

Norfolk Boreas Offshore Wind Farm

Consultation Report

Appendix 9.21 Norfolk Boreas Health outgoing documents

Applicant: Norfolk Boreas Limited
Document Reference: 5.1.9.21
Pursuant to APFP Regulation: 5(2)(q)

Date: June 2019
Revision: Version 1
Author: Copper Consultancy

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Norfolk Boreas Offshore Wind Farm

Environmental Impact Assessment

Health Impact Review Method Statement

Document Reference: PB5640-004-009

Author: Royal HaskoningDHV
Applicant: Norfolk Boreas Ltd
Date: January 2018



Date	Issue No.	Remarks / Reason for Issue	Author	Checked	Approved
1/12/2017	D01	Draft for internal review	P Thornton	DT	AD
5/01/2017	D02	Updated following internal review	PT	JD	AD
10/01/2018	D03	Issue for Vattenfall review	PT	JD	AD
29/01/2018	01F	Issue for Consultation	PT	CD	JL

This method statement has been prepared by Royal HaskoningDHV on behalf of Norfolk Boreas Limited in order to build upon the information provided within the Norfolk Boreas Environmental Impact Assessment (EIA) Scoping Report. It has been produced following a full review of the Scoping Opinion provided by the Planning Inspectorate. All content and material within this document is draft for stakeholder consultation purposes, within the Evidence Plan Process.

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1 INTRODUCTION

1. The purpose of this method statement is to build upon the information provided within the Norfolk Boreas Environmental Impact Assessment (EIA) Scoping Report, in outlining the proposed approach to be taken and considerations to be made in the assessment of the proposed development on human health.
2. This method statement and the consultation around it form part of the Norfolk Boreas Evidence Plan Process (EPP). The aim is to gain agreement on this method statement from all members of the Health Expert Topic Group (ETG), all agreement will be recorded in the agreement log.
3. This method statement has been produced following a full review of the Scoping Opinion provided by the Planning Inspectorate, responses to the Norfolk Vanguard Preliminary Environmental Information Report (PEIR) and consultation undertaken through the Norfolk Vanguard EPP.
4. The Health Impact Review assumes all legal and policy requirement relating to the protection of public health and delivery of safe working conditions are complied with by the project and enforced by the relevant authorities.
5. Information provided in this method statement is a draft for stakeholder consultation only and is provided in confidence. It is recognised that Norfolk Vanguard ETG meetings are being held in January 2018 and that agreements will be made during those meetings which are not reflected here. However due to certain project "Mile Stones" which have been set by the Crown Estate, Norfolk Boreas must progress on a programme which requires consultation on the Norfolk Boreas method statements prior to the conclusion of the Norfolk Vanguard EPP. Therefore, the material provided in this document represents the best available information at the time of writing.

1.1 Background

6. A Scoping Report for the Norfolk Boreas EIA was submitted to the Planning Inspectorate on the 9th May 2017. Further background information on the project can be found in the Scoping Report which is available at:

<https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010087/EN010087-000015-Scoping%20Report.pdf>

7. The Scoping Opinion was received on the 16th June 2017 and can be found at:

<https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010087/EN010087-000013-Scoping%20Opinion.pdf>

1.2 Norfolk Boreas Programme

8. This section provides an overview of the planned key milestone dates for Norfolk Boreas.

1.2.1 Development Consent Order (DCO) Programme

- EIA Scoping Request submission - 09/05/17
- Preliminary Environmental Information (PEI) submission - Q4 2018
- Environmental Statement (ES) and DCO submission - Q2 2019

1.2.2 Evidence Plan Process Programme

9. The Evidence Plan Terms of Reference (Royal HaskoningDHV, 2017a) provides an overview of the Evidence Plan Process and expected logistics, below is a summary of anticipated meetings:

- Agreement of Terms of Reference. - Q3 2017
- Post-scoping Expert Topic Group consultation:
 - Discuss method statements. -Q1 2018
- Expert Topic Group and Steering Group meetings as required: - 2018
 - To be determined by the relevant groups based on issues raised.
- PEI Report (PEIR) Expert Topic Group and Steering Group meetings: - Q4 2018/
- Q1 2019
 - To discuss the findings of the PEI (before or after submission).
- Pre-submission Expert Topic Group and Steering Group meetings: - Q1/Q2 2019

- To discuss updates to the PEIR prior to submission of the ES.

1.2.3 Consultation to Date

10. Norfolk Boreas is the sister project to Norfolk Vanguard (see section 2 for further details). A programme of consultation has already been undertaken for Norfolk Vanguard, much of which is of relevance to Norfolk Boreas and this is listed below:

- EIA Scoping Request submission - 03/10/16
- Receipt of Scoping Opinion - 11/11/16
- Steering Group meeting 21/03/16
- Steering Group meeting - 20/09/16
- Post-scoping Expert Topic Group meetings - Q1 2017
 - Discuss method statements and Project Design Statement.

11. Responses to the Norfolk Vanguard PEIR (Royal HaskoningDHV, 2017b) were received in December 2017. This method statement has been updated to incorporate any key comments made that affect the proposed methodology for the Norfolk Boreas EIA.

1.2.4 Survey Programme

12. Currently there is no intention to carry out any specific surveys in respect of the consideration of health impact. Other surveys have been carried out in other sections, for example noise, that may be referred to in this chapter.

2 PROJECT DESCRIPTION

2.1 Context and Scenarios

13. Norfolk Boreas is the sister project to Norfolk Vanguard. Vattenfall Wind Power Ltd (VWPL) is developing the two projects in tandem, and is planning to co-locate the export infrastructure for both projects in order to minimise overall impacts. This co-location strategy applies to the offshore and onshore parts of the export cable route, the cable landfalls, cable relay stations, and onshore substations.
14. The Norfolk Boreas project is approximately 12 months behind Norfolk Vanguard in the Development Consent Order (DCO) process. As such, the Norfolk Vanguard team is leading on site selection for both projects. Although Norfolk Boreas is the subject of a separate DCO application, the project will adopt these strategic site selection decisions.
15. In order to minimise impacts associated with onshore construction works for the two projects, VWPL is aiming to carry out enabling works for both projects under the Norfolk Vanguard DCO. This covers the installation of buried ducts along the onshore cable route, from the landfall to the onshore substation, modifications at the Necton National Grid substation, visual screening works access road construction, utility connections (water, electricity and phone) and site drainage.
16. However, Norfolk Boreas needs to consider the possibility that the Norfolk Vanguard project may not be constructed. In order for Norfolk Boreas to stand up as an independent project, this scenario must be provided for within the Norfolk Boreas DCO. Thus, there are two alternative scenarios to be considered in the context of the EIA and this method statement:

- **Scenario 1:** Norfolk Vanguard consents and constructs transmission infrastructure which would be used by Norfolk Boreas. This includes, cable ducts, access routes to jointing pit locations, extension of the Necton National Grid substation, overhead line modification at the Necton National Grid substation and any site drainage, landscaping and planting schemes around co-located infrastructure. Under Scenario 1 Norfolk Boreas will seek to consent the Horizontal Directional Drilling (HDD) at landfall, creation of the jointing and transition pits onshore project substation, cable relay station (if required) and the installation of cables in the ducts through a process of cable pulling.
- **Scenario 2:** Norfolk Vanguard is not constructed and therefore Norfolk Boreas will seek to consent and construct all required project infrastructure including: HDD at landfall, creation of the jointing bays, transition and jointing pits, installation of cable ducts, cable installation, cable relay station (if required), onshore project substation,

400kV interface works (between the onshore project substation and the Necton National Grid substation), extension to the Necton National Grid substation, overhead line modification and any site drainage and landscape and planting schemes. For the sake of clarity, the Norfolk Boreas project would, under Scenario 2, involve the construction and installation of all onshore infrastructure necessary for a viable project.

17. **Appendix 1** contains a set of figures showing the onshore infrastructure and **Appendix 2** contains a detailed comparison of what is included in the two different scenarios across all elements of the project. Both these appendices are provided in separate documents.
18. The two scenarios are likely to result in the same potential risks to human health (see section 4.2) however the scale / magnitude of the potential risks during construction for Scenario 1 would be much lower than Scenario 2 for most risks given that there would be significantly less ground disturbance / construction activities / plant and traffic in Scenario 1. Therefore potential risks to health from the following would be significantly lower:
- Accidental or incidental chemical spills/leaks/releases during transport;
 - Emissions to air (from plant/vehicles and fugitive emissions (e.g. dust));
 - Emissions to water (surface and groundwaters);
 - Emissions to soil (contaminants and ground gas);
 - Waste disposal and disposal transport;
 - Community anxiety and stress.
19. In the operational phase for both scenarios, the potential risks to human health are similar. Given the limited source scales (the nature of potential sources of risk factors) are considered to be low to negligible and there is very little scale difference between either scenario. Though for most risks (those listed above), Scenario 2 would be likely to have lower magnitude sources, and hence slightly smaller magnitudes for potential impacts.

2.2 Study Area

20. Potential impacts on human health relate to direct and indirect effects which will be assessed in the following dedicated EIAs within the the PEI and Environmental Statement (ES) :
- Marine water and sediment quality;
 - Ground conditions and contamination;
 - Air quality;
 - Onshore noise and vibration;

- Traffic and transport;
- Landscape and visual; and
- Socio-economics (including tourism and recreation).

21. The study area will be defined based on these assessments and the populations which they identify as being potentially impacted. Both offshore and onshore 'sources' of potential risks to health will be considered in relation to the present population receptors. However, given that there are no 'resident' population present in the coastal waters, transient human receptors in the marine environment will not be considered in the assessment.

2.3 Indicative Worst Case Scenario

22. The worst case scenarios are those that give rise to greater physical disturbance (i.e. ground excavation, vehicle / plant movements) or chemical sources (i.e. increased types, increased volumes, increased potency, management methods) closer to populations in the study area, or those that extend the duration of such disturbances or source.
23. The assessment will initially be made on the basis of the Scenario 2 as the worst case scenario whereby Norfolk Vanguard is not constructed and therefore Norfolk Boreas consents and construction activities require project infrastructure including cable ducts, extension to the Necton National Grid Substation, overhead line modification and any landscape and planting schemes.
24. A separate assessment will be then be completed for Scenario 1 construction phase. As identified in section 2.1, the majority of potential construction impacts relating to human health under Scenario 1 are likely to conclude much lower magnitudes of scale (of risk sources) for potential impacts; the scales of disturbance are much lower in Scenario 1 because much of the infrastructure (ducts, substations, etc) would already have been built as part of the Norfolk Vanguard project.
25. Potential impacts during the operational phase would be of a higher magnitude for Scenario 1 than Scenario 2, as the assumption is that only Scenario 1 includes the additional 'activities' with the Norfolk Vanguard infrastructure and activities occurring. However, in terms of potential magnitudes the frequency and scale is significantly lower than in the construction phase.
26. Cumulative impacts with Norfolk Vanguard will be considered as part of the cumulative impact assessment.

3 BASELINE ENVIRONMENT

3.1 Desk Based Review

3.1.1 Available Data

27. Data sources related to human receptors that will be reviewed and updated are presented in the following method statements:
- Marine water and sediment quality;
 - Ground conditions and contamination;
 - Air quality;
 - Onshore noise and vibration;
 - Traffic and transport;
 - Landscape and visual; and
 - Socio-economics (including tourism and recreation).
28. Other data sources include:
- ONS and Neighbourhood statistics regarding Health and Care for local, County, and regional data, particularly focussing on general health.
 - OS maps combined with ONS data for lower level super output areas to identify detailed community and population data at relevant spatial locations.

3.2 Planned Data Collection

29. No additional survey is planned as it is considered that appropriate data will be obtained as detailed in the relevant chapters listed in section 3.1.1 above.

4 IMPACT ASSESSMENT METHODOLOGY

4.1 Defining Impact Significance

30. There is no statutory guidance for assessing the significance of health impacts within the context of an EIA. The Institute of Environmental Assessment and Management (IEMA) have prepared a ‘primer’ and a briefing note in relation to the consideration of health in impact assessment (Cave *et al.*, 2017a; Cave *et al.*, 2017b). The methodology for consideration of impacts on human health as a result of the construction and operation of Norfolk Boreas would align with the approaches and uncertainties presented in these notes. Given the lack of specific guidance the standard source-pathway-receptor model approach used in EIA will be adopted. Similarly, appropriate criteria extracted from relevant best practice documents for determining impact significance / risk likelihood will also be utilised.
31. The significance of the impact is determined through the identification of the magnitude of the impact and the likelihood of the impact occurring. The following sections describe these elements of the approach.

4.1.1 Likelihood

32. The likelihood (or probability) of a health impact will be determined using the definitions presented in **Table 4.1**, which is derived from risk methodology examples in IFC (2009). The likelihood column provides the ‘rating’ which will be used to inform the assessment of significance. The rating is selected on the basis of the description or probability of the likelihood occurring. The description definitions are intended to provide a ‘scalar’ indication of whether the affect will actually occur (essentially if there is uncertainty), whilst the ‘probability’ provides definition of intermittency if an effect is likely.

Table 4.1 Example definitions of likelihood of a particular health impact occurring

Likelihood	Description
High	Very likely
Medium	Likely
Low	Possible
Negligible	Unlikely

4.1.2 Magnitude

33. The magnitude of each health impact is determined from a consideration of the numbers of receptors (human) within the influenced zone (pathway), the frequency (constant or intermittent) and duration of the source impact, and the actual physical or mental effect that would arise. The magnitude of the impacts will be determined

and classified using the description presented in **Table 4.2** (based on various guidance (e.g. ICMM (2010) and IFC (2009)), on the basis of expert judgement. Justification and rationale of how magnitude has been assigned will be provided throughout the assessment.

34. The health impact review will consider the residual impacts as assessed and determined in other relevant topic chapters, to ensure that the focus of any required mitigation will be on remaining potential health risks.

Table 4.2 Example definitions of the magnitude levels for health impacts

Magnitude	Definition
High	Deaths, acute or chronic diseases or mental ill health would arise. Exposure to noise, air pollutants, odour, visual disamenity of high intensity and/or long duration and/or over a wide geographical area and/or likely to affect a large number of people (e.g. over 500) and/or vulnerable groups e.g. children/older people. Long-term and/or permanent effects on physical and mental health.
Medium	Exacerbation of existing health conditions, or temporary symptoms. Exposure to noise, air pollutants, odour, visual disamenity of medium term and/or moderate intensity and/or over a relatively localised area and/or of intermittent duration and/or likely to affect a moderate-large number of people e.g. between 100-500 and/or vulnerable groups. Medium-term and/or temporary effects which may affect physical and mental health.
Low	Disruption to quality of life or wellbeing. Exposure to noise, air pollutants, odour, visual disamenity of low intensity and/or short/intermittent duration and/or over a small area and/or affect a small number of people e.g. less than 100. Short-term and/or temporary effects which are unlikely to affect physical and mental health.
Negligible	Health effects are barely discernible or measurable though complete absence cannot be shown.

4.1.3 Significance

35. Following the identification of likelihood and magnitude of the effect, it is possible to determine the significance of the impact. The matrix presented in **Table 4.3** will be used to identify the significance of an impact. However, the matrix (and indeed the definitions of likelihood and magnitude) is a framework to aid understanding of how a judgement has been reached from the narrative of each impact assessment and it is not a prescriptive formulaic method.
36. Each of the technical chapters provides the criteria, including sources and justifications, for quantifying the different levels of impact. Where possible, this is based upon quantitative and accepted criteria (for example, noise assessment guidelines, air quality standards, water quality thresholds), together with the use of

value judgement and expert interpretation to establish to what extent an impact is significant.

Table 4.3 Impact Significance Matrix

		Magnitude			
		High	Medium	Low	Negligible
Likelihood	High – likely to occur frequently	Major	Major	Moderate	Negligible
	Medium – likely to occur infrequently	Major	Moderate	Minor	Negligible
	Low – unlikely to occur	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible

37. **Table 4.4** presents a definition of the impact significance identified through the matrix approach.

Table 4.4 Impact Significance Definitions

Impact Significance	Definition
Major	The impacts could result in permanent physical health effects of a permanent nature or long-term intermittent effects affecting large numbers across the district.
Moderate	The impact could be notable across the district or number of areas, and result in long-term continuous effects with direct physical impacts to populations.
Minor	The impact could be either intermittent or temporary and limited in scale, both with no lasting physical effects.
Negligible	No noticeable or quantifiable health effects within the local population, or very localised temporary levels but with no lingering after effects.

38. Note that for the purposes of the EIA, **major** and **moderate** impacts are usually deemed to be 'significant'. In addition, whilst **minor** impacts are not significant in their own right, it is important to recognise that they may contribute to significant impacts cumulatively or through interactions.
39. Embedded mitigation will be referred to and included in the relevant topic chapter assessment of impacts. Such mitigation specifically relates to Construction Industry Research and Information Association (CIRIA) Environment Good Practice on Site, 3rd Edition and the Construction Industry Publication (CIP) Construction Environmental Manual. However, if further mitigation is required additional measures will be identified, and an assessment made of the post-mitigation residual impact.

4.1.4 In-combination Assessment

40. Following the identification of the significance of all the potential impacts on human health, an assessment will then be made of which of those human health receptors 'overlap' in terms of the impacts. If a segment or segments of population are affected by more than one impact, the assessment will seek to determine whether those impacts would influence the receptors additively or synergistically to increase the significance of the overarching 'in-combination' impact.

4.2 Potential Impacts

41. The following potential impacts have been recommended for consideration within the assessment as derived from the Scoping Opinion responses and identified in the Scoping Report prepared on behalf of Vattenfall:

- Health impact resulting from accidental or incidental chemical spills/leaks/releases during transport during construction, operation & maintenance, and decommissioning.
- Health impact as a result of emissions to air (from plant/vehicles and fugitive emissions (e.g. dust)) during construction, operation & maintenance, and decommissioning.
- Health impact as a result of emissions to water (surface and groundwaters) during construction, operation & maintenance, and decommissioning.
- Health impact as a result of emissions to soil (contaminants and ground gas) during construction, operation & maintenance, and decommissioning.
- Health impacts as a result of transport related accidents

42. The following additional impacts will be considered on the basis of potential risk identified in the Scoping Report prepared on behalf of Vattenfall:

- Health impact from electromagnetic radiation from substations, cable relay stations and cables during operation.
- Health impact as a result of waste disposal and disposal transport during construction, operation & maintenance, and decommissioning.
- Health impact as a result of community anxiety and stress during construction, operation & maintenance, and decommissioning.

5 POTENTIAL IMPACTS

5.1 Potential Impacts during Construction

5.1.1 Impact: Accidental / Incidental Chemical Spills/Leaks/Releases during Transport

43. The accidental spillage or leak of chemicals transport during construction or within the equipment being installed could have potential health risks.

5.1.1.1 Approach to assessment

44. In the Norfolk Boreas Scoping Opinion the SoS has requested that all known chemicals to be used should be identified (to Chemical Abstract Service (CAS) numbers alongside the names). Whilst assessment to quantify impact of unplanned spills is not possible, the intent would be to highlight the potential risks of the chemicals likely to be used (where known at the application stage) and make recommendations or clarify the required procedures for transporting and managing such chemicals in order to avoid the risk of spillage, or identifying response measures to minimise the risk in the event of spillage or leakage.

5.1.2 Impact: Emissions to Air

45. Emissions from plant, machinery and road transport can impact on air quality, particularly in relation to particulates and other chemicals such as nitrogen oxides,, sulphur dioxide, volatile organic compounds (VOCs) and carbon monoxide. Similarly dust generation during construction activities can result in localised increases in airborne particulates. These all can result in temporary or permanent respiratory health risks in particular to vulnerable receptors (i.e. the young, old, or those with existing pulmonary or coronary health issues). Elevated dust levels can also represent a nuisance impact to all receptors.

5.1.2.1 Approach to assessment

46. The approach to the assessment of impacts on air quality is detailed in the Air Quality method statement.

5.1.3 Impact: Emissions to Water

47. Emissions of contaminants to water (surface, coastal, and groundwater) could, through these pathways, give rise to exposure by contact or ingestion, and thereby impact on human health. As any planned discharges would be subject to regulatory compliance, the key consideration would be associated with the accidental spillage or leaks considered above.

5.1.3.1 Approach to assessment

48. The approach to the assessment of impacts on onshore water quality is detailed in the Onshore Water Resources and Flood Risk method statement (document reference PB5640.004.008).
49. The approach to the assessment of impacts on coastal water quality is detailed in the Marine Water and Sediment Quality method statement (document reference PB5460.004.019).

5.1.4 Impact: Emissions to Soil

50. Emissions of contaminants to soil could give rise to exposure by contact or ingestion and thereby impact on human health, for example if they occur in areas used for agriculture. Such releases may also be associated with the long-term formation of ground gas.

5.1.4.1 Approach to assessment

51. The approach to the assessment of impacts on soil quality is detailed in the Ground Conditions and Contamination method statement (document reference PB5460.004.001).

5.1.5 Impact: Waste Disposal and Transport

52. Public Health England requested the consideration of impacts of waste disposal and the transport of the waste to the disposal locations.

5.1.5.1 Approach to assessment

53. All waste will be disposed of through licenced waste transport provider to the appropriately licensed disposal sites. As these are licenced, the impacts of receiving and managing the waste have already been considered and form part of the site's operation and management regime. Consequently, there is no further consideration for this element. The transport of the waste will be considered in line with the assessment method in relation to the Accidental / Incidental Chemical Spills/Leaks/Releases during transport as described earlier. However, there will be less certainty over the nature of the waste material. However, similar risk avoidance and mitigation measures will be identified.

5.1.6 Impact: Community Anxiety and Stress

54. Public Health England states that large scale industrial projects can result in increased anxiety and stress across receptor communities, particularly with respect

to the lack of information that is often provided, and uncertainties over how people will be affected.

5.1.6.1 Approach to assessment

55. There is no established methodology for quantifying community anxiety or stress. Communities that are within a zone of influence / disturbance (i.e. noise, air, transport, water, and visual) that could arise will be identified. Focussed information will be provided to the Norfolk Boreas communications team regarding the nature of the disturbance activities that could impact on those communities (essentially a summary of each of the particular impacts and their scale alongside the description of activities and programme). The project is committed to regular community consultation and engagement through a range of media and events. These public fora and consultation tools will provide an indication regarding the level of community stress or anxiety associated with the proposed project. Elements of the engagement material will be tailored to seek feedback from the consultees.

5.2 Potential Impacts during O&M

5.2.1 Impact: Electromagnetic Radiation

56. Concern regarding the long-term exposure to electromagnetic radiation from electricity cables and related infrastructure from this and other wind farm and grid connection projects has been raised as a concern.

5.2.1.1 Approach to assessment

57. The project will be designed and locations for electricity cables and infrastructure selected to ensure that the relevant ICNIRP (2009) guidelines will not be exceeded. Confirmation will be made through clarification of the relevant exposure levels for the different cables and thresholds in relation to the presence of receptors and probability.

5.2.2 Impact: Community Anxiety and Stress

58. Public Health England states that large scale industrial projects can result in increased anxiety and stress across communities particularly with respect to the lack of information that is often provided and uncertainties over how they will be affected.

5.2.2.1 Approach to assessment

59. The approach to the assessment will be as described for the construction phase, though the operational lifetime of the project will be taken into account.

5.3 Potential Impacts during Decommissioning

60. No decision has been made regarding the final decommissioning plans for the substation, as it is recognised that industry best practice, rules and legislation change over time.
61. A full EIA will be carried out ahead of any decommissioning works being undertaken. The programme for decommissioning is expected to be similar in duration to the construction phase of 18 months.

5.4 Potential Cumulative Impacts

62. Any other project with the potential to result in impacts that may act cumulatively with Norfolk Boreas will be identified during consultation as part of the EPP and following a review of available information. These projects will then be included in the Cumulative Impact Assessment (CIA) and therefore are scoped into the assessment.
63. The assessment would consider the potential for significant cumulative impacts to arise as a result of the construction, operation and decommissioning of Norfolk Boreas in the context of other developments that are existing, consented or at application stage.
64. Cumulative impacts as a result of the proposed Norfolk Vanguard project; the Dudgeon offshore wind farm and the proposed Hornsea Project 3 Offshore Wind Farm will be considered as part of the assessment.
65. The following potential cumulative impacts will be assessed:
 - Construction phase:
 - Emissions to air;
 - Emissions to water;
 - Emissions to soil;
 - Community anxiety and stress.
 - Operational phase:
 - Electromagnetic radiation;
 - Community Anxiety and Stress.
 - Decommissioning phase:
 - Emissions to air;
 - Emissions to water;
 - Emissions to soil;
 - Community anxiety and stress.

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