

Great Yarmouth Third River Crossing Application for Development Consent Order

Document 6.2: Environmental Statement Volume II: Technical Appendix 6B: Air Quality Construction Phase Assessment Methodology

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1 Air Quality Construction Phase Assessment Methodology

1.1 Introduction and Scope of the Assessment

1.1.1 Appendix 6B of the Environmental Statement (ES) outlines the guidance provided by the Institute of Air Quality Management (IAQM) for the assessment of air quality impacts arising from demolition and construction activities¹, (herein referred to as ‘the Guidance ‘).

1.2 Step One: Screen the Need for a Detailed Assessment

1.2.1 An assessment of construction phase dust emissions will normally be required where there are:

- ‘Human receptors’ within 350m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s)¹; and
- ‘Ecological receptors’ within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

1.2.2 Human and ecological receptors have been considered up to a distance of 500m to incorporate the distances specified in the IAQM guidance.

1.2.3 The Guidance refers to a ‘Human receptor’, as any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM₁₀ over period relevant to the air quality objectives, as defined in Defra technical air quality guidance (Ref 6.5).

1.2.4 The Guidance refers to an ‘Ecological receptor’ as any sensitive habitat affected by dust soiling and includes locations with a statutory designation such as a Site of Specific Scientific Interest (SSSI), Special Area of Conservation (SACs), Special Protection Areas (SPAs) and RAMSAR sites, as designated under the RAMSAR convention.

¹ The distance applied is in line with the IAQM Guidance on the assessment of dust from demolition and construction and differs from the land referencing limits in accordance with the discipline specific guidance which captures a more conservative area.

- 1.2.5 Where the need for a more detailed assessment is screened out, the Guidance concludes that the level of risk is ‘negligible’ and that any effects are unlikely to be significant.

1.3 Step Two: Assess the Risk of Dust Impacts

1.3.1 The Guidance states that the risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (Step Two (A)); and
- The sensitivity of the area to dust impacts (Step Two (B)) which is defined as low, medium or high sensitivity.

1.3.2 These two factors are combined to determine the risk of dust impacts with no mitigation applied. Depending on the activities undertaken, risk category designations may be required for each of four construction activities defined by the Guidance; namely Demolition, Construction, Earthworks and Trackout.

Step Two (A): Define the Potential Dust Emission Magnitude

1.3.3 The dust emission magnitude has been based on the scale of the anticipated works and is classified as ‘Small’, ‘Medium’, or ‘Large’ as identified for each construction activity from the criteria in Table 1.1.

Table 1.1: Dust Emission Magnitude Criteria

Activity	Description		
	Small	Medium	Large
Demolition	Total building volume less than 20,000m ³ , construction material with low potential for dust release (e.g. metal cladding or timber) demolition activities less than 10m above ground level; demolition during wetter months	Total building volume between 20,000m ³ – 50,000m ³ , potentially dusty construction material; demolition activities between 10m and 20m above ground level	Total building volume more than 50,000m ³ , potentially dusty construction material (e.g. concrete); on-site crushing and screening; demolition activities more than 20m above ground level
Earthworks	Total site area less than	Total site area between 2,500m ²	Total site area more than

Activity	Description		
	Small	Medium	Large
	2,500m ² ; soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <20,000 tonnes, earthworks during wetter months	to 10,000m ² ; moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m - 8m in height, total material moved 20,000 tonnes – 100,000 tonnes	10,000m ² ; potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds more than 8m in height, total material moved more than 100,000 tonnes
Construction	Total building volume less than 25,000m ³ ; construction material with low potential for dust release (e.g. metal cladding or timber).	Total building volume between 25,000 m ³ and 100,000m ³ ; potentially dusty construction material (e.g. concrete), on- site concrete batching;	Total building volume more than 100,000m ³ ; on-site concrete batching, sandblasting;
Trackout	Less than 10 HDV outward movements in any one day; surface material with low potential for dust release; unpaved road length less than 50m	Between 10 to 50 HDV outward movements in any one day; moderately dusty surface material (e.g. high clay content); unpaved road length between 50 and 100m	More than 50 HDV outward movements in any one day; potentially dusty surface material (e.g. high clay content); unpaved road length more than 100m

1.3.4 Table 1.11 details the risk of impacts for potential dust nuisance, health and ecosystem effects from demolition; earthworks; general construction activities and trackout, respectively. For the purposes of the Step Two (A) assessment, in accordance with the Guidance, it is assumed that no mitigation measures are applied, the dust emission magnitude is dependent

on the available information on the construction phase and professional judgement.

1.3.5 A summary of the dust emission magnitude assigned to each construction activity as part of this assessment is outlined in Table 1.2.

Table 1.2: Dust Emission Magnitude

Activity	Dust Emission Magnitude	Description
Demolition	Large	The construction demolition involves the removal of a foot bridge constructed of concrete, 22 two storey brick residential buildings, one two storey brick building and eight large sheds with corrugated roofs mounted on concrete pillars and associated hardstanding. A worst-case assumption that asbestos may be present within structures has been taken.
Earthworks	Large	The exact extent of Earthworks is unknown at this ES stage. However, due to the size of the Scheme and taking a worst-case approach to the assessment, it is judged that Earthworks could produce high levels of dust and it has accordingly been included within the assessment.
Construction	Large	Extensive onsite works will be required during construction of the Scheme therefore a worst-case assumption that works have the potential to generate high levels of dust was taken.
Trackout	Large	At the ES stage, the exact number of construction vehicles utilised throughout the construction phasing is unknown, nor the amount and length of unpaved roads that will be used. As a worst case estimate it is assumed that the scheme will generate up to a peak of 140 two-way HDV vehicle movements, and 290 LDV movements per day (see 6.4 of the (ES Document Reference

Activity	Dust Emission Magnitude	Description
		6.1)) and it is likely that there will be sections of unpaved road during construction. The approach routes to the construction compounds will be the trunk road network and vehicles accessing the construction compound situated on the east side of the Principal Application Site will use Fish Wharf for access. Vehicles accessing the construction compound situated on the west side of the Principal Application Site will use Williams Adams Way, Suffolk Road and Queen Anne's Road.

Step Two (B): Define the Sensitivity of the Area

1.3.6 The sensitivity of the area takes into account a number of factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM₁₀, the local background concentration; and
- Site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

1.3.7 The significance of dust effects associated with the construction phase was defined using the criteria detailed in Table 1.3,

1.3.8 Table 1.4 and Table 1.5.

Table 1.3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m) ^c			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

^a The sensitivity of the area is derived for each of the four activities: demolition, construction, earthworks and trackout.

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

^c For trackout, the distances are measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500m from large sites as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road where sensitivity would be high when the number of receptors is over 100.

Table 1.4: Sensitivity of the Area to Human Health Impacts^{ab}

Receptor Sensitivity	Annual mean PM ₁₀ concentration	Number of Receptors	Distance from the Source (m) ^c				
			<20	<50	<100	<200	<350
High	>32 µg.m ³	>100	High	High	Medium	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg.m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg.m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg.m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg.m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg.m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg.m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low

Receptor Sensitivity	Annual mean PM ₁₀ concentration	Number of Receptors	Distance from the Source (m) ^c				
			<20	<50	<100	<200	<350
	<24 µg.m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

^a The sensitivity of the area is derived for each of the four activities: demolition, construction, earthworks and trackout.

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

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

^d In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

^e For trackout, the distances are measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50m from the edge of the road where sensitivity would be high when the number of receptors is over 100.



Table 1.5: Sensitivity of the Area to Ecological Impacts^{ab}

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

^a The sensitivity of the area is derived for each of the four activities: demolition, construction, earthworks and trackout and for each designated site.

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

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

1.3.9 Table 1.6 provides the method of defining the sensitivity of the area.

Table 1.6: Outcome of Defining the Sensitivity of the Area

Receptor Sensitivity	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	High	High	High	High
Ecological	High	High	High	High

Step Two (C): Define Risk of Impacts

1.3.10 The dust emission magnitude determined using the criteria in Table 1.1 Table 1.1: Dust Emission Magnitude Criteria and justified in Table 1.2 has been combined with the sensitivity of the area determined through the implementation of Table 1.3,



1.3.11 Table 1.4 and Table 1.5 to determine the risk of impacts without mitigation.

1.3.12 The matrices in



- 1.3.13** Table 1.7 provide a method of assigning the level of risk for each activity. This has been used in determining the level of mitigation that must be applied and discussed in Step Three. For those cases where the risk category is 'negligible', no mitigation measures beyond those required by legislation are required.

Table 1.7: Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	Small	Medium	Large
Demolition			
Low	Negligible	Low Risk	Medium Risk
Medium	Low Risk	Medium Risk	High Risk
High	Medium Risk	Medium Risk	High Risk
Earthworks			
Low	Negligible	Low Risk	Low Risk
Medium	Low Risk	Medium Risk	Medium Risk
High	Low Risk	Medium Risk	High Risk
Construction			
Low	Negligible	Low Risk	Low Risk
Medium	Low Risk	Medium Risk	Medium Risk
High	Low Risk	Medium Risk	High Risk
Trackout			
Low	Negligible	Low Risk	Low Risk
Medium	Negligible	Low Risk	Medium Risk
High	Low Risk	Medium Risk	High Risk

1.3.14 Table 1.8 provides a summary of the risk of dust impacts for the four activities and allows for site-specific mitigation measures to be specified for inclusion in this assessment (see Step Three).

Table 1.8: Summary of Risk for Definition of Mitigation Measures

Sensitivity of Area	Summary of Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High Risk	High Risk	High Risk	High Risk
Human Health	High Risk	High Risk	High Risk	High Risk
Ecological	High Risk	High Risk	High Risk	High Risk

1.4 Step Three: Site-specific Mitigation

- 1.4.1 The dust risk categories for each of the four activities determined in Step Two have been used to define the appropriate, site-specific, mitigation measures to be adopted and reflected in the OCoCP (document 6.16).
- 1.4.2 The mitigation measures are divided into general measures applicable to all site and measures applicable specifically to demolition, earthworks, construction and trackout, for consistency with the assessment methodology. More information on the site-specific mitigation identified as part of this air quality assessment can be found in the Sections 6.7 and 6.8 of Chapter 6 of the ES (document reference 6.1).

1.5 Step Four: Determine Significant Effects

- 1.5.1 Once the risk of dust impacts has been determined in Step Two and the appropriate dust mitigation measures identified in Step Three, the final step has been to determine whether there are significant effects arising from the construction phase of the Scheme. This assessment is based on professional judgement and takes account of the significance of the effect of each of the four construction activities.
- 1.5.2 For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. The Guidance states that this is normally possible. Hence the residual effect will normally be 'not significant'.

1.6 Step Five: Dust Assessment Report

- 1.6.1 The findings of the construction phase dust assessment are reported in Section 6.8 of Chapter 6 of the ES (document reference 6.1). This assessment includes:
- A summary of dust emission magnitude and sensitivity of the study area;
 - The potential risk of impacts associated with the construction phase, without mitigation; and
 - Details of appropriate mitigation measures commensurate to the scale and nature of construction activities and locations; this will be applied via the OCoCP.

1.7 Mitigation Measures

- 1.7.1 Following assessment of the potential risk for construction dust impacts from the Application Sites, where practicable the following mitigation measures recommended by IAQM should be implemented where high risk activities are
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identified. A site-specific list of recommended measures is included in Chapter 6 Section 6.8 and included within the Outline CoCP (document reference: 6.16).

- 1.7.2 Dust and PM₁₀ monitoring is also included within the Outline CoCP (document reference 6.16) as embedded mitigation for medium to high risk sites, as defined by IAQM. The monitoring locations should be agreed with the county planning authority in consultation with GYBC, with baseline monitoring taking place at least three months before construction works commence.
- 1.7.3 The following additional mitigation will be applied through the OCoCP with further measures as practicable to be applied to demolition, trackout, and construction activities through the relevant phases of the construction programme.
- 1.7.4 For mitigation measures specific to **demolition** it is highly recommended to:
- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where reasonably practicable, to provide a screen against dust).
 - Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
 - Avoid explosive blasting, using appropriate manual or mechanical alternatives.
 - Bag and remove any biological debris or damp down such material before demolition.
- 1.7.5 For mitigation measures specific to **trackout** it is highly recommended to:
- 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.
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- 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 10m from receptors where reasonably practicable.

1.7.6 For mitigation measures specific the **earthworks** it is highly recommended to:

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

1.7.7 For mitigation measures specific to **construction**:

- Regular monitoring will be undertaken including regular onsite and offsite inspection where receptors are nearby and are accessible, to monitor dust, record inspection results, and make the log available to the local authority when requested. The frequency of site inspections by the person accountable for air quality and dust issues on site will be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions;
 - Site management will be applied to - record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken; make the complaints log available to the local authority when asked; record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book; hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
 - Regarding preparing and maintaining the site – the site layout will be optimized so that machinery and dust causing activities are located away from receptors, as far as is possible; solid screens or barriers will be
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erected around dusty activities or the site boundary that are at least as high as any stockpiles on site; where applicable for specific operations where there is a high potential for dust production and the site is active for an extensive period full enclosure may be required; Measures will be taken to avoid site runoff of water or mud; Site fencing, barriers and scaffolding will be kept clean using wet methods; Materials that have a potential to produce dust will be removed from site as soon as possible, unless being re-used on site. Stockpiles will be covered to prevent wind whipping.

- Dust generating activities (e.g. cutting, grinding and sawing) will be minimised and weather conditions considered prior to conducting potentially dust emitting activities. Cutting, grinding or sawing equipment will be fitted or used in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems where practicable;
 - Fine material will not be stockpiled to an excessive height in order to prevent exposure to wind and dust nuisance;
 - Scabbling (roughening of concrete surfaces) will be avoided if possible.
 - Sand and other aggregates will be stored in bunded areas and 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.
 - Bulk cement and other fine powder materials are to be delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
 - For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
 - Roads and accesses will be kept clean;
 - Where reasonably practicable, plant will be located away from site boundaries that are close to residential areas;
 - Water will be used as a dust suppressant, where applicable;
 - Drop heights from excavators to crushing plant will be kept to a minimum;
 - Distances from crushing plant to stockpiles will be kept to the minimum practicable to control dust generation associated with the fall of materials. 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.
 - Skips will be securely covered;
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- Soiling, seeding, planting or sealing of completed earthworks will be completed as soon as reasonably practicable following completion of earthworks;
- Dust suppression and the maintenance of the surface of access routes will be appropriate to avoid dust as far as practicable, taking into account the intended level of trafficking;
- Wheel wash facilities to minimise trackout of dust;
- Material will not be burnt on site; and
- Engines will be switched off when not in operation. A Framework Construction Traffic Management Plan is given in Appendix A to the OCoCP to minimise any adverse effects related to construction traffic.

1.7.8 The Outline CoCP (document reference 6.16) requires that the full CoCP stipulates the following to ensure the aforementioned mitigation is implemented effectively, continually monitored and updated accordingly:

- Identification of a responsible environmental manager; and
 - Method statements for the control of dust in such locations.
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