11.14 Modelled levels of hydrogen sulphide and odours

Location	Hydrogen sulphide 98th percentile of 30 minute mean (µg/m³)	Odour 98th percentile of hourly means (OU/m³)
Odour guideline	**7**	**1.5**
1 Court Farm	0.16	0.24
2 Pussy Willows Cattery	0.24	0.33
3 Print Waste Recycling	0.35	0.57
4 Footpath, Brockhampton	0.38	0.54
5 Home Farm, Brockhampton	0.39	0.51
6 Brockhampton village	0.16	0.21
7 Longacre Farm	0.15	0.20
8 Home Farm, Swindon	0.08	0.12
9 Industrial estate, Orchard Rd	0.10	0.14
10 Lower farm	0.36	0.73
11 Cleeves Garden Machinery	0.16	0.30
12 Zurich building	0.37	0.87
13 Residential property adjacent to A435 (south)	1.3	1.9
14 Farriers Reach	3.5	3.8
15 The Laurels	4.4	4.7
16 Residential property, Bishop's Cleeve	4.1	4.9
17 Malvern View, Bishop's Cleeve	6.6	7.1
18 Cheltenham North Rugby Club	10.7	11.9
19 Haydon	8.7	10.8
20 Glebe Farm	0.31	0.59
21 Wingmoor Lodge	0.43	0.63
22 Footpath southwest of Bishop's Cleeve	0.21	0.29
23 Sewage Works	0.12	0.16
24 Civic Amenity Site	0.49	0.74
25 Residential property adjacent to A435 (north)	2.4	2.6

not represent a widespread odour problem. This is consistent with the pattern of odour complaints reported by the Environment Agency.

Combustion emissions

11.102 The potential effects of emissions from landfill gas combustion plant were assessed as part of an air quality assessment for an increase in engine capacity at the site. This study included an air quality screening component, which indicated that all landfill gas combustion products can be screened out of requiring more detailed assessment. Nitrogen dioxide was the only substance which was not screened out at the first stage.

11.103 In the second stage of the screening assessment, the highest modelled contribution to levels of nitrogen dioxide due to emissions from the site was found to be 1.6 $\mu g/m^3$ at Haydon. The overall concentration of nitrogen dioxide due to site emissions combined with background levels was well within the air quality standard of 40 $\mu g/m^3$, consistent with the findings of the baseline air quality survey.

11.104 Modelled levels of oxides of nitrogen at all nearby Sites of Special Scientific Interest are less than 1% of the air quality standard for protection of habitats. On this basis, the impact of the proposed landfill extension is forecast to be negligible at these locations.

11.105 The modelled level of oxides of nitrogen at the adjacent local nature reserve was forecast to be 0.7 $\mu g/m^3$. The background levels of oxides of nitrogen at this location was estimated to be 16.7 $\mu g/m^3$. The estimated level of oxides of nitrogen due to emissions from combustion plant combined with background levels at this location was 17.4 $\mu g/m^3$. This complies with the air quality standard for protection of habitats of 30 $\mu g/m^3$. On this basis, it is concluded that emissions from combustion plant at the Wingmoor Farm site will have no significant adverse effect on the Wingmoor Farm Meadow nature reserve.

11.106 In view of this, it was concluded that there would be no significant effects on air quality due to emissions of combustion products associated with the proposed scheme.

Dust emissions

11.107 The proposed scheme will result in the continued importation of potentially dust-generating materials, similar to the present rates. Similarly, the generation of dust from quarrying activities is likely to be similar to the present situation.

Table 11.15 Outline exposure assessment for dioxins and furans

Individual	Estimated worst-case exposure to dioxins and furans (picogram TEQ/day)		Estimated worst-case exposure to dioxins and furans as percentage of TDI
	picogram TEQ/day	picogram TEQ per kg body weight /day	
Adult resident	2.91	0.042	2.1%
Adult farmer	8.06	0.115	5.7%
Child resident	1.08	0.072	3.6%
Child of farmer	2.89	0.192	9.6%
Infant resident	3.43	0.403	20%
Infant of farmer	9.38	1.104	55%
School child 6 - 11	2.02	0.062	3.1%
School child 11 - 16	2.13	0.041	2.0%

11.108 The extensive air monitoring programme carried out around the site has found that airborne levels of fine particulate matter (PM_{10}) are in compliance with the relevant air quality objectives – see section 11.66. Furthermore, the evaluation of potentially hazardous trace components has also found that airborne levels of these substances are in compliance with the relevant air quality guidelines.

11.109 Airborne levels of dioxins and furans cannot be assessed in the same way, because overall exposure to levels of these substances is relevant. Exposure to airborne levels of dioxins and furans is typically a relatively small component of public exposure. The potential exposure of local residents and local farmers exposed to levels of dust recorded in the local area via all potentially significant pathways was evaluated. As a worst-case, it was assumed that all the dust experienced by a local resident could theoretically result from air pollution control residues. In practice, only a relatively small proportion of dust will result from APC residues. The results of this pathway assessment were as follows.

11.110 The worst-case exposure levels based on current levels of dioxins and furans were in compliance with the relevant UK Tolerable Daily Intake values. For the majority of individuals, the worst-case exposure levels are only a small proportion of the TDI value. The worst-case exposure levels would only be a more significant proportion of the TDI value in the case of a breastfeeding infant in a household consuming a significant proportion of locally-grown produce. Nevertheless, the worst-case forecast exposure levels for an infant under these circumstances due to dust emissions from the site are in compliance with the TDI value. This is consistent with the findings of previous risk assessment studies carried out in relation to the Wingmoor Farm site. *(Macleod C, Duarte-Davidson R, Fisher B, Ng B, Willey D, Shi JP, Martin I, Drew G and Pollard S, "Modeling human exposures to air pollution control (APC) residues released from landfills in England and Wales," Environment International, 32, Issue 4, 2006 pp 500-509 and Erratum, Environment International Volume 33, Issue 8, 2007, p 1123*
Grundon Waste Management Ltd, "Detailed Assessment of Potential Public health Impacts of APC Residue Emissions," AMEC Earth & Environmental Report Ref. D6915/R2838, September 2007)

11.111 In practice, exposure levels will be significantly lower than the values set out in Table 11.15, because APC residues will account for only a small proportion of dust rather than 100% as assumed in the assessment in Table 11.15. The operator is currently funding a research programme designed to use state of the art monitoring techniques to give a better understanding of the origin of dust levels measured in the vicinity of the Wingmoor Farm site.

11.112 The throughput of APC residues is not expected to increase significantly above the existing levels. The proposed scheme envisages approximately 62,750 tonnes of hazardous waste per annum, compared to 60,000 tonnes received at the site in 2007. The proportion of APC residues within this total amount is anticipated to remain the same. In view of this, no increase in emissions of APC residues is considered likely to occur. With the recent implementation of the "Concover" system, fugitive dust emissions would be expected to reduce.

Road traffic exhaust emissions

11.113 The potential effects of road traffic emissions on air quality were assessed using the DMRB procedure, as set out above. The traffic data used in the assessment is set out in Table 11.16, and is derived from Table 9.11. It was assumed the two-way traffic flows given in Table 9.11 were equally split in each direction. The traffic speed was estimated to be 56 km/hour away from the A435/Stoke Road roundabout, and 25 km/hour in the vicinity of the roundabout. The results of the DMRB calculations are given in Table 11.17.

11.114 All forecast levels of airborne pollutants comply with the relevant air quality standards and guidelines. Although levels of traffic emissions would be slightly higher for the proposal compared to the minimum engineered scheme, in practice, this difference would not

Table 11.16 Road traffic assessment input data

Road Link	AADT			%HGV		Distance to road (m)			
	2009 Notional base	2024 MES	2024 Proposal	2009 Notional base and 2024 MES	2024 Proposal	Farriers Reach	Stoke Road	Littlecote Close	Yarlington Close
Stoke Orchard Road Eastbound	4368	5353	5542	5.94%	8.32%	6.9			11.3
Stoke Orchard Road Westbound	4367	5353	5541	5.94%	8.32%	12.7			16.9
A435 North Northbound	6985	8524	8580	1.24%	1.79%		13.8		24.7
A435 North Southbound	6984	8524	8580	1.24%	1.79%		9.6		38.7
A435 South Northbound	8246	10091	10213	2.10%	3.01%			15.8	35.8
A435 South Southbound	8245	10090	10212	2.10%	3.01%			8.9	47.6

Table 11.17 Results of DMRB assessment

Location	Scenario	NO_2 Annual mean µg/m³	PM_{10} Annual mean µg/m³	PM_{10} Days >50mg/m³
Air quality standard		40	40	35
Farriers Reach (near Stoke Orchard Road)	Notional Base 2009	36.15	17.96	1.43
	MES 2024	35.60	17.76	1.26
	Proposal 2024	35.90	17.82	1.31
Stoke Road (near A435 north of roundabout)	Notional Base 2009	36.20	18.20	1.63
	MES 2024	35.91	18.10	1.54
	Proposal 2024	36.05	18.12	1.56
Littlecote Close (near A435 south of roundabout)	Notional Base 2009	36.94	18.49	1.90
	MES 2024	36.47	18.30	1.72
	Proposal 2024	36.74	18.36	1.77
Yarlington Close (near roundabout)	Notional Base 2009	39.40	20.22	5.62
	MES 2024	38.29	19.69	4.13
	Proposal 2024	38.89	19.85	4.53

Table 11.18 Significance of Residual Impacts

Aspect	Sensitivity of receiving environment	Magnitude	Frequency	Spatial extent	Timescale	Overall significance
Management of fugitive dust from APC residues	Medium	Low	Continuous	Immediate	Temporary long term	Minor
Management of fugitive dust from quarrying activities	Medium	Low	Continuous	Immediate	Temporary long term	Insignificant
Fugitive landfill gas emissions	Medium	Low	Continuous	Local	Permanent	Minor
Landfill gas combustion emissions	Medium	Low	Continuous	Local	Permanent	Minor
				Regional		Insignificant
Emissions from road traffic	Medium	Low	Continuous	Local	Temporary long term	Insignificant
Emissions associated with the operation of the MRF	Medium	Low	Continuous	Local	Temporary long term	Insignificant

Note: "Temporary long term" refers to an impact extending for the lifetime of the proposals. "Permanent" refers to an impact extending beyond the lifetime of the proposals.

be discernible or significant. On this basis, it is concluded that there will be no significant adverse effects on air quality due to exhaust emissions from traffic associated with the proposed scheme.

Odours and dusts associated with MRF

11.115 The air quality study submitted with planning application ref. 05/4037/1317FUL in 2005 addresses odour and dust control issues. The controls on odour and dust set out in the 2005 study would be applied as part of the ongoing operation of the MRF. The study characterises baseline conditions in the local area, and goes on to set out the controls and mitigation for odours and dusts which would be enforced via the operating licence/permit. A screening study of potential odour emissions was carried out which indicated that odours would not affect nearby properties. A qualitative assessment of dust was carried out which highlighted the need for control of dust to ensure that there would be no effects at the nearby Rugby Club. An "air quality management plan" was provided, which is designed to assist in carrying out odour and dust controls; measuring dusts and odours; and responding to any complaints.

11.116 The 2005 study concludes that there are unlikely to be any significant adverse effects due to fugitive odour and dust at nearby sensitive locations.

Summary: Significance of the Residual Impacts

11.117 The significance of residual impacts is summarised in Table 11.18.

11.118 Provided the appropriate mitigation measures set out above continue to be applied, it is concluded that the proposals would have a residual impact of no more than minor significance on air quality. It is important that attention continues to be focused on the control of dust and landfill gas under the terms of the site Environmental Permit.

Significance of Residual Impacts compared to reference scenarios

Proposed scheme assessed against notional do nothing scenario

11.119 Under the proposed scheme, there would continue to be a risk of fugitive dusts from activities which would cease under the notional do nothing scenario (traffic movements; handling of APC residues, contaminated soil, asbestos containing wastes; and other waste related activities). However, there would be significant improvements in the control of fugitive dust, due to inadequate or non-existent contouring, capping and maintenance under the do nothing scenario. There would be substantially better control of landfill gas under the proposed scheme, which would result in lower levels of odours and emissions of potentially hazardous substances compared to the do nothing scenario.

11.120 In summary, the proposed scheme would have lower impacts on air quality than the notional do-nothing scenario. The potential impacts of the notional do-nothing scenario on air quality cannot readily be assessed, but could be significant.

Proposed scheme assessed against minimum engineered scheme

11.121 The proposed scheme would have a longer operational lifetime when compared with the minimum engineered scheme. There would continue to be a risk of fugitive dusts from the handling and disposal of hazardous and non-hazardous wastes under either scenario, although larger quantities of materials would be handled under the proposed scheme. Landfill gas would continue to be generated at the site. On balance, emissions of landfill gas would be expected to be higher for the proposed scheme compared to the minimum engineered scheme being in place, but with potentially better quality assurance on controls.

11.122 In summary, the proposals would have higher potential for impacts on air quality when assessed against the minimum engineered scheme being in place. In view of the controls on air quality impacts associated with the proposals, and the assessment set out in this chapter, it is concluded that these differences would not be significant, and the proposed scheme would have no significant effects on air quality.

Cumulative Effects

11.123 It is understood that the following developments are planned for the local area.

- Homelands Farm – a development of approximately 450 dwellings to the north of Bishop's Cleeve. Traffic associated with this development has been taken into account in the assessment of the potential effects of road traffic described in this environmental statement.
- There are development proposals in the Regional Spatial Strategy for 4-5000 dwellings to the north of Cheltenham. It is anticipated that any development brought forward under the RSS would be no closer to the Wingmoor Farm site than current properties – e.g. in the village of Swindon, to the south of the site.

- One thousand additional homes may be allocated to the Bishop's Cleeve area. Approximately half of these would be delivered via the proposed Homelands farm development. It is not yet known where the additional 550 properties would be located, but again it is anticipated that they will be no closer than existing properties in Bishop's Cleeve
- The adjacent landfill site run by Cory Environmental has a number of active planning permissions and proposals. This includes mechanical biological treatment, anaerobic digestion and in-vessel composting processes. If anything, these developments would be expected to give rise to a reduced potential for cumulative effects compared to the current waste transfer and landfill activities at this site.

11.124 On this basis, it is concluded that there are no potentially significant cumulative effects which need to be borne in mind from the perspective of air quality and odour, other than those taken into account in the assessment of emissions from road traffic.

Summary

11.125 An assessment of the air quality effects of the proposed development of the Wingmoor Farm landfill site has been carried out. This study considered the following aspects:

- Control of dust from handling hazardous and non-hazardous waste materials, quarrying, and associated activities;
- Control of odours;
- Control of emissions to air of treated or untreated landfill gas; and
- Emissions from road traffic

11.126 The assessment has used a variety of techniques to investigate the current and forecast levels of airborne pollutants in the vicinity of the Wingmoor Farm site.

11.127 It was found that dust levels in the local area are not at levels which would give cause for concern with regard to potential effects on amenity. Furthermore, the levels of chemicals within the dust are sufficiently low that they would not be of concern with regard to their potential effects on air quality.

11.128 Emissions from the site do occasionally give rise to odours in the local area, but this does not represent a widespread odour problem – other sources of odour such as an adjacent site have been more significant sources of odour. It is important that ongoing attention is paid to reducing impacts of odour. The most important means of achieving this will be to continue to develop and improve the system for collecting and using landfill gas to generate electricity.

11.129 Emissions from road traffic were forecast not to have a significant effect on local air quality. In conclusion, provided the appropriate mitigation measures continue to be applied, it was found that the proposals will have a residual impact on air quality of no more than minor significance. It is important that attention continues to be focused on the control of dust and landfill gas under the terms of the site Environmental Permit.