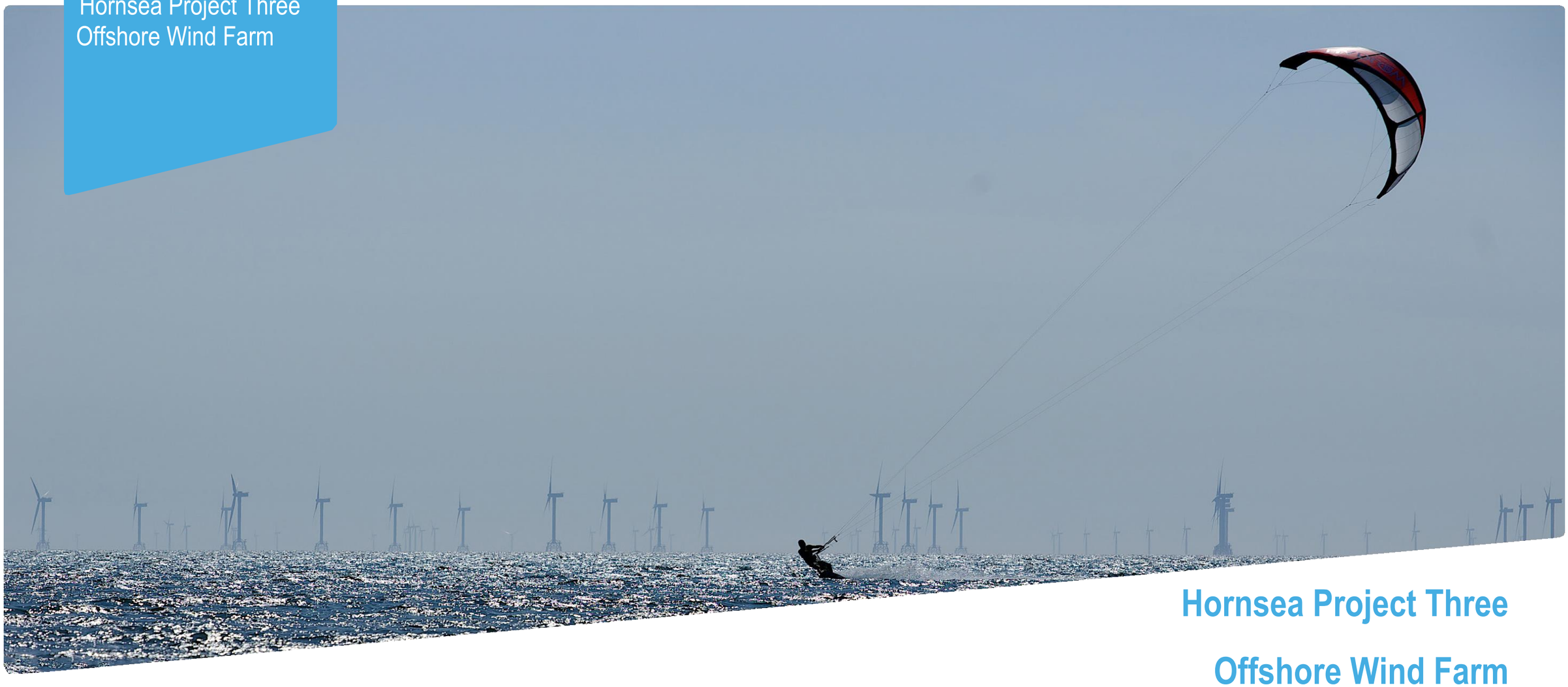
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Preliminary Environmental Information Report:
Chapter 9: Air Quality

Date: July 2017

Hornsea 3
Offshore Wind Farm

DONG energy

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume 3

Chapter 9 – Air Quality

Liability

This report has been prepared by RPS, with all reasonable skill, care and diligence within the terms of their contracts with DONG Energy Power (UK).

Report Number: P6.3.9

Version: Final

Date: July 2017

This report is also downloadable from the Hornsea Project Three offshore wind farm website at www.dongenergy.co.uk/hornseaproject3

DONG Energy Power (UK) Ltd.

5 Howick Place,

London, SW1P 1WG

Front cover picture: Kite surfer near one of DONG Energy's UK offshore wind farms © DONG Energy Hornsea Project Three (UK) Ltd., 2016.

Prepared by: RPS

Checked by: Sergio Zappulo and Kieran Bell

Accepted by: Sophie Banham

Approved by: Stuart Livesey

Table of Contents

List of Tables

List of Figures

Glossary

Term	Definition
Deposited Dust	Dust that has settled out onto a surface after having been suspended in air.
Dust	Solid particles suspended in air or settled out onto a surface after having been suspended in air
Effect	The consequences of an impact, experienced by a receptor
Heavy Duty Vehicle	Vehicles greater than 3.5 t gross vehicle weight including buses
Impact	The change in atmospheric pollutant concentration and/or dust deposition. A scheme can have an 'impact' on atmospheric pollutant concentration but no effect, for instance if there are no receptors to experience the impact.
Magnitude	A combination of the extent, duration, frequency and reversibility of an impact.
Measures adopted as part of the project	Enhancement, mitigation or monitoring commitment (which may include process or design measures) intended to avoid, reduce and where possible, remedy significant adverse impacts of a development.
National Policy Statement (NPS)	A document setting out national policy against which proposals for NSIPs will be assessed and decided upon.
Nationally Significant Infrastructure Project (NSIP)	Large scale development including power generating stations which requires development consent under the Planning Act 2008. An offshore wind farm project with a capacity of more than 100 MW constitutes an NSIP.
Norwich Main National Grid Substation	The existing National Grid Norwich Main substation which Hornsea Project Three will ultimately connect to.
PM_{10}	Particulate matter of diameter less than or equal to 10 micrometers
Receptor	A person, their land or property and ecologically sensitive sites that may be affected by air quality.
Risk	The likelihood of an adverse event occurring
Sensitivity	The extent to which a receptor can accept a change, of a particular type and scale
Significance	The significance of an effect combines the evaluation of the magnitude of an impact and the sensitivity of the receptor.
Trackout	The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicle using the network

Acronyms

Acronyms	Description
AADT	Annual Average Daily Traffic Flow
ADMS	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
DCO	Development Consent Order
DMMP	Dust Management and Monitoring Plan
EIA	Environmental Impact Assessment
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LGV	Light Goods Vehicle
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NRMM	Non road mobile machinery

Units

Unit	Description
GW	Gigawatt (power)
kV	Kilovolt (electrical potential)
kW	Kilowatt (power)
$\mu g.m^{-3}$	Micrograms per cubic metre (concentration)
µm	Micrometer (distance)
km	Kilometre (distance)
m	Metre (distance)
m^2	Metres squared (area)
m^3	Metres cubed (volume)

9. Air Quality

9.1 Introduction

9.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary results of the Environmental Impact Assessment (EIA) of the onshore elements of the Hornsea Project Three offshore wind farm (hereafter referred to as Hornsea Three) relevant to air quality (namely the Hornsea Three landfall area, the onshore cable corridor search area, the onshore HVAC booster station, the onshore HVDC converter/HVAC substation and the interconnection with the Norwich Main National Grid substation), during its construction, operation and maintenance, and decommissioning. The onshore cable corridor search area comprises a 200 m wide corridor within which the refined onshore cable corridor (80 m wide) will be located. The refined cable corridor will be included in the application for Development Consent. The onshore HVAC booster station is an option which would only be considered for the HVAC transmission option (see volume 1, chapter 3: Project Description).

9.2 Purpose of this chapter

9.2.1.1 The primary purpose of the Environmental Statement is to support the Development Consent Order (DCO) application for Hornsea Three under the Planning Act 2008 (the 2008 Act). This PEIR constitutes the Preliminary Environmental Information for Hornsea Three and sets out the findings of the EIA to date to support pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Environmental Statement will accompany the application to the Secretary of State for Development Consent.

9.2.1.2 The PEIR will form the basis for Phase 2 Consultation which will commence on 27 July and conclude on 20 September 2017. At this point, comments received on the PEIR will be reviewed and incorporated (where appropriate) into the EIA Report, which will be submitted in support of the application for Development Consent scheduled for the second quarter of 2018.

9.2.1.3 In particular, this PEIR chapter:

- Presents the existing environmental baseline established from desk studies, together with relevant information from the consultation;
- Presents the potential environmental effects on air quality arising from Hornsea Three, based on the information gathered and the analysis and assessments undertaken to date;
- Identifies any assumptions and limitations encountered in compiling the environmental information; and
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process to date.

9.2.1.4 The air quality assessment has focused on the evaluation of dust and particulate matter generated during the construction and decommissioning phases. These are the phases when the main potential air quality impacts are likely to arise. Appropriate mitigation measures, where necessary, have been identified for inclusion as part of Hornsea Three.

9.2.1.5 Emissions from construction traffic have the potential to affect local air quality, with the exhaust-related pollutants of local relevance being particulate matter of diameter less than or equal to 10 micrometers (PM_{10}) and nitrogen dioxide (NO_2). To calculate the likely changes in traffic numbers generated during construction (and therefore, the potential air quality impacts) traffic surveys will be carried out in July 2017. An assessment of the air quality impacts of emissions from traffic will be presented in the Environmental Statement. Key stakeholders will be consulted on the outputs once complete and before application.

9.3 Study area

9.3.1.1 The study area for the air quality construction dust assessment is shown in Figure 9.1 and comprises the onshore elements of Hornsea Three (as described in paragraph 9.1.1.1) and the potential locations for the main compound plus a 350 m buffer. The potential locations of the main compounds are identified in volume 1, chapter 3: Project Description. Additional construction compounds will be required to facilitate the construction process and will be identified in the Environmental Statement.

9.3.1.2 The air quality (construction dust assessment) study area includes the area over which dust effects may be expected to occur. Guidance from the Institute of Air Quality Assessment (IAQM, 2014) considers that no likely significant dust effects would be expected beyond 350 m from the sources. The scope of the PEIR assessment for air quality has been discussed with the local planning authorities leading up to the PEIR submission and further feedback is welcomed at this stage.

.

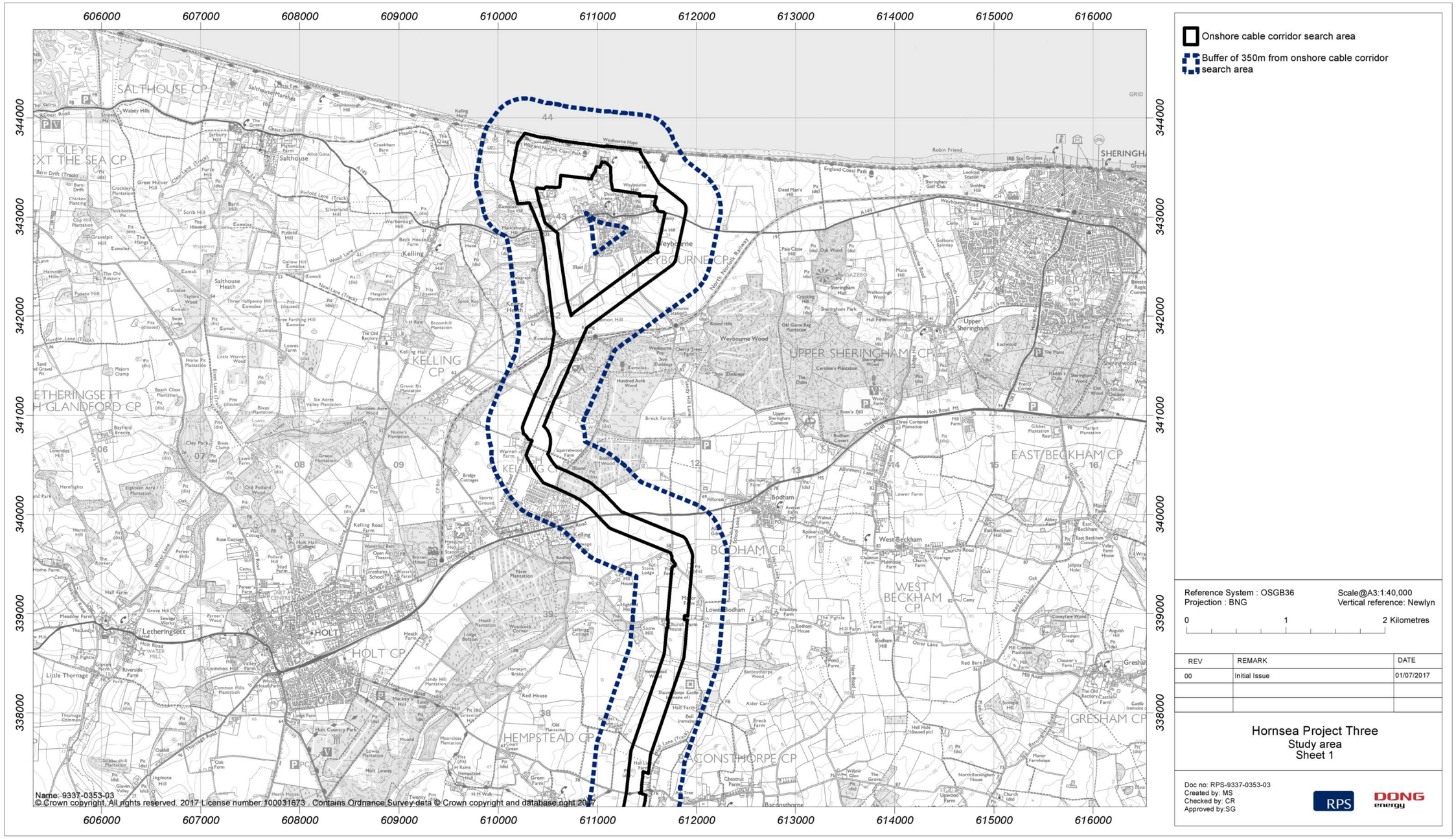


Figure 9.1: Hornsea Three air quality (construction dust assessment) study area.

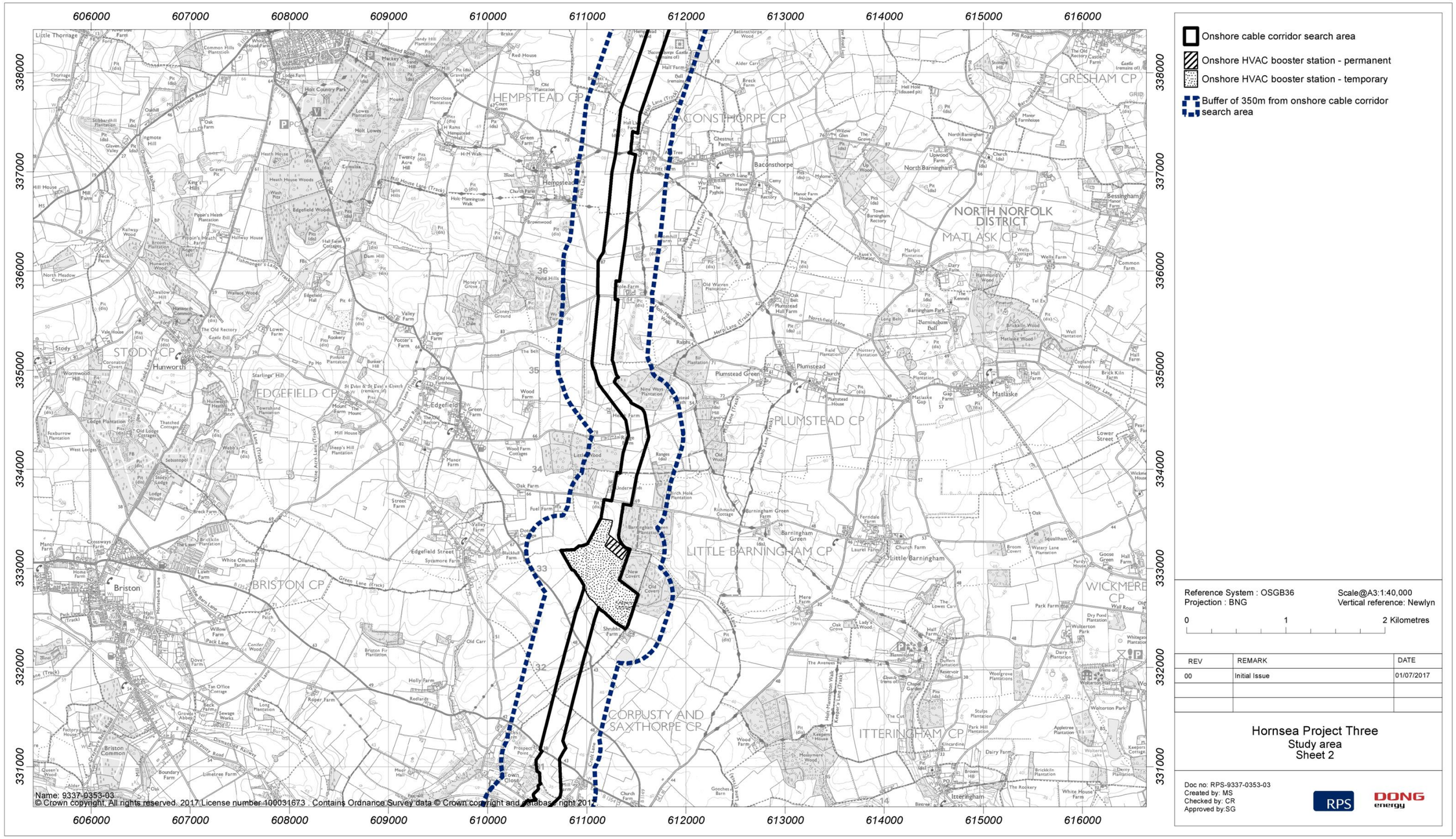


Figure 9.1: Hornsea Three air quality (construction dust assessment) study area.

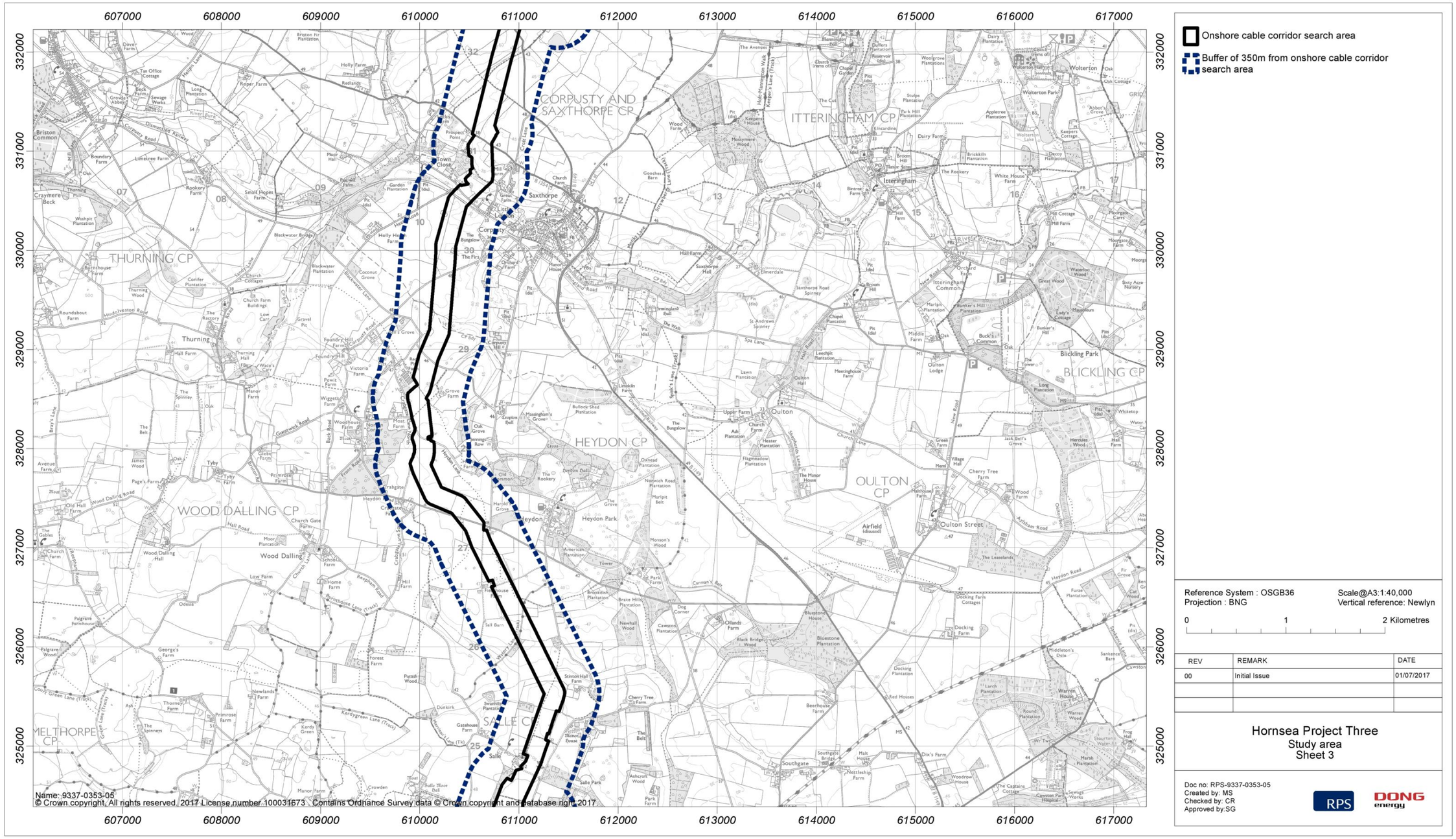


Figure 9.1: Hornsea Three air quality (construction dust assessment) study area.

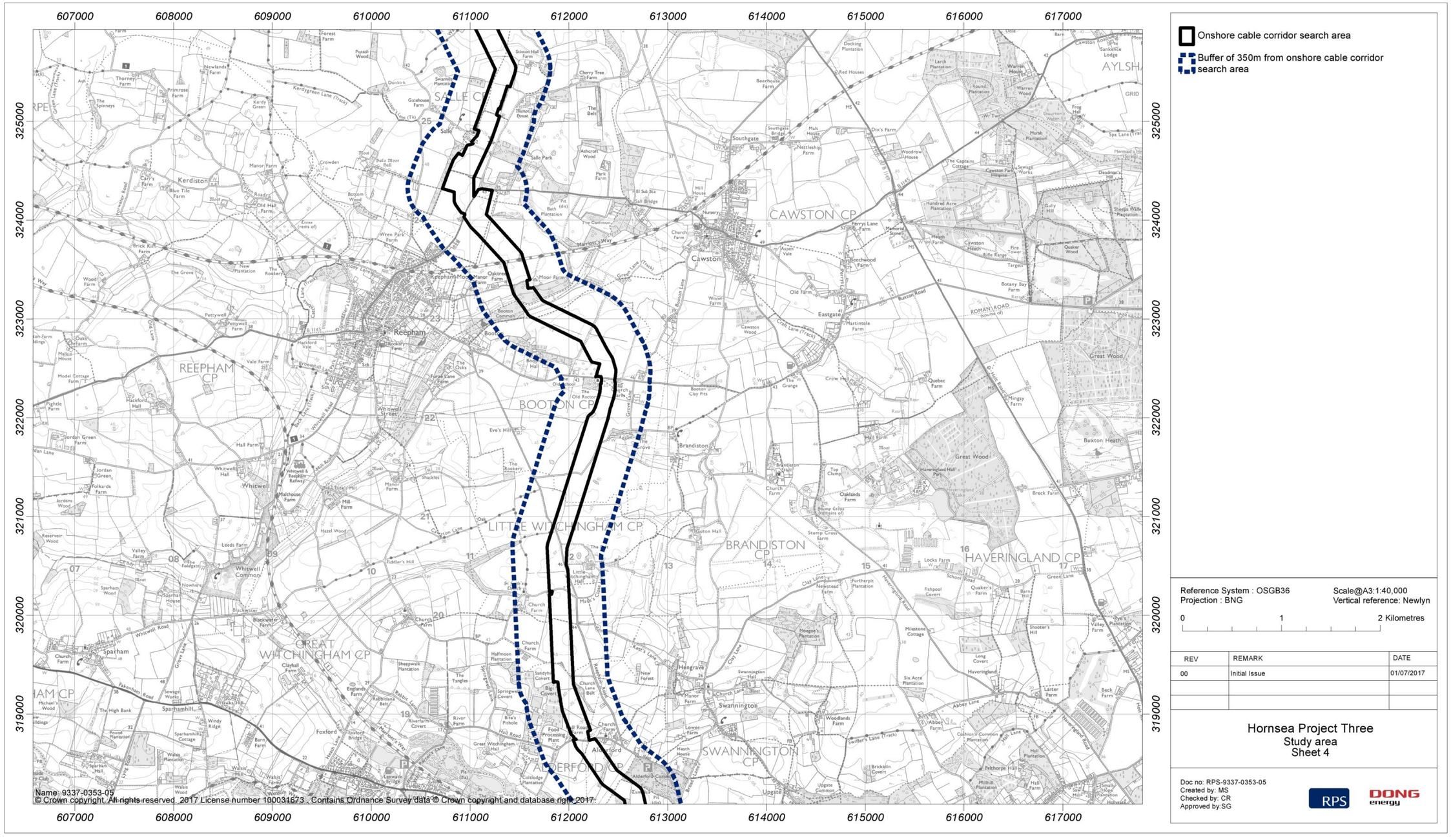


Figure 9.1: Hornsea Three air quality (construction dust assessment) study area.

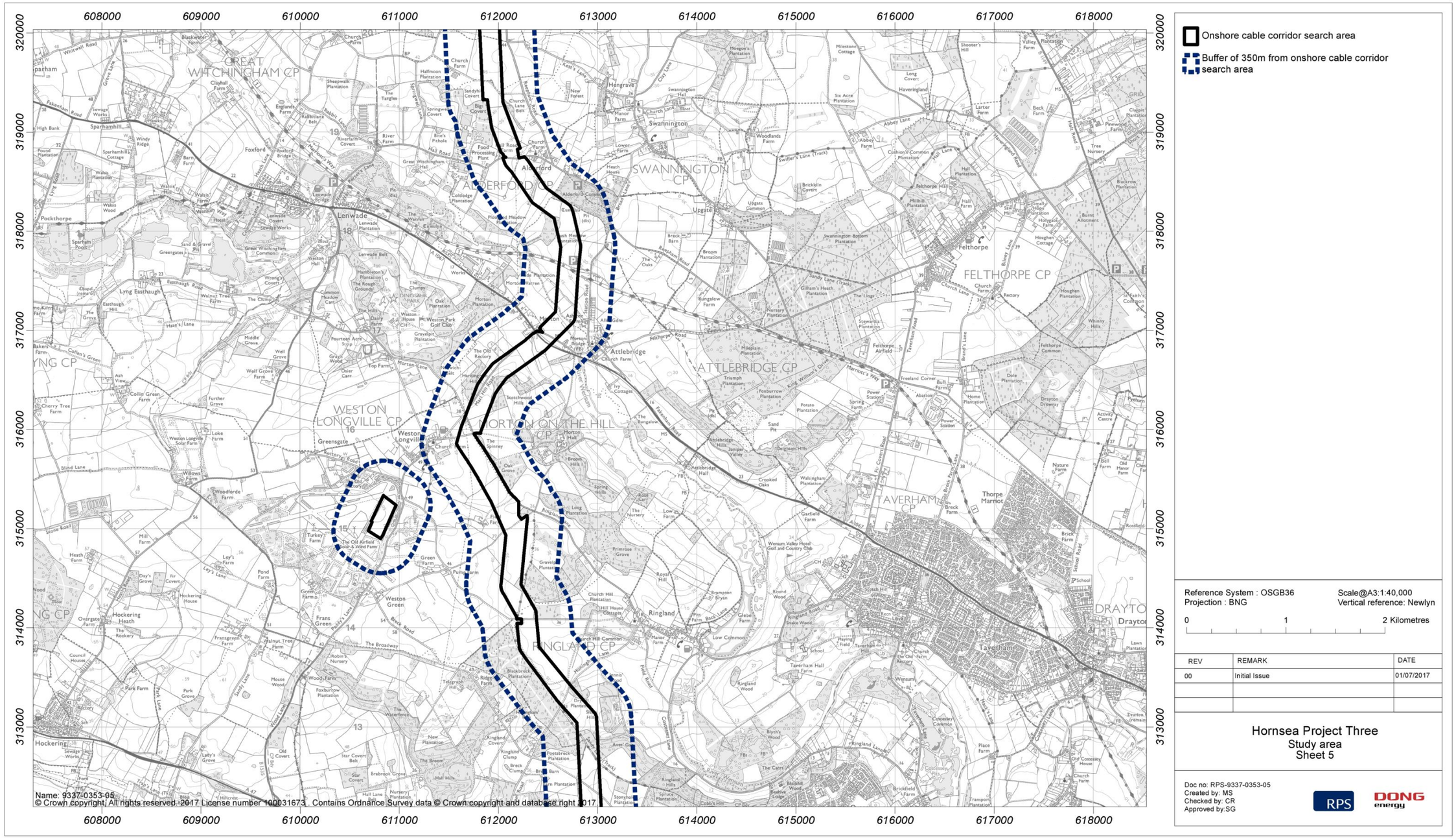


Figure 9.1: Hornsea Three air quality (construction dust assessment) study area.

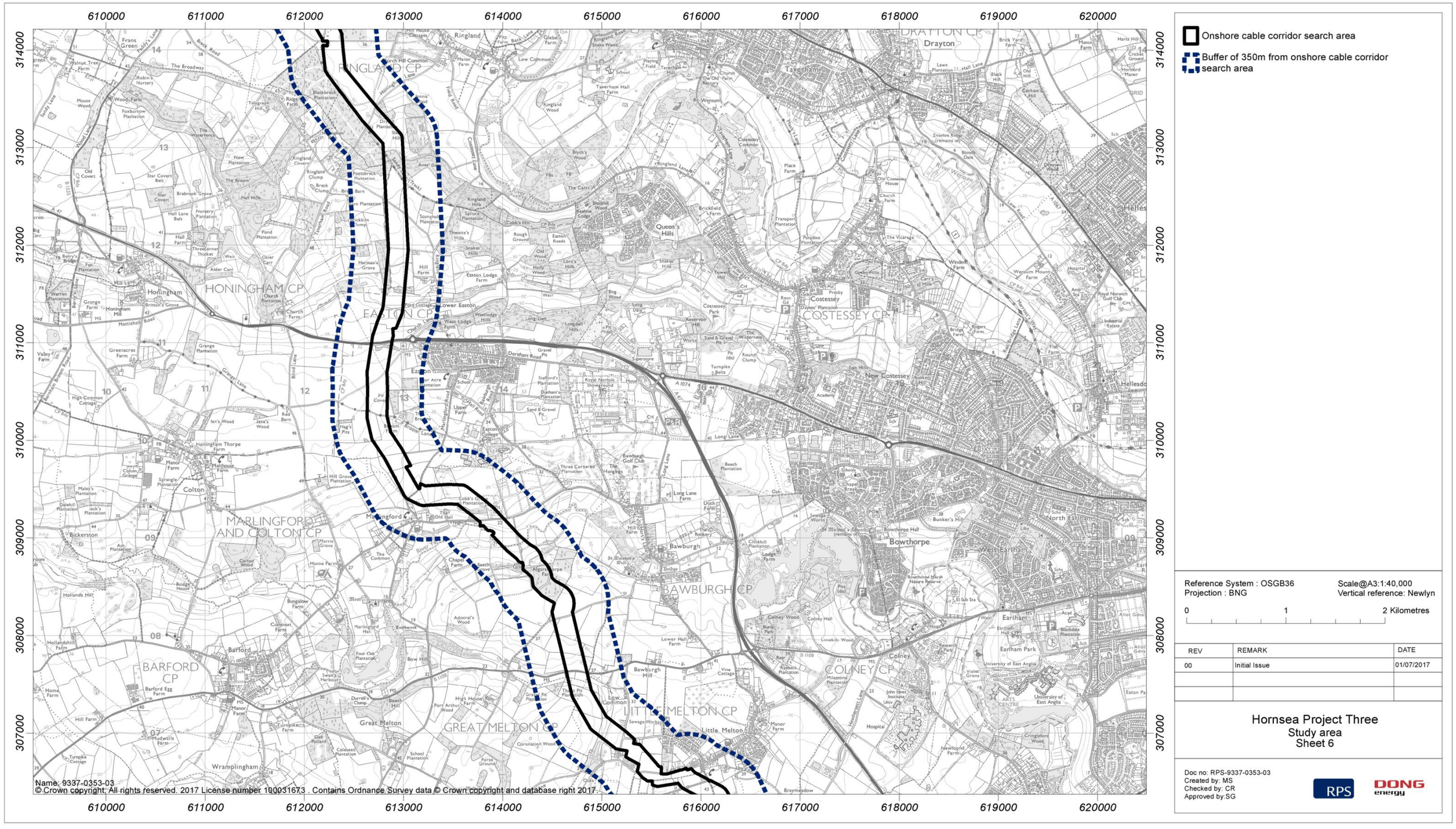


Figure 9.1: Hornsea Three air quality (construction dust assessment) study area.

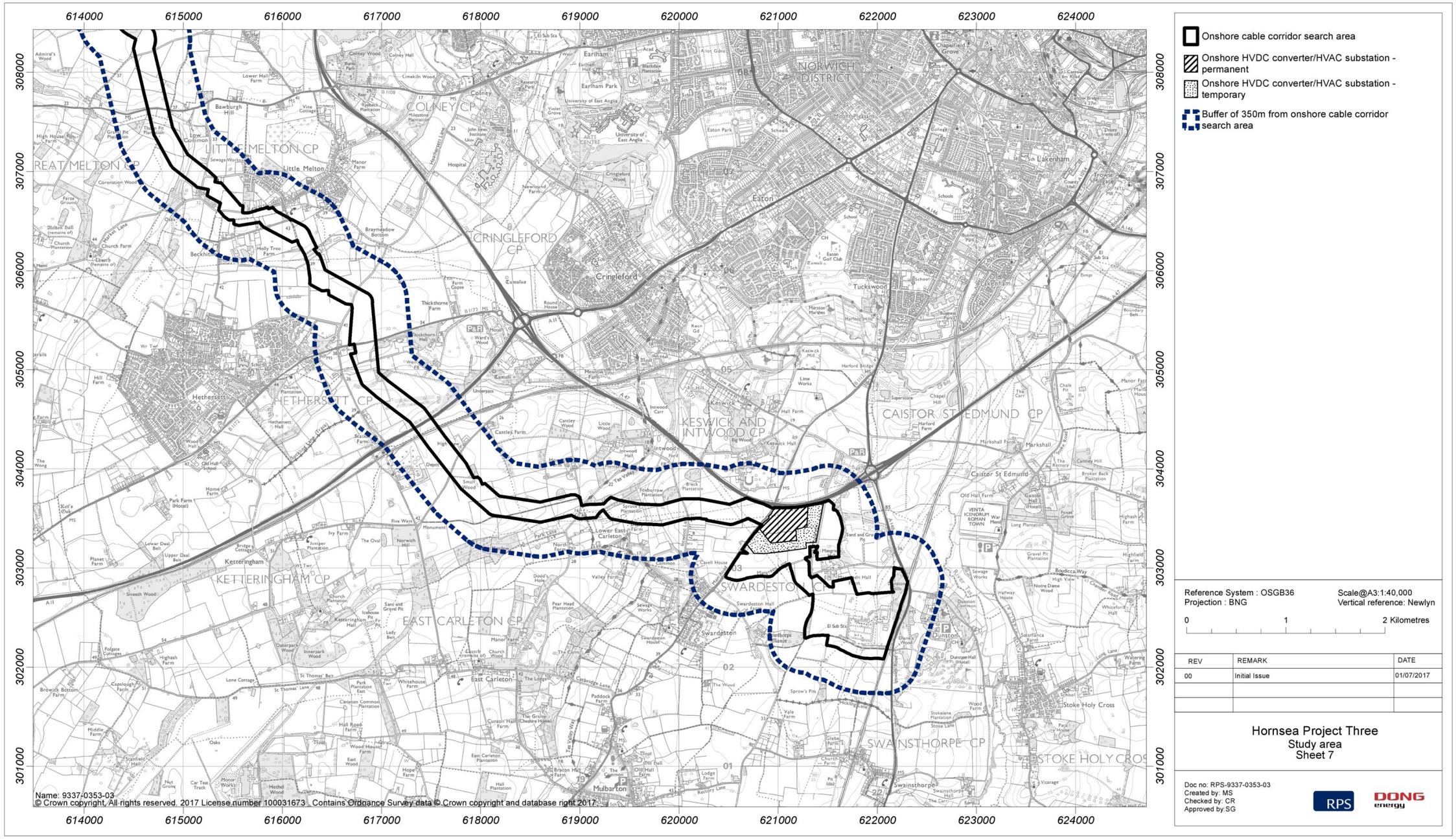


Figure 9.1: Hornsea Three air quality (construction dust assessment) study area.

9.4 Planning policy context

9.4.1.1 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to Air Quality, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1) (DECC, 2011a), the NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b) and the NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011c).

9.4.1.2 Specifically, the guidance provided within NPS EN-1, NPS EN-3 and NPS EN-5 was considered, in particular paragraphs 5.2.6 and 5.2.7 of NPS EN-1 (see Table 9.1 below). Other planning policy and guidance relevant to this chapter includes:

- National Planning Policy Framework (NPPF) (2012);
- Web based Planning Practice Guidance is provided by the Department for Communities and Local Government (DCLG); and
- North Norfolk District Council Core Strategy (2008).

Table 9.1: Summary of NPS EN-1, NPS EN-3 and NPS EN-5 provisions relevant to air quality.

Summary of NPS EN-1, NPS EN-3 and NPS EN-5 provision	How and where considered in the PEIR
NPS EN-1 includes generic guidance on the assessment of air quality impacts for major energy projects: *"Where the project is likely to have adverse effects on air quality the applicant should undertake an assessment of the impacts of the proposed project as part of the Environmental Statement (ES)."* (paragraph 5.2.6). This requires the Environmental Statement to describe: *"any significant air emissions, their mitigation and any residual effects, distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project; the predicted absolute emission levels of the proposed project, after mitigation methods have been applied; existing air quality levels and the relative change in air quality from existing levels; and any potential eutrophication impacts."* (paragraph 5.2.7).	The potential air quality impacts as a result of Hornsea Three have been described and considered within this chapter. This chapter focuses on the potential impacts from dusts generated by the scheme and considers mitigation and residual effects. Impacts from traffic will be assessed in the Environmental Statement. The existing air quality levels have been described (see paragraphs 9.8.1 to 9.8.1.2). The predicted impacts on local air quality from dust generated during the construction phase have been described (see paragraphs 9.10.1.1 to 9.10.3.79.10.3.7). NPS EN-1 states that "*Eutrophication from air pollution results mainly from emissions of NOx and ammonia*." Emissions of these pollutants are not considered significant and potential eutrophication impacts have been scoped out of this assessment.
NPS EN-1 and NPS EN-3 refer to NPS EN-5 as the primary guidance document in relation to onshore grid connection infrastructure. Air quality is not identified as a key impact for such infrastructure within either NPS EN-5 or the offshore wind farm section of NPS EN-3.	Air quality has been considered despite the fact that it is not identified as a key impact for such infrastructure.

9.4.1.3 NPS EN-3 also highlights a number of factors relating to the determination of an application and in relation to mitigation. The only relevant point for air quality is summarised in Table 9.2 below.

Table 9.2: Summary of NPS EN-3 policy on decision-making relevant to air quality.

Summary of NPS EN-3 policy on decision making (and mitigation)	How and where considered in the PEIR
EN-3 states that *"Where the applicant has identified a precise route for the cable from the wind farm to a precise location for the onshore substation and connection to the transmission network, the EIA should assess the effects of the cable."* (paragraph 2.6.37). This guidance applies to all the disciplines within the EIA and is not specific to air quality impact assessment.	The air quality assessment considers potential impacts of dusts on sensitive receptors within the air quality (construction dust) study area (within which the cable route is situated).

9.4.2 National Planning Policy Framework (2012)

9.4.2.1 The National Planning Policy Framework (NPPF) (DCLG, 2012) states at paragraph 109 that *"the planning system should contribute to and enhance the natural and local environment by … preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution."* It goes on to state at paragraph 124 that *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan"*.

9.4.2.2 At paragraph 120, the NPPF also states: *"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account".* Hornsea Three would not generate operational emissions of air pollutants, beyond those associated with vehicle movements.

9.4.2.3 In March 2014, the Department for Communities and Local Government (DCLG) launched the National Planning Practice Guidance (NPPG) as a web-based resource. The air quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment (DCLG, 2014).

9.4.2.4 The NPPG advises that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

9.4.2.5 The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

9.4.2.6 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK (EPUK) and the Institute of Air Quality Management. However, the NPPG does advise that *"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific."*

9.4.2.7 The NPPG provides advice on how air quality impacts can be mitigated and notes *"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met. Examples of mitigation include… controlling dust and emissions from construction, operation and demolition…".*

9.4.3 Local planning policy

9.4.3.1 The North Norfolk Local Plan (North Norfolk District Council, 2008) sets out a number of aims and objectives, including *"To improve river water quality and minimise air, land and water pollution"*.

9.4.3.2 The Local Plan also sets out Policy EN 13, which states that *"proposals will only be permitted where, individuals or cumulatively, there are no unacceptable impacts on; … air quality"*.

9.4.3.3 The Broadland District Council and South Norfolk District Council have set out their strategic policies in a Joint Core Strategy Development Partnership Document together with Norwich City Council (Greater Norwich Growth Board, 2014). The Joint Core Strategy Development Partnership Document (adopted 2011) does not include any specific policies relating to air quality.

9.5 Legislation and Guidance

9.5.1.1 The European Union Framework Directive 2008/50/EC (European Council, 2008) relating to ambient air quality assessment and management aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

9.5.1.2 The Air Quality Standards Regulations 2010 (AQS Regulations) implement air quality limit values prescribed by Directive 2008/50/EC. The limit values are legally binding and the Secretary of State, on behalf of the UK Government, is responsible for their implementation.

9.5.1.3 The current UK Air Quality Strategy (AQS) (Defra, 2007) describes the Government's strategy for improving air quality in the UK. One of the key aspects of the strategy was the setting of air quality objectives for pollutants. The objectives are statements of policy intentions made by the UK Government and the devolved administrations. The AQS objectives are based on the evidence supporting the identification of Directive 2008/50 limit values and, in some instances, are more onerous than the requirements established by that Directive.

9.5.1.4 The limit values and relevant objectives for nitrogen dioxide (NO_2) and particulate matter are summarised in Table 9.3 and are framed as a mass concentration per unit volume of air ($\mu g.m^{-3}$). The deposition of dust from the air onto surfaces can be measured in terms of mass per unit area over a period of time (e.g. $mg.m^{-2}.day^{-1}$).

9.5.1.5 Under the AQS, local authorities have a duty to review and assess local air quality within their administrative area. The review and assessment process requires local authorities to undertake a phased assessment to identify any areas likely to experience exceedances of the air quality objectives. Historically, the process has involved regular Progress Reports and Updating and Screening Assessments. From 2017 onwards, Annual Status Reports must be published. If required, the authority must progress to Detailed Assessments and Further Assessments. Where an objective is unlikely to be met by the relevant deadline, local authorities must designate the relevant area as an Air Quality Management Area (AQMA). The Environment Act 1995 requires those authorities that have designated AQMAs to produce an Air Quality Action Plan, with the aim of achieving the air quality standards and objectives in the designated area.

9.5.1.6 Environmental Protection UK (EPUK) guidance on the assessment of air quality effects (EPUK and IAQM, 2017) indicates that air quality assessment of construction traffic is likely to be necessary for those large, long-term construction sites that would generate large HGV flows (of over 100 movements per day) over a period of a year or more. Details of the traffic likely to be generated by the onshore elements of Hornsea Three will be set out in chapter 7: Traffic and Transport of the Environmental Statement. This will indicate whether the EPUK thresholds for assessment of air quality impacts from construction traffic (HGV flows of over 100 movements per day over a period of a year or more) are likely to be exceeded along road links during the construction phase of Hornsea Three.

Table 9.3: Monitored annual-mean NO_2 concentrations ($\mu g.m^{-3}$).

Pollutant	Averaging Period	Objectives/Limit Values	Not to be exceeded more than	Target Date
Nitrogen dioxide (NO_2)	1 hour	200 $\mu g.m^{-3}$	18 times per calendar year.	N/A
	Annual	40 $\mu g.m^{-3}$	N/A	N/A
Particulate Matter (PM_{10})	24 hour	50 $\mu g.m^{-3}$	35 times per calendar year.	N/A
	Annual	40 $\mu g.m^{-3}$	N/A	N/A
Particulate Matter ($PM_{2.5}$)	Annual	Target of 15% reduction in concentrations at urban background locations.	N/A	Between 2010 and 2020 (a).
		Variable target of up to 20% reduction in concentrations at urban background locations (c).	N/A	Between 2010 and 2020 (b).
	Annual	25 $\mu g.m^{-3}$	N/A	01.01.2020 (a)
		25 $\mu g.m^{-3}$	N/A	01.01.2015 (b)

$\mu g.m^{-3}$ – micrograms per cubic meter.
PM_{10} refers to particles with a mean aerodynamic diameter of up to 10 µm.
$PM_{2.5}$ refers to particles with a mean aerodynamic diameter of up to 2.5 µm.
(a) Target date set in UK Air Quality Strategy 2007.
(b) Target date set in Air Quality Standards Regulations 2010.
(c) Aim to not exceed 18 $\mu g.m^{-3}$ by 2020.

9.5.1.7 The Institute of Air Quality Management (IAQM) has issued guidance on assessment of dust, the latest guidance being Guidance on the assessment of dust from demolition and construction (IAQM, 2014), which replaces Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance (IAQM, 2012). The methodology in the revised 2014 guidance is based on the same principles as the previous version; however, there are a few notable differences: the latest version does not assess the risk of impacts at specific receptor locations; rather it assesses the overall risk of impacts on the local area (based on the same principles); additionally, the revised guidance is more explicit in how it distinguishes the separate impacts from the different construction activities (demolition, earthworks, construction, and track out) and on the impacts at ecological receptors.

9.5.1.8 The aim of the latest guidance continues to be to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM guidance document states: *"The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified"* (IAQM, 2014, page 4).

9.5.1.9 The IAQM guidance provides a methodological framework, but notes that professional judgement is required to assess effects: "This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified" (IAQM, 2014, page 30).

9.6 Consultation

9.6.1.1 A summary of the key issues raised during consultation specific to air quality is outlined below, together with how these issues have been considered in the production of this PEIR and how these issues have been addressed within this PEIR or how the Applicant has had regard to them.

Table 9.4: Summary of key consultation issues raised during consultation activities undertaken for Hornsea Three relevant to air quality.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
December 2016	PINS Scoping Opinion	The Secretary of State recommends that the study area, methodology and choice of air quality and health receptors are agreed with the relevant consultees and should have regard to recognised standards and guidance. The Scoping Report confirms that the Applicant does not propose to undertaken air quality monitoring to ascertain the baseline; instead the approach is to rely upon existing publically available data sources. The Applicant should ensure that the air quality data used to inform the baseline assessment is up to date, sufficiently detailed and has adequate coverage of the study area. Table 12.13 makes reference to the demolition of buildings as part of the decommissioning phase. It is not clear that this has been consistently considered in decommissioning activities have been consistently considered throughout the Scoping Report. Such works should be included in the list of works in the project description to ensure that all sections of the Scoping Opinion assess the demolition impacts. It also mentioned buildings to be constructed. Should these be buildings which are not substations, these should also be listed in the works. The Environmental Statement should assess decommissioning activities consistently for each topic. Table 12.13 references the demolition of buildings; however it is not clear that this has been consistently considered throughout the Scoping Report. Such works should be included in the list of works in the project description to ensure that all sections of the Scoping Opinion assess the demolition impacts. It also mentioned buildings to be constructed. Should these be building which are not substations, these should also be listed in the works. Table 12.13 makes reference to 'dust' instead of 'dust' throughout. This should be rectified. The Secretary of State welcomes the provision of a Code of Construction Practice (CoCP) and decommissioning plan to be developed as part of the DCO application. The Secretary of State recommends that a draft version of these plans is provided with the DCO application. The Applicant should ensure that any specific measures relied upon to support the outcome of the assessment are appropriately detailed and secured in the CoCP or other suitable plans.	This air quality assessment has been based on recognised standards and practice. Suitable and sufficient baseline data has been used. The approach to the air quality assessment will be developed in consultation with Norfolk County Council and the district authorities prior to carrying out the assessment. Agreement will be sought on: • The acceptability of the methodology used in the PEIR for assessing dust in the construction, operational and decommissioning phases; and • An appropriate methodology for assessing vehicle emissions in the construction, operational and decommissioning phases. Mitigation measures for the decommissioning phase will be captured in a decommissioning plan. The draft content of the decommissioning plan will be set out in the Environmental Statement however the plan itself will not be submitted at the application stage.

9.7 Methodology to inform the baseline

9.7.1 Desktop study

9.7.1.1 Information on air quality within the air quality (construction dust assessment) study area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 9.5 below.

Table 9.5: Summary of key sources for air quality.

Title	Source	Year	Author
Defra, which produces projections of pollutant concentrations for years from 2013 to 2030 for each 1 km grid square in the UK.	https://uk-air.defra.gov.uk/data/laqm-background-home	2013	Defra
Air Quality Review and Assessment documents prepared by North Norfolk District Council.	https://www.north-norfolk.gov.uk/media/2651/nndc_air_quality_progress_report_.pdf	2013	North Norfolk District Council
Air Quality Review and Assessment documents prepared by Broadlands District Council.	https://www.broadland.gov.uk/downloads/file/924/updating_and_screening_assessment_2015	2015	Broadland District Council
Air Quality Review and Assessment documents prepared by South Norfolk District Council.	https://www.south-norfolk.gov.uk/sites/default/files/Air_Quality_Report_2015.pdf	2015	South Norfolk District Council

9.7.2 Site specific surveys

9.7.2.1 Site specific air quality surveys are not considered to be necessary to characterise the baseline conditions. National Planning Practice Guidance, EPUK and Institute of Air Quality Management (IAQM) guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM.TG16 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: *"Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality"*. The baseline levels of dust and traffic pollutants have been established for this assessment in accordance with the above guidance, using publically available data. Traffic surveys are proposed in chapter 7: Traffic and Transport which will predict the changes in traffic levels during construction. This information will be used in the Environmental Statement to assess emissions from construction traffic.

9.8 Baseline environment

9.8.1 Air quality

9.8.1.1 This section reviews the air quality conditions within the air quality (construction dust assessment) study area. The onshore assessment commences at Mean High Water Spring (MHWS) and does not consider the intertidal zone. There are no sensitive receptors in the intertidal zone due to the damp conditions.

9.8.1.2 Air quality in North Norfolk, Broadland and South Norfolk is generally very good based on publically available data published by Defra and BDC, North Norfolk District Council, and South Norfolk District Council. There are no designated AQMAs within these districts, as concentrations of all pollutants are below the relevant objective and limit values. Therefore, there are no AQMAs within the air quality (construction dust assessment) study area.

9.8.1.3 Baseline data has been obtained for particulate matter (PM_{10} and $PM_{2.5}$) and NO_2 which has been used to inform the assessment of construction dust and vehicle emissions. The assessment of vehicle emissions will be reported in the Environmental Statement.

9.8.2 Baseline nitrogen dioxide (NO_2) monitoring data

9.8.2.1 North Norfolk District Council carries out diffusion tube monitoring in one urban background location. The most recent measured annual-mean concentrations measured at the urban background location are shown in Table 9.6. Broadland District Council and South Norfolk District Council do not monitor NO_2 background locations.

Table 9.6: Monitored annual-mean NO_2 concentrations ($\mu g.m^{-3}$).

Site Location	Monitored annual-mean background concentrations ($\mu g.m^{-3}$)				
	2009	2010	2011	2012	2013
Hoveton 11 (urban background)	12.5	20.5	18.1	14.7	15.1

9.8.2.2 The monitored annual-mean NO_2 concentrations range from 12.5 to 20.5 $\mu g.m^{-3}$, which are well below the AQS objective of 40 $\mu g.m^{-3}$.

9.8.3 Defra NO_2 background data

9.8.3.1 Defra provides estimates of NO_2 concentrations across the UK on maps with a spatial resolution of 1 km^2, for each year from 2013 to 2030. The average annual-mean NO_2 concentration estimate in 2013 for the onshore elements of Hornsea Three has been calculated. The overall average background Defra pollutant concentration estimate of NO_2 is provided in Table 9.7.

Table 9.7: Defra Mapped Annual-Mean Background NO_2 Concentration Estimate ($\mu g.m^{-3}$).

Pollutant	Defra mapped background NO_2 concentration estimate for 2013 ($\mu g.m^{-3}$)
NO_2	10.3

9.8.3.2 The average estimated background Defra NO_2 concentration of 10.3 $\mu g.m^{-3}$ is well below the annual mean AQS objective of 40 $\mu g.m^{-3}$.

9.8.4 Selection of appropriate background NO_2 concentration

9.8.4.1 Monitoring data indicates that NO_2 concentrations are between 12.5 to 20.5 $\mu g.m^{-3}$ at the Hoveton urban background location (NGR 631129 318621). The Defra estimate of background concentration in the area of interest is 10.3 $\mu g.m^{-3}$ (Table 9.5). This estimate is reasonable, as total nitrogen oxides (NO_x) concentrations in rural locations are likely to be even lower than urban background locations. The Defra background concentration estimate of 10.3 $\mu g.m^{-3}$ has therefore been used to set the baseline for NO_2 in this assessment.

9.8.4.2 Historically, the view has been that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. However, the results of recent monitoring across the UK suggest that background annual-mean NO_2 concentrations have not decreased in line with expectations. Therefore, to provide a conservative assessment, annual-mean background NO_2 concentrations have not been reduced for future years and the Defra estimate for the background for 2013, 10.3 $\mu g.m^{-3}$, has been used to set the background for the assessment.

9.8.5 Baseline Particulate Matter (PM_{10} and $PM_{2.5}$)

9.8.5.1 North Norfolk District Council, Broadlands District Council and South Norfolk District Council do not monitor PM_{10} or $PM_{2.5}$.

Defra particulate matter background data

9.8.5.2 The average annual-mean PM_{10} and $PM_{2.5}$ concentration estimate in 2013 for the air quality (construction dust assessment) study area has been calculated. The overall average background Defra pollutant concentration estimates of PM_{10} and $PM_{2.5}$ are provided in Table 9.8.

Table 9.8: Defra Mapped Annual-Mean Background PM_{10} and $PM_{2.5}$ Concentration Estimates ($\mu g.m^{-3}$).

Pollutant	Defra mapped background PM_{10} and $PM_{2.5}$ concentration estimate for 2013 ($\mu g.m^{-3}$)
PM_{10}	16.9
$PM_{2.5}$	11.6

9.8.5.3 The average estimated background Defra concentrations of PM_{10} and $PM_{2.5}$ are well below the annual mean objectives of 40 $\mu g.m^{-3}$ and 25 $\mu g.m^{-3}$, respectively.

9.8.6 Selection of appropriate background particulate matter concentration

9.8.6.1 In the absence of PM_{10} and $PM_{2.5}$ monitoring at this site, the background annual-mean concentration within the air quality (construction dust assessment) study area has been derived from the Defra mapped background concentration estimate.

9.9 Key parameters for assessment

9.9.1 Maximum design scenario

9.9.1.1 The maximum design scenarios identified in Table 9.9 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (volume 1, chapter 3: Project Description). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope, to that assessed here be taken forward in the final design scheme.

9.9.2 Impacts scoped out of the assessment

9.9.2.1 On the basis of the baseline environment and the project description outlined in volume 1, chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for air quality. These impacts are outlined, together with a justification for scoping them out, in Table 9.10.

Table 9.9: Maximum design scenario considered for the assessment of potential impacts on air quality.

Potential impact	Maximum design scenario	Justification
Construction phase		
The temporary impacts of construction at the Hornsea Three landfall, the cable route and construction site access and the onshore HVAC booster station and HVDC converter/HVAC substation may affect receptors sensitive to dust (human and ecological).	<u>Hornsea Three landfall</u> Open cut techniques installing up to eight cables with a corridor up to 20 m either side of each cable. The width of the corridor at landfall would be up to 20 m either side of each cable. Up to eight transition joint bays of total up to 2,000 m^2 (250 m^2 x 8). <u>Onshore export cable corridor</u> Temporary onshore cable corridor area is 80 m wide and 55 km long (including 60 m wide permanent onshore cable corridor (wider where obstacles occur)). Up to six cable trenches (each containing one circuit) each trench is 5 m wide and 2 m deep. Depth of stabilised backfill up to 1.5 m. Up to 330 junction bays and link boxes. Closest separation distance between junction bay and link box: - 750 m. Up to 74,250 m^2 area required for junction bays (based on 330 junction bays (each junction bay is 9 m x 25 m)). Up to 2,970 m^2 area required for link boxes (based on 330 link boxes (each link box: is 3 m x 3 m)). Up to two temporary haul roads 5 m wide (7 m wide at passing places) constructed using soil stabilisation. Up to 50 HDD crossings. A compound would be located at both ends of the HDD crossing each with a footprint of up to 4,900 m^2 (70 m x 70 m) with permeable surfacing. <u>Onshore HVAC booster station</u> Permanent area of site is 25,000 m^2 plus a temporary works area up to 25,000 m^2. Building scenario with the largest footprint - single building with area of 4,500 m^2 (150 m length and 30 m width) and height up to 12.5 m. <u>Onshore HVDC converter/HVAC substation</u> Permanent area of site is 128,000 m^2 (including an area which may be used for landscaping) plus a temporary works area of 100,000 m^2. The transmission option with the greatest number of buildings and largest footprint is the HVDC converter station – up to five buildings. The main building (single building scenario) for the HVDC converter station will have a footprint of 11,250 m^2 (75 m x 150 m). Dimensions for the multiple building scenarios would be reduced proportionately but the overall footprint would be the same. The maximum onshore construction programme (including all phases and gaps between phases) will be up to 11 years.	The maximum design scenario for construction dust impacts would be the HVAC transmission option due to the greater number of cable trenches required and the potential need to construct the onshore HVAC booster station as this would result in the largest area of ground disturbance and therefore the greatest potential for dust generation. The onshore HVDC converter station represents the maximum design scenario as this has the greatest number of buildings and largest footprint and therefore, the largest disturbance from the construction of foundations. The longest onshore construction programme (i.e. 11 years) represents the maximum design scenario as this is the longest duration over which dust generation from construction may occur. The IAQM guidance (IAQM, 2014) requires that demolition is considered as a part of the overall construction process. Whilst no specific demolition activities have been identified in the Hornsea Three design, demolition has been considered in the dust assessment as a maximum design scenario in order to comply with industry guidance.

Potential impact	Maximum design scenario	Justification
Decommissioning phase		
The temporary impacts of decommissioning of the onshore cable route and onshore HVAC booster station and HVDC converter/HVAC substation may affect receptors sensitive to dust (human and ecological).	Cables to be left in place in ground, with end sealed and securely buried.	To minimise the environmental disturbance during decommissioning the onshore cables will be left in place in the ground with the cable ends cut at the onshore substation, sealed and securely buried as a precautionary measure. No works are currently expected to be required for decommissioning along the onshore cable route corridor.
	All elements of the onshore HVAC booster station and HVDC converter/HVAC substation would be removed, site reinstated to original condition or for alternative use.	In practice impacts from decommissioning are likely to be less than during construction. Therefore, assessing impacts during decommissioning on the same basis as impacts during the construction phase represents worst case.

Table 9.10: Impacts scoped out of the assessment for air quality.

Potential impact	Justification
Construction phase	
National Policy Statement (NPS) EN-1 states that "*Eutrophication from air pollution results mainly from emissions of NOx and ammonia*".	Potential eutrophication impacts have been scoped out of this assessment. Emissions of NOx and ammonia are not expected to be significant and will be confirmed in the Environmental Statement.
Operation and maintenance phase	
The impacts due to operation of the underground onshore cables onshore HVAC booster station and HVDC converter/HVAC substation may affect human and ecological receptors.	The operation of the HVAC booster station and the HVDC converter/HVAC substation is not expected to generate any air emissions during normal operational activities. However, it may generate a small number of staff trips with occasional maintenance vehicle movements. Any routine maintenance of the cables during the operational phase would be limited to occasional site inspections at link boxes and therefore, are unlikely to result in any air quality impacts. The number of vehicle movements generated during this phase is anticipated to be negligible, and the traffic impacts would be considerably smaller than those for the construction phase.
National Policy Statement (NPS) EN-1 states that "Eutrophication from air pollution results mainly from emissions of NOx and ammonia."	Potential eutrophication impacts have been scoped out of this assessment. Emissions of NOx and ammonia are not expected to be significant and will be confirmed in the Environmental Statement.
Decommissioning phase	
The temporary impacts due to traffic may affect human and ecological receptors during the decommissioning phases.	The decommissioning of the cable route and the HVDC converter/HVAC substation is expected to generate significantly less traffic than the construction phase. The number of vehicle movements generated during this phase is anticipated to be negligible, and an assessment of traffic impacts has been scoped out for this phase.
National Policy Statement (NPS) EN-1 states that "Eutrophication from air pollution results mainly from emissions of NOx and ammonia."	Potential eutrophication impacts have been scoped out of this assessment. Emissions of NOx and ammonia are not expected to be significant and will be confirmed in the Environmental Statement.

9.10 Impact assessment criteria

9.10.1 Assessment of Construction Dust

9.10.1.1 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter (British Standards Institute, 1983). Particles greater than 75 µm in diameter are termed grit rather than dust.

9.10.1.2 Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

9.10.1.3 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, such deposited dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

9.10.1.4 Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for deposited dust annoyance or nuisance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

9.10.1.5 Consistent with the recommendations in the IAQM guidance, a risk-based assessment has been undertaken for Hornsea Three, using the well-established source-pathway-receptor approach:

- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.
- The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the dust impact risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

9.10.1.6 The organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of in this assessment have professional affiliations that include Fellow of the Institute of Air Quality Management, Chartered Chemist, Chartered Scientist, Chartered Environmentalist and Member of the Royal Society of Chemistry and have the required academic qualifications for these professional bodies.

9.10.2 Source Magnitude

9.10.2.1 The IAQM guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and track-out. These example dust emission magnitudes are based on the site area, building volume, number of Heavy Duty Vehicle movements generated by the activities and the materials used. These example magnitudes have been combined with the duration of construction activities and the resulting ranking of source magnitude is set out in Table 9.11.

Table 9.11: Risk allocation – source (dust emission magnitude).

Features of the source of dust emissions	Dust emission magnitude
Demolition – building over 50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level. **Earthworks** – total site area over 10,000 m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved > 100,000 tonnes. **Construction** – total building volume over 100,000 m^3, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years. **Track-out** – 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition – building between 20,000 to 50,000 m^3, potentially dusty construction material and demolition activities 10 to 20 m above ground level. **Earthworks** – total site area between 2,500 to 10,000 m^2, moderately dusty soil type (e.g. silt), five to ten heavy earth moving vehicles active at any one time, formation of bunds 4 to 8 m in height, total material moved 20,000 to 100,000 tonnes. **Construction** – total building volume between 25,000 and 100,000 m^3, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. Period of construction activities between one and two years. **Track-out** – 10 to 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.	Medium

Features of the source of dust emissions	Dust emission magnitude
Demolition – building less than 20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during winter months. **Earthworks** – total site area less than 2,500 m^2. Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 10,000 tonnes earthworks during winter months. **Construction** – total building volume below 25,000 m^3, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year. **Track-out** – < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	Small

9.10.3 Pathway and receptor – sensitivity of the area

9.10.3.1 Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.

9.10.3.2 As noted in the IAQM guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however, there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors. Table 9.12 and Table 9.13 set out the IAQM basis for categorising the sensitivity of people, property and ecological receptors to dust and PM_{10}.

Table 9.12: Sensitivities of people and property receptors to dust.

Receptor	Sensitivity
Principles:- • Users can reasonably expect enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative examples:- • Residential properties. • Museums and other culturally important collections. • Medium and long-term car parks and car showrooms.	High
Principles:- • Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative examples:- • Parks, places of work.	Medium
Principles:- • The enjoyment of amenity would not reasonably be expected; or • There is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative examples:- • Playing fields, farmland (unless commercially-sensitive horticultural) • Footpaths and roads • Short-term car parks.	Low

Table 9.13: Sensitivities of people and property receptors to PM_{10}.

Receptor	Sensitivity
Principles:- • Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples:- • Residential properties. • Schools, hospitals and residential care homes.	High
Principles:- • Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples:- • Office and shop workers (but generally excludes workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).	Medium
Principles:- • Locations where human exposure is transient. Indicative examples:- • Public footpaths, playing fields, parks. • Shopping streets.	Low

9.10.3.3 Table 9.14 sets out the basis for determining the sensitivity of ecological receptors to dust.

Table 9.14: Sensitivities of ecological receptors to dust.

Receptor	Sensitivity
Principles:- • Locations with an international or national designation and the designated features may be affected by dust soiling; or • Locations where there is a community of a particularly dust sensitive species such as vascular plant species included in the Red Data List For Great Britain. Examples:- • Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	High
Principles:- • Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition. Examples:- • Site of Special Scientific Interest (SSSI) with dust sensitive features.	Medium
Principles:- • Locations with a local designation where the features may be affected by dust deposition Examples:- • A Local Nature Reserve, with dust sensitive features.	Low

9.10.3.4 The IAQM methodology combines consideration of the pathway and receptor to derive the sensitivity of the area. Table 9.15, Table 9.16 and Table 9.17 show how the sensitivity of the area has been derived for this assessment using the IAQM approach.

Table 9.15: Sensitivity of the Area to Dust Soiling Effects on People and Property.

Receptor Sensitivity	Number of Receptors [a]	Distance from the Source (m) [b]			
		<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

Receptor Sensitivity	Number of Receptors [a]	Distance from the Source (m) [b]
The sensitivity of the area has been derived for demolition, construction, earthworks and trackout. a The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded. b For trackout, the distances have been 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, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.		

Table 9.16: Sensitivity of the Area to Human Health Impacts.

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d]				
			<20	<50	<100	<200	<350
High	> 32 µg.m^{-3}	>100	High	High	High	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
	< 28 µg.m^{-3}	>1	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Receptor	Annual Mean PM_{10}	Number of	Distance from the Source (m) [d]
The sensitivity of the area has been derived for demolition, construction, earthworks and trackout. a This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland. b The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded. c For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors. d For trackout, the distances have been 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, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.			

Table 9.17: Sensitivity of the Area to Ecological Impacts.

Receptor Sensitivity	Distance from the Source (m) [a]	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low
The sensitivity of the area has been derived for demolition, construction, earthworks and trackout and for each designated site. a Only the highest level of area sensitivity has been recorded.		

9.10.3.5 The IAQM lists the following additional factors that can potentially affect the sensitivity of the area and, where necessary, professional judgement has been used to adjust the sensitivity allocated to a particular area:

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

- Any known specific receptor sensitivities which are considered to go beyond the classifications given in the table above.

9.10.3.6 The matrices in Table 9.18, Table 9.19, Table 9.20 and Table 9.21 have been used to assign the risk for each activity, which has been used to determine the level of mitigation that should be applied. For those cases where the risk category is negligible, no dust controls beyond those required by legislation are considered necessary.

Table 9.18: 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 9.19: Risk of dust impacts – earthworks.

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 9.20: Risk of dust impacts – 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 9.21: 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

9.10.3.7 The dust risk categories that have been determined for each of the four activities above have been used to define the appropriate site-specific dust control measures based on those described in the IAQM guidance. The guidance states that provided the dust control measures are successfully implemented, the resultant effects of the dust exposure will normally be *"not significant"*.

9.11 Measures adopted as part of Hornsea Three

9.11.1.1 As part of the project design process, a number of designed-in measures have been proposed to reduce the potential for air quality impacts (see Table 9.22). This approach has been employed in order to demonstrate commitment to measures by including them in the design of Hornsea Three and have therefore been considered in the assessment presented in section 9.12. These measures are considered standard industry practice for this type of development. Assessment of sensitivity, magnitude and therefore, significance includes implementation of these measures. The construction measures set out below would be contained within a Code of Construction Practice which will accompany the Environmental Statement.

9.11.2 Construction Phase Dust

9.11.2.1 The IAQM dust guidance lists control measures for low, medium and high dust risks which would be adopted for Hornsea Three where possible.

Table 9.22: Designed-in dust control measures adopted as part of Hornsea Three.

Measures adopted as part of Hornsea Three	Justification
Communications Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. Display the head or regional office contact information.	To facilitate community engagement and a proactive approach to complaints regarding nuisance dusts.
Dust Management Develop and implement a Dust Management and Monitoring Plan (DMMP), 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 the IAQM guidance. The 'desirable' measures should be included as appropriate for the site. The DMMP may also include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.	To document controls to prevent or control the generation and release of nuisance dusts during construction.
Site Management Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the 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 off-site, and the action taken to resolve the situation in the log book. Hold regular liaison meetings with other high risk construction sites within 500 m 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.	To facilitate community engagement and a proactive approach to complaints regarding nuisance dusts.
Monitoring Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary, with cleaning to be provided if necessary. Carry out regular site inspections to monitor compliance with the DMMP, record inspection results, and make an inspection log available to the local authority when asked. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	To verify the effective control of dust releases at the site.
Preparing and maintaining the site 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 extended 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 as described below. Cover, seed or fence stockpiles to prevent wind whipping.	To minimise generation of nuisance dusts during construction.
Operating vehicle/machinery and sustainable travel 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. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	To minimise generation of nuisance dusts during construction.
Operations 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/mitigation, 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.	To minimise generation of nuisance dusts during construction.
Waste management Avoid bonfires and burning of waste materials.	To minimise generation of nuisance dusts during construction.

Measures adopted as part of Hornsea Three	Justification
Measures specific to demolition Soft-strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, 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.	To minimise generation of nuisance dusts during demolition
Measures specific to earthworks Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. Only remove the cover in small areas during work and not all at once.	To minimise generation of nuisance dusts during construction.
Measures specific to construction Avoid scabbling (roughening of concrete surfaces) if possible. 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. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	To minimise generation of nuisance dusts during construction.
Measures specific to trackout 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.	To minimise generation of nuisance dusts during construction.

9.12 Assessment of significance

9.12.1 Construction phase

9.12.1.1 The effects of the construction of Hornsea Three have been assessed on air quality in the air quality (construction dust assessment) study area. The environmental impacts arising from the construction of Hornsea Three are listed in Table 9.9 above along with the maximum design scenario against which each construction phase impact has been assessed.

9.12.1.2 In accordance with the IAQM Guidance the magnitude of impact is detailed as worst case without any design measures detailed in Table 9.22. Nevertheless, the significance of effect given in the following section does assume that the design measures in Table 9.22 have been adopted reducing the significance in comparison to if no measures were adopted.

9.12.1.3 A description of the significance of effects upon air quality receptors caused by each identified impact is given below.

The temporary impacts of the construction at the Hornsea Three landfall, onshore cable route construction side accesses, of the onshore HVAC booster station and HVDC converter/HVAC substation may affect receptors sensitive to dust (human and ecological).

Magnitude of impact

9.12.1.4 In the absence of dust controls, the overall dust impact risk for demolition (any activity with low potential for dust release (e.g. metal cladding or timber)) and construction is medium, and the dust impact risk for earthworks and track-out is high based on the dust emission magnitudes shown below and the receptor sensitivities in the area. Taking the site as a whole, the risk is deemed to be **high.**

9.12.1.5 The IAQM Guidance (IAQM, 2014) requires demolition to be considered as part of the assessment of the overall construction process. Whilst no demolition works are currently anticipated, they have been included in the assessment in accordance with the guidance and following a precautionary approach. Therefore, the dust emission magnitude for the demolition phase is classified as small as per the IAQM Guidance (IAQM, 2014 p. 14).

9.12.1.6 The site area is in excess of 10,000 m^2 and the dust emission magnitude for the earthworks phase is therefore classified as large.

9.12.1.7 The total volume of the buildings to be constructed would be between 25,000 and 100,000 m^3, the dust emission magnitude for the construction phase is classified as medium.

9.12.1.8 In lieu of appropriate information, the maximum design scenario has been adopted (Table 9.11). The maximum number of outwards movements in any one day is in excess of 50 HDVs, and the dust emission magnitude for track-out is classified as large.

Table 9.23: Dust impact risk for demolition, earthworks, construction and trackout.

Potential impact	Source			
	Demolition	Earthworks	Construction	Trackout
Potential impact of dust soiling	Medium	High	Medium	High
Potential impact on human health	Negligible	Low	Low	Low
Potential impact on ecological receptors	Medium	High	Medium	High
Risk	**Medium**	**High**	**Medium**	**High**

Sensitivity of the receptor

9.12.1.9 All demolition, earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the site boundary have been identified. The IAQM methodology requires that the collective sensitivity of the surrounding area to demolition, construction and earthworks, is categorised. This has been carried out and is shown in Table 9.24 below.

Table 9.24: Sensitivity of the surrounding area for demolition, earthworks and construction.

Potential impact	Sensitivity of the surrounding area	Reason for sensitivity classification
Potential impact of dust soiling	High	There are between 10 and 100 high-sensitivity receptors within 20 m of the onshore elements of Hornsea Three.
Potential impact on human health	Low	There are between 10 and 100 high-sensitivity receptors within 20 m of the onshore elements of Hornsea Three.and existing PM_{10} concentrations are between 16 and 18 $\mu g.m^{-3}$.
Potential impact on ecological receptors	High	There are four ecological sites within the air quality (construction dust assessment) study area: • Kelling Heath SSSI • Booton Common SSSI and SAC • Alderford Common SSSI • River Wensum

9.12.1.10 The IAQM advises that trackout may occur on roads up to 500 m from the order limits, which covers an extensive area. The sensitivity of the area potentially impacted by trackout, which is defined as within 50 m of the edges of these roads, is summarised in below.

Table 9.25: Sensitivity of the surrounding area for trackout.

Potential impact	Sensitivity of the surrounding area	Reason for sensitivity classification
Potential impact of dust soiling	High	There are more than 100 high-sensitivity receptors within 50 m of the edge of roads within 500 m of the onshore elements of Hornsea Three.
Potential impact on human health	Low	There are more than 100 high sensitivity receptors within 50 m of the edge of roads within 500 m of the order limits and existing PM_{10} concentrations are between 16 and 18 $\mu g.m^{-3}$.
Potential impact on ecological receptors	High	There are six ecological sites within the study area; Kelling Heath SSSI, Edgfield Little Wood SSSI, Booton Common SSSI and SAC, Alderford Common SSSI, River Wensum.

9.12.1.11 The area within 20 m of the order limits is home to between 10 and 100 high-sensitivity receptors and on this basis the sensitivity of the surrounding area has been classified as high for potential impact of dust soiling. For potential impact to human health the sensitivity of the surrounding area has been classified as low. This is based on existing background concentrations of PM_{10} between 16 and 18 $\mu g.m^{-3}$. There are five ecological sites within the study area (Kelling Heath SSSI, Booton Common SSSI and SAC, Alderford Common SSSI and River Wensum), and the sensitivity of the surrounding area has been classified as high for potential impact to ecological receptors.

9.12.1.12 The area adjoining the routes for construction traffic is more densely populated with high sensitivity receptors and the sensitivity of the surrounding area has been classified as high for potential impact as dust soiling. Existing background concentrations on PM_{10} are between 16 and 18 $\mu g.m^{-3}$, and on this basis the sensitivity of the surrounding area has been classified as low for potential impact to human health. There are five ecological sites within the study area (Kelling Heath SSSI, Edgefield Little Wood SSSI, Booton Common SSSI and SAC, Alderford Common SSSI and River Wensum), and the sensitivity of the surrounding area has been classified as high for potential impact to ecological receptors.

Significance of effect

9.12.1.13 Table 9.26 summarises the risk of dust impacts associated with Hornsea Three for the four activities, taking into account the dust magnitudes and the sensitivity of the area.

Table 9.26: Dust impact risk for demolition, earthworks, construction and trackout.

Potential impact	Source			
	Demolition	Earthworks	Construction	Trackout
Potential impact of dust soiling	Medium	High	Medium	High
Potential impact on human health	Negligible	Low	Low	Low
Potential impact on ecological receptors	Medium	High	Medium	High
Risk	**Medium**	**High**	**Medium**	**High**

9.12.1.14 The dust control measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in Table 9.22. The IAQM guidance recommends that significance is only assigned to the effect after the recommended controls have assumed to be put in place.

9.12.1.15 The IAQM guidance states that "*For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'*." (IAQM, 2014, page 28).

9.12.1.16 The impact, which would affect receptors directly, is considered to be potentially high, before dust controls; however, with the application of controls recommended for high risk, the risk of impacts would be expected to be reduced such that the effect is not significant. Furthermore, the impact is predicted to be of local spatial extent, intermittent and effects are not anticipated to continue beyond the construction phase (i.e. they are predominantly reversible).

9.12.1.17 The effect with the IAQM recommended dust controls in place will, therefore, be not significant in EIA terms.

Further Mitigation

9.12.1.18 With IAQM recommended dust controls in place, the effects are not significant and further mitigation is not required. However, the effectiveness of the controls will be checked through an inspection/monitoring programme detailed below.

Future monitoring

9.12.1.19 The main influences on air quality arising from the construction phase of the onshore infrastructure for Hornsea Three are likely to be dust generating activities, and recommended monitoring methods include:

- Daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results;
- Regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions increase the frequency of inspections; and
- Record keeping: a record is to be kept of all dust and air quality complaints and any exceptional incidents that cause dust and/or air emissions, either on- or offsite, to identify cause(s), and appropriate measures taken to reduce emissions in a timely manner. These measures are also to be recorded.

9.12.1.20 The scope of monitoring will be discussed and agreed with Norfolk County Council and the district authorities.

9.12.2 Decommissioning phase

9.12.2.1 The effects of the decommissioning of Hornsea Three have been assessed on air quality in the air quality (construction dust assessment) study area. The environmental effects arising from the decommissioning of Hornsea Three are listed in Table 9.9 along with the maximum design scenario against which each decommissioning phase impact has been assessed.

The temporary impacts of decommissioning of the onshore cable route, onshore HVAC booster station and HVDC converter/HVAC substation may affect receptors sensitive to dust (human and ecological).

9.12.2.2 The temporary impacts of decommissioning of the onshore cable route, the onshore HVAC booster station and HVDC converter HVAC substation may affect receptors sensitive to dust (human and ecological).

Magnitude of impact

9.12.2.3 The magnitude of impacts of decommissioning activities are expected to be the same or similar to the impacts from construction at the onshore HVAC booster station and HVDC converter/HVAC substation. The magnitude of impacts from the decommissioning the onshore cable route is expected to be less than the impacts from construction.

Sensitivity of the receptor

9.12.2.4 The sensitivity of the receptor in the decommissioning phase is expected to be the same or similar to the sensitivity of the receptor in the construction phase at the substation and the Hornsea Three landfall.

Significance of effect

9.12.2.5 In the absence of dust controls, the overall dust impact risk for demolition and construction is medium, and the dust impact risk for earthworks and track-out is high. Taking the site as a whole, the risk is deemed to be high. The dust control measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in Table 9.22. As noted above, the IAQM guidance recommends that significance is only assigned to the effect after the recommended controls have assumed to be put in place.

9.12.2.6 The IAQM guidance states that *"For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'."* (IAQM, 2014, page 28).

9.12.2.7 The impact, which would affect receptors directly, is considered to be potentially high, before dust controls; however, with the application of controls, the risk of impacts would be expected to be reduced such that the effect is not significant. Furthermore, the impact is predicted to be of local spatial extent, short term duration, intermittent and effects are not anticipated to continue beyond the construction phase (i.e. they are predominantly reversible).

9.12.2.8 The effect with the IAQM recommended dust controls in place will, therefore, be not significant in EIA terms.

Further Mitigation

9.12.2.9 With IAQM recommended dust controls in place, the effects are not significant and further mitigation is not required. However, the effectiveness of the controls will be checked through an inspection/monitoring programme detailed below.

Future monitoring

9.12.2.10 The main influences on air quality arising from the decommissioning phase of the onshore infrastructure for Hornsea Three are likely to be dust generating activities, and recommended monitoring methods include:

- Daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results;
- Regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions increase the frequency of inspections; and
- Record keeping: a record is to be kept of all dust and air quality complaints and any exceptional incidents that cause dust and/or air emissions, either on- or offsite, to identify cause(s), and appropriate measures taken to reduce emissions in a timely manner. These measures are also to be recorded.

9.12.2.11 The scope of monitoring will be discussed and agreed with Norfolk County Council and the district authorities.

9.13 Cumulative Effect Assessment methodology

9.13.1 Screening of other projects and plans into the Cumulative Effect Assessment

9.13.1.1 The Cumulative Effect Assessment (CEA) takes into account the impact associated with Hornsea Three together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA long list' of projects (see volume 4, annex 5.1: Cumulative Effects Screening Matrix and Location of Schemes). Each project on the CEA long list has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

9.13.1.2 In undertaking the CEA for Hornsea Three, it is important to bear in mind that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside Hornsea Three. For example, relevant projects and plans that are already under construction are likely to contribute to cumulative impact with Hornsea Three (providing effect or spatial pathways exist), whereas projects and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant projects and plans considered cumulatively alongside Hornsea Three have been allocated into 'Tiers', reflecting their current stage within the planning and development process. This allows the CEA to present several future development scenarios, each with a differing potential for being ultimately built out. Appropriate weight may therefore be given to each Tier in the decision making process when considering the potential cumulative impact associated with Hornsea Three (e.g. it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). An explanation of each tier is included below:

- Tier 1: Hornsea Three considered alongside other project/plans currently under construction and/or those consented but not yet implemented, and/or those submitted but not yet determined and/or those currently operational that were not operational when baseline data was collected, and/or those that are operational but have an on-going impact;
- Tier 2: All projects/plans considered in Tier 1, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information, along with the planning register held by the relevant local planning authorities). Specifically, this Tier includes all projects where the developer has submitted a Scoping Report; and
- Tier 3: All projects/plans considered in Tier 2, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information). Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future but have not submitted a Scoping Report.

9.13.1.3 The schemes listed in Table 9.27 have been considered in the cumulative assessment for air quality. Detailed consideration of the potential for cumulative impacts has been limited to the construction phase, because air quality impacts from the operational phase of the proposed development are expected to be negligible. Effects during decommissioning would be of a similar nature to construction but would be lower and thus construction represents the worst case. The study area for cumulative assessment for air quality is 350 m from the onshore elements of Hornsea Three (see Figure 9.1). The basis for this is that at a distance greater than 350 m from construction activities the IAQM guidance advises that impacts are expected to be 'negligible'. Therefore, schemes within 350 m could have a cumulative impact with regard to air quality if their construction activity takes place during the same period.

9.13.1.4 The schemes listed in Table 9.27 have been considered in the cumulative assessment for air quality.

Table 9.27: List of other projects and plans considered within the CEA.

Tier	Phase	Project/Plan	Distance from Hornsea Three	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
1	***Residential Developments***						
	Construction	Land off Rectory Road and Holt Road, Edgefield, Norfolk	<1 km	Erection of twenty two residential units (Class C3) with associated highway and landscape works.	2020-2022	Yes	Yes
	Construction	Land North And South Of Dereham Road	<1 km	The erection of 890 dwellings; the creation of a village heart to feature an extended primary school, a new village hall, a retail store and areas of public open space; the relocation and increased capacity of the allotments; and associated infrastructure including public open space and highway works.	2018-2028	Yes	Yes
	Construction	Phase A1-A Land North Of Hethersett Village Centre Little Melton Road Hethersett Norfolk	<1 km	Residential development of 95 no dwellings with associated open space and infrastructure.	2018-2029	Yes	Yes
	Construction	Land South Of Ringwood Close Little Melton Norfolk	<1 km	Outline application for up to 20 residential units and associated highways works with all matters reserved	2020-2021	Yes	Yes
	Construction	1-4 Station Road, Swannington, NR9 5SY	<1km	Demolition of 4 Existing Units and Development of 10 Residential Units, Together with Associated Access (Outline)	2022-2023	Yes	Yes
	Industrial						
	Construction	Mangreen Quarry, Swardeston, Norwich, Norfolk	<1 km	(I) For a southern extension to Mangreen Quarry and ancillary works with progressive restoration to agriculture and nature conservation by the importation of inert restoration materials; (II) Retention of existing consented facilities at Mangreen Quarry; (III) Establishment of crossing point over Mangreen Lane; and (IV) Proposed variation to approved restoration scheme at Mangreen Quarry	2019-2024	Yes	Yes
	Operational				N/A	N/A	Yes
2	***Commercial***						
	Construction	Greater Norwich Food Enterprise Zone	<1 km	Land off Church Lane, Honingham	Pending consideration	Yes	Yes
3	***Offshore Wind Farm***						
	Construction	Norfolk Vanguard Offshore Windfarm	<1 km	Norfolk Vanguard is a proposed offshore windfarm with an approximate capacity of 1800 MW off the coast of Norfolk.	2020-2024	Yes	Yes

9.14 Cumulative Effect Assessment

9.14.1 Construction Phase

The temporary impacts of the construction at the Hornsea Three landfall, onshore cable route construction side accesses, of the onshore HVAC booster station and HVDC converter/HVAC substation may affect receptors sensitive to dust (human and ecological).

9.14.1.1 In the event that the construction programmes for other schemes overlap with Hornsea Three, the most significant issue in relation to local air quality effects is likely to be the temporary nuisance caused by the deposition of dust during the construction phase.

Magnitude of impact

9.14.1.2 With the IAQM recommended dust controls in place, the magnitude of impacts from cumulative developments are expected to be the same or similar to the impacts from construction at the onshore HVAC booster station, HVDC converter/HVAC substation and the Hornsea Three landfall.

Sensitivity of the receptor

9.14.1.3 The sensitivity of the receptor is expected to be the same or similar to the impacts from construction at onshore HVAC booster station, HVDC converter/HVAC substation and the Hornsea Three landfall.

Significance of effect

9.14.1.4 Provided that the cumulative developments use the recommended IAQM dust controls, the effect will be not significant in EIA terms.

Further Mitigation

9.14.1.5 With IAQM recommended dust controls in place, the effects are not significant and further mitigation is not required.

9.14.2 Decommissioning Phase

9.14.2.1 Detailed consideration of the potential for cumulative impacts has been limited to the construction phase, because effects during decommissioning would be of a similar nature to construction but would be lower and thus construction represents the maximum design scenario.

9.15 Transboundary effects

9.15.1.1 A screening of transboundary impacts has been carried out and is presented in volume 4, annex 5.3: Transboundary Impacts Screening Note. This screening exercise identified that there was no potential for significant transboundary effects with regard to air quality from Hornsea Three upon the interests of other EEA States.

9.16 Inter-related effects

9.16.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (construction, operational and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. subsea noise effects from piling, operational turbines, vessels and decommissioning).
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on air quality, such as construction dust and vehicle emissions, may interact to produce a different or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

9.16.1.2 A description of the likely inter-related effects arising from Hornsea Three on air quality is provided in chapter 12: Inter-Related Effects (Onshore).

9.17 Conclusion and summary

9.17.1.1 A risk-based assessment of potential impacts from construction dusts has been undertaken for demolition earthworks, construction and track-out development, using the IAQM method.

9.17.1.2 Using this approach, described in detail in section 9.10.1 the dust effects associated with construction activity after implementation of the proposed control measures would be not significant in EIA terms.

9.17.1.3 Receptors more than 350 m from the sources of emissions are unlikely to be affected by nuisance dust effects during the construction phase. Consequently, due to the large separation distance between the UK and other EEA States, the development is not likely to have a significant effect on the environment in another EEA State in terms of local air quality.

9.17.1.4 In the event that the construction programmes for cumulative developments overlap, the most significant issue in relation to local air quality effects is likely to be temporary disamenity caused by the deposition of dust during the construction phase and with appropriate dust controls, impacts could be expected to be minimal.

9.17.1.5 Assuming that the cumulative developments implement the recommended IAQM dust controls the magnitude of impacts from cumulative developments are expected to be the same or similar to the impacts from construction at the onshore HVAC booster station, HVDC converter/HVAC substation and the Hornsea Three landfall. The effect would not be significant in EIA terms.

9.18 Next Steps

9.18.1.1 The number of vehicles generated by construction-related activities for Hornsea Three is expected to exceed the 100 HDV movements per day assessment threshold, over a period of a year or more on a number of road links. This will be determined on receipt of traffic data collected post-PEIR. Where the 100 HDV movement threshold is exceeded, an air quality assessment will be undertaken to assess the impact of construction traffic exhaust emissions on local air quality, at human health receptors and designated sites. The approach to the air quality assessment will be developed in consultation with Norfolk County Council and the district authorities prior to carrying out the final assessment. Agreement will be sought on:

- The acceptability of the methodology used in the PEIR for assessing dust in the construction, operational and decommissioning phases; and
- An appropriate methodology for assessing vehicle emissions in the construction, operational and decommissioning phases.

Table 9.28: Summary of potential environment effects, mitigation and monitoring.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction Phase							
The temporary impacts of construction at the Hornsea Three landfall, the cable route and construction site access and the onshore HVAC booster station and HVDC converter/HVAC substation may affect receptors sensitive to dust (human and ecological).	Table 9.22	High without dust and control measures	Medium to high	Not significant with designed-in dust controls in place	N/A	Not significant	As described in Table 9.22
Decommissioning Phase							
The temporary impacts of decommissioning of the onshore cable route and onshore HVAC booster station and HVDC converter/HVAC substation may affect receptors sensitive to dust (human and ecological).	Table 9.22	High without dust control measures	Medium to high	Not significant with designed-in dust controls in place	N/A	Not significant	As described in Table 9.22

9.19 References

AEAT (2008) Analysis of the relationship between annual-mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective. Didcot, AEAT.

British Standard Institute (1983) BS 6069-2:1983 Characterization of air quality. Glossary. London, British Standard Institute.

Broadland District Council (BDC) (2015) Updating and Screening Assessment 2015. [Online]. Availiable at: https://www.broadland.gov.uk/downloads/file/924/updating_and_screening_assessment_2015.

Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2. London, The Stationery Office.

The Air Quality Standards Regulations 2010. 2010 SI 2010/1001. London, The Stationery Office.

Defra (n.d.) List of Local Authorities with AQMAs. [Online]. Available at: https://uk-air.defra.gov.uk/aqma/list?la=all&country=all&pollutant=all (Accessed 13/03/2017).

Defra (2013) Background Mapping data for local authorities. [Online]. Available at: https://uk-air.defra.gov.uk/data/laqm-background-home.

Department for Communities and Local Government (2012) National Planning Policy Framework. National Planning Policy Framework. London, Department for Communities and Local Government.

Department for Communities and Local Government (2014) Guidance, Air Quality. [Online]. Available at: https://www.gov.uk/guidance/air-quality--3.

Department of Energy and Climate Change (2011a) Overarching National Policy Statement for Energy (NPS EN-1). London, The Stationery Office.

Department of Energy and Climate Change (2011b) National Policy Statement for Renewable Energy Infrastructure (NPS EN-3). London, The Stationery Office.

Department of Energy and Climate Change (2011c) National Policy Statement for Electricity Networks Infrastructure (NPS EN-5). London, The Stationery Office.

EPUK and IAQM (2017) Land-Use Planning & Development Control: Planning For Air Quality. London, Institute of Air Quality Management.

European Council 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe.

Greater Norwich Growth Board (2014) Joint Core Strategy for Broadland, Norwich and South Norfolk. [Online]. Availiable at: http://www.greaternorwichgrowth.org.uk/planning/joint-core-strategy/ (Accessed 13/03/2017).

IAQM (2012) Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance. London, IAQM.

IAQM (2014) Guidance on the assessment of dust from demolition and construction. London, IAQM.

North Norfolk District Council (2008) North Norfolk Local Plan. Cromer, North Norfolk District Council.

North Norfolk District Council (2013) 2013 Air Quality Progress Report for North Norfolk District Council. [Online]. Avilable at: https://www.north-norfolk.gov.uk/media/2651/nndc_air_quality_progress_report_.pdf.

Planning Inspectorate (2016) Scoping Opinion: Proposed Hornsea Three. Bristol, Planning Inspectorate.

South Norfolk District Council (2013) 2015 Air Quality Progress Report. [Online]. Available at: https://www.south-norfolk.gov.uk/sites/default/files/Air_Quality_Report_2015.pdf.