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WCTIS Phase 3/4

Construction Dust Assessment

Gloucester County Council

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Notice

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Document history

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1. Introduction

Atkins Ltd was commissioned to undertake a construction dust assessment to support the proposed highway improvement scheme WCTIS UK Cyber Business Park Phase 3 and Phase 4, herein referred to as the "Proposed Scheme".

The Proposed Scheme is expected to open in 2021 and comprises the final phases of a wider programme of investments on the A40 in Cheltenham through the West of Cheltenham Transport Improvement Scheme (WCTIS). This report presents an assessment of the potential local air quality effects associated with the construction of the Proposed Scheme.

The key objective of Phase 3 is to reduce congestion on the A40 eastbound between Arle Court and Benhall roundabout, with an additional focus of improving access into and out of GCHQ at the Telstar Way junction. The existing highway layout is characterised by two lanes for the A40 eastbound movement, a dedicated third left turn lane at Telstar Way, widening from two to three lanes on the approach to Benhall roundabout and a two lane roundabout gyratory. The aim of Phase 4 is to reduce congestion on the A40 eastbound between Benhall roundabout and the TGI Fridays junction. The existing network layout consists of a single lane for mainline eastbound traffic and a segregated bus lane between Benhall roundabout and the A40 junction with Granley Road, where it joins regular traffic.

During construction, dust and particulate matter may be generated by dust-raising activities.

The key air pollutant addressed in this assessment is construction dust as this has the potential to result in dust soiling (deposited dust) and human health and ecological effects.

1.1. Study Area

The Proposed Scheme is located on the west-side of Cheltenham on the A40 section of the current highway network between Arle Court roundabout and the Benhall roundabout and lies within the administrative boundary of Cheltenham Borough Council (CBC). The construction dust assessment study area includes the area within 350 metres of the red line construction boundary and an area 50 metres from the roads used by vehicles to enter and leave the construction area referred to as trackout.

The Proposed Scheme is located within CBC which has designated the entire borough as an Air Quality Management Area (AQMA). The majority of sensitive receptors within the construction dust assessment study area are located within the residential areas of north east Cheltenham within 350 metres of the scheme boundary.

The construction dust assessment study area is presented in Figure 1.

1.2. Assessment Scope

A construction dust assessment has been prepared to include the following information:

- A review of local air pollutants, construction dust, and the regulatory and policy context;
- A summary of baseline conditions;
- A qualitative assessment of the potential air quality effects during the construction phase;
- Recommendations for mitigation of potentially significant effects; and
- Conclusions.

2. Legislation, Policy and Guidance

2.1.1. Construction Dust Guidance

Dust is defined within the Institute of Air Quality Management (IAQM)'s "Guidance on the assessment of dust from demolition and construction" (IAQM Dust Guidance)[1] as solid particles that are suspended in air or that have settled out onto a surface after having been suspended in air. It includes particles that give rise to soiling (deposited dust) and to human health and ecological effects.

The IAQM Dust Guidance states that there is evidence that, without effective mitigation, major construction sites can lead to an increase in annual mean PM_{10} concentrations and the number of exceedances of the short term 24-hour objective for PM_{10}. In addition, construction activities have the potential to cause higher than normal levels of dust deposition in the surrounding area. Dust emissions from a construction site may be mechanically generated due to land preparation (e.g. demolition, land clearing and earth moving) or released from site plant and from the movement of road vehicles on temporary roads, open ground and haul routes.

The IAQM Construction Dust Guidance[1] provides a framework for a risk-based approach to the assessment of dust emissions from demolition and construction land development schemes and outlines options for mitigation depending on the level of 'dust risk' identified for a site through the assessment process.

2.1.2. Dust Deposition Criteria

There are no national standards or guidelines for dust deposition currently set for the UK, nor by the European Union or any international organisation. This is mainly due to the difficulty in setting a standard that needs to relate to dust being a perceptual problem rather than being specifically related to health effects. Typically, assessments use an indicative threshold for the 'likelihood of complaint' for instance, in residential areas a dust deposition flux (as an average measured over a month using a passive deposition gauge) of 200 mg/m^2/day or greater.

3. Assessment Methodology

3.1. Baseline

Information on existing baseline air quality conditions within the study area was obtained from the following sources:

- CBC's and TBC's air quality review and assessment reports[2];
- Designated ecological site information from Natural England Multi-Agency Geographic Information for the Countryside (MAGIC) website[3];
- AQMA mapping[4]; and
- Ordnance Survey (OS) Mastermap and AddressBasePlus base mapping to identify locations of sensitive receptors (residential properties, schools, hospitals and elderly care homes).

3.2. Construction Phase

The IAQM Construction Dust Guidance[1] provides a framework for a risk-based approach to the assessment of dust emissions from demolition and construction. The assessment of dust emissions during construction of the Proposed Scheme is considered in the context of the overall scale and nature of the development under consideration and the potential sensitivity of neighbouring land uses. The quantity and distribution of dust emissions varies according to type,

[1] Institute of Air Quality Management (IAQM) (2014). Guidance on the assessment of dust from demolition and construction. http://iaqm.co.uk/text/guidance/construction-dust-2014.pdf
[2] https://www.cheltenham.gov.uk/info/66/environmental_protection_and_pollution/288/air_quality_and_pollution & https://www.tewkesbury.gov.uk/air-quality
[3] http://magic.DEFRA.gov.uk/
[4] https://uk-air.DEFRA.gov.uk/aqma/

duration and location of activity, weather conditions and the effectiveness of suppression (mitigation) measures. Good practice control measures that are "highly recommended" or "desirable" for dust control for the various dust risk categories are recommended.

3.2.1. Construction Dust Risk Assessment

Assessment of the potential impact of the construction phase of the Proposed Scheme on air quality with regards dust and PM_{10} emissions has been carried out with reference to the four-step process described in the IAQM Construction Dust Guidance[5]. These steps are summarised in Appendix A.

3.2.2. Construction Vehicle Emissions

The EPUK/IAQM's 'Land-use Planning and Development Control: Planning for Air Quality' (2017)[6] advises that an air quality assessment would be required where a development causes a change in Heavy Duty Vehicle (HDV)[7] flows on local roads of more than 25 per day within an AQMA. The construction period for the proposed scheme will last six months and any effect on air quality from construction traffic will be temporary. Where construction flows are likely to exceed 25 vehicles per day for extended periods during the construction works on sensitive routes, it is recommended that a traffic management plan should be prepared.

3.2.3. Meteorological Data

Hourly sequential meteorological data for the nearest suitable meteorological station, in this case Gloucester Airport,for the year 2017 (to match the traffic model base year). The weather station is approximately 2.5 kilometres west of the Proposed Scheme.

A windrose for Gloucester Airport 2017 is presented in

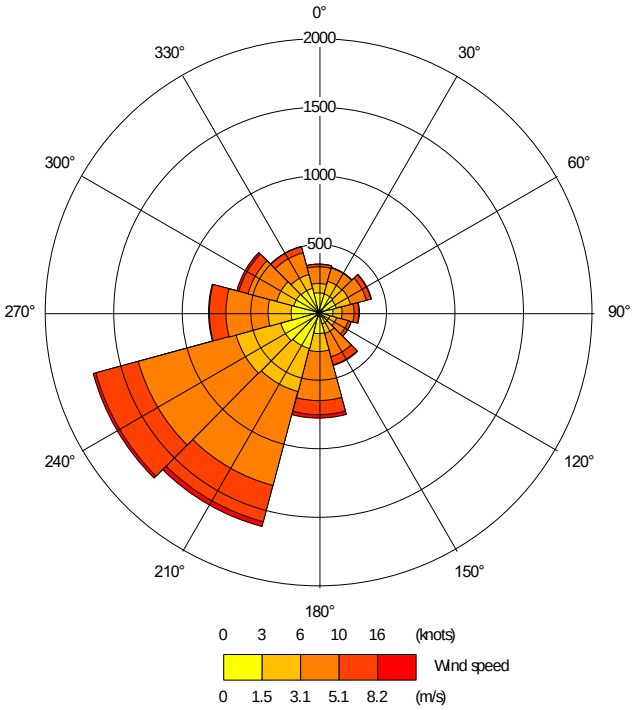
Insert 3-1 - Windrose for Gloucestershire Meteorological Site - 2017, which indicates that the prevailing wind is from the southwest.

Insert 3-1 - Windrose for Gloucestershire Meteorological Site - 2017

[5] Institute of Air Quality Management (2014) "Guidance on assessment of dust from demolition and construction", version 1.1, http://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

[6] Environmental Protection UK and Institute of Air Quality Management (2017), 'Land-Use Planning & Development Control: Planning for Air Quality', http://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

[7] HDV comprises goods vehicles and buses >3.5 tonnes gross vehicle weight



3.2.4. Receptors

Receptors could be affected by construction dust where they are located within 350 metres of the construction boundary. Ordnance Survey AddressBasePlus data was used to determine the location of sensitive human health receptors (e.g. residential dwellings, schools and hospitals) and the Defra mapping website[8] was used to identify any sensitive ecological receptors.
A total of 2,143 human health receptors were located within 350 metres of the construction boundary, of which 134 receptors were located within 50 metres of the road approaching the construction site which might be affected by dust tracking out from any construction work.

There were no designated ecological sites within 350 metres of the construction boundary.

The locations of the construction dust receptors are shown in **Error! Reference source not found.**.

4. Baseline Conditions

4.1. Local Air Quality Management

The construction dust assessment area includes the borough wide AQMA administered by CBC, declared in 2011 for exceedances of the national NO_2 annual mean AQS objective. The AQMA is currently under review and monitoring data published in the Annual Status Report 2018 confirmed that the annual mean AQS objective is only exceeded in isolated areas to the west of Cheltenham town centre. It is likely that the AQMA will be revised to reflect these findings.

A summary of the AQMAs is presented in Table 1**Error! Reference source not found.**.

Table 1 - AQMAs declared by CBC in proximity to the Proposed Scheme

Name	AQS Objective Exceeded	Description
Cheltenham Whole Borough AQMA	Annual mean nitrogen dioxide NO_2	The whole borough of Cheltenham
SOURCE: https://uk-air.defra.gov.uk/aqma/		

[8] https://magic.defra.gov.uk/MagicMap.aspx

5. Potential Impacts

5.1. Construction Phase

5.1.1. Construction Dust

The planned construction period will last approximately 26 weeks and given the close proximity of receptors to the Proposed Scheme, an assessment of construction dust emissions has been undertaken.

In accordance with IAQM Construction Dust Guidance[1], an initial screening assessment was carried out using Ordnance Survey[9] base mapping and DEFRA's mapping website "Magic"**Error! Bookmark not defined.** to determine the location and number of sensitive receptors within relevant distances of the Proposed Scheme. A total of 2,143 human health receptors are located within a buffer of 350 metres around the site (134 of which are also within 200 metres of the site entrance on routes expected to be used by construction vehicles), while no ecological sites were identified within 50 metres of either the site boundary or the access routes likely to be used by construction vehicles). The site boundary, site compound, buffers and sensitive human health receptors are shown in Figure 2 - Construction Dust Assessment.

Table 2 shows the assumed dust emission magnitude for each construction activity. Earthworks were classed as "medium", considering the area of the earthworks included in the Proposed Scheme is less than 2,500 m^2 and material moved is less than 20,000 tonnes. No information has been provided in respect of demolition activities and therefore it has been assumed that only the material of the road surfaces and infrastructure will be removed to clear the area for the new road links and reconfigured junction. Construction activities are categorised as "medium" due to the total construction area which is approximately 40,000 m^3 using potentially dusty construction materials for road building. Estimates of vehicle movements for the construction of the Proposed Scheme are not available at this stage, therefore a conservative assumption of between 10 to 50 HGV outward movements per day with very little unpaved road accessing the site compound has been used to generate a "medium" emission magnitude for trackout.

Table 2 - Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	N/A
Earthworks	Medium
Construction	Medium
Trackout	Medium

There are 118 high sensitivity receptors within 20 metres of the site boundary, and consequently the sensitivity of the surrounding area to dust soiling is high. Background annual mean PM_{10} concentrations are below 24 µg/m^3 in the area at 13.3 µg/m^3 [10], so the sensitivity of the surrounding area to human health impacts is classed as low. The sensitivity of the surrounding area to trackout is also classed as high for dust soiling, as there are more than 100 (134) sensitive receptors were identified within 50 metres of likely trackout routes, and classed as low for human health as background PM_{10} concentrations are low. The effect on ecological sites was scoped out given that there were no ecological receptors within 50 metres of the boundary.

The potential risk of dust soiling and human health impacts, given the dust emission magnitudes and sensitivities described above, are summarised in Table 3Table 3.

Table 3 - Summary of Expected Dust Risk

[9] https://www.ordnancesurvey.co.uk/opendatadownload/products.html

[10] Average Defra background PM_{10} concentrations for grid squares 391500;221500, 391500;222500,392500;222500 available from https://laqm.DEFRA.gov.uk/review-and-assessment/tools/background-maps.html

Sensitivity of Surrounding Area		Summary of Dust Risk			
		Earthworks	Construction	Demolition	Trackout
Dust Soiling	High	Medium	Medium	N/A	Medium
Human Health	Low	Low	Low	N/A	Low

5.1.2. Construction Traffic

An estimate of between 10 and 50 outward HDV movements per day has been identified for the proposed scheme. This would equate to between 20 and 100 additional HDV movements per day on the traffic network during the 26 week construction period for the Proposed Scheme. Although this might exceed the assessment threshold within an AQMA of more than 25 HDV movements no data is currently available regarding the likely route of the vehicles. It is recommended that a preferred route should be prepared to identify routes for supplier and contractor vehicles accessing the site, avoiding sensitive sections of the road network. It is acknowledged that changes as a result of construction traffic are temporary, will vary during the construction period and will revert to normal operation when the scheme is completed.

6. Mitigation

6.1. Construction Phase

Construction works associated with the Proposed Scheme have the potential to generate dust emissions, which will require effective control/minimisation for the duration of the construction project through a Construction Environmental Management Plan (CEMP) or similar. The dust risk was assessed as medium during earthworks, construction and trackout works.

Selected mitigation measures given in the IAQM Dust Guidance[1] which are applicable to a medium risk construction site, such as this, are described below. Suggested measures include:

- Stakeholder communication is recommended, with community engagement both before and during work on site and the clear display of contact details for those responsible for dust issues on site. Any complaints and exceptional incidents should be logged along with the appropriate measures taken to reduce emissions.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, realtime PM_{10} continuous monitoring and/or visual inspections.
- Regular site management of emission control measures should be undertaken, with visual inspections of activities and control measures carried out especially during dry conditions or dusty operations. This should include recording of activities, controls, weather (wind direction, precipitation) and ground conditions, and observations of surface dust deposits at and 100 metres beyond the site boundary near sensitive receptors.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover, seed or fence stockpiles to prevent wind whipping;

- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials;
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigations, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- Avoid bonfires and burning of waste materials;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

Where construction traffic is expected to exceed 25 HDVs per day and therefore has the potential to cause a potential air quality impact it is recommended a Transport Management Plan should be prepared. With appropriate mitigation measures in place, any adverse effects resulting from the construction works should be minimised such that there is no significant residual effect on nearby receptors.

7. Conclusions

This construction dust assessment included a qualitative assessment of construction dust emissions to identify the impacts and potential for significant effects due to the construction of the Proposed Scheme.

Construction Dust Assessment Phase

The construction phase of the Proposed Scheme has the potential to generate dust and PM_{10} emissions, which may have a short term adverse impact for dust soiling and nearby human health receptors. With appropriate mitigation measures in place however, as discussed in the mitigation section, these works should not result in a significant residual adverse effect at the sensitive receptors. The construction traffic has the potential to affect local air quality, given that traffic flows may exceed 25 HDV movements a day. A management plan for construction traffic would prevent

vehicles accessing sensitive roads within the CBC AQMA. Mitigation measures for construction dust should be secured within a Dust Management Plan for the site.

Figure 1 - Air Quality Constraints

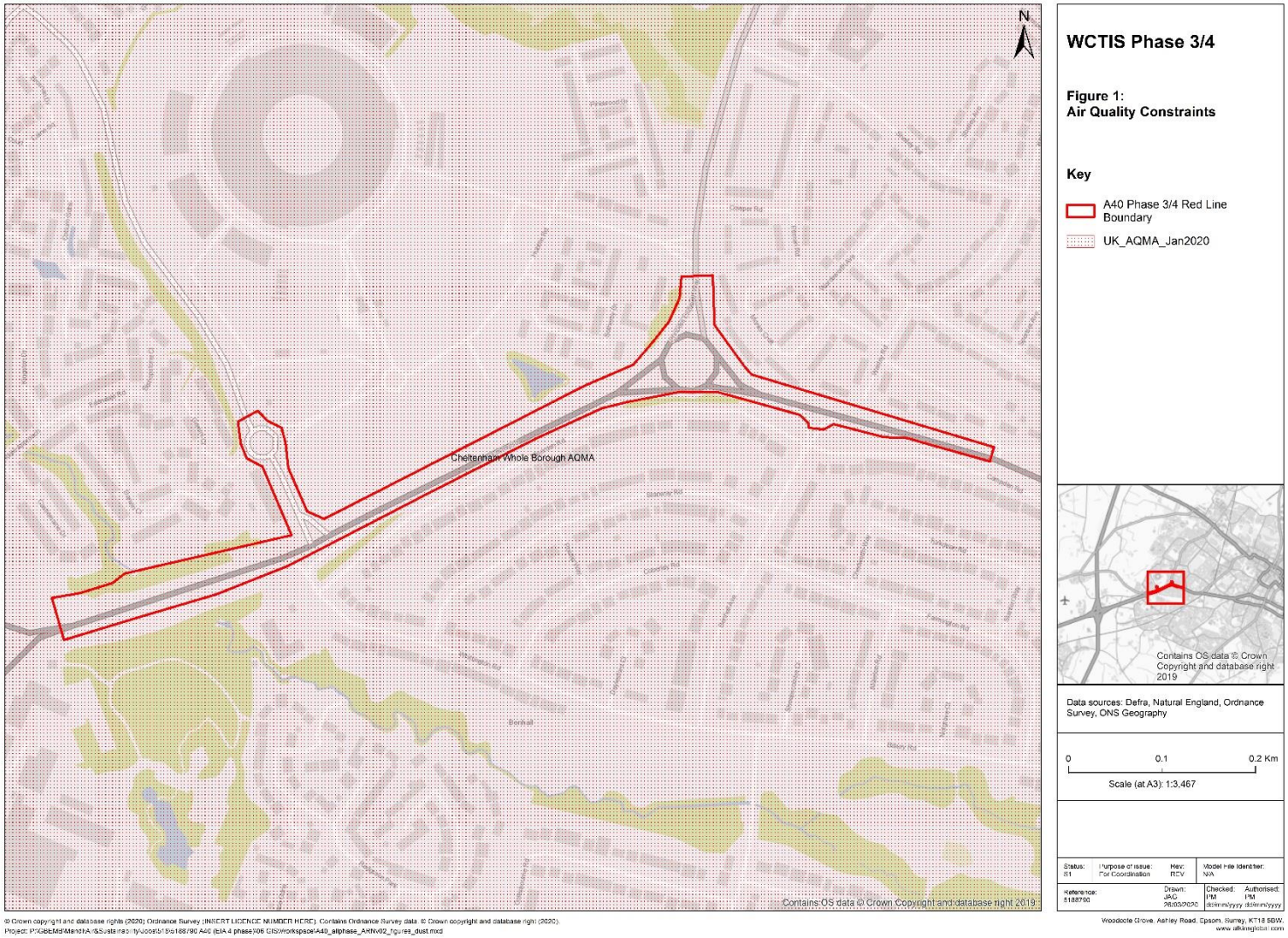
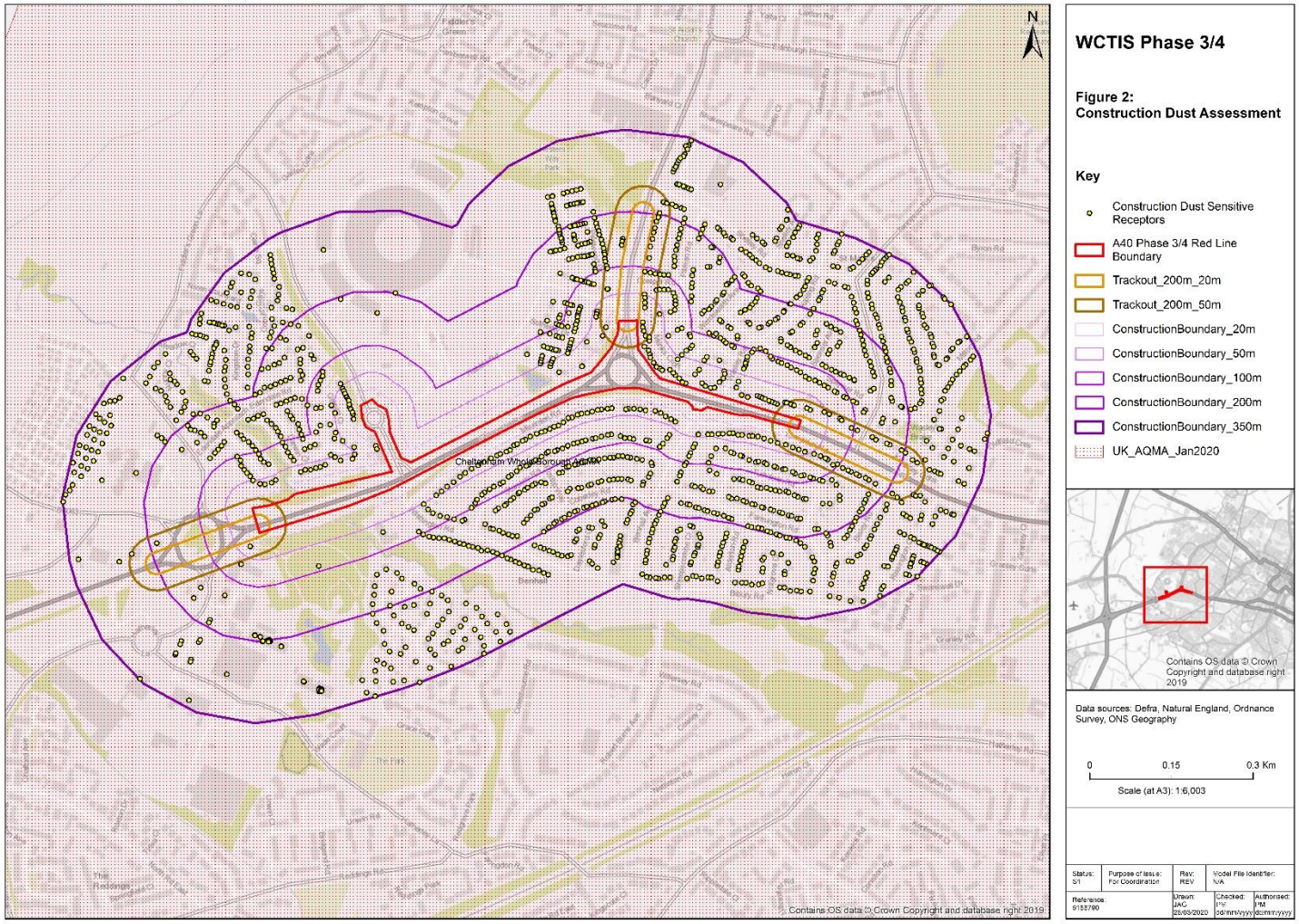


Figure 2 - Construction Dust Assessment



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Appendices

Appendix A. Construction Dust Methodology

Assessment of the potential impact of the construction phase of the Proposed Scheme on air quality with regards dust and PM_{10} emissions has been carried out with reference to the four-step process described in the IAQM Dust Guidance. These steps are summarised below:

- Step 1 (screening) – Identification of the number of human receptors within 350 metres of the boundary of the Site and/or within 50 metres of the route(s) used by construction vehicles on the public highway up to 50 metres from the Site entrance. Ecological receptors should also be identified within 50 metres of either the boundary of the Site and/or of the route(s) used by construction vehicles on the public highway up to 50 metres from the Site entrance. No further assessment is required if there are no receptors.

  'Human' receptors include residential dwellings and other premises that may have a particular sensitivity to dust deposition or to the health effects of PM_{10} e.g. vehicle showrooms, museums, long-term car parks, hospitals, schools and residential care homes. 'Ecological' receptors include sites with statutory designations e.g. Ramsar sites, Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI), as well as non-statutory sites such as local wildlife sites and/or locations with very specific ecological sensitivities e.g. horticultural operations.
- Step 2 – Assessment of the risk of dust effects by considering the area around the Site in the context of potential dust impacts and distances to nearby receptors in relation to proposed activities in terms of demolition, earthworks, construction, and trackout. Trackout can be defined as the deposition of dust and dirt from a construction site onto a public road network where it may then be re-suspended in the air by vehicles using the road network.

  Dust emission magnitude classes of 'large', 'medium' and 'small' are used to define the level of risk arising from each activity depending on the nature and scale of operation.

  The sensitivity of the area is defined as 'high', 'medium' or 'low' for dust soiling effects, human health impacts, and ecological impacts separately, considering the sensitivity of receptors, distance and number of receptors from dust generating activities, and other site specific factors (defined in the IAQM Dust Guidance). In addition, for the effect on human health, background PM_{10} concentrations are considered. The definitions are provided in Tables 2, 3 and 4 of the IAQM Dust Guidance[1].
- Step 3 – Site specific mitigation in terms of the identified risks is identified.
- Step 4 – Assessment of the significance of the residual dust risk, after the application of the site specific mitigation.

Tables 6 to 9 of the IAQM Dust Guidance are used to define the risk of impact based on the dust emission magnitude and sensitivity of area. These are reproduced in Table 4 to Table 6 below.

Table 4 - Air Quality: Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 5 - Air Quality: Risk of Dust Impacts – Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk

Low	Low Risk	Low Risk	Negligible

Table 6 - Air Quality: Risk of Dust Impacts - Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible